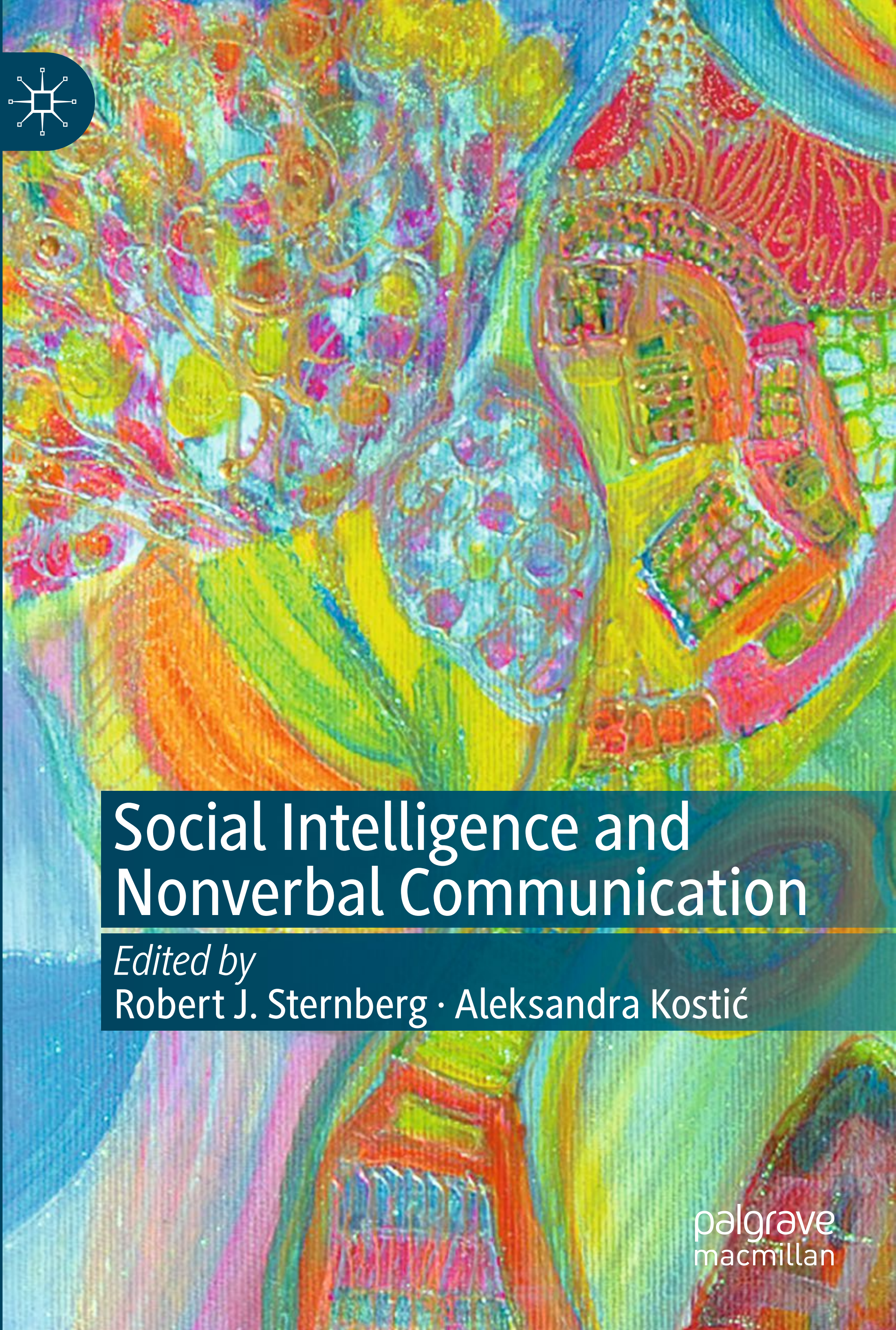

Social Intelligence and Nonverbal Communication

Edited by
Robert J. Sternberg · Aleksandra Kostić

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Social Intelligence and Nonverbal Communication

"Robert J. Sternberg and Aleksandra Kostić have come up with the right book at the right time. Social intelligence is comprised of a wide range of abilities, but the foundation of them all is nonverbal processing skill. They have gathered the leading researchers from different fields of study to present what is known about what has become an increasingly important area. I applaud this effort and recommend it to anyone with an interest in the origins and applications of nonverbal communication ability."

—Stephen Nowicki Jr.

"Developing social intelligence is crucial to effective functioning in virtually all arenas of our daily life. As this book notes, nonverbal behavior plays a central role in that process. This book is a 'must have' resource for anyone seeking a greater understanding how we accurately (and inaccurately) send and receive messages. The content is especially appealing to scholars and students in Psychology and Communication. The editors have brought together a remarkable cast of distinguished international scholars, who clearly report the most recent research on a variety of fascinating topics ranging from the evolutionary roots of social intelligence to human-machine interaction."

—Mark L. Knapp, *Jesse H. Jones Centennial Professor Emeritus and University of Texas Distinguished Teaching Professor Emeritus*

"I am pleased to be able to recommend wholeheartedly a new compendium of research and theory on the non-verbal communication dimension of social intelligence. Editors Robert Sternberg and Aleksandra Kostić head a team of more than a dozen leading researchers offering an interdisciplinary approach that covers many domains of psychology. They highlight both the real-world implications for understanding much of human behavior, as well as offering us a better understanding of social media and political communication.

Social Intelligence: The Adaptive Advantages of Nonverbal Communication is essential reading for both academics and laypersons wishing to have a clearer and more profound understanding of modern society as a whole."

—Philip Zimbardo, Ph.D., *Emeritus Professor of Psychology, Stanford University, author of the bestseller, The Lucifer Effect*

"This book on people's wisdom in using and understanding nonverbal communication marks a new level of maturity in the nonverbal field. First we figured out how to measure such ability, then we asked about its correlates, and finally we are asking what it's actually good for. Kudos to the field and to these talented authors!"

—Judith Hall, *University Distinguished Professor of Psychology, Northeastern University, USA*

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Preface

The study of intelligence has a long and somewhat checkered past. There are many reasons for this mixed background but, almost certainly, one is that people can be intelligent, in a conventional sense, and lack much (and sometimes, seemingly any) social, practical, or emotional skills (Sternberg, 2003). The so-called intelligent person may do well on a conventional intelligence test but fare only poorly in his or her ability to adapt to the environment, which, from a Darwinian point of view, is essential to intelligence. Indeed, historically, intelligence has been defined at least in part in terms of the ability to adapt to the environment (e.g., Sternberg & Detterman, 1986).

Recognizing the limitations of conventional conceptions of intelligence, some researchers have sought to expand conceptions of intelligence better to reflect the importance of various noncognitive skills that are critical for adaptation to the environment. One such set of skills—arguably, one of the most important sets—is to be found in what has come to be called *social intelligence.* Social intelligence is the ability to understand, flexibly manage, and, sometimes, control interactions with other people (see various definitions in Albrecht, 2009; Goleman, 2007; Kihlstrom & Cantor, 2011, in press; see also Barnes & Sternberg, 1989; Sternberg & Smith, 1985).

The concept of social intelligence appears to date back to Dewey (1909), but it was popularized by Thorndike (1920). Different taxonomies of social intelligence have been proposed. But one simple one is between verbal and nonverbal social intelligence, whereby verbal social intelligence pertains to interactions of a verbal nature—orally or in writing—and nonverbal social intelligence pertains to interactions that are or a nonverbal nature, such as eye contact, gesture, facial expressions, bodily form and contact, and so forth. Nonverbal social intelligence is important in many domains—in job interviews, in giving presentations, in intimate relationships or attempts to establish intimate relationships, in inferring friendly or hostile intent, and in conveying messages of approval or disapproval, among other things. Sometimes, nonverbal communication supports verbal communication, but other times, it directly contradicts it. People who are high in social intelligence need to learn to use nonverbal cues to discern whether, for example, what they are hearing corresponds to what a speaker actually thinks or feels. As all of us know, sometimes people say one thing and nonverbally leak another so that nonverbal communication becomes our primary means for detecting deception.

The goal of this book is to review in a comprehensive and readable way the best work of recent years (focusing especially on the last decade or so) on nonverbal social intelligence. Anyone reading the book will be up-to-date regarding the significant work of the past decade in this important field in psychology. Although the field is sometimes viewed as a branch of social psychology, it is actually interdisciplinary, cross-cutting social, cognitive, developmental, differential, personality, and biological psychology.

Why a Book on Nonverbal Social Intelligence, and Why Now?

First, many scholars, the editors and authors included, have felt that psychology needs to reach out to the real world in terms of its implications for understanding human behavior. The older approach of doing lab experiments with little ecological validity just does not meet current needs. There are few fields with more real-world implications than that of nonverbal social intelligence.

Second, in society today, words seem to be of less and less value in knowing what a person thinks or feels. Anyone who relies on the words of a politician or even political leader to know what he or she is thinking is bound to be disappointed. People are using social media as much to disguise what they really think and why, as to express their true beliefs.

Television and other electronic means of mass communication increasingly are controlled by conglomerates with political and economic agendas. Nonverbal communication is becoming increasingly important as the value of verbal communication for conveying truth seems to diminish.

Third, research on nonverbal social intelligence has moved at a fast clip in the last decade, some of it in conjunction with research on nonverbal emotional intelligence. Those familiar with older research will find that research has quickly become dated.

Finally, research on nonverbal social intelligence provides a window into society as it exists today. Some means of nonverbal communication, such as emojis, hardly were used a decade or two ago. Understanding nonverbal social intelligence helps one understand society as a whole.

This book will be of interest to anyone with an interest in either intelligence or communications. Thus, the audience may include social psychologists, cognitive psychologists, personality psychologists, differential psychologists, developmental psychologists, and others.

In putting together the book, we have had several issues in mind: that we (1) recruit the top authors in the field; (2) further seek authors who are diverse in terms of geographic location and psychological perspective; (3) cover hot important topics for psychology and communication; (4) provide up-to-date theory, data, and applications; (5) provide comprehensive coverage of the field; and (6) provide chapters that are eminently readable.

We hope you find the content of this book stimulating and provocative for your own further thought about the topic of social intelligence as revealed by nonverbal communication.

Ithaca, NY — Robert J. Sternberg
Niš, Serbia — Aleksandra Kostić

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Social Intelligence: What It Is and Why We Need It More than Ever Before

Robert J. Sternberg and Avery Siying Li

Traditionally, being "book smart" has been viewed as a valuable predictor of success (Sternberg, 2000). However, being competent at conventional intelligence tests or good at schoolwork is not a guarantee that one can adjust to different environments and succeed in the real world. For that, a person also needs social intelligence. In this chapter, we discuss what social intelligence is and how it relates to other kinds of intelligence, discuss then the role of nonverbal communication in social intelligence, and then discuss how it fits into a broader concept of adaptive intelligence, or intelligence as adaptation to the environment.

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Definition of Social Intelligence

The definition of social intelligence has evolved over time (see Kihlstrom & Cantor, 2011, in press, for a much more detailed history of this evolution). Social intelligence was first mentioned and described by Dewey (1909) as the ability to observe and understand social circumstances as part of the ultimate goal of moral education. Later on, the concept of social intelligence was included in one of Thorndike's (1920) three kinds of intelligences and defined as "the ability to understand and manage men and women, boys and girls—to act wisely in human relations" (p. 228). (The other two aspects of intelligence were abstract and mechanical intelligence.) Wedeck (1947) went further, describing it as a "psychological ability to judge correctly the feelings, moods, and motivations of individuals" (p. 133). Likewise, Wechsler (1958) indicated that social intelligence is a "facility in dealing with human beings" (p. 8). Later on, nonverbal cues were included in the conceptualization of social intelligence: "the ability to understand the thoughts, feelings, and intentions of other people as manifested in discernible, expressional cues" (O'Sullivan, Guilford, & deMille, 1965, p. 6). Barnes and Sternberg (1989) added to this definition by emphasizing the importance of information-decoding skills. They further defined social intelligence as "the ability to accurately decode social information" (p. 263). They found, as did Sternberg and Smith (1985), that social intelligence as the ability to decode is relatively independent of measures of general intelligence. However, different social-intelligence tests, such as discerning whether a photograph is of a real couple or a fake couple (i.e., an unconnected couple posing as a real couple) and discerning who of two people is the supervisor and who is the supervisee, are also relatively independent of each other. On average, women performed better than men on the tests. Finally, Daniel Goleman has viewed social intelligence as emerging from the interaction of people, in contrast to emotional intelligence, which can emerge from just a single individual (Goleman, 1995, 2006).

The first to integrate social intelligence fully into a complete model of intelligence was J. P. Guilford (1967; Guilford & Hoepfner, 1971). Guilford suggested that intelligence could be understood, metaphorically, in terms of a cube crossing five contents, six products, and five operations. The total number of abilities was 5 × 6 × 5, or 150 (or 120, in the original version of the model). Relevant to social intelligence was what Guilford referred to as "behavioral" content. For example, one ability was evaluation (operation) of behavioral (content) systems (product). The behavioral facets of the theory were tested through items similar to those on tests generated by other models.

Howard Gardner later integrated multiple facets of intelligence into his conceptualization of multiple intelligences. He created a theory of eight multiple intelligences, which included allegedly independent intelligences such as linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, and naturalist. Two further intelligences, however, could be considered as relevant to the full concept of social intelligence: interpersonal intelligence and intrapersonal intelligence (Gardner, 1983, 2011). This theory was partly informed by Walker and Foley (1973), who went beyond decoding skills to include encoding communication skills in their definition of social intelligence: "the ability to understand people and to act wisely in social situations" (p. 839). Similarly, Marlowe (1986) defined social intelligence as "the ability to understand the feelings, thoughts, and behaviors of persons, and to act appropriately upon that understanding" (p. 56). This definition combined the interpersonal and intrapersonal components from Gardner's multiple intelligences theory and is consistent with Sternberg's practical intelligence (Romney & Pyryt, 1999).

In Sternberg's theory of successful intelligence (1997, in press-b), social intelligence is a part of practical intelligence. Practical intelligence is a function of tacit knowledge (Polanyi, 1976), or what one needs to know to succeed in life that is not explicitly taught and that often is not even verbalized. For example, typically, no one teaches a child how to encode or decode nonverbal cues or how to recognize when another person is extremely upset. One learns from experience.

What are some of the main psychometric and other properties of practical intelligence (Hedlund, in press; Hedlund et al., 2003; Hedlund, Wilt, Nebel, Ashford, & Sternberg, 2006; Sternberg, 2009, 2010; Sternberg et al., 2000; Sternberg & Hedlund, 2002; Wagner, 2011)? First, practical intelligence can be measured reliably. In particular, when measures of managing oneself, managing others, and managing tasks are included in a practical-intelligence test, the measures show high internal consistency within category and high correlations between categories. Second, measures of practical intelligence tend to show relatively weak correlations with typical measures of general (cognitive) intelligence. In one case, the correlation of practical with general intelligence was negative (Sternberg et al., 2001). Third, measures of practical intelligence provide significant incremental validity over conventional intelligence tests in predicting both academic and extracurricular performance as well as in predicting on-the-job performance (Sternberg, 2010). Fourth, practical intelligence can be statistically differentiated not only from academic aspects of intelligence but also from various aspects of personality (Sternberg & Hedlund, 2002). Fifth, measures of practical intelligence can predict success in military leadership independently of measures of general intelligence (Horvath et al., 1999). Sixth, practical-intelligence measures, at least within a given domain (such as for salespeople or business executives or academics), tend to be moderately to highly correlated with each other (Sternberg et al., 2000). Finally, factor analyses reveal practical intelligence to be a separate factor from general intelligence, except when practical intelligence is measured through multiple-choice format. When it is measured by multiple-choice items, it comes closer to general intelligence (Sternberg, Wong, & Sternberg, 2019).

Sternberg and his colleagues further investigated social intelligence in the context of style of conflict resolution (Sternberg & Dobson, 1987; Sternberg & Soriano, 1984). Problems were presented in the form of narratives that posed interpersonal, interorganizational, or international conflicts. Participants were asked to evaluate solutions that were of different kinds, such as resolving conflicts by physical threats, economics threats, seeking third-party intervention, and so forth. The style of conflict resolution that was most highly correlated with general intelligence was a step-down style, whereby the protagonist tried to resolve the conflict by means that involved lessening rather than heightening tensions.

Should Social Intelligence Be Separated from General Intelligence?

The concept of social intelligence was not explicitly included in most definitions of human intelligence until Sternberg (1997) included it as part of practical intelligence—an ability to use knowledge and skills to solve problems in daily life—in his triarchic theory of successful intelligence. Yet the question of whether social intelligence should be independent from general intelligence has been long debated. Wechsler (1958), for instance, claimed that social intelligence is “just general intelligence applied to social situations” (p. 75). In contrast, Riggio, Messamer, and Throckmorton (1991) argued that social intelligence is a distinctive psychological construct and emphasized the necessity of distinguishing it from general intelligence.

Despite the efforts of scholars like Riggio, Messamer, and Throckmorton (1991), social intelligence could not yet be established as a distinct and separate domain (Marlowe, 1986), in part due to shortcomings with measurement. Stricker (1982) proposed that many of the tests used to measure social intelligence overlapped with general intellectual ability, causing confusion and making it difficult to separate social intelligence from general intelligence. Keating (1978) had the same observation as Stricker, noting that the format used in social-intelligence tests might overlap with that in measurements of academic intelligence, which would be problematic. Green (1981) agreed, pointing out that the paper-and-pencil format of social-intelligence tests measured verbal reasoning, which meant that the test no longer exclusively measured social intelligence. Eventually, however, improved methods were able to separate out measurements of distinctly social intelligence and laid a solid foundation for the independence of the construct (Marlowe, 1986). For instance, Marlowe and Bedell (1982) used true-or-false questions to keep the “academic” requirements of taking the test to a minimum and prevent any other interference. These developments are important because once social intelligence is well defined and measured, the construct at least potentially can be shown to be independent from general intelligence.

Clinical, neural, and social evidence also support the notion of social intelligence as being distinct from general intelligence. For example, some children with autism spectrum disorders (ASD) are highly intelligent cognitively, but their social intelligence is low (Humphrey, 1976). Individuals who suffer from ASD have significantly impaired social skills compared with their academic intelligence (Klin et al., 2006).

Neural evidence comes from Brothers's (1990) proposition that the orbitofrontal cortex (OFC), superior temporal gyrus (STG), and amygdala comprise the "social brain." Damasio, Tranel, and Damasio (1990) further elaborated upon this proposition by finding that damage to certain brain areas causes defects in social judgment, while general problem-solving ability remains intact. Likewise, Tranel and Hyman (1990) claimed that amygdala damage leads to a loss of social judgment. If social and nonsocial intelligence are functionally dissociated, it is possible to claim relative neural independence between them. Baron-Cohen et al. (1999), by testing high-functioning autism and Asperger Syndrome (AS) patients who have deficits in social intelligence, used neuroimaging methods to support the "social-brain" theory and to provide evidence for the independence of social intelligence from general intelligence.

In today's society, it is just as common to find people who are skilled at interacting socially but who lack cognitive problem-solving skills (Karmiloff-Smith, Grant, Bellugi, & Baron-Cohen, 1995) as it is to find people who have a natural ability to learn academic concepts but are inept socially (Baron-Cohen et al., 1999).

The Role of Nonverbal Communication

One classification scheme that can be used to further categorize types of social intelligence is to separate nonverbal from verbal communication. While definitions of nonverbal communication can range from fairly broad to relatively narrow (Harper, Wiens, & Matarazzo, 1978), researchers and laypersons generally define nonverbal communication as all human responses which are not overtly manifested as words, either spoken or written (Harper et al., 1978; Knapp, 1972, p. 57).

Classifications of nonverbal communication vary, depending on different criteria used by researchers. Some researchers have classified nonverbal communication based on body area or body activities (Harper et al., 1978). Barker and Collins (1970) comprehensively categorized 18 forms of nonverbal communication, including commonly recognized forms, such as gestures, facial expressions, and bodily movements, as well as some less recognized ones, like learning, media, and time. Alternatively, Poyatos (1974) classified nonverbal phenomena into verbal-vocal, nonverbal-vocal, and nonverbal-nonvocal categories based on the sensorial channels involved. Duncan (1969) added olfaction, skin sensitivity to temperature, and kinesic behavior to common interpretations of nonverbal communication, which typically include eye behavior, facial expressions, gestures, and body movements. Knapp (1972) expanded the definition further to include paralanguage, touching behavior, proxemics, artifacts, and environmental factors.

Other researchers have interpreted nonverbal communication in a more abstract way. For instance, Reusch and Kees (1972) proposed that nonverbal communication is "action language," "sign language," and "object language." Work by Hall, Rosenthal, Archer, DiMatteo, and Rogers (1977) followed, describing nonverbal communication as the sending and receiving of nonverbal cues indicating feeling or attitude. Burgoon, Buller, and Woodall (1996) went on to describe nonverbal communication as "behaviors that are typically sent with intent, are used with regularity among members of a social community, are typically interpreted as intentional, and have consensually recognized interpretations" (p. 113).

Although academia has so far failed to reach a consensual definition, it is important for researchers to continue to work toward a full conceptualization of nonverbal communication. Ultimately, it affects—and is affected by—a variety of disciplines, including various branches of psychology (social, cognitive, personality, and biological psychology), communication studies, sociology, and anthropology, and, as discussed next, it influences basic aspects of daily living.

Nonverbal communication affects every aspect of social human interaction (Hall, Horgan, & Murphy, 2019). Consequently, it is both useful and impactful in many life situations, such as those arising in the workplace, and in industries such as sales and marketing.

In the workplace setting, nonverbal communication skills play an irreplaceable role, helping individuals convey information in job interviews, discern other people's intentions, gain a better understanding of the surrounding environment, and improve work performance (Gorman, 2011; Hogan, 2008; Kudesia & Elfenbein, 2013; Perkins, 2008). Ambady and Gray (2002) found that nonverbal information is much more reliable than verbal information in first-time meetings, such as interviews, since it does not require careful cognitive processing (Dimberg, Thunberg, & Elmehed, 2000). More gestures, eye contact, and smiles in job interviews can leave a more favorable impression (Washburn & Hakel, 1973). Moreover, nonverbal communication can help individuals navigate power dynamics and workplace relationships. Nonverbal cues can be used to convey leadership and power between information senders and receivers, as well (Hall, Coats, & Smith LeBeau, 2005). To interpret these cues, Chesebro (2014) emphasized the importance of nonverbal communication and suggested people familiarize themselves with nonverbal signals to discern others' intentions in the workplace.

Outside the workplace, nonverbal cues are important tactics in retail sales and marketing, as well. Visual, auditory, olfactory, gustatory, and tactile choices in atmosphere will affect sales (Grewal, Roggeveen, Puccinelli, & Spence, 2014). Nonverbal communication can also influence interactions with clients. Smiles and friendly behaviors from a salesperson encourage customers to smile back and lead to a higher chance of purchase (Puccinelli, Motyka, & Grewal, 2010). Handshaking, use of touch, head nodding, and constant eye contact by employees imbues interactions with customers with feelings of friendliness and trust (Sundaram & Webster, 2000).

In sum, nonverbal social intelligence is crucial to social interaction. It is distinct from academic intelligence, but no less important, albeit in different domains. Decoding nonverbal cues helps us understand society as a whole. Learning to execute these cues enables us to influence others in ways that can be more powerful than anything words could ever achieve.

Adaptive Intelligence

In recent work, Sternberg (in press-a) has suggested that conceptions of intelligence have strayed from their original conceptualization, which was of intelligence as adaptation to the environment. Even modern definitions emphasize adaptation (Gottfredson, 1997; Snyderman & Rothman, 1987; Sternberg, 1990). Many societies are fixated on the cognitive aspect of intelligence, following in the footsteps that Charles Spearman (1927) laid out almost a century ago when he suggested that there is a general cognitive ability, or *g*. Today, many workers in the field of intelligence call it GCA (or general mental ability [GMA]) rather than "intelligence," in order to avoid arguments as to what intelligence "really" is (Sackett, Shewach, & Dahlke, in press).

Sternberg (in press-a) suggests that the conventional conception of intelligence as relying heavily on general mental ability and little, if anything else, is a mistake. If one looks at common cultural views of intelligence around the world, what we are calling "social intelligence" in this book plays a major role in intelligence rather than the at best secondary role to which it has been assigned in Western views of experts on intelligence.

As one example, a Confucian perspective on intelligence emphasizes kindness toward others and simply doing the right thing in social relationships (Yang & Sternberg, 1997a). In the Taoist tradition, in contrast, the emphasis is somewhat different. Here, the emphasis is on the importance of humility, of freeing oneself from the conventional norms that govern so many of our everyday judgments, and of understanding the world and how people act in it.

The difference between Eastern and Western conceptions of intelligence has persisted over many years. Modern conceptions of intelligence among Taiwanese Chinese involve five distinct factors (Yang & Sternberg, 1997b): first, a general cognitive factor, which is essentially the general (or g) factor that underlies scores on conventional Western tests of intelligence; second, interpersonal (social) intelligence (which involves understanding and dealing with other people); third, intrapersonal intelligence (which involves understanding oneself and what motivates oneself to think and act in various ways); fourth, intellectual self-assertion (which is an ability and also a willingness to communicate one's points of view to other people); and fifth, intellectual self-effacement (which involves understanding the limits of one's own knowledge).

China might seem far away to people in the West. But even in the West, people's folk theories of intelligence involve social as well as cognitive aspects. Sternberg, Conway, Ketron, and Bernstein (1981) found three factors in US conceptions of intelligence: first, practical problem-solving; second, verbal ability; and third, social competence. Thus, in the United States as in Taiwan, folk conceptions of intelligence contain a major social-intelligence aspect.

Experts might be predisposed quite readily to dismiss the folk conceptions of laypeople—after all, what do laypeople know compared with distinguished experts in the field of intelligence? But an alternative point of view might be that the problem resides with the experts rather than the novices—that the experts have become locked into a paradigm started a century ago that does not reflect the demands of everyday people adapting to their environments. On this view, the experts are entrenched and the laypeople reflect the current environment in which they live (see also Frensch & Sternberg, 1989).

Studies run in Africa also provide ammunition for those who believe that social intelligence is an integral part of what people see as adaptive to their environments—not just some kind of add-on that is distinct from intelligence as it should be normally defined. In Africa, folk conceptions of intelligence highlight mostly the social and related skills that serve to facilitate, to maintain, and further to develop stable and harmonious relationships among people (Ruzgis & Grigorenko, 1994). Chewa adults in Zambia, for example, especially emphasize the importance for intelligence of social responsibilities toward others and society, cooperation, and obedience to appropriate authorities. Intelligent children should be respectful and obedient toward adults (Serpell, 1974). Parents of children in rural Kenya also place great emphasis on the importance of responsible, socially appropriate participation in the social life of the family and of larger groups in society (Super & Harkness, 1982). In Zimbabwe, the word that is most nearly equivalent to intelligence, *ngware*, signifies a person who is prudent, balanced, and cautious, especially in relationships with others. Among members of the Baoule tribe, service to the family and to the surrounding community is key to intelligence. So are politeness toward and respect for elders (Dasen, 1984). In rural Kenya, people used four distinct terms to refer to aspects of intelligence—*rieko* (consisting of knowledge and skills), *luoro* (which is essentially respect for others), *winjo* (which is understanding of how to handle real-life problems), and *paro* (which involves initiative and motivation in daily life) (Grigorenko et al., 2001). Note that only the *rieko* concept refers to the kinds of cognitive elements that might be measured by a conventional cognitive intelligence test. Views of intelligence in at least some Asian cultures also emphasize the social and other-oriented aspects of intelligence more than does the conventional and highly individualistic Western or intelligence quotient (IQ)-based notion of intelligence (Azuma & Kashiwagi, 1987).

Conclusions

We believe it is important at this point in the history of theory and research on intelligence to recapture the notion of intelligence as adaptation (Sternberg, in press-a). In particular, much, if not most, of adaptation involves interacting with others in appropriate, meaningful, and usually constructive ways. If, as the research suggests, the social and cognitive aspects of intelligence are at best weakly related, then defining *intelligence* only in cognitive terms would seem to be a misappropriation of the word "intelligence."

When one considers high-stakes adaptive behavior in life, one perhaps would *not* first think of the kinds of behavior that lead to success in school over a small fraction of the years of an entire life span, or that lead to success on multiple-choice tests asking questions that in many ways trivialize the kinds of skills people need to succeed in their lives. What are some of the truly high-stakes kinds of actions one needs to take in one's life? We propose ten examples.

- *Getting along, as a child, with one's parents and teachers.*
- *Forming friendships as a child.*

- *Initiating a romantic relationship with a significant other.*
- *Successfully keeping an intimate relationship going over a period of a number of years.*
- *Knowing how to act toward one's own and others' children, including teaching them, supporting them, role-modeling appropriate behavior for them, and disciplining them as necessary.*
- *Knowing what to say, and generally, how to behave in a job interview.*
- *Knowing how effectively to resolve conflicts, whether at work or at home.*
- *Knowing how to respond appropriately when one is threatened by others.*
- *Knowing how to channel one's aggressive impulses constructively so that one does not antagonize others, especially those upon whom one is dependent.*
- *Getting along with one's boss and with one's colleagues at work.*

Obviously, one could generate many other kinds of life challenges, some more cognitively oriented than are these challenges. But we believe that this is a fair list of high-stakes challenges virtually everyone confronts, and each of the challenges requires social intelligence to deal with the challenge. Why, then, would social intelligence be relegated to second-class status, or even no status at all, as seems to be the case in much contemporary work on intelligence (see Sternberg, in press-c; Sternberg & Kaufman, 2011)? Why is it not a major and central field of study in its own right (Kihlstrom & Cantor, 2000, 2011, in press)?

The world is facing problems different from those of the early twentieth century, when contemporary theories of intelligence such as that of Spearman and contemporary tests of intelligence such as the Stanford-Binet and Wechsler were first being proposed (e.g., Binet & Simon, 1916; Wechsler, 1944). Perhaps the greatest challenges then were related to industrialization, where cognitive intelligence was indeed of premier importance (although the lack of social intelligence on the part of many managers may have left too much of the population failing to gain from the explosion of industrial goods). Technological problems remain of great importance of course—there is always one more new laptop computer or cell phone design waiting to be created. But we suspect that the very greatest problems of today will not be solved by IQ alone, or anything closely related to it. Contemporary problems of great magnitude are not the ones that the 30 points of IQ gained during the twentieth century will help solve (Flynn, 1984).

The greatest challenges we face today are the ones that require social solutions more than just technological ones (Sternberg, 2019). Consider, for example, global climate change, which is wreaking havoc on much of the world already and promises to wreak even more havoc in the years to come. The problem of climate change will not be solved merely by higher cognitive intelligence; indeed, it would be fair to argue, we believe, that it was largely created by higher IQ (Sternberg, 2019). Industrialization and increased use of fossil fuels have contributed mightily to the problems we see today—more and more severe hurricanes, tornadoes, and heat waves; melting of glaciers leading to land masses going underwater; and temperatures in places that used to have moderate climates but that now have climates more resembling those that formerly were reserved for the hottest regions. We are making the world barely habitable or even uninhabitable for future generations.

We have the alternative fuel sources to reduce carbon emissions greatly. What we also have, unfortunately, are extremely wealthy and powerful people who profit from the current system and have no desire to change it, regardless of what its effects may be on future generations. And we also have not so wealthy people whose livelihoods depend on jobs that promote carbon emissions. If jobs based on carbon emissions start to disappear, these people will need new jobs. What the world needs to solve the problem of climate change is not necessarily more clever technology but a willingness for people to work together to solve a complex problem of technology but more so of social relations among groups that not only bedevils almost all of them but that will bedevil their children and future generations beyond.

Global climate change is only one of the problems that needs people to use social intelligence to work together toward common goals. Another problem is air pollution, also due in large part to the hydrocarbons produced by the fossil fuel industry but further produced by industrial gaseous waste from numerous factories around the world. Not all the industrial waste is gaseous, of course. Lead, mercury, radioactive elements, and other waste products are polluting our soil and groundwater just as gases are polluting the air (Bellinger, in press; Flynn & Sternberg, in press). Again, we have the technology to do much better. What we lack is the collective action derived from a socially intelligent analysis of what all this waste is doing to people and to so many other species in the world, many of which are on the brink of extinction.

When we talk about intelligence as adaptation—adaptive intelligence (Sternberg, in press-a), we refer to the intelligence we need to ensure the survival of our kin, of people around the world, and of the species on which we depend in various ways, for food, for various kinds of clothing, or whatever. We cannot go on as we have. Reasoning based on IQ has failed to provide solutions. Rather, it has provided an extremely hollow and unsuccessful approach to the problems the world faces. We need to pay attention to social intelligence and to make it more central to our thinking about intelligence, not just as a scientific nicety, but because our survival depends on it.

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2

Nonverbal Receiving Ability as Emotional and Cognitive Empathy: Conceptualization and Measurement

Ross Buck, Brett Graham, Ryan J. Allred, and Roeland Hancock

Social and Emotional Intelligence

A consistently important aspect of social and emotional intelligence is *nonverbal receiving ability*: the ability to know the feelings and thoughts of other persons via nonverbal displays. At first glance, the measurement of such abilities might seem relatively straightforward: asking participants to judge the nonverbally expressed feelings and thoughts of other persons. However, whereas such methods have led to the development of psychometrically reliable and valid tests of intelligence in the abstract-reasoning sense (Neisser et al., 1996), attempts to measure social and emotional intelligence have encountered significant difficulties.

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Construct Validity Issues. Classic principles of construct validity require that different measures of a construct must agree and disagree with one another in coherent ways, forming a *nomological net* of relationships with measures of related constructs (Cronbach & Meehl, 1955; MacCorquodale & Meehl, 1948). This net includes *convergent validity* or the degree to which measures of a construct correlate with scores on other measures designed to assess the same construct and *discriminant validity*, or whether measures of constructs that should not be related are in fact not related (Campbell & Fiske, 1959). A major problem with measures of nonverbal receiving ability is that, while designed to measure the same construct—the ability to know accurately the feelings and thoughts of other persons—they typically do not correlate strongly with one another. This may imply that nonverbal receiving ability is not a single, uniform ability, although the nature of these putative abilities is not clear from the research.

Early studies of what was then termed accuracy in person perception assumed that the ability to discern the personality, attitudes, and values of other persons would allow one to predict their behavior in a wide variety of situations (Bruner & Tagiuri, 1954; Cline, 1964). However, studies in this tradition were undermined by methodological problems, including developing reliable criterion measures of personality, attitudes, and values; and judges often assumed that others were similar in these characteristics to themselves (*assumed similarity*: Hastorf & Bender, 1952). Thus, extroverts assume that others are extroverted, and appear to be more accurate in identifying such persons than introverts, and introverts similarly appear to be more accurate in identifying introverts (Buck, 1984).

These problems seemed to be addressed when person-perception accuracy was reconceptualized in terms of emotion-recognition accuracy: the criteria for emotion were simpler and more concrete than those for personality, attitudes, and values. Also, a variety of emotion displays can be expressed by a single sender or target individual, so that problems with assumed similarity are avoided. The affect theory of Silvan Tomkins proposed that certain emotions are associated with specific and discrete facial expressions (Tomkins, 1962–1963). Guided by this theory, Paul Ekman and colleagues collected 3000+ example photographs of posed facial expressions representing "peak" points of the displays, and in a series of judgment studies they reduced these to 32 photographs that consistently (over 90%) were rated as expressing six *primary affects*: Happiness, Sadness, Fear, Anger, Surprise, and Disgust/Contempt (Ekman, Friesen, & Ellsworth, 1972). Research with the isolated Fore culture of New Guinea suggested that most of these facial expressions are universal, pan-cultural, and therefore likely innate (Ekman, Sorenson, & Friesen, 1969).

Ekman, Friesen, and colleagues used these photographs to define the essential features of the facial expressions of primary affects, developing coding systems including the Facial Affect Scoring Technique (FAST) linked to emotions, the more general Facial Action Coding System (FACS: Ekman, Friesen, & Hagar, 2002), and an abbreviated version of FACS assessing muscle movements involved in emotion, the Emotion Facial Action Coding System (EMFACS: Ekman & Friesen, 1976, 1978). The FACS is a comprehensive rating system based on the facial musculature and designed to measure any visually distinguishable facial movement. The EMFACS is the basis of the Pictures of Facial Affect (POFA) collection of 110 black-and-white photographs of peak facial expressions, which has been applied widely in neuropsychological research (Ekman & Friesen, 1975). These studies have demonstrated that POFA abilities are linked to critical interpersonal skills and social functions, including autism (Tseng et al., 2016), psychopathic traits (Seara-Cardoso, Sebastian, Viding, & Roiser, 2016), intermittent explosive disorder (Cremers, Lee, Keedy, Phan, & Coccaro, 2016), disruptive mood dysregulation disorder (Stoddard et al., 2016), violent offensive disorders (Schienle, Wabnegger, Leitner, & Leutgeb, 2016), and emotional intelligence (Quarto et al., 2016). This evidence strongly supports the proposition that nonverbal receiving ability is a critical component of social and emotional intelligence.

The BART and JACBART. POFA photographs were used in the design of one of the first formal performance-based measures of nonverbal receiving ability, the Brief Affect Recognition Test (BART; Ekman & Friesen, 1974). BART included 70 photographs showing the six primary affect displays plus neutral expressions. As these are generally correctly identified over 90% of the time, the images were degraded by using brief 1/30-second presentations to reveal individual differences in recognition ability. Seven scores were derived: one for total accuracy and one for each of the primary affects. However, experience showed that the brief presentation could produce afterimages that make actual perceived presentation time much longer (1–2 seconds).

Matsumoto et al. (2000) addressed these limitations in a new version termed the Japanese and Caucasian Brief Affect Recognition Test (JACBART). This included photographs from the Matsumoto and Ekman (1988) Japanese and Caucasian Facial Expressions of Emotion (JACFEE). The test showed equal numbers of posers from Japanese and Caucasian ethnic groups, and of males and females within each group, for each of the seven primary affects; plus, Neutral Faces (JACNeuF) consisting of neutral poses by the JACFEE posers. Afterimages were eliminated by embedding a brief JACFEE expression in the middle of a 1-second presentation of that poser's JACNeuF expression. Matsumoto et al. (2000) reported evidence for JACBART internal reliability.

Other Measures. BART and JACBART both employed static photographs of posed displays, and despite robust evidence that POFA abilities are linked to social skills, problems of the ecological validity of such stimuli have been recognized. First, the static quality of such stimulus is problematic: nonverbal recognition accuracy involves dynamic emotional expressions. Neural reactions to dynamic facial expressions are distinct from reactions to static pictures of emotional faces, both in intensity and in regions activated (Kilts, Egan, Gideon, Ely, & Hoffman, 2003; LaBar, Crupain, Voyvodic, & McCarthy, 2003; Sato, Kochiyama, Yoshikawa, Naito, & Matsumura, 2004; Schienle et al., 2016; Stoddard et al., 2016). However, these studies operationalized dynamic facial expressions by combining and animating pictures of static, posed facial expressions like the POFA.

There have been other attempts to develop performance-based measures of nonverbal recognition accuracy, using a wide variety of techniques. These include the Diagnostic Analysis of Nonverbal Accuracy (DANVA: Nowicki & Duke, 1994); the Profile of Nonverbal Sensitivity (PONS: Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Bänziger, Scherer, Hall, & Rosenthal, 2011); the Reading the Mind in the Eyes Test (RMET: Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), the CMU Pose, Illumination, and Expression database (CMU Multi-PIE:

Sim, Baker, & Bsat, 2003; Gross, Matthews, Cohn, Kanade, & Baker, 2008); the Multimodal Emotion Recognition Test (MERT: Bänziger, Grandjean, & Scherer, 2009); the Amsterdam Dynamic Facial Expression Set (ADFES: van der Schalk, Hawk, Fischer, & Doosje, 2011); the Geneva Emotion Recognition Test (GERT: Schlegel, Grandjean, & Scherer, 2014); and the Facial Expressed Emotional Labeling task (FEEL: Cronlein, Langguth, Eichhammer, & Busch, 2016). However, as noted, establishing construct validity has been problematic with measures of emotion-recognition ability because they intercorrelate poorly (Buck, 1984; Hall, 2001).

Two meta-analyses relevant to emotion-receiving ability have addressed these issues. Elfenbein and Eisenkraft (2010, p. 313) focused on a long-standing issue in the field of nonverbal communication: the relationship between emotion-receiving ability and sending accuracy, with empirical studies showing correlations between the two variables ranging from $r = -.80$ to $r = +.64$.[1] To address this range, they conducted a meta-analysis of 40 studies, demonstrating a significant positive correlation in studies using the sending and receiving of intentionally posed displays ($r = .19$), so that good senders tended to be good receivers.[2] However, the correlation between the two when spontaneous displays were involved was not significant. Schlegel, Boone, and Hall (2017) took a wider view of the judgment-accuracy issue and conducted a meta-analysis on judgments in several content domains, including judging partners' emotions, thoughts and feelings, situation the other is in, deception, social attributes such as political allegiances, and personality traits. They analyzed 16 formal interpersonal accuracy tests and many non-standardized tests in 103 studies. They reported an overall correlation between measures of $r = .19$, but the average correlation between emotion-receiving tests was significantly larger than most of the others ($r = .29$). They noted that the overall effect size was modest in comparison between tests in other psychological domains, such as abstract reasoning, but that the data suggest the importance of domain-specific skills—kinds of accuracy—prominently including emotion-receiving ability.

Other approaches to increase the ecological validity of measures of emotion-recognition accuracy have employed techniques designed to capture authentically the classic primary affect expressions in dynamic displays. For example, the designers of the ADFES employed FACS-trained coaches in attempting to ensure that "all models utilized the same facial actions (AUs) to portray a particular emotion … to make expressions as similar as possible between models … and to incorporate the most prototypical elements of the displays" (van der Schalk et al., 2011, p. 909). To accomplish this, before filming, models were given a training manual using pictorial and verbal descriptions of critical FACS facial expressions, and they practiced the expressions with the manual and mirror for at least one hour. At the filming session, they discussed the AUs and expressions with two FACS coaches. Models were filmed by two cameras at 45 degrees from each other, with the cameras operated by one FACS coach with the other viewing the filming on a TV monitor, in 2–2.5-hour sessions. For each emotion, models' expressions were checked for accuracy with AU criteria during the filming by both FACS coaches: "models were continuously coached during the session, to improve the accuracy and naturalness of their expressions" (p. 910). When the coaches agreed that an expression had been satisfactorily generated, they went on to another emotion.

Additional approaches have used Stanislavsky or "Method" acting techniques to enact emotional expressions. Stanislavsky acting seeks to mobilize conscious thinking to find inner motives for actions and activate authentic emotional experiences. In Gur, Schroeder et al. (2002) and Gur, Sara (2002), volunteer actors were coached by professional directors to pose and enact displays of happiness, sadness, anger, and fear. These photographs were used in the Penn Emotion Recognition Test (Penn ER-40), which is the Emotion Identification (EMO) component of the Penn Computerized Neurocognitive Battery (PCNB: Gur et al., 2010; Moore, Reise, Gur, Hakonarson, & Gur, 2015).

Similarly, the Geneva Multimodal Expression Portrayals (GEMEP) corpus used professional theater actors as models, recruited through a professional theater director (Bänziger & Scherer, 2010). Scherer and Bänziger (2010) defended the ability of this portrayal paradigm to produce accurate instances of prototypical emotion displays in standard scenarios in terms of Stanislavsky acting. The goal was to record expressions obtained "through an enactment of emotions felt or recalled … within the context of a sociocommunicative interactive framework" (Bänziger, Mortillaro, & Scherer, 2012, p. 1167). Models were given materials, defining the meaning of 15 emotion categories and three scenarios for each prior to the filming. Filming was done for a full day in a specially constructed recording studio with the professional director. Model and director chose the scenarios and emotions to be enacted that were personally relevant to the model. The intention was that recorded expressions emerge dynamically from the interaction of model and director: "the complete procedure was designed … to achieve a maximal amount of induction of the respective emotion and the associated feeling as authentically as possible (given the constraints of the recall and mental imagery procedures)" (p. 1167). Three digital cameras recorded the performances, two focused directly on the face and the face-plus-body, and one from a 90-degree profile showing the face-plus-body.

While quite different from one another, the procedures in these studies yielded highly voluntary and intentional expressions in a social context in which models were expected to learn appropriate expressive displays and produce them in a social context in which the quality of their performance was closely observed, recorded, and explicitly or implicitly judged. In the case of ADFES, models were expected to learn and perform elements of the highly complex FACS system; with the Penn ER-40 and GEMEP, models were in both an "official" situational context involving posing/enacting specific facial displays and an "unofficial" context involving expert and skilled performance that was being closely observed, recorded, and judged. It is possible and even likely that these challenges could have elicited spontaneous displays of negative affect and intention movements that were appropriate to the skilled performance context, but the judges rating these were asked only about the emotions intended to be displayed in the official context. This possibility could be examined if the ADFES, EMO, and GEMEP stimuli were scored by automatic facial analysis systems, which would objectively score evidence of expressions of discomfort, distress, or effort despite the content of the "official" displays. We examine relevant evidence later in this chapter.

Discussion. Neuropsychological research with the POFA has demonstrated robust linkages between abilities to read facial expressions and important psychosocial outcomes, supporting the notion that nonverbal receiving ability is indeed a critical component of social and emotional intelligence. However, a psychometrically acceptable, construct-valid measure of nonverbal receiving ability has not emerged despite decades of research. A problem with virtually all performance-based measures of nonverbal recognition accuracy is that they employ intentionally posed or enacted displays as stimuli. Generally, scholars define nonverbal recognition accuracy conceptually in terms of a receiver's ability to know the emotional state of a sender, and senders posing expressions are not actually experiencing the enacted emotion.

There is evidence that posed and spontaneous displays differ in internal timing (Cohn & Schmidt, 2004; Krumhuber & Kappas, 2005), and brain regions sensitive to display may fire only to biologically genuine stimuli (Tai, Scherfler, & Brooks, 2004). Moreover, behavioral and functional magnetic resonance imaging (fMRI) evidence has demonstrated that authenticity affects the recognition of emotions in speech (Drolet, Schubotz, & Fischer, 2012), and that when viewing pretended as opposed to actual acts, brain mechanisms implicated in explicit mental state judgments are activated (German, Niehaus, Roarty, Giesbrecht, & Miller, 2004), so that emotion and pretense may be confounded in many studies. Studies using naturalistic and dynamic depictions of spontaneous emotional expressions as stimuli are necessary.

A related problem with posed or enacted stimuli is that the criteria of accuracy in emotion recognition are limited and/or unclear. Often, investigators define authentic facially expressed emotions displayed according to technical criteria, such as agreement with the classic EMFACS cues associated with primary affects. However, such criteria are limited to the primary affects, and in any case, ability measures should employ clearly objective accuracy criteria.

Spontaneous Versus Symbolic Emotion Display and Communication

There is evidence for two distinct mechanisms of facial/vocal display, in both cases involving a brainstem system where these appear to be "hard wired" (Jurgens, 1979; Ploog, 1981). One input to the brainstem system comes from paleocortical limbic brain areas associated with emotion, providing a direct, non-voluntary "readout" of emotion in facial and vocal display. Buck and Van Lear (2002) suggested this display is involved in nonpropositional *spontaneous communication*, as opposed to socially structured, voluntary, propositional *symbolic communication*. In a meta-analysis of neuropsychological studies, they presented evidence that spontaneous communication is associated with the right hemisphere and symbolic communication the left hemisphere of the brain. The second input to the brainstem facial/vocal display system comes from the supplemental motor cortex, which appears to enable the voluntary expression of the same displays. This is *voluntary expression initiation*, which does not form expressions but rather initiates expressions already hardwired in the midbrain, bypassing the limbic system (Jurgens & von Cramon, 1982). Buck and Van Lear termed this *pseudospontaneous communication*, which is intentional in the sender but, if the sender is effective, can manipulate the receiver into believing the sender is experiencing the emotion in question. This may be the basis of *charisma*, where the sender is able to intentionally manipulate the feelings or "push the emotional buttons" of the audience. Ploog (1981) suggested that spontaneous and pseudospontaneous displays follow a distinct maturational sequence, with the former functioning from birth and the latter becoming operational at about 3 months when the infant's vocal behavior becomes conditionable.

Spontaneous and pseudospontaneous facial/vocal expressions are distinct from *voluntary expression formation*, which involves the construction of the expression by the brain via the cortical neocortex. This bypasses the limbic system and brainstem system and controls the facial musculature directly. This is most developed in humans and underlies language associated with Broca's area in the anterior left hemisphere. Damage to this area is associated with deficits in language expression (*Broca's aphasia*). In contrast, damage to the analog of Broca's area in the anterior right hemisphere produces deficits in facial expression and vocal prosody (Buck & Duffy, 1980; Ross, 1981). Ross termed this deficit syndrome *expressive aprosodia*. Formally, spontaneous communication is defined as biologically based, non-intentional, consisting of signs (which are a direct readout of the referent), and nonpropositional. In contrast, symbolic communication is learned and culturally patterned, intentional at some level, consisting of symbols (with an arbitrary relationship with the referent), and propositional (Buck, 1984).

In discussing the portrayal paradigm, Scherer and Bänziger (2010) considered other techniques of observing and recording facial expressions, arguing that such strong prototypical emotions and expressions are relatively rare in real life: “fleeting evanescent events that come and go rapidly” (p. 167). They also considered induction techniques, where emotions are induced in the laboratory (e.g., by viewing emotional pictures). They asserted, “the intensity of the resulting states is generally low, with little outwardly observable expression” (p. 167), particularly because no action tendencies are involved. Scherer and Bänziger acknowledged, “It is obvious that actor portrayals cannot be treated as expressions of spontaneously occurring emotions” (p. 176), which they defined as “biologically determined externalizations … (such as) … reactive animal expressions, infant grunts and cries, affect bursts, or sudden, uncontrolled emotional utterances” (p. 172). They argued that the study of pure spontaneous expressions “is unrealistic in practice, and probably of little interest, given the scarcity of such pure expressions in social life” (p. 166). However, spontaneous display and expression are far from scarce in social life; it indeed is ubiquitous (Buck, 1984, 2014).

Measuring spontaneous expression: The slide-viewing technique. An emotion-induction technique that arguably captures strong spontaneous facial/gestural expressions is the Slide-Viewing Technique (SVT), developed from Robert E. Miller’s studies of affect expression and communication in rhesus monkeys (Miller, 1967). In Miller’s *cooperative conditioning* technique, two monkeys were first taught to pull a bar when a light goes on, to obtain food, or avoid shock. The animals were then separated in different rooms such that one, the sender or target, could see the light but did not have the bar. The other, receiver or judge, had the bar but not the light. However, the receiver was provided with the televised image of the face of the sender. Miller reasoned that if the light produced a facial expression in the sender, and if the receiver could perceive and correctly interpret that expression, the receiver could pull the bar at the correct time, therefore demonstrating affect communication. In fact, normal rhesus monkeys solved this task rather easily, and Miller went on to explore the effects of psychoactive drugs on sending and receiving ability (Miller, Levine, & Mirsky, 1973). He also showed that monkeys raised by wire surrogate mothers in Harry F. Harlow's laboratory were unable to either send or receive vis-à-vis other monkeys, and he suggested that the social devastation demonstrated in Harlow's surrogate-reared animals was due to their deficiencies in affect communication (Miller, Caul, & Mirsky, 1967).

The SVT was developed as an adaptation of cooperative conditioning to human participants. In it, senders were informed that the subject of the experiment was emotional expression (Buck, Savin, Miller, & Caul, 1972). Participants sat alone in a room and were shown a series of slides while physiological measures (heart rate and skin conductance) were taken. Slide categories have included Familiar people, Unfamiliar people, Sexual, Scenic, Unpleasant, and Unusual. After each slide was presented for 10 seconds, a light was activated, and participants were instructed to report verbally how the slide made them feel into a microphone. After 10 additional seconds, the light and slide were removed, and participants rated their feelings on a series of emotion scales. Unknown to participants, their facial/gestural displays were filmed by a hidden camera. The filmed expressions were shown to groups of receivers or judges who guessed what kind of slide was presented on each trial, and how the participant felt about the slide, on the same scales used by senders. This yielded two measures of communication accuracy: the percent of slides correctly identified (%-correct measure) and the correlations between sender's and mean receivers' ratings on each of the emotion scales computed across the slides for each sender (emotion-correlation measure).

Results revealed highly statistically significant communication accuracy on both measures, with *sending accuracy* computed across receivers and *receiving ability* computed across senders (Buck et al., 1972; Buck, Miller, & Caul, 1974). Female participants were markedly higher in sending accuracy than males, and sending accuracy was positively correlated with personality measures of extraversion and self-esteem and with a "personal" verbal description of their emotional experience (e.g., mentioning oneself and a feeling: "That makes me feel good" as opposed to describing the slide: "That's a nice picture"). Sending accuracy was positively correlated with autonomic measures within-participants: stimuli eliciting greater expressivity caused larger skin conductance responses.

This likely reflects the relative effectiveness of stimuli to produce emotional responses. However, between-participants, autonomic responses were negatively correlated with expressivity. Good senders showed an "externalizing" mode of response with high facial expressivity and low autonomic responding, while poor senders showed an "internalizing" pattern of low expressivity and high autonomic response. Women tended to show externalizing, and men internalizing, modes of response. That is, women showed greater expressivity and men showed higher autonomic responses. Subsequent studies with preschool children (aged 3.5–6) demonstrated significant sending accuracy with no sex difference, although as boys got older, they tended to become poorer senders, suggesting the effect of sex role-related socialization of expressivity (Buck, 1975, 1977).

Sending accuracy or spontaneous expressivity has demonstrated satisfactory evidence of construct validity, with a nomological net of relationships involving sex, verbal report, personality, physiological measures, and age. In addition to the findings summarized earlier, emotion-sending accuracy scores have been positively related to teacher ratings of externalizing in preschoolers and perceived popularity and likeability, negatively related to emotional and behavioral disorder and schizophrenia; it is also related to brain damage, with left hemisphere damage disrupting symbolic communication and right hemisphere damage disrupting spontaneous communication (Buck & Duffy, 1980. See reviews by Buck & Powers, 2006). Also, spontaneous expressivity has been interpreted as constituting a genetic marker for trustworthiness (Boone & Buck, 2003. See Buck, Stifano, Graham, and Allred, this volume).

The Communication of Affect Receiving Ability Test (CARAT). When computed across senders, the SVT produces a measure of emotion-receiving ability, and this was used as the basis for creating a formal test: The Communication of Affect Receiving Ability Test (CARAT: Buck, 1976). The initial CARAT-01 was assembled from 600 10–20-second video clips (15 from each of 40 target/senders). Slide categories included Sexual, Scenic, Unpleasant, and Unusual. Clips were collected using progressive item analyses in a series of studies where judges/receivers attempted to guess the category of image being viewed by the sender. Accuracy was objectively determined by comparing the judgment with the actual image viewed: this is a "situational reference" task in Frijda's

(1969) terminology. Essentially, CARAT presents "thin slices" of spontaneous facial-gestural expression, which carry powerful albeit often unconscious nonverbal messages (Ambady & Rosenthal, 1993).

CARAT fulfills desiderata pointed out in a survey of studies of facial expression recognition and analysis (Bettadapura, 2012). This is argued for shifting the analysis of posed to spontaneous expression, with a standardized spontaneous expression database containing video clips in which the participant is unaware of being filmed and in conditions where spontaneous expressions are encouraged. In addition, such clips should be labeled, with information about the participant's emotional response, either from participant self-ratings, ratings of observers, or both. Also, such clips should show a complete temporal pattern including the onset, apex, and offset of the emotional response. All these characteristics are found in CARAT clips: They involve spontaneous expression, with video clips in which the participant is unaware of being filmed and in a minimally social situation where spontaneous expressions are encouraged. Clips include information about the sender's emotional response from both senders' self-ratings and ratings of observers, and clips show the onset, apex, and offset of the senders' responses. Apropos of Scherer and Bänziger's (2010) point that induction techniques do not involve action tendencies, the requirement that participants describe their emotional experience adds an active aspect to the SVT, while also providing an additional useful dependent variable.

Emotion-Recognition Accuracy and Empathy

Emotional and cognitive empathy. The construct of emotion-recognition accuracy is typically defined by performance on behavioral tests, and the construct *empathy* is suspect among many behavioral researchers because of its tinge of subjectivism. Nonetheless, there is a close conceptual relationship between empathy and emotion-recognition accuracy, and contemporary neuroscience studies using such measures to investigate brain correlates typically frame their findings in terms of emotional and/or cognitive empathy.

Empathy is defined as the ability to know the feelings and to understand the thoughts and perspectives of other persons (Cuff, Brown, Taylor, & Howat, 2012). There is a widely accepted conception that empathy involves both emotional and cognitive aspects (e.g., Decety & Jackson, 2004; Telle & Pfister, 2016). These are often assessed by performance-based measures of nonverbal emotion-recognition accuracy and perspective-taking ability, respectively. Neuroscience studies have found that emotional and cognitive empathy have distinct neurobiological underpinnings: They are dependent on different neuroanatomical substrates and can be doubly dissociated neurologically, so that each is impacted independently of the other in studies of brain lesions (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). Also, variations in the oxytocin receptor OXTR gene are associated with emotional empathy and variations in the arginine vasopressin and dopamine receptor genes (AVPR1a and DRD4-7R) are associated with cognitive empathy (Uzefovsky et al., 2014, 2015).

We consider measures of emotion-recognition accuracy described previously to assess emotional empathy, as neuropsychological studies have assumed. Cognitive empathy has been defined in many ways, involving Theory of Mind (ToM), appraisal, attribution, and perspective-taking abilities. Compared with emotional empathy, there are relatively few explicitly designed performance measures of cognitive empathy. One is Ickes's empathic accuracy paradigm, which assesses abilities to infer the specific content of others' thoughts, using others' reports as criteria of accuracy (Ickes, 1993; Ickes & Hodges, 2013). However, there are potential problems with this approach: unreliability or bias on the part of participants to judge or report thoughts, or on the part of coders to rate the similarity of these reports and receiver judgments.

Measuring emotional intelligence (EI). Potential problems of accuracy criteria also arise with emotional intelligence (EI), as measured by the Mayer, Salovey, and Caruso Emotional Intelligence Test (MSCEIT, 1999). EI involves both emotional and cognitive empathy, involving "the accurate appraisal and expression of emotion in oneself and in others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan, and achieve in one's life" (Salovey & Mayer, 1990, p. 185). Emotion-recognition accuracy is considered a basic facet of emotional intelligence (Mayer, Roberts, & Barsade, 2008; Hildebrandt et al., 2015), and indeed Rivers, Brackett, Salovey, and Mayer (2007) noted that emotion perception is the most studied of the EI dimensions. The Perceiving Emotions subsection of the MSCEIT, assessing emotion-recognition accuracy, comprises face photographs and pictures/abstract art representations that the respondent rates along five emotion dimensions. The other EI dimensions involve cognitive empathy. Research with the MSCEIT has found evidence of significant convergent validity with cognitive abilities, personality measures, social functioning, psychological well-being, and workplace outcomes (see Rivers et al., 2007, for a review).

Although EI is considered to reflect an ability, many questions assessing EI do not have clear and objectively correct answers. Two two accuracy criteria are, agreement with expert raters, and consistency with other judges. For example, questions in the MSCEIT ask how well various activities will preserve a pleasant mood: making a to-do list, thinking pleasant thoughts, or ignoring the feelings (Mayer, 2019). Rivers et al. (2007) acknowledged that it is unclear whether these criteria assess EI or agreement with popular opinion. Moreover, studies using the expert- and consensus-scoring protocols have yielded contradictory findings (Roberts, Zeidner, & Matthews, 2001). Veridical scoring, with objective accuracy scoring criteria, is preferable.

Measuring Emotional and Cognitive Empathy with CARAT

CARAT-SPR: Spontaneous, Posed, Regulated. A new version of CARAT termed CARAT-SPR (Spontaneous, Posed, Regulated) is designed to measure both emotional and cognitive empathy using objective and veridical scoring (Buck, Powers, & Hull, 2017). It was assembled from 1500 clips (12 digital clips from 125 senders). Clips were digital from the outset, increasing quality and permanence. An additional 32 senders responded to emotional images (160 additional spontaneous clips) and were then asked to pose “as if” they were viewing emotional images (160 posed/simulated clips) and also responded “as if” they were viewing an emotional image when an image of opposite valence was in fact present (128 regulated/masked clips). Spontaneous, Posed, and

Regulated clips were then subjected to successive item analyses in judgment sessions. The final CARAT-SPR includes 24 spontaneous clips that are shown first, assessing emotion-recognition accuracy (emotional empathy). We then told judges that the next group of clips depict senders either responding spontaneously as before, posing with no emotional image present, or regulating, or posing with an image of opposite valence present. Participants judge whether each sender is being spontaneous, posing, or regulating—including ten spontaneous, eight posed, and eight regulated clips.

CARAT-SPR was designed as a performance measure of ability to detect emotion accurately from spontaneous clips (emotion-recognition accuracy) and to differentiate Spontaneous, Posed, and Regulated clips (Expression Categorization ability). Spontaneous clips, like those in CARAT-01, show the response of the sender/target person to an emotional image but are shorter in duration (6 seconds). Posed clips involve asking the sender to display "as if" responding to a particular sort of image when no image is in fact present, while regulated clips involve asking the sender to display "as if" responding to a particular sort of image when an image of opposite valence is in fact present (e.g., they were asked to pose meeting a friend when a disgusting image was actually presented). Posing was termed *simulation* by Ekman and Friesen (1975), while regulation involves *masking*. Expression Categorization involves abilities at nonverbal eavesdropping or recognizing deception—simulation and masking—and thus to a kind of perspective-taking or cognitive empathy (Lawless DesJardins & Hodges, 2015).

In an MTurk test, emotion-recognition accuracy was weakly but significantly negatively correlated with Expression Categorization ability ($r[513] = -.125$, two-tailed $p = .005$), suggesting with other evidence that emotional and cognitive empathy are distinct or even in opposition to one another. Emotion-recognition accuracy was related to perceived trustworthiness of the sender. In a brief version of the CARAT-SPR, women showed evidence of greater emotion-signal detection, while men reported greater confidence in Expression Categorization. Expression Categorization ability was negatively correlated with Avoidant Attachment in women and positively correlated with Openness to Experience in men (Buck et al., 2017).

CARAT-SPR clips were analyzed with judges' ratings of emotion and objective facial scoring using the iMotions FACET system (Buck, Dana, Battaglia, Powers, & Hull, 2017). The 12-ITEM Brief CARAT-SPR includes four spontaneous, four posed, and four regulated clips (Hull, 2015). Overall, 275 female and 151 male judges in an MTurk sample viewed and rated the clips on 7-point "not at all" to "very much" scales: Happy, Surprised, Sad, Afraid, Angry, Disgusted, and Pleasant-Unpleasant. The same clips were automatically analyzed for the same emotions by FACET software. FACET scores were baseline to peak changes in Happiness, Surprise, Sadness, Fear, and Anger, and (Pleasantness-Unpleasantness). The four correlation coefficients between mean judges' ratings and FACET scores across these seven emotions were averaged. This revealed positive and significant average correlations for spontaneous and regulated clips (average r's = .69 and .68 respectively, p's < .001), but not Posed clips (average $r = -.31$, NS). Thus, when expressions were organized by an effective emotional stimulus, ratings by human judges were positively and significantly correlated with objective FACET scores, supporting the construct validity of both measures. When expressions were posed, however, ratings by human judges were not significantly correlated with FACET scores. Inspection revealed that FACET often detected negative expressions that were not highly rated by human judges. This is consistent with the speculation regarding possible spontaneous negative emotions associated with highly voluntary and intentional posed and enacted expressions, as we noted previously in this chapter.

Critics of the CARAT technique have argued that it lacks a clear theoretical basis in emotion theory. For example, are the spontaneous smiles to pictures of familiar persons display the discrete emotion of happiness or do they reflect face-recognition processes? But this critique misses the fact that CARAT assesses emotion-*communication* accuracy, which finesses issues of exactly what the state is that is being communicated. The original research that produced CARAT-01 determined image categories that were agreed to by virtually all (> 95%) in a sample of judges: Sexual, Scenic, Pleasant People, Unpleasant, and Unusual. We recognized that these images might produce different specific discrete emotions in different persons, so judges were asked about what sorts of images were seen by the sender and a %-correct measure was computed. In addition, to measure specific emotion-communication accuracy, senders rated the feelings generated by each image, including the primary affects, and judges similarly rated the sender's feelings. This generated emotion-correlation scores for each emotion: for example, the sender's and mean receivers' rating of the sender's Happiness across images was the Happiness accuracy score (Wagner, Buck, & Winterbotham, 1993).[3] Also, arguably from an ecological viewpoint, communication accuracy is the point: We do not go about consciously labeling specific emotions when we interact with others. On the other hand, with the assistance of automatic facial coding, we can bring specific emotion theory back into the picture, assessing abilities to detect specific discrete emotion expressions objectively present in the spontaneous and dynamic behavior stream.

The CARAT-DPA: Discrete Primary Affects. CARAT-DPA (Discrete Primary Affects) is a performance-based measure of emotion-recognition ability based on the objective FACET analysis of the original corpus of items used to create CARAT-SPR. The items are like the spontaneous items of the CARAT-SPR, but the task of the judges is different. Judges are asked to detect specific emotional facial expressions demonstrated by FACET software to be objectively present in the digital video clip. To select clips showing the purest examples of specific discrete primary affect displays, we determined for each individual clip the maximum value for each emotion calculated by the FACET software. This software codes the positively valenced affects like Joy, Unvalenced Neutral, and Surprise, and negatively valenced Sadness, Fear, Anger, Disgust, and Contempt. Using as criterion the highest single maximum peak with no strong competing peaks, we sorted the videos into pure emotion categories: Joy, Disgust, Sadness, Anger, and Neutral (defined as showing consistently low scores with no peak). From that pool, we selected the eight clips with the highest maximum peak of each emotion category, including four male and four female senders (Buck, Battaglia, & Dana, 2019).

We administered CARAT-DPA to 200 female and 128 male student participants in an online survey along with the CARAT-SPR and the self-report Toronto Empathy questionnaire (TEQ: Spreng et al., 2009). In the latter, participants rated how frequently they feel or act in response to statements relevant to empathy. Statements are positive (QP: I enjoy making other people feel better) or negative (QN: I become irritated when someone cries). For both females and males, CARAT-DPA Total Hit scores were positively and significantly related to emotional empathy accuracy on the Spontaneous CARAT-SPR items. Results are shown in Table 2.1. For males, CARAT-DPA hits were significantly positively correlated with

Table 2.1 Intercorrelations of empathy measures for male (Mr) and female (Fr) participants

	Total correct CARAT-Spontaneous	Tot correct CARAT-SPR	Toronto Empathy QP	Toronto Empathy QN	Toronto Empathy Total (TEQ)
Total hits CARAT-DPA	Mr = 0.62*** Fr = 0.47***	Mr = 0.30** Fr = 0.02	Mr = 0.12 Fr = −0.03	Mr = −0.08 Fr = −0.14*	Mr = 0.11 Fr = 0.07
Total correct CARAT-spontaneous		Mr = 0.37*** Fr = 0.19**	Mr = 0.20* Fr = 0.06	Mr = −0.01 Fr = −0.20**	Mr = 0.12 Fr = 0.14*
Tot correct CARAT-SPR (cognitive)			Mr = 0.10 Fr = 0.06	Mr = −0.03 Fr = −0.10	Mr = 0.07 Fr = 0.09
Toronto empathy QP				Mr = −0.55*** Fr = −0.59***	Mr = 0.88*** Fr = 0.87***
Toronto empathy QN					Mr = −88*** Fr = −0.90***

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

cognitive-empathy accuracy as well. Also, for females CARAT-DPA total hits and CARAT-SPR emotion-empathy accuracy were significantly negatively correlated with the TEQ QN score, and, for the CARAT spontaneous items positively correlated with the total (Buck et al., 2019). This pattern of results is encouraging in suggesting that CARAT-DPA and CARAT-SPR will contribute to a coherent nomological net.

Conclusions

The search for a reliable, valid, and useful measure of nonverbal receiving ability has gone on for a century, but such a measure has not emerged. Experience with static stimuli such as the POFA suggests that such abilities relate to a wide variety of critical social and psychological outcomes and may create a window into the brain mechanisms underlying such outcomes. The CARAT technique shows promise for providing such a measure. Research with the CARAT-SPR, a provisional version of the CARAT-DPA, and a self-report empathy scale demonstrate evidence of construct validity as measures of emotional empathy at levels higher than have been achieved by measures using posed expression. Moreover, the CARAT-SPR is a potentially useful behavioral measure of cognitive empathy. Both have objective and veridical accuracy scores.

We saw that data from a short form of the CARAT-SPR suggests that Spontaneous and Regulated clips are rated similarly by FACET and human judges, while Posed clips are not. Automatic techniques such as FACET can score facial movements and expressions that are objectively present but may be discounted by human judges instructed to pay attention to emotion displays. These might include displays of negative affect associated with effort and/or intention movements. Such displays may be particularly sensitive to method variables associated with how the posed displays are elicited and/or enacted, which in turn might explain why measures fail to correlate strongly, resulting in poor evidence of construct validity. The implication is that, however carefully constructed, technologically elegant, and theoretically grounded, posed, enacted, or otherwise intentionally evoked displays are simply inappropriate to use as stimuli in measures of emotion-recognition accuracy.

It is of interest that the Schlegel et al. (2019) meta-analysis found tests of nonverbal recognition accuracy using posed expressions and tests of intelligence to be correlated at about the same level as the intercorrelations between the tests themselves. One explanation for this might be that nonverbal recognition accuracy is a specific aspect of general intelligence, but another interpretation is that measures using posed/enacted displays are simply rather poor measures of general intelligence, and that true empathy must be assessed using sensitivity to spontaneous expressions.

In conclusion, our findings suggest that nonverbal receiving ability involving dynamic and spontaneous displays may in fact constitute a single, uniform ability, with deep implications for psychological and social functioning. Tests using dynamic, spontaneous, and naturalistic stimuli may both produce construct-valid tests of emotion-receiving ability and serve usefully in neurophysiological studies (Powers, Buck, Kiehl, & Schaich-Borg, 2007). However, nonverbal receiving ability involves unique complexities, which we explore in another chapter in this volume.

Notes

1. Corrections to correlations, for example, for attenuation and/or range restriction, are considered by these meta-analyses.
2. A recent meta-analysis of the relationship between emotional receiving ability and intelligence in adults showed an overall effect size of $r = .19$, suggesting that it may be an ability amid other mental abilities that are distinct from each other yet may share an "elementary cognitive basis" (Schlegel et al., 2019).
3. As each sender appears only once in CARAT-SPR, emotion correlation scores cannot be taken.

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3

Empathy as Spontaneous Communication: At the Intersection of the Traditional Social and Behavioral Sciences and the New Affective and Communication Sciences

Ross Buck, Stephen Stifano, Brett Graham, and Ryan J. Allred

Spontaneous Communication: Definition

George Herbert Mead (1934) argued that human verbal communication evolved from a biologically shared signal system, which he termed a "conversation of gesture." His example was a dog fight, where antagonists circle, responding instantly to signs of advance or retreat. He argued that dogs' gestures are not voluntary: "It is quite impossible to assume that animals express (their emotions) for the benefit of other animals" (p. 16). Similarly, those gestures are not "symbols" because the relationships with

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their references (advance or retreat) are not arbitrary. Instead, gestures are *signs* that are externally accessible aspects of their referents, as smoke is a sign of fire. Because signs are external aspects of an internal state, it makes no sense to inquire whether they are true or false because if the internal state were not there, the sign would be absent. Because a proposition must be capable of being true or false (Russell, 1903), communication via gesture must be nonpropositional. "If a gesture occurs in the absence of the appropriate motivational-emotional state—for example, if a one 'puts on a happy face' while feeling miserable …—it is not spontaneous communication by this definition" (Buck, 1984, p. 7). It is instead *pseudospontaneous communication* (Buck & Van Lear, 2002).

Thus, emotional empathy involves spontaneous communication based on a biologically shared signal system involving *displays* in the sender and *preattunements* to those displays in the receiver (e.g., mirror neuron systems). Spontaneous communication is nonvoluntary, the elements of the message are signs, and it is nonpropositional. In contrast, *symbolic communication* involves a symbol system learned and shared by sender and receiver, is intentional at some level, and is propositional (Buck, 1984).

What Is This Thing Called Subjective Emotional Experience?

The state that is spontaneously communicated in empathy is subjectively experienced emotion, also known as *affect*. Biological emotions include physiological responses, displays, and subjective affects—termed Emotion I, II, and III, respectively (Buck, 1985). Affects are a bugaboo to objective science because they are by their very nature "subjective" and not available to direct observation and measurement. B. F. Skinner discussed the "world within one's skin" as involving *private events* that "may be distinguished by their limited accessibility, but not, so far as we know, by any special structure or nature" (1953, p. 267). What is unique about such events is their "degree of accessibility to the community" (p. 262). This makes affects singular from a social learning point of view because it makes it difficult to establish a reliable consensual vocabulary to "identify, categorize, and understand (one's) affective experience" (Buck, 1988,

p. 350). This, in turn, requires that a unique process of *emotional education* must take place, where labels and expectations are associated with subjectively experienced feelings and desires (Buck, 1983). We explore the relevance of this for the development of social and emotional intelligence later in this chapter.

Affect is necessarily subjective and therefore in a mysterious realm hidden from both objective science and everyday interaction partners. However, a feature of the current renaissance of research and theory on emotion is that this realm is increasingly open to indirect observation, measurement, and manipulation, both by techniques in neuroscience such as brain scanning and studying drug effects, and by methods of observing, recording, and presenting nuances of nonverbal display and communication by modern video technology. These techniques have enabled the investigation of the biological bases of affects as never before.

James-Lange versus Cannon. There are two major psychological theories of affect. One, the *James-Lange theory* (James, 1884/1968), suggests that subjective aspects of emotion involve feedback from the body, particularly the autonomic nervous system (ANS). When one becomes aware of an emotionally arousing event, responses are initiated in the sympathetic nervous system (SNS: fight or flight response) and parasympathetic nervous system (PNS: relaxation, sociability), and the feeling of these bodily responses is held to be the subjective aspect of emotion. Thus, when we see a dangerous bear, ANS (heart pounding) and somatic (running) responses occur, and "our feeling of these same changes as they occur *is* the emotion. … Without the bodily states following the perception, the latter would be purely cognitive in form, pale, colorless, destitute of emotional warmth" (James, 1884/1968, p. 19. Italics in the original).

The James-Lange theory was famously criticized by physiologist Walter B. Cannon (1927), whose work elucidated many of the functions of the ANS. Among other things, Cannon argued that the viscera are too slow and insufficiently differentiated to be a source of all emotional feelings, and that total separation of the viscera from the brain, as in severe spinal injuries, does not impair emotional experience. Instead, Cannon proposed that emotional stimuli act on subcortical systems that independently and simultaneously activate ANS and bodily responding, and subjectively experienced affects. Cannon incorrectly identified these subcortical systems with the thalamus, but anatomist James Papez (1937) suggested that the ANS response to emotion was associated with the hypothalamus, and subjective experience involves the *limbic system*. The limbic system includes paleocortical (3–5 layered) brain tissue plus the amygdalae. Subsequent research found neurochemical systems with neurotransmitters associated with specific subjective affective experiences to be in limbic system structures (See Buck, 2014 for review). This is consistent with specific *discrete biological affect systems* including fear, anger, sadness, happiness, surprise, interest, distress, sex, nurturance, bonding, love, and play; this reasoning led to the development of *affective neuroscience* (Panksepp, 1998).

Gut feelings versus discrete affects. An examination of contemporary evidence regarding the neural bases of subjectively experienced emotion suggests that both the James-Lange and Cannon theories are correct as far as they go, but that they describe different sorts of subjective emotional experience, the former based on interoceptive input and the latter on exteroceptive input to the brain. The SNS and PNS carry interoceptive information from the smooth muscles of the viscera (e.g., the *enteric nervous system*). Afferent or sensory input to the brain via the ANS primarily involves the splanchnic nerves of the SNS and vagus nerves of the PNS. The brain target of both systems is the insula, the part of the limbic system that serves as the sensory cortex of the ANS. Right and left branches of the splanchnic innervate the right insula, and right and left branches of the vagus innervate the left insula (Craig, 2005).

Subjective affective qualia associated with ANS input were illuminated by Soviet researcher P. O. Markov (1950), who swallowed a balloon with electrodes to shock the interior of his own stomach. He reported no sensation even with relatively strong shocks. Gradually, as shocks became stronger, he reported first vague and diffuse sensations and finally acute and localized pain. Razran (1961) reviewed Soviet literature on interoceptive conditioning, where either the conditioned stimulus, unconditioned stimulus, or both are internal bodily functions, and he assumed, citing Markov, that most such stimuli are unconscious. Razran reported many experimental situations that robustly demonstrated interoceptive conditioning, and because of its unconscious aspect, he termed the resulting pattern of interoceptive conditioned responses the *observable uncon-*

scious. In every organism, a unique, complex, and unconscious system of conditioned visceral responses must emerge as "an almost built-in function that is constantly generated and regenerated in the very process of living and action" (Razran, 1961, p. 97). These can in turn become associated with an endless variety of exteroceptive stimuli including nonverbal displays of other persons, generating vague but powerful and possibly quite valid "gut feelings" and "hunches" that are an important aspect of empathy.

At the same time, afferent/sensory inputs to the brain from exteroceptive senses such as vision and audition proceed via classical sensory pathways proceeding from sensory organs, to subcortical areas, to sensory cortices of the brain. Joseph LeDoux (1996) demonstrated that parts of the auditory system went from the cochlea to the brain's amygdalae, generating a response that was less differentiated but faster than information directed to the neocortex. LeDoux termed the amygdala route the *low road* to cognition, suggesting that it served as an early warning mechanism: faster but less differentiated than the *high road* associated with the neocortex. This exteroceptive input can activate neurochemical systems in the limbic system such as those distinguished by Panksepp (1998), generating discrete affects and associated displays including pheromones, facial expressions, gestures, postures, and movements.

In conclusion, evidence regarding the nature of subjective experience suggests that there may be two sorts of emotional empathy: relatively diffuse and undifferentiated "gut feelings" stemming from conditioned responses to others' displays and more specific discrete affects stemming from others' displays of discrete emotions. The latter may involve mirror neuron systems that respond to specific displays (Mukamel, Ekstrom, Kaplan, Iacoboni, & Fried, 2010).

Biological and higher-level emotions. A distinction is useful between biological emotions and higher-level emotions such as pride, guilt, and shame. Biological emotions, including specific and discrete subjective affects, are always "on" in the sense that the neurochemical systems underlying them are active to some degree even though we may not notice them. But, like the feel of our shoes on our feet, we can always turn our attention to how happy, angry, sexy, and so on we are (Buck, 2014).

Higher-level emotions involve biologically based affects, but these emotions respond to recurring ecological challenges in the social and physical environment.[1] *Primary social affects* involve attachment motives that underlie needs to be loved and to meet or exceed social expectations. If one succeeds relative to comparison others in meeting these needs, one tends to experience *Pride/Arrogance*; if one fails, one experiences *Guilt/Shame*. If one compares oneself relative to a comparison other who succeeds, one experiences *Envy/Jealousy*; if is the comparison other who fails, one experiences *Pity/Scorn*. These eight primary social emotions reflect recurring ecological challenges involving dominance and submission: the dominant feels and displays Pride/Arrogance and regards the comparison other with Pity/Scorn; the submissive feels and displays Guilt/Shame and regards the dominant with Envy/Jealousy (Buck, 1988, p. 528). These emotions can be displayed in gesture, facial expressions, and body posture. Generally, secure persons feel Pride, Guilt, Envy, and Pity in situations where insecure persons feel Arrogance, Shame, Jealousy, and Scorn (Buck, 2014). For example, photographs of US Vice President Mike Pence at an immigrant camp in Texas in July 2019 showed nonverbal displays of domination and power unsettlingly like those displayed by Reichsführer-SS Heinrich Himmler visiting a concentration camp in Europe in 1942. In both cases, dominant but insecure males in positions of power were in the presence of helpless, hated enemies: an ecological situation that evoked in them displays, and we think feelings, of arrogance, scorn, and contempt; without pity, sympathy, or compassion.

Conclusions. We have seen that, although subjective emotional experience is forever blocked from direct observation, new techniques of observation have allowed the observation, measurement, and manipulation of systems that suggest that biologically based subjective experiences can have both interoceptive and exteroceptive origins, and that higher-level feelings and desires flow from ecologically fundamental social and situational contingencies. The evidence suggests that subjectively experienced emotion involves a rich tapestry of feelings and desires originating within the body as well as in response to events in the physical and social environments. Buck (2014) used the analogy of a "symphony of feeling, usually whispering in pianissimo but occasionally screaming and shouting in fortissimo crescendo, filling every waking moment and even invading our dreams" (p. i). These feelings and desires are similarly displayed outwardly in nonverbal expression and are publicly present in every nuance of facial expression, look, and gesture: the raw material of emotional empathy.

Nonverbal Receiving Ability as Communication

Nonverbal receiving ability involves not only an individual receiver but also *communication* between a sender or target and a receiver or judge. Emotion-receiving ability is usually conceptualized as an individual's skill or ability to judge others, like intelligence in the abstract-reasoning sense. However, even if a valid and reliable measure of emotion-recognition accuracy were developed from Communication of Affect Receiving Ability Test (CARAT) and other techniques, there are complexities to it that do not exist in the realm of abstract reasoning. First, emotion-receiving accuracy involves a sender or target who may differ in expressivity or "judgeability." Second, in emotion-receiving ability measures, the sender or target is generally a stranger unknown to the receiver; there is evidence that acquaintance importantly influences receiving ability. Third, measures of emotion-recognition ability explicitly direct the attention of judges to the nonverbal behavior of the target, so that a person who habitually ignores nonverbal cues in her everyday life may appear falsely to be skilled (Buck, 1984; Kenny, in press).

The Social Relations Model. That apparently straightforward communication scores have hidden complexity is revealed by the Warner, Kenny, and Stoto (1979) Social Relations Model (SRM). Communication involves a sender or expresser (S), a receiver or judge (R), the unique relationship between S and R (U S->R), and error. Thus, the total communication from S to R (Comm S->R) is made up of S's individual sending accuracy or expressivity, R's individual receiving ability, plus the unique ability of individual S to send to individual R (U S->R). The latter, unique ability, is termed the *relationship effect*, reflecting the ability of a sender and receiver to send and receive vis-à-vis each other controlling for their ability to send to and receive from other persons.

An application of the SRM involving spontaneous communication involved married couples' sending and receiving to each other and then receiving from other female and male strangers via the CARAT-01.[2] Wives' and husbands' filmed expressions were then viewed by female and male receiver/judges to provide a stable estimate of their sending accuracy or expressivity (Sabatelli, Buck, & Dreyer, 1982). Sabatelli, Buck, and Kenny (1986) found that the SRM broke down the total communication variances between spouses as follows:

Husband -> Wife Communication was composed of:

$$22\% \text{ Husband sending} + 10\% \text{ Wife receiving}$$
$$+68\% \left(\text{Wife unique ability to read husband} + \text{error}\right)$$

Wife -> Husband Communication was composed of:

$$48\% \text{ Wife sending} + 1\% \text{ Husband receiving}$$
$$+51\% \left(\text{Husband unique ability to read wife} + \text{error}\right)$$

A measure of marital complaints showed no relationship with overall communication between spouses, but husbands reported being happier when their wives were good senders ($r = .42$), and wives reported being happier when they could uniquely read their husbands ($r = .32$), suggesting that wives' and husband's nonverbal communication patterns may play markedly different relational roles.

Sender and receiver effects. The SRM sending and receiving scores represent individual sending accuracy and receiving ability, respectively. The Sabatelli et al. (1986) percentages illustrate a more general point that, across many kinds of interpersonal perception/judgment studies, individual sender or target differences in accuracy contribute more variance to overall communication than do individual receiver or judge differences (Kenny, in press). Indeed, Kenny suggested that interpersonal-perception studies focus more on individual differences in senders/targets than in receivers/judges.

Boone and Buck (2004) also emphasized the role of sender expressivity in driving emotional communication in face-to-face interaction. A highly expressive sender tends to encourage mimicry and therefore expressivity with everyone she interacts, in effect carrying around a "bubble of expressivity" wherever she goes. A poor sender, in contrast, carries an emotionally deficient "bubble of inexpressivity," turning off the expressivity of interaction partners. In this way, expressivity acts like "emotional sonar," inducing comparable levels of expressivity in others. Expressivity also functions as "emotional IFF" (identification of friend or foe), enabling the detection of trustworthiness in others. Indeed, Boone and Buck (2003) suggested that expressivity may function as a marker of trustworthiness in everyday interaction, an issue we consider later.

Relationship effects: Emotional and cognitive rapport. Kenny (in press) suggested that accurate senders are "good targets" and accurate receivers are "good judges," and that relationships that are more accurate constitute "good pairs." He noted that relationship effects have attracted relatively less interest compared with individual-level sender and receiver effects, perhaps because, as dyad-level rather than individual-level effects, they are relatively abstract and challenging to conceptualize.

One way of conceptualizing relationship effects is in terms of the reciprocal empathy of the dyad, as expressed by the term *rapport*. That is, if person P has high empathic accuracy when interacting with O, and O similarly has high empathic accuracy when interacting with P, O and P have high reciprocal empathy and are a "good pair" high in rapport. Tickle-Degnen and Rosenthal (1990) suggested that rapport has three aspects—mutual attention, coordinated interaction, and positive behaviors—which foster feelings of mutual interest, friendliness, and harmony (Buck, 1990). Indeed, the term rapport is generally used when the interaction is friendly, but we shall see that mutual attention and coordinated interaction—and even empathy—can be associated with confrontation, negative affect, and conflict.

The Development of Empathy

So, emotional empathy involves the display of emotion by a sender, and the pickup of that emotional information by a receiver. Another major issue involving empathy is the developmental course of this process from birth to adulthood.

Affectional systems in monkeys. Empathy has its roots in the very earliest interactions between infant and caregiver. The importance of early touch, or *contact comfort*, was demonstrated in the well-known research of Harry Harlow and colleagues. Harlow (1971) found that contact comfort is necessary and sufficient for the formation of basic trust in rhesus monkeys and necessary but not sufficient for full socialization. In observations of monkey colonies, he found that the first three months in the life of an infant monkey are filled with contact with the mother, and there is virtually no punishment of the infant by the mother. Harlow termed this the *maternal affectional system* (perhaps better, *parental affectional system*), and it appeared to establish the bases of emotional empathy. Between three and six months, however, punishment increased, and contact declined precipitously: the mother punished unrestricted contact. That forced youngsters to go off on their own, which was consistent with their growing motor skills, and brought them into contact with the community of other young monkeys. This initiated the *peer affectional system* (6–12 months) that is characterized by *play* that becomes increasingly rough and tumble as the youngster got older. In this play context, Harlow noted the increasing and increasingly skillful use of the emotional displays of fear and, later, anger that characterize adult monkey social organization. The youngsters learned to use displays of dominance, submission, courting, and warning in the context of play. Later, with the onset of puberty in the *sexual affectional system*, these same displays were used with deadly serious intent. Essentially, the monkeys *learned how to use* emotional displays and preattunements critical to rhesus monkey social organization in playful interactions with peers: they learned the rules of rhesus monkey nonverbal communication to discern the perspective and intent, as well as the feelings, of their fellow monkeys: thus, they gradually learned the basics of cognitive empathy.

Mutually contingent responsiveness and primary intersubjectivity. In human infants, there is an initial period of *primary intersubjectivity* between infant and caregiver that is initiated by their *mutually contingent responsiveness*: each automatically, directly, and unconsciously becomes attuned to the subjective state displayed by the other in initial *protoconversations* (Trevarthen, 1979). Phases of *secondary* and *tertiary intersubjectivity* succeed the initial phase, and, later, more advanced forms of cognitive empathy involving perspective taking, Theory of Mind (ToM), inference, appraisal, and attribution emerge (Braten & Trevarthen, 2007). Thus, consistent with de Waal's (2007) "Russian Doll" model, raw emotional empathy involving primary intersubjectivity is hidden within secondary and tertiary intersubjectivity and advanced cognitive empathy (De Waal & Preston, 2017).

Social biofeedback, emotional education, and emotional competence. Interactions involving subjectively felt emotion and feedback from others foster learning about the social meaning of felt affect. When a child displays an emotion, like a boy, Johnny, throwing his toys in an angry tantrum, an adult might explain that Johnny is angry because he is tired and frustrated, and that he should not throw things, but rather relax until he feels better. That is *social biofeedback* that gives Johnny a wealth of information about that subjective feeling: it is called anger, it may be caused by fatigue and frustration, and that relaxing is permitted when such feelings occur but throwing toys is not. Thus, Johnny learns about labeling and understanding that feeling (*emotional education*) and what to do and not do when it occurs (*emotional competence*). In contrast, a little girl, Janie, may do the same thing and might be slapped and called a "bad girl," learning in effect that angry feelings are "bad" and are punished, and therefore their display is suppressed and inhibited. Johnny may of course learn to similarly inhibit fearful or sad feelings. Capacities to empathize with such feelings in others may be influenced similarly.

Interpersonal Immediacy and Interpersonal Synchrony

We have seen that empathy and rapport are dyad-level phenomenon in that they must involve at least two individuals. Interpersonal immediacy is also a dyad-level phenomenon. In their classic analysis of the maintenance of intimacy in interaction, Michael Argyle and Janet Dean (1965) suggested that intimacy is signaled in online interaction by a variety of *immediacy behaviors*, including frequent eye contact, close and direct spacing, high interpersonal synchrony, and intimacy of conversation topic. They suggested that if the interaction is constrained in some way, such as the space becoming uncomfortably close on an elevator or subway, other indices of intimacy will lessen—with lessened eye contact, synchrony, and intimacy of topic. Thus, these immediacy behaviors show *equilibrium* when intimacy remains stable. The intimacy of the interaction may change, however, and in that case the immediacy behaviors will change accordingly. If one interaction partner moves slightly closer and the other does as well (*reciprocity*), the overall intimacy of the interaction is increased.

Ruth Feldman and colleagues have assessed immediacy behaviors to study three prototypes of attachment in human beings: parental love, sexual love, and filial love between friends (Feldman, 2012). Feldman summarized research involving the observation and micro-coding of human immediacy behaviors such as touching, eye contact, emotion display, soft vocalization, and interpersonal synchrony. Results suggested these prototypes share common brain mechanisms in the promotion of biobehavioral synchrony, involving the temporal concordance of the biological and social behavior of interactants. Many of these studies examined the effects of the neurohormone oxytocin (OT) administered in intranasal spray. This method enables powerful double-blind research designs, in which neither experimenter nor participant is aware whether the spray contains OT or a placebo.

As an example, Feldman (2012) reported a study that administered OT or a placebo to fathers in a nasal spray, and subsequently micro-coded fathers' and their infants' behaviors during play. Fathers inhaling OT showed more engagement with their infant and more frequent touch. Significantly, levels of OT *in the infant* were dramatically raised when their fathers had inhaled OT. Also, infants in the father-OT condition showed longer social gaze and toy engagement, and they had increased Respiratory Sinus Arrhythmia (RSA), a measure of PNS arousal associated with readiness for social contact (Porges, 1995). Feldman concluded, "OT administrations to a parent can lead to alterations in the physiology and behavior of an infant in ways that induce greater readiness for social contact" (2012, p. 7). Presumably, the OT functioned by increasing fathers' empathy with their infants, resulting in corresponding empathy in the infants, thus increasing rapport. We examine the functioning of OT further, later in this chapter.

Altruism and the Selfish Gene Hypothesis

Many have suggested that empathy naturally increases tendencies toward *altruism*—the unselfish aiding of others (see Batson & Oleson's, 1991 *empathy-altruism hypothesis*). Altruism is defined biologically as giving up one's own genetic fitness to favor the genetic fitness of another organism; the possibility for this happening has been strongly challenged. Ethologists such as Konrad Lorenz (1966) and Niko Tinbergen (1952) assumed, based on Darwinian theory, that communication in a variety of settings including courting, dominance, and warning is functional, increasing the chances of individual and species survival (*fitness*). For example, an animal signals dominance with a threat display and another responds with submission, both avoiding a costly fight. Ethologists studied the evolution of instincts or *fixed action patterns* in animal communication, including the elements of spontaneous communication, that is, displays and preattunements. Spontaneous communication mechanisms underlie social organization even in relatively simple single-celled creatures, such as quorum-sensing in bacteria that respond when concentrations in an area reach a certain level (Waters & Bassler, 2005).

The classic ethological view was challenged by investigators who conceived of evolution as operating at the level of the gene (Dawkins 1976; Trivers, 1971). Richard Dawkins (1982) argued that the unit of evolutionary selection is the *replicator*—something whose activities determine whether copies are made of it across the span of evolutionary time. He argued that the gene is the only active replicator, so the *selfish gene* is the unit of selection motivated only by "the law of universal ruthless selfishness" to make copies of itself (Dawkins, 1976, p. 3). Based on this theory, Dawkins argued that biological altruism is impossible. Krebs and Dawkins (1984) defined animal communication as inevitably selfish: "a means by which one animal (the 'actor') exploits another animal's (the 'reactor's') muscle power" (pp. 380–381). Dawkins wrote, "Be warned that if you wish, as I do, to build a society in which individuals cooperate generously and unselfishly towards a common good, you can expect little help from biological nature. Let us try to teach generosity and altruism, because we are born selfish" (1976, p. 3). To explain apparent acts of altruism, Dawkins and colleagues suggested that, in some cases, altruistic behavior indirectly increases the genetic fitness of the actor (*inclusive fitness*). For example, if one aids a relative, genes one has in common with the relative common are favored (*kin selection*), or if one aids an ally, the recipient may return the indulgence later, thus favoring one's genes (*reciprocity*).

Critics of selfish gene theory responded that true altruism is possible in cases of group selection, where behaviors may favor the genes of group members (Wilson & Sober, 1994). Dawkins (1994) replied persuasively that although group selection is possible in theory, groups cannot be units of selection, or replicators, because they do not persist across evolutionary timescales. Buck and Ginsburg (1991, 1997; Buck, 2011) addressed Dawkins' objection with the *communicative gene hypothesis*. Communication (Comm S -> R) is the phenotype selected in evolution, which leads to the *co-evolution* of display in the sender and preattunements to that display in the receiver. That is, when sender S's threat display leads to submission in a receiver R and avoids a dangerous fight, genes underlying the threat display in the dominant S and genes underlying the preattunements to the display in the submissive R are simultaneously favored and thus co-evolve (Buck & Powers, 2006). In this way, the unique communication of S to R (U S->R) is selected and becomes a replicator in Dawkins' (1982) sense. Such communication is ubiquitous throughout nature, as can be observed in quorum-sensing, the complex social organization of slime mold *Dictyostelium discoideum* (e.g., Strassmann, Zhu, & Queller, 2000), and gonadotropin-releasing hormone (GnRH) as a sexual pheromone in yeast (Loumaye, Thorner, & Catt, 1982).

Spontaneous communication fills Dawkins' (1982) criterion of being a unit of selection or replicator. We saw that communication involves unique relationship effects (U S->R) in addition to individual-level sender and receiver effects. Unlike groups, such communicative relationships persist across evolutionary timescales. Such relationships, including dominance-submission, courting, nurturance, and warning, can therefore function as replicators, and these are exactly the relationships studied by classical ethology. Thus, there is a biological basis for the evolution of biological altruism. Ironically, as the late Benson Ginsburg pointed out (personal communication), kin selection and reciprocity may be the bases not of altruism, but of *restricting* altruism to kin and comrade—the bases of xenophobia.

Honest Signaling: Expressivity as a Marker of Trustworthiness

We saw that selfish gene theorists regard communication as inevitably selfish and manipulative (Krebs & Dawkins, 1984). From this point of view, honest signaling is unlikely because it makes it clear who is willing to make individual-level sacrifices, putting the sender at a disadvantage. Honest persons will be marked for exploitation and thus will be less likely to survive to pass on their genes, so signaling trustworthiness would seem to be an evolutionary dead-end.

Zahavi (1975, 1977) applied evolutionary game theory to this issue, suggesting that displays can be honest if and only if they are costly to the sender: in the absence of costs, displays are too easily mimicked and become unreliable. Frank's (1988, 2001) Commitment Model included Zahavi's logic, and it argued that cooperation would be aided by markers that distinguish more and less cooperative individuals: that is markers that signal trustworthiness. Frank argued that such markers are probably signaled via nonverbal communication.

As noted, Boone and Buck (2004) argued that emotional expressivity, or the spontaneous tendency to accurately communicate one's feelings and desires, can function as an "IFF" mechanism, differentiating friend from foe. Boone and Buck (2003) suggested further that expressivity may act as Frank's marker for trustworthiness and cooperative behavior. Expressivity can play two roles: signaling the sender's motives in a display that is perceived as honest because it is potentially costly and simultaneously "pinging" interaction partners, encouraging expressivity that may reveal their true motives. There is evidence for this in game situations involving cooperation. Krumhuber et al. (2007) demonstrated that partners' smiles increased judgments of trustworthiness and cooperative behavior, with the perception of trustworthiness mediating the effect of the facial expression on cooperative behavior. Also, Schug, Matsumoto, Horita, Yamagishi, and Bonnet (2010) found that cooperators showed higher expressivity when receiving unfair offers in an Ultimatum game, concluding that general emotional expressivity reliably signals cooperation. Also, Reed, Zeglen, and Schmidt (2012) showed that, in an acquaintance period preceding a Prisoner's Dilemma game, participants were able to detect accurately their partner's trustworthiness. Expressions of happiness elicited judgments that the expresser was trustworthy and predicted cooperation. Conversely, displays of contempt were related to defection on the part of both the expresser and the partner, eliciting suspicion in the partner who accurately detected the expresser was not trustworthy.

Emotional expressivity, then, can signal trustworthiness and thereby open the gates for cooperation. This natural, spontaneous, and automatic process has its developmental roots in the earliest interactions involving mutual contingent responsiveness of parent and infant, fostering the primary intersubjectivity that is at the heart of empathy.

Emotion, Empathy, and Communication Media

According to media theorist Marshall McLuhan, because of electronic communication media, "We begin again to structure the primordial feelings and emotions from which 3000 years of literacy have divorced us" (McLuhan, 1969, p. 17). McLuhan wrote about the effects of electronic media in terms of perceptual sense ratios and did not systematically consider emotion. However, one of the features of modern media is that they portray emotion displays effectively in sight and sound, and sometimes even smell and touch, and thereby enhance spontaneous communication and empathy with media figures. Spontaneous communication involves the direct pickup of displays via preattunements, and although it seems paradoxical at first glance, such direct communication can occur via media because of the ability of media to faithfully and powerfully reproduce emotional display. As McLuhan's aphorism states, "the medium is the message," and the message is spontaneous emotion.

The uncanny valley. One might think that, as robots, androids, and other automata resemble humans more, empathy would increase, and they would become better accepted as interaction partners. However, this does not seem to be the case. A puzzling aspect of human-computer interaction is that as automata become more human-like (*homophily*) they appear to stir feelings of unfamiliarity and unease: M. Mori termed this the *uncanny valley* (2012).

If not restricted by the reality of the human figure, artists, designers, and engineers can consciously or unconsciously take advantage of the static aspects of display to produce *superdisplays* that can elicit enhanced empathic responses in human observers, even vis-à-vis inanimate objects. For example, large eyes and forehead, rounded face, and small chin are aspects of *babyfacedness* that are perceived as cute, vulnerable, and endearing, eliciting feelings of caring and nurturance. These are widely seen in cartoon characters, dolls, and puppets meant to be appealing, innocent, and perhaps a bit naïve. In contrast, "bad guys" such as the big bad wolf are often depicted with small foreheads, large chins, sharp teeth, and beady little eyes. Similarly, femininity can be depicted by small waist-to-hip ratios and masculinity by small waist-to-shoulder ratios (Braun & Bryan, 2006). These and other static displays can be combined: for example, the original Superman combined a masculine small waist-to-shoulder ratio body with a babyish face, depicting a combination of strength with compassion and vulnerability. Audio-vocal superdisplays can be manipulated as well. The effectiveness by which this is done determines much of the "charisma" of a cartoon character.

As they become more human-like, the ability of automata to employ superdisplays necessarily declines. At the same time, the relative inability of automata to employ dynamic aspects of empathy vis-à-vis a human observer—for example, immediacy behaviors like maintaining eye contact, mutually contingent responsiveness, and interpersonal synchrony—does not change. Hence, the uncanny valley. Some puppets such as the Muppets and Japanese Bunraku avoid this to some extent because they are operated directly by human beings and therefore are capable of some dynamic empathy behaviors.

Trusting machines: The User Affective Experience (UAX) scale. Recent research has emphasized the importance of emotion in decision-making, particularly *anticipated affects*, the feelings one anticipates because of a decision (Loewenstein, Weber, Hsee, & Welch, 2001). This approach implies that humans can anticipate subjective feelings with some degree of reliability. One way to confirm this is to use principles of crowdsourcing, where many people are asked to anticipate how they would feel if confronted by some event. This is relevant to understanding *user experience* (UX), which has been described as a "core concept of human-computer interaction" (Lallemand, Gronier, & Koenig, 2015, p. 35). The User Affective Experience (UAX) scale was constructed by asking participants to report emotions they feel when pop-up ads interrupt their online surfing (Buck, Khan, Fagan, & Coman, 2018). Results revealed that participants agreed on four kinds of emotions: men and women reported equal positive emotions, women reported more fear/anxiety, and men reported more anger/annoyance. Interestingly, men also reported more sadness/loneliness in response to pop-up messages than women did. Such emotional reactions have implications for whether automatic systems are trusted, which is a subject of major concern (Khan et al., 2017). How to gain the trust of systems by operators and how to repair trust when the system malfunctions are critically important issues for system design.

Empathy and emotional education I: Silly love songs. We discussed previously the phenomenon of social biofeedback and how children come to learn about private subjectively experienced feelings and desires involving loving attachment, fear, sadness, and anger in the context of communicative interactions with parents and peers. As childhood merges into adolescence, feelings of hostility and sexual desire mature with the physical maturation of sexual systems. These feelings and desires are relatively difficult to share with others, and (fortunately!) actual situations that arouse such feelings in the lives of young people are relatively rare. It may be that this is a reason that young people tend to turn to media—to literature, art, drama, and music—at this age: media may provide vicarious emotional education, helping the user to detect, label, and understand feelings and desires that are ordinarily not shared by others, particularly not "official" socialization agents like parents and teachers. Such media have been widely criticized for depictions of sex and violence—indeed, sex and violence have suffused media since the plays of the Greeks and Shakespeare—and certainly sex and violence are often depicted in ways that titillate rather than instruct.

Another common media theme involves romance: innumerable songs explore the romantic aspects of human sexual relationships, ranging from "Some Enchanted Evening"[3] to "Love Stinks."[4] Beatles member Paul McCartney reportedly wrote "Silly Love Songs" in 1976 in response to John Lennon's teasing for writing lightweight songs, but the great popularity of such songs begs important questions regarding the motivation involved.

We have done studies of emotional responses to MTV videos, asking participants what emotions they felt while listening, and whether they liked the song (Buck, 2010). Different songs showed different emotional appeals: for example, Lionel Richie's "All Night Long" had a *happiness appeal*, in that participants who reported being happy liked the song; "Under Cover of the Night" by the Rolling Stones had a *power appeal*, and an anti-war song by Big Country had a *sadness*, *fear*, and *anger* appeal for men, in that men who liked it reported that it made them feel sad, afraid, and angry. In addition, two emotions related similarly to liking across all the videos. Participants indicated liking videos that made them feel interested (average $r = .61$) and not liking videos that made them feel bored (average $r = -.43$). This suggests that viewing the videos was a kind of exploratory behavior, where one explored their own feelings and desires. The successful evocation of feelings and desires—even "negative" ones—produced empathic responses that in themselves were pleasurable. This suggests in turn that empathy with media characters can foster emotional education.

Empathy and emotional education II: A full-length motion picture. Measuring empathy with characters in film communication presents a challenge: in order to know whether audience empathy with actors and director predicts liking for a film, one must measure the thoughts and emotions film creators are seeking to communicate. This was the strategy taken by Stephen C. Stifano, who produced and directed a full-length (108-minute) dramatic narrative film *Belief* (2014: https://www.imdb.com/title/tt1773304/) and recorded the emotions and artistic intentions of film creators during the film's production, including 89 different scenes. *Belief* would be "R-rated," containing scenes of violence and partial nudity. Viewers in a large test-audience setting viewed the film and rated film comprehension, emotional and rational involvement, emotional responses to the film, attitude toward the film, actor evaluation, and viewer-character identification.

Emotions were measured by the *EGrats-II* scale, a 35-item measure of emotional uses and gratifications. Emotional empathy was assessed as the correlation between the mean scores of creators rating how they felt during the film's creation and the responses of individual participants. The audience did not know that the creators had been surveyed or that their answers would be compared/correlated. Results revealed that both comprehension and emotional empathy were significantly related to involvement with the film and viewer attitude, with emotional empathy showing stronger relationships. Indeed, director-to-viewer emotional empathy accounted for some 25% of the variance in viewer liking of media.

Relationships between individual actor-viewer empathy and viewer evaluations were positive with the lead characters and varied with the role and sex of other actors, including some negative relationships involving a rivalry between characters. Empathy led to character identification, and identification changed the moral judgment of characters' actions and misdeeds. More specifically, women who identified with the male lead were less likely to support punishing him for his crimes. Women who identified with the female lead were also less willing to punish the male lead, while men who identified with the female lead were *more* willing to punish. Stifano noted that understanding active emotional empathy with film characters may help to explain fascination with "negative" antiheroes. He also noted the promise of understanding rational and emotional empathy via media as an important supplement to traditional concerns of media effects.

Oxytocin: The "Empathy Molecule?"

Having traveled the scale of complexity from the genes to media effects—DNA to MTV—we return to the level of molecules that appear to underlie empathy. We saw that the neurohormone oxytocin (OT) has been associated with attachment: positively toned social behavior and reports of warm feelings. Indeed, it has been known variously as the "cuddle hormone" or "love hormone" because of this association. However, many have questioned how such complex socioemotional behaviors can be related to a single molecule.

Churchland and Winkielman (2012) argued that it is doubtful that oxytocin directly influences complex social cognition, such as trust, generosity, or mentalizing. Instead, they suggested that OT has effects on lower level and general mechanisms, such as anxiety and social motivation. They reviewed evidence that OT works by decreasing anxiety (Evans, Dal Monte, Noble, & Averbeck, 2014). However, there is evidence that OT not only increases trust and empathic concern but also facilitates the categorization of others into in-group and out-group, and trust and concern may be reserved primarily for the members of the in-group (De Dreu, 2012). For example, in rodents, OT plays a role not only in maternal care but also maternal aggression in defense of the young (Neumann, 2008). Also, Shamay-Tsoory et al. (2009) showed that OT can increase negative as well as positive social emotions in humans: in an economic choice game, OT increased both reported gloating when one gained more than an opponent (schadenfreude, or pleasure at the distress of others) and reported envy when the opponent was more successful.

Thus, OT may increase empathic concern and the GREAT emotions of *gratitude, respect, elevation, appreciation,* and *trust* with in-groups (Buck, 2014) and simultaneously increase feelings of *loneliness, ostracism, shunning, exclusion*, and *rejection* toward out-groups (the LOSER emotions). Thus, the general mechanism that OT increases may be communication or empathy. If the person that one is communicating with is friend, kin, or ally, the effect of OT is to decrease anxiety and increase prosocial tendencies and the GREAT emotions, but if the other is foe, stranger, or enemy, the effect is to increase anxiety and rejection, activating LOSER emotions in the rejected person. Thus, ironically, OT may function simultaneously as a love hormone and a hormone of xenophobia.

Conclusions

Empathy is a central concept tying together the traditional social and behavioral sciences and the burgeoning affective and communication sciences. It organizes individual and social existence based upon simple and fundamental principles of spontaneous communication literally from the beginning of life on the earth, and from the beginning of the life of an infant with its caregiver. The simple single-celled creatures inhabiting the early Earth—blue-green algae producing stromatolites—lived a social existence in organized colonies, and quorum-sensing via peptide neurohormones organizes the social lives of microbes to this day. And, the relationship spontaneously established between newborns and their caregivers affords primary intersubjectivity and introduces the individual to the pleasures and pains of social life. Empathy is a link between brain and brain: literally between the neurochemical systems of sender and receiver. Empathy speaks to the fundamental prosociality of human nature as opposed to ruthless selfishness and at the same time to the deadly hatred and violence that can flow from the manipulation of that very prosociality in the rejection of outsiders.

Notes

1. Many suggest that higher-level emotions must involve cognitive appraisal, but the presence of higher-level emotions among animals and young children excludes this possibility (e.g., Bloom & Wynn, 2016; de Waal & Preston, 2017).
2. See Buck, Graham, Allred, and Hancock, this volume.
3. From the Rogers and Hammerstein musical *South Pacific*.
4. © 1980 by the J. Geils Band.

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4

Factors that Facilitate or Impair Kinesic and Vocalic Nonverbal Behaviors During Interpersonal Deception

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Nonverbal demeanor has long been thought to be a high-fidelity display window into a person's inner self. At the same time, nonverbal behaviors are thought by laypeople to be reliable indicators of dissembling. In the

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realm of deception, both of those beliefs are true—and false. Humans can choose to reveal their personal identity, affiliations, attitudes, and behavioral inclinations through their nonverbal presentation of self. But, as the adaptive creatures that they are, humans also use their nonverbal actions to fabricate, conceal, and evade. In this respect, deception can disguise the true self and yet can also betray the truth. In this chapter, we take a closer look at nonverbal deception and the ways in which motivated deceivers behave so as to evade detection. We also consider whether the modality in which communication takes place makes it easier or more difficult for deceivers to manage their behavior.

The Role of Motivation in Deceptive Interactions

Motivation Defined

At first blush the term "motivation" may seem straightforward, referring to *an internal drive state that impels an individual to accomplish a self-imposed or externally generated goal*—in this case, succeeding with deception and evading detection. That is, motivated communicators are the ones who "try harder." But how to recognize "trying harder" when one sees it becomes murky. Consequently, in the published deception literature, motivation has been operationally defined in highly diverse ways, or its definition has been sidestepped altogether by inferring it from outcomes (Burgoon, 2005). This latter strategy was employed in the program of motivation impairment research by DePaulo and colleagues (see DePaulo & Kirkendol, 1989, for a summary). Conditions surmised to heighten (or dampen) motivation—such as interacting with a target who is attractive (or unattractive), opposite sex (or same sex), worthy of ingratiation (or not), likely to be evaluative (or not), and so forth—were created. It was assumed that motivation was higher in the more socially desirable condition (i.e., the attractive, opposite sex, and worthy-of-ingratiation conditions). Whether motivation was the causal mechanism accounting for the results depends on the reader's sense of whether the experimental manipulations had face validity. Our interpretation (also articulated in Burgoon, 2005) is that the inferential leaps attributing results to motivation were questionable and that more explicit, unequivocal evidence of motivation as the causal mechanism is warranted, including experimental participants' own self-reports. However, to maintain comparability with prior motivation impairment effect (MIE) investigations (e.g., DePaulo & Kirkendol, 1989) and deception meta-analyses (e.g., Bond & DePaulo, 2006; Zuckerman & Driver, 1985), we follow their method of incorporating inducements to boost performance drives but with the addition of manipulation/induction checks.

The Motivation Impairment Effect

The roots of the MIE can be traced to the pioneering work of Ekman and Friesen (1969), who put forward the concepts of leakage and deception clues. They hypothesized that the internal distress or excitement over attempted deceit would give rise to involuntary outward manifestations that would "leak" out of the body unbidden or would tip off the receiver that something was afoot. These leakage behaviors and deception clues would serve as telltale signs of the true internal states or as indications that a communicator was prevaricating, thus making deception detectable. This view of deception was developed further in the four-factor "theory" proposed by Zuckerman, DePaulo, and Rosenthal (1981), which posited that deception gives rise to four psychophysiological processes—arousal, negative affect, cognitive load (or difficulty), and attempted control—that together account for overt indicators of deception. Deceptive communicators were thought to (1) undergo heightened arousal, (2) experience negative emotions such as fear or guilt, and (3) expend greater cognitive exertion to create plausible deceptions, all of which would have corollary outward verbal and nonverbal manifestations, including (4) attempts to manage behavior so as to quell these other reflexive, involuntary signs. It is this foundation that gave birth to the MIE (DePaulo & Kirkendol, 1989; DePaulo, Stone, & Lassiter, 1985).

The MIE is a dual hypothesis of impairment of nonverbal performance and facilitation of verbal performance. The precise wording, first articulated in DePaulo, Lanier, and Davis (1983), is as follows:

> In any condition in which nonverbal cues are available, the lies of highly motivated senders will be more readily detected than the lies of less motivated senders. However, if only verbal cues are made available, then the lies of highly motivated senders will be less readily detected. (DePaulo et al., p. 1097)

Paraphrased, it proposes that motivated deception results in performances that make deception more detectable when receivers can see or hear nonverbal features of a message and less detectable when only the words are available. That is, *motivation impairs nonverbal deception but facilitates verbal deception*. The reasoning behind this claim is that when deceptive individuals are highly motivated, they will experience even greater distress and negative emotions of guilt, discomfort, and/or the fear of being caught than that associated with deception alone. Because the physiological changes that accompany heightened arousal and negative affect purportedly occur involuntarily and inadvertently, they are posited to escape deceiver control and thus to disrupt a deceiver's usual nonverbal demeanor. Along with the physiological changes, deceivers are thought to become more aware of, and to put more cognitive effort into, controlling what they say. Cognitive exertion may also betray itself through outward telltale signs. However, nonverbal behavior is assumed to be largely uncontrollable or uncontrolled. The net result of these concerted efforts to conceal and control behavior is that the harder deceivers try, the more their nonverbal performance becomes unnatural. Thus, motivation backfires, making deception more readily detectable when receivers have access to the nonverbal indicators. In this manner, increased motivation is hypothesized to be the deceiver's undoing.

An opposite prediction is made for the effect of motivation on verbal behavior. The MIE postulates that verbal behavior is both controllable and monitored by senders and thus benefits from heightened motivation. This felicitous attentiveness to verbal performance, however, comes at the expense of attending to and controlling nonverbal performance. Thus, the MIE predicts that greater cognitive effort and attempted control facilitate verbal performance but further impair nonverbal performance.

Modality comes into play in that the MIE traditionally has been tested by examining not the actual behaviors that are displayed but rather receiver accuracy in detection. Thus, impairment is predicted to be most transparent under those modalities that afford receivers access to nonverbal information, that is, face-to-face, video, or audio communication. When the modality is verbal only, such as with text chat, email, fax, or written correspondence, the performance of motivated deceivers should benefit relative to low-motivation counterparts because there is no longer any nonverbal leakage to give them away.

It bears repeating that tests of the MIE do *not* test performance itself. Instead, they focus on how accurately the receivers judge message deceit. Judgmental accuracy is calculated by differencing judgments of truthful from judgments of deceptive responding. Thus, although both truthful and deceptive responding are measured, only a single difference score between truthful and deceptive responses is reported and analyzed in the published MIE reports. That is, detection accuracy is actually a measure of differentiation between truth and deception.

The widespread acceptance and citation of the MIE (see, e.g., DePaulo et al., 2003; Hancock, Woodworth, & Goorha, 2010; Sporer & Schwandt, 2007; Vrij, 2000; Vrij, Semin, & Bull, 1996; Woodworth, Hancock, & Goorha, 2005) has led to a fairly uncritical acceptance of its validity. Because it is predicated on claims that have strong implications for communication generally and deception detection specifically, we undertook the current investigation to unpack this phenomenon and assess whether motivation truly backfires, making deceit more transparent to receivers, or enables more successful evasion of detection. To do so required investigating the motivation level of communicators and the modality through which communication took place, as well as communicators' subjective experiences of stress, cognitive load, and behavioral control.

A Contrastive Strategic Communication Perspective

Contrasting with the view of motivation having a debilitating effect on nonverbal performances is a view derived from the basic tenets of self-presentation and strategic interpersonal communication. Among those tenets is that, ceteris paribus, motivation generally benefits communicative performances, including deceptive ones. Several deception scholars have put forward the view of deception as a strategic activity that promotes impression management and avoids telltale deception clues (e.g., DePaulo, 1992; Grazioli, Johnson, & Jamal, 2006; Colwell, Hiscock-Anisman, Memon, Woods & Michlik, 2006; Lee, Welker, & Odom, 2009; Okubo, Kobayashi, & Ishikawa, 2012; Stiff, 1996). As explained in interpersonal deception theory (IDT; Buller & Burgoon, 1996; Burgoon & Buller, 2008; Burgoon & Levine, 2009), deception can include both strategic and nonstrategic behavior. The former class includes verbal and nonverbal aspects of performance that are under sender control and deliberately produced. The latter correspond to involuntary or less controlled aspects of behavior as described by the leakage hypothesis and four-factor model. Motivated deception may include both. Although deceivers may give off some inadvertent indications of discomfort or cognitive difficulty, especially when trying to inhibit high-intensity emotions (Porter, ten Brinke, & Wallace, 2012), those who are motivated to evade detection can succeed by strategically adjusting their self-presentation in response to self-monitoring and receiver feedback, thus rendering their deceit less detectable (Burgoon & Buller, 1994; Burgoon & Levine, 2009). Moreover, greater efforts to control performance can be beneficial rather than detrimental to both the verbal aspects of a message and the nonverbal elements that accompany it, inasmuch as the verbal and nonverbal components of a message form an integrated whole (McNeill, 1985, 2005).

This position is bolstered by evidence that people not only can control their nonverbal performance under conditions of moderately high motivation and heightened arousal but also can do so in a self-benefiting manner (e.g., Burgoon, Buller, Guerrero, & Feldman, 1994; Burgoon & Floyd, 2000; Porter et al., 2012). As several deception investigations have confirmed, deceivers are often able to adapt their performance over time to converge toward that of truth tellers (Burgoon, Buller, & Floyd, 2001; Burgoon, Buller, White, Afifi, & Buslig, 1999; Stiff, Corman, Snyder, & Krizek, 1994; White & Burgoon, 2001), making noticeable impairments transitory. Interactions between people are constantly changing, which allows deceivers the chance to repair any nonverbal and verbal missteps by altering what they say and what they do as the conversation progresses. By reading the situation and modifying their actions accordingly, deceivers can successfully elude detection. Presumably, motivated deceivers will make greater effort to monitor their own and other's behavior and to be responsive to the interlocutor's feedback. Further, motivation-induced enhancements need not be specific to deception. All speakers, regardless of sincerity, may produce more polished, effective communication as long as the situation is mildly or moderately arousing. On all these grounds, then, greater motivation should facilitate better verbal and nonverbal performance for both deceivers and truth tellers, and especially for senders who exercise greater behavioral control.

Of course, it is easy to imagine circumstances of extreme jeopardy—such as a government official being indicted on obstruction of justice, an employee being accused of a felony, a border crosser being threatened with deportation, or an enemy captive being interrogated on the field of battle—that would push one's stress beyond a manageable threshold and cause one's communication to suffer. All but the most skillful and practiced deceivers would doubtless experience verbal and nonverbal impairment. Under such dire circumstances, the accruing cognitive and behavioral demands would be difficult to manage without experiencing some impairment and might be better accounted for by Baumeister's (1984) choking-under-pressure hypothesis. However, in the typical social-science experiments that can earn Institutional Review Board approval, such jeopardy is not possible. More often than not, motivation is manipulated in the form of monetary motivations for successful evasion of detection, rather than threats of serious consequences for being detected. Thus, truly high-stakes deceit and jeopardy are outside the scope of the current investigation. Because of this limitation, the influence of motivation on judgments is more likely to fit a linear or modestly nonlinear pattern.

The Role of Arousal and Negative Emotions

Central to the differences between the MIE and an IDT perspective are the role of the four factors hypothesized as causal mechanisms for deception displays. In the MIE, deception is thought to precipitate a heightened state of arousal and such negative emotions as anxiety, fear, or shame that give rise to involuntary and uncontrolled telltale nonverbal signs.

From a communication perspective, however, prevaricating need not spark distress or negative feelings. In support of this view, research on everyday lies by DePaulo and Kashy (1998) and others (George, Marett, & Tilley, 2004; Turner, Edgley, & Olmstead, 1975) suggests that deceit is so commonplace, and so often goes unchallenged, that it is unlikely to be highly arousing and guilt- or fear-provoking except under situations of significant jeopardy. Indicators of discomfort or cognitive load should be modest at best. The Ekman (1985) notion of duping delight also introduces the possibility that motivated deceivers such as grifters and con artists may find deception exhilarating rather than distressing. Moreover, any deceptive situation that has game-like qualities may engender positive rather than negative forms of arousal that facilitate rather than debilitate communicative performance.

Modality may also influence physiological reactivity apart from, or in interaction with, deception effects. Rather than arousal arising from the act of deceit per se, it may be an artifact of the modality in which a message is produced and transmitted. Typing on a keyboard, for example, is more effortful than speaking into a telephone, and videoconferencing can introduce frustration due to technical challenges associated with the medium. Facing a potentially suspicious interlocutor in person should be more stressful than talking to one via a mediated form of communication. Other modalities such as online texting may afford the communicator the ability to edit what is said before transmitting a message and thus minimize telltale signs (Dunbar et al., 2013; Lee et al., 2009). Consistent with this latter speculation, a pilot study for the current investigation found that communicators experienced far less negative arousal when communicating via text chat than face-to-face (Burgoon, Blair, & Moyer, 2005). These moderating factors thus make the sweeping assumption of motivated deception causing greater arousal and negative emotions untenable.

The Role of Cognitive Load

A wealth of empirical evidence has shown that deceiving is generally more cognitively taxing than truth-telling (e.g., Cheng & Broadhurst, 2005; Gilbert, Krull, & Malone, 1990; Goldman-Eisler, 1968; Mann, Vrij, & Bull, 2002; Sporer & Schwandt, 2006; Vrij, 2000, 2008). This is the position adhered to by the MIE. However, to the extent that deceivers are able to make performance adaptations over time, as argued by IDT, cognitive difficulty may be a transient issue, with differences between truthful and deceptive responding becoming negligible by an interaction's end (in the absence of active intervention strategies by an interlocutor to educe information and behavior). Burgoon (2015) identified a baker's dozen of moderators that can intensify or mitigate the effects of cognitive load (setting aside the case of pathological liars and psychopaths, who lie with ease).

One of those moderators is modality. The MIE focuses on judgment processes rather than actual performance, so it is mute on the direct impact of modality on message production. However, to the extent that cognitive taxation is due partly to the modality in which deception is produced, rather than deception per se, the cause may be misattributed to motivated deception rather than to the modality through which a message is transmitted. Face-to-face interaction may require greater cognitive effort than mediated and asynchronous forms of communication because of the need to be cognizant of receiver reactions and produce messages extemporaneously. Teasing out whether effects are due to motivation, deception, or modality, or to the interactions among these variables, requires a research design that includes all three factors.

The Role of Behavioral Control and Strategic Adaptation

The MIE perspective assumes that deceivers will be unable to control their nonverbal behaviors because those displays are the product of involuntary and uncontrollable physiological responses, or efforts to control behavior will result in overkill, producing stilted, unnatural performances. There is empirical evidence of such suppression during very brief responding such as concealed information tests (Pentland, Twyman, Burgoon, Nunamaker, & Diller, 2017; Pentland & Zhang, 2016; Twyman, Elkins, Burgoon, & Nunamaker, 2014; Twyman, Proudfoot, Schuetzler, Elkins, & Derrick, 2015). In such tests, suspects are presented with a series of words or objects to which they respond with yes-no answers or by repeating the names of the objects, one of which is related to the crime of interest. Guilty parties are thought to show differential kinesic (face, head, eye, body) or vocalic responses to the target items relative to nontarget items, thus failing to conceal their guilty knowledge.

This position sells nonverbal behavior short, however, and is at odds with IDT and DePaulo's (1992) self-presentation model, both of which argue that deceivers are proactive, self-interested communicators who strategically plan and regulate what they say and do in order to appear sincere and honest. Studies specifically in the deception arena have supported both the intention and ability by "bad actors" to control behaviors during deceptive interactions (Burgoon, Buller, Floyd, & Grandpre, 1996; White & Burgoon, 2001), especially among socially skilled communicators (Burgoon, Buller, & Guerrero, 1995; Riggio, Tucker, & Throckmorton, 1987), albeit with some suppression of all activity, regardless of veracity (Hurley & Frank, 2011).

One reason that motivated deception should translate into greater, not lesser, success is that deceivers interpret receivers' interpersonal reactions as feedback (White & Burgoon, 2001) and make the aforementioned adjustments to increase their likelihood of not being caught. For instance, deceivers may increase laughing and smiling to appear friendly and place themselves in a more positive light (Greene, O'Hair, Cody, & Yen, 1985; Okubo et al., 2012). They may increase their levels of involvement in the conversation so that their demeanor comports with normal conversational patterns (Burgoon et al., 1999). Greater motivation under these circumstances has been associated with more, rather than less, successful deception (Burgoon et al., 1994, 1995; Burgoon & Floyd, 2000; Seiter, 1997). A pilot test of the methods for the experiment to be reported likewise revealed that deceivers were motivated to succeed and exerted more behavioral control than truth tellers (Burgoon et al., 2005). In other words, deception itself was a motivating factor and was accompanied by greater efforts to put forward a credible performance. In turn, greater motivation was positively correlated with being perceived as more truthful. Had nonverbal performance been significantly impaired, one would expect overall believability to suffer.

IDT instead posits that motivation brings forth more strategic self-presentational efforts by communicators so as to appear credible. In the current experiment, this was made especially salient using DePaulo's motivation induction that stresses one's future success is enhanced by deception and apparent credibility. Plus, high-motivation participants received bonuses for being judged credible. Hence, highly motivated communicators were expected to engage in more strategic information, behavior, and image management, and be judged as more truthful and innocent, than less motivated ones (Buller & Burgoon, 1996). The result should be that high-motivation deceivers would be judged as innocent, that is, deception detection accuracy would be poorer than when deceivers lack motivation. The result for innocent communicators likewise should be a motivation boost to their credibility and make their true state of innocence detected accurately by interviewers. We tested these predictions using both a self-reported measure of motivation and the induced motivations that are regarded as synonymous with motivation in previous MIE tests.

As for the impact of modality, the MIE's authors stress that the MIE is appropriately tested by comparing judges of those who have access to nonverbal modalities to those who do not (DePaulo & Kirkendol, 1989). Relative to less motivated deceivers, more motivated deceivers should be less detectable in the verbal modality and more detectable in the nonverbal ones. This translates into detection accuracy being highest for interviewers questioning highly motivated deceivers in face-to-face or audio modalities and lowest with highly motivated deceivers interacting by text. That is, the MIE would predict a three-way interaction among veracity, modality, and motivation.

Communication perspectives would predict that modality itself influences both verbal and nonverbal performances. Text may inhibit detectability of deceit regardless of motivations by virtue of attenuating arousal and cognitive effort, permitting some degree of editing before transmission, and allowing deceivers to marshal all their resources toward controlling a single communication channel. The reduction in telltale indicators of negative affect, arousal, and cognitive effort, coupled with more successful behavioral control, would render deceit relatively undetectable when receivers have access only to verbal modalities. Empirical evidence has confirmed that this is the case: Deception detection accuracy is quite poor with text (Burgoon, Blair, & Strom, 2008). Comparatively, more, and more intense, telltale leakage cues would be available in the nonverbal modalities, and communicators would have to divide their behavior management efforts among multiple modalities, making deceit more apparent. Competing predictions can be made for face-to-face versus audio communication. Audio communication could facilitate performance by deceivers due to a reduction in cognitive load and greater opportunity to control behavior, free of surveillance. Conversely, the controllability hierarchy advanced by Ekman and Friesen (1969), which places the face at the top of the hierarchy, implies that detectability should be lower in the visual than the audio channel. The findings from Okubo et al. (2012) that cheaters can thwart detection by putting on a fake smile, from Porter et al. (2012) that untrained judges were unable to distinguish felt from faked emotions in the face with above chance accuracy, despite the presence of leakage in the upper face, and from Burgoon et al. (2008) that judges were best able to discriminate between truth and deception in the audio modality, all indicate that the nonverbal modalities differ in their degree of transparency.

Hypotheses

In preview, participants in the current experiment either committed a mock crime (they "stole" a wallet from a classroom chalkboard) or were innocent bystanders. All were then interviewed about the theft by trained interviewers and encouraged to convince the interviewer of their truthfulness and innocence. Thus, guilty participants were expected to be deceptive, while innocent participants were deemed as truthful. To manipulate motivation, half of the interviewees were incentivized to be judged as credible and truthful by the interviewer; they received additional monetary and self-presentational motivations; the other half in the low motivation (low incentive) condition received minimal encouragement and instead participated in a drawing afterward (so as to have the same opportunity to receive the additional bonus). Interviews were conducted in one of three modalities: face-to-face, audio, or text chat. Interviewers made judgments of sender veracity at the conclusion of the

10-minute interviews. Interviewees reported their motivation, arousal, cognitive effort, and behavioral control in a post-interaction questionnaire. Subsequently, verbal and nonverbal behaviors were measured to assess verbal and nonverbal performance. The transcriptions of the verbal behavior were submitted to automated analysis; the nonverbal behaviors were submitted to manual coding by trained raters.

If the reasoning of the MIE is correct that it is impaired nonverbal performance by high-motivation deceivers that makes them transparent to judges, an interaction between veracity and motivation should emerge for all of these nonverbal behaviors such that performance decrements should be most evident by highly incentivized deceivers relative to all other conditions. Alternatively, if deception and motivation exert independent and/or facilitative effects, then the MIE predictions will not hold. H1 tested the IDT-based predictions that motivation facilitates nonverbal performance for both truth tellers and deceivers and mitigates impairment due to deception.

H1 *Motivation and deception interact in an ordinal manner to affect nonverbal performance such that high motivation improves performance relative to low motivation and mitigates any performance impairments for deceivers.*

The behaviors measured as indicative of impaired performance were the following kinesic and vocalic indicators: (a) more frequent adaptor gestures, (b) fewer illustrator gestures, (c) more rigid head and posture position, (d) longer response latencies, (e) more filled and unfilled pauses and other dysfluencies, (f) higher voice pitch (fundamental frequency), (g) reduced pitch variety, and (h) slower tempo. Adaptor gestures are ones such as finger fidgeting or hand-to-face touches that are indicative of physical or psychological discomfort and nervousness. Illustrator gestures are ones that accompany and clarify speech. Response latencies refer to the turn-switch pauses between two speakers. A credible performance should include few adaptor gestures; many animated illustrator gestures; relaxed head and posture; brief pauses before speaking; and deep-pitched, varied, and moderately rapid speech.

The MIE perspective hypothesizes a three-way interaction among motivation, veracity, and modality such that truthful and deceptive performances are most detectable among high-motivation communicators judged from a nonverbal modality and least detectable among high-motivation communicators judged from a verbal-only modality, with low-motivation performances falling in-between. The verbal measures for the current investigation were presented in a companion article (Burgoon, 2018), so those results can be compared to the current ones for trends toward better or worse performance by deceivers and truth tellers.

Both nonstrategic and strategic views of deception cite arousal, cognitive effort, and attempted behavioral control as potential causal mechanisms of deceiver performance and as mediators of the effects of motivation. The next hypotheses therefore examined the relationships among motivation, arousal, cognitive effort, and behavioral control. Following a strategic perspective and prior empirical evidence (e.g., Dunbar et al., 2014), we expected deception itself to instigate higher motivation, and with it, greater negative arousal, cognitive effort, and behavioral control. We also expected, contrary to the inverse relationship implicit in the MIE, that the relationships would be positive. As for motivation, we expected that it would be positively associated with higher cognitive effort and behavioral control as part of a general self-presentational strategy to appear credible. Finally, although both the MIE and IDT posit that deception is associated with greater negative arousal, cognitive exertion, and attempted behavioral control, modality may mitigate some of the cognitive load and negative arousal, reducing the difficulties of those who engage in text-based deception. Thus, modality of interaction may affect the ease with which strategic communication can be enacted, which would provide some explanation for the proposed performance enhancement under verbal-only modalities. Our pilot experiment (Burgoon et al., 2005), along with other recent empirical evidence (e.g., Dunbar et al., 2013; Hancock et al., 2010), showed that face-to-face communication was more arousing and cognitively taxing than text-based interaction. The modality itself, rather than senders' motivation-related proclivities per se, therefore may account for senders' internal states, a possibility tested in the final hypothesis.

H2 *Motivation is positively related to (a) arousal, (b) cognitive effort, and (c) attempted behavioral control.*

H3 *Deceivers, relative to truth tellers, (a) are more motivated, (b) experience higher arousal, (c) experience more cognitive effort, and (d) attempt more behavioral control.*

H4 *Modality independently, and in conjunction with deception, influences (a) motivation, (b) arousal, (c) cognitive load, and (d) behavioral control such that they are greater with face-to-face interaction than audio interaction.*

Method

Sample

After deleting 5 participants who confessed to lying, 8 who failed to comply with instructions, and those whose audio or video recordings had technical difficulties, the total sample of cases was 170, and the total available for nonverbal analysis was 116. Participants were recruited from a multi-sectioned, introductory-level communication class for a study investigating "the ability of people to deceive others and escape detection." (For some measures, computer errors in capturing the web-based survey resulted in incomplete data and hence differing sample sizes.) Participants received extra credit for participation and the chance to receive a monetary bonus if they were successful at convincing an interviewer of their innocence and credibility. Of those completing the experiment, 68% were female and 32% were male, 76% were of age 20 or under, with a mean age of 19.65 (range = 18–31). By race and ethnicity, 77% were Caucasian, 14% were African American, and 9% were Hispanic/Latino, Pacific Islander, or of another ethnicity.

Experimental Design and Procedures

The experiment utilized a 2 (deception: truthful/deceptive) by 2 (motivation: high/low) by 3 (modality: face-to-face/audio/text) × 2 (interview phase: baseline/theft) factorial design with the last factor repeated. Baseline questions were two questions about a favorite high school class.

After being asked about work experience, participants were asked the theft-related questions.

All participants who volunteered for the study were contacted by phone and email to schedule their participation and were assigned randomly to deception, motivation, and modality conditions. Those assigned the "thief" role were instructed to commit a mock theft of a wallet from their classroom, to conceal the wallet on their person, and then to lie to an interviewer about the theft. They thus constituted the *deception* condition. Those assigned the "innocent" role were instructed to be completely truthful during the interview and hence constituted the *truthful condition*. Those in the innocent group were told they needed to be present in class on certain scheduled days and alerted that a theft might take place in their class so that attentiveness to events on the day in question would be equivalent between innocent and guilty participants. All participants were instructed to report for an interview immediately after class and informed that they would also complete a written statement and a questionnaire.

As noted earlier, one of the problems surrounding testing of motivation is that it has been defined operationally in a variety of ways, with motivation often only inferred rather than manipulated or measured directly, producing empirical findings fraught with inconsistencies and contradictions (Burgoon et al., 2005; Burgoon & Floyd, 2000). Given that we define motivation as an internal drive an individual possesses to accomplish a self-imposed or externally generated goal, we chose to operationalize motivation through individual self-report. However, we also wanted to instigate differential degrees of motivation experimentally. A common method has been to couple extrinsic rewards such as money with ego-based appeals meant to activate intrinsic motivations (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996; DePaulo, LeMay & Epstein, 1991; DePaulo et al., 1983; Furedy & Ben-Shakkar, 1991; DePaulo et al., 2003; Krauss, 1981; Zuckerman & Driver, 1985). For example, participants have been told that the ability to convey trustworthiness and sincerity is a predictor of success in numerous career fields and that the upcoming experimental interview would be an opportunity to put their own skills to the test. We adopted a similar methodology. However, we label the experimental instigation as *motivations*, to distinguish the internal subjective state from external influences and to signal that a variety of other factors can also influence individual motivation.

Those in the *high-motivation* condition were told that, in addition to their extra course credit, they could earn $10 if the interviewer evaluated them as being truthful. If they were the most successful at being evaluated as truthful, they would earn an additional $50. Those in the *low-motivation* condition were told merely that their task was to convince the interviewer that they did not take the wallet and were reminded that regardless of how successful they were, they would receive course credit. After the interview, they became eligible for the same monetary rewards as those in the high-motivation condition so that no one was disadvantaged by the condition to which they were assigned.

Interviews took place under one of three modalities. In the *text condition*, interviewer and interviewee were placed in separate rooms equipped with wireless notebook computers and conducted the interview using Microsoft NetMeeting's chat facility. In the *audio condition*, interviewer and interviewee were placed in the same separate rooms but communicated via handsets. In the *face-to-face condition*, interviewer and interviewee were located in the same room and the interview was video recorded for later transcription and nonverbal analysis.

Upon reporting to the research laboratory, interviewees completed a social-skills pretest and a written statement following procedures common to those used in criminal investigations. They were then interviewed by one of the three trained interviewers. The interviews followed a Behavioral Analysis Interview (BAI) format that is taught to criminal investigators nationwide (see Inbau, Reid, Buckley, & Jayne, 2001). It began with innocuous background questions related to high school and their most recent employment before moving to specific questions about the incident. In addition to a direct question asking about whether they committed the theft, interviewees were asked for a detailed narrative about the interviewee's activities on the day in question, their speculations about who might be responsible for the theft, what should be done to punish the perpetrator, and so forth. Two interviewers received training in this procedure from the third interviewer, who is a certified trainer in interviewing and interrogation. Interviewers gained extensive practice and feedback during the pilot test (see Burgoon et al., 2005). All interviewers followed the same script and question sequence. Interviews lasted an average of 10 minutes.

Following the interview, interviewees reported to a separate room to complete a post-interview questionnaire and to be debriefed.

Dependent Measures

The interviewees' self-reported motivation, arousal, cognitive load, and behavioral control were tested with a series of semantic differential scales that were validated in the pilot test (Burgoon et al., 2005). The measure of *motivation* consisted of three questions ("How important was it to you to succeed in making the interviewer believe you?," "During the interview, how important was it to you to give convincing answers?," and "How hard did you try to convince the interviewer that you were innocent?") that were rated on unipolar scales ranging from not at all (1) to very important (7). Cronbach's α was .72. Due to the fact that most measures of arousal already incorporate valence, we did not include a separate measure of negative emotions. (Participation in a mock theft was also unlikely to generate true fear of detection or guilt.) We combined *negative affect* and *arousal* into a single measure with six items on which interviewees reported how they felt during the interview. Sample items were rated on a scale ranging from not at all nervous (1) to completely nervous (7) and completely composed (1) to completely flustered (7). Cronbach's α was .85. *Cognitive load* was measured with four semantic differential-type items in response to the question, "How hard was it mentally to answer the questions?" Interviewees rated cognitive load on unipolar scales ranging from not at all (1) to very (7) difficult, easy (reverse coded), simple (reverse coded), and challenging. Cronbach's α was .89. Due to low inter-item reliability among its items, attempted behavior control was measured by a single item asking interviewees how hard they tried to control their behavior.

Kinesic and vocalic behaviors were coded by three trained coders who received extensive training and practice conducting behavioral observation using C-BAS, a software behavioral annotation tool that assigns time codes to the beginnings and endings of durational events and frequencies of brief discrete events. The kinesic behaviors of interest were illustrator gestures (those gestures that accompany and clarify or modify what is said orally), adaptor gestures (noncommunicative self-touches such as hand fidgets, hand-to-face rubbing, and rubbing one's neck that are meant to alleviate discomfort and nervousness), head movements, and postural shifts (squirming, rocking, and other restless changes in one's seated posture). Interrater reliabilities based on intraclass correlation, calculated within each interview phase, were .78 to .88 for illustrators, .82 and .83 for adaptors, .78 and .80 for head movements, and –.08 and .42 for postural shifts. Because postural shifts were so infrequent, with the mode being 0% and 98% being 0 or 1, the measure had a nonnormal distribution and too restricted a range to calculate reliability. All ratings were averaged across the three coders.

The vocalic measures of interest were turn-at-talk duration, filled pauses (noncommunicative sounds replacing words, such as "um" and "uh-huh"), silent pauses, and other nonfluencies (e.g., stutter starts, repetitious sounds, and garbled sounds). For each measure, the frequencies or durations (where applicable) were calculated then frequencies were divided by utterance length to adjust for the possibility that the measure was reflecting turn length rather than the other vocalic measures. The interrater reliabilities for the initial phase and theft phase of the interviews were, respectively, .99 and .99 for turn duration, .94 and .92 for frequency of vocalized pauses, .59 and .92 for silent pauses, and .48 and .57 for other nonfluencies. Where a third coder only completed some coding and reliabilities improved when the coder was omitted, the two-coder version of the measure was used. Additional acoustic analyses, conducted with assistance from the Air Force Research Laboratory on the theft portion of the interview, are reported in a dissertation by T. O. Meservy (2007).

Results

Manipulation Checks

A repeated measures ANOVA on interviewees' reported truthfulness on six questions produced a significant main effect for deception, $F(1, 171) = 946.89$, $p < .0001$, $\eta_p^2 = .85$, which confirmed that the deception manipulation was successful. Deceivers reported being far less truthful ($M_{deceivers}$ = 2.11, SD = 3.87) than did truth tellers ($M_{truth\ tellers}$ = 9.27, SD = 2.56).

Motivation was manipulated in the form of different monetary and ego-based incentives to succeed, and measured through a self-report measure collected after the experiment. The self-report measure was collected after the experiment because collecting it prior to the experiment risked creating demand characteristics. The comparison between the high and low motivation conditions failed to produce different levels of self-reported motivation, $F(1,179) = .003$, $p > .20$, $\eta_p^2 < .001$. Interviewees in both conditions reported being highly motivated (M_{low} = 5.31, SD = 1.58; M_{high} = 5.51, SD = 1.53). It is possible that the retrospective nature of the motivation scale lessened the differentiation between high and low conditions, as retrospective questions may have inclined most participants to report that they were highly motivated to succeed. Alternatively, the nonsignificant results may have been due to the very nature of laboratory-based deception experiments: To earn Institution Review Board approval, such investigations cannot create the kinds of high-stakes situations or jeopardy that would naturally prompt stronger differentiation between high and low motivation. Inasmuch as the current induction adhered closely to the procedures used in previous MIE investigations (which stopped reporting any manipulation checks, perhaps for the same reason), and inasmuch as the current experiment produced innumerable significant motivation effects (reported below), we are confident that the manipulation of motivations was valid. Nonetheless, the nonsignificant manipulation check warrants reevaluation of how to measure motivation in the future.

Effects of Motivation and Modality on Verbal Performance

As context for the nonverbal performance results, it is useful to review the linguistic results that are reported in Burgoon (2018). Seven dimensions of language—quantity, immediacy, vividness/dominance, specificity, complexity, diversity, and hedging/uncertainty—were all affected by deception and the latter four measures had deception by motivation interactions. Main effects on deception revealed that deceivers' utterances were shorter, less certain, more active, and more immediate than truth tellers. This is a mix of beneficial and detrimental effects on responses.

Motivation in itself also exerted numerous effects. Usually higher credibility is associated with giving lots of details, giving specific sights, sounds, locations, chronology, and the like, using less repetitive language, and using more personal pronouns. In this experiment, higher motivation led speakers to talk more, modify what they said, use more "you" pronouns, use more pleasant language, and use simpler vocabulary. It also led deceivers in particular to give *fewer* details and specifics, use *more* repetitive language, and use *fewer* personal pronouns but also more complex language. Comparatively, truth tellers looked largely like high-motivation deceivers. The exception was complexity: In the *absence* of motivating incentives, deceivers performed better than truth tellers; in the *presence* of motivating incentives, truth tellers and deceivers were alike.[1]

Modality primarily exerted main effects rather than interacting with deception. Quantity of words, verbs, and modifiers; average word length; lexical and content word diversity; redundancy; ratio of spatially distant terms; first-person and total pronouns; and affect all varied by modality.[2]

Summing up, motivation had both beneficial and deleterious effects on language use, effects that were not moderated by modality.

Effects of Motivation and Modality on Nonverbal Performance

H1 *Motivation and deception interact in an ordinal manner to affect nonverbal performance such that high motivation improves performance relative to low motivation and mitigates any performance impairments for deceivers.*

Separate 2 (motivation) × 2 (deception) × 2 (interview phase) repeated measures analyses of variance were conducted on illustrator gestures, head movements, adaptors, and postural shifts. It was expected that motivation would facilitate expressive gestures and head movements and suppress indicators of nervousness and discomfort such as adaptor gestures and shifting posture. Overcontrol, as evidenced by reductions in expressive behavior, reductions in adaptors, and rigid, wooden posture would indicate that motivation was impairing rather than aiding deceptive demeanor. Kinesic behaviors were only present in the face-to-face condition, so modality was not a factor.

Results showed strong effects for motivation throughout and effects for deception on only some measures. For the frequency of illustrators,[3] more motivated speakers used more illustrator gestures, and gesturing increased over time. Exploratory correlation analysis showed that more motivated communicators gestured more frequently: $r(64) = .37$, $p = .001$, one-tailed, and for longer durations; $r(64) = .28$, $p = .012$, one-tailed, during baseline as well as theft interview phases; $r(64) = .25$, $p = .024$, one-tailed, for frequency; and $r(64) = .31$, $p = .006$, one-tailed, for duration. The patterns were present within the deceptive and truthful conditions but with stronger correlations in the truth condition.

The results for head movement were similar, with strong effects for motivation.[4] Additionally, low-motivation deceivers and high-motivation truth tellers moved their heads a higher percentage of their talk time. The patterns were the same within truth and deception.

Adaptor gestures and postural shifts were influenced by deception and, to a lesser extent, motivation.[5] During the baseline, high-motivation deceivers exhibited the longest adaptors and high-motivation truth tellers, the shortest. But during the theft portion of the interview, motivated deceivers converged on the pattern of motivated truth tellers, as shown in Fig. 4.1. Motivation did not impair the performance of deceivers relative to truth tellers. Low motivation was associated with shorter adaptors. For postural shifts, the overall pattern was one of most movement by truth tellers and a reduction in postural fidgeting over time by everyone. High motivation sparked initial physical movement, especially by truth tellers. During the theft interview, truth tellers' behavior was not associated with motivation. Motivation may have impaired deceivers' performance by eliciting postural rigidity, but this conclusion is premature given the infrequency of postural shifting.

Turning to vocalic behaviors, the repeated measures analysis now included the modality factor. Duration of interviewee turns produced main effects for phase, $F(1,87) = 316.60$, $p < .001$, $\eta_p^2 = .755$; motivation,

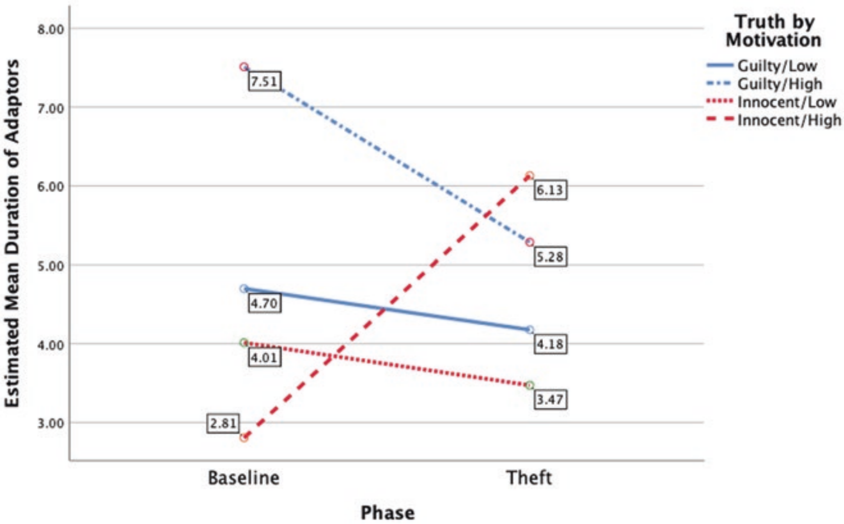

Fig. 4.1 Changes in duration of adaptors across two phases of the interview. Phase 1 asked about a favorite high-school class. Phase 2 asked about the theft of the wallet, during which perpetrators of the theft lied and innocent students told the truth

$F(1,87) = 20.39$, $p < .001$, $\eta_p^2 = .165$; and a phase by motivation interaction, $F(1,87) = 8.63$, $p = .004$, $\eta_p^2 = .077$, but no effects for deception or modality. Turn duration increased from baseline to the theft phase for both deceivers and truth tellers, with motivation intensifying that increase. Analyzing mean turn length added a phase by modality interaction, $F(1,87) = 15.34$, $p < .001$, $\eta_p^2 = .138$, such that during the baseline the two modalities differed but during the theft phase, they converged. Correlational analysis showed that as motivation increased, so did duration of talk time and turn length during both the baseline and theft phases, respectively, $r(105) = .38$, $p < .001$; $r(105) = .17$, $p = .042$; $r(105) = .36$, $p < .001$; and r(105) = .19, $p = .025$, all one-tailed. Motivation facilitated speech for deceivers and truth tellers alike.

Dysfluencies were separated into vocalized pauses such as "ums" and "ahs" and other speech disturbances such as stutter starts and garbled sounds. The analysis of the frequency of vocalized pauses produced main effects for deception, $F(1,100) = 8.10$, $p = .005$, $\eta_p^2 = .075$, motivation,

$F(1,100) = 10.86$, $p = .001$, $\eta_p^2 = .098$, modality, $F(1,100) = 4.87$, $p = .030$, $\eta_p^2 = .046$, and phase, $F(1,100) = 105.41$, $p < .001$, $\eta_p^2 = .513$. Deceivers, motivated interviewees, and those in the face-to-face modality used more vocalized fillers like "um." Vocalized pauses were also more prevalent during the theft portion of the interview. The combined main effects for deception and motivation meant that motivated deceivers produced the highest rate of vocalized pauses (see Fig. 4.2). Correlational analysis revealed that higher motivation was associated with more vocalized pauses during both the baseline, $r(105) = .22$, $p = .011$, and the theft phase, $r(105) = .32$, $p < .001$. Speech disturbances showed a phase main effect, $F(1,88) = 44.51$, $p < .001$, $\eta_p^2 = .336$, and a significant deception by motivation interaction, $F(1,88) = 6.03$, $p = .016$, $\eta_p^2 = .055$ (see Fig. 4.3). Speech disturbances were most evident among high-motivation truth tellers and least evident among low-motivation truth tellers. Thus, motivation increased speech errors for both truth tellers and deceivers, but whereas deceivers exhibited more of the everyday form of fillers than did truth tellers, truth tellers exhibited more of the problematic types of

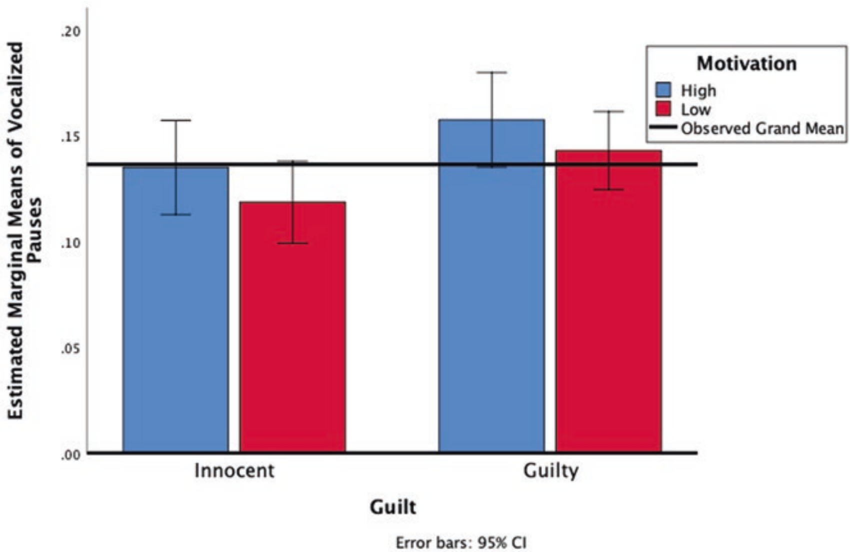

Fig. 4.2 Effects of deception and motivation on vocalized pauses

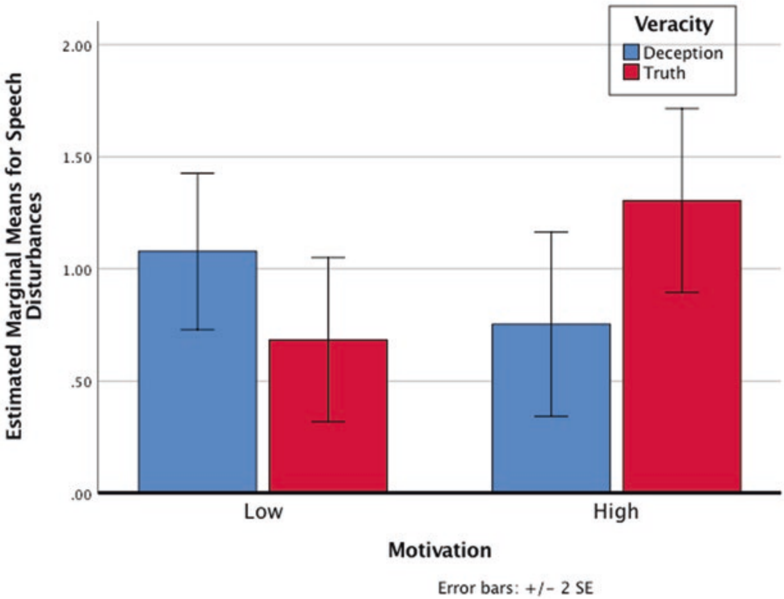

Fig. 4.3 Effects of deception and motivation on speech disturbances

dysfluencies. In this respect, motivation could be said to impair speech but not uniformly.

Modality differences, beyond the greater aforementioned vocalized pauses in face-to-face than audio interviews, were a higher rate of silent pauses and a phase by modality interaction such that the rate of pauses was higher under face-to-face than audio communication and during the theft phase of the interview. A summed measure of total dysfluencies also produced a phase by modality interaction that duplicated the pattern for silent pauses.

In sum, deception had an effect on some of the nonverbal behaviors but not in a manner suggesting impairment, with or without the influence of motivation. Gestures related to animating speech—illustrator gestures and head movement—were most influenced by motivation, not deception. High-motivation truth tellers did the most postural fidgeting and high-motivation deceivers started out with more adaptor gestures but reduced them to the level of truth tellers by the theft phase. Whether deceivers' head and posture stillness constitute rigidity must await a more detailed investigation. Vocally, it was motivated truth tellers who showed the most speech disturbances, whereas deceivers showed more of the vocalized pauses common to most people's speech.

Relationships Among Motivation, Deception, Modality, and Psychophysiological States

H2 *Motivation is positively related to (a) arousal, (b) cognitive effort, and (c) attempted behavioral control.*

Hypothesis 2 predicted that motivation is positively associated with arousal, cognitive effort, and behavioral control, thereby facilitating detection of truth but impairing detection of deceit. Pearson product-moment bivariate correlations shown in Table 4.1 support the hypothesized positive associations. More motivated interviewees reported more arousal and cognitive effort but also more effort directed toward controlling their behavior. The relationships between motivation on the one hand and arousal and cognitive effort on the other represent small effect sizes (only 2.3% to 3.3% shared variance), whereas the relationship between motivation and behavioral control constitutes a medium effect size (12% shared variance). These relationships suggest that motivation has only a modest influence on cognitive exertion and arousal and primarily affects attempted behavioral control. Also noteworthy is that greater cognitive load was associated with greater negative arousal, that is, these two internal states are linked to one another, at least as self-reported by interviewees.

Table 4.1 Pearson product-moment correlations among motivation, arousal, cognitive effort, and behavioral control

	Cognitive effort	Arousal	Behavioral control
Motivation	.151[a]	.184[b]	.346[b]
Cognitive effort		.598[b]	.242[b]
Arousal			.224[b]
Behavior control			

[a]Correlation is significant at the 0.05 level (1-tailed).
[b]Correlation is significant at the 0.01 level (1-tailed).

H3 *Deceivers, relative to truth tellers, (a) are more motivated, (b) experience higher arousal, (c) experience more cognitive effort, and (d) attempt more behavioral control.*

This hypothesis was tested in a 2 (deception) × 2 (motivation) × 3 (modality) multivariate analysis of variance on the four self-report measures.[6] The hypothesis was supported: Deceivers reported greater motivation, arousal, cognitive effort, and behavioral control attempts than truth tellers (see Table 4.2 for means and standard deviations).

Table 4.2 Means and standard deviations for effects of deception and modality on motivation, cognitive load, negative arousal, and behavioral control

Modality	Deception		Motivation	Cognitive effort	Negative arousal	Behavioral control
Audio	Deception	N	31	30	31	30
		Mean	5.90	2.97	2.88	3.83
		SD	1.23	1.39	1.39	1.98
	Truth	N	27	27	27	27
		Mean	4.48	1.41	1.72	3.22
		SD	1.86	0.577	0.78	2.37
	Total	N	58	57	58	57
		Mean	5.24	2.23	2.34	3.54
		SD	1.70	1.33	1.28	2.18
Face-to-face	Deception	N	37	37	37	36
		Mean	6.12	2.75	3.10	4.36
		SD	0.90	1.44	1.24	1.85
	Truth	N	32	32	32	32
		Mean	5.04	1.50	2.14	3.37
		SD	1.91	0.82	0.95	1.86
	Total	N	69	69	69	68
		Mean	5.62	2.17	2.65	3.90
		SD	1.55	1.34	1.21	1.91
Text	Deception	N	26	26	26	26
		Mean	5.53	1.72	2.12	2.88
		SD	1.13	0.91	0.85	1.86
	Truth	N	30	30	30	30
		Mean	4.89	2.11	2.04	2.57
		SD	1.55	1.41	1.12	1.65
	Total	N	56	56	56	56
		Mean	5.18	1.93	2.08	2.71
		SD	1.56	1.30	1.19	2.00

Relationship of Modality to Deception, Motivation, and Psychophysiological States

H4 *Modality independently, and in conjunction with deception, influences motivation, arousal, cognitive load, and behavioral control.*

This last hypothesis was tested in the same MANOVAs as the deception factor.[7] Interviewees in the face-to-face condition experienced the most arousal and attempted to exert the most control over their behavior, regardless of their veracity. The audio condition produced intermediate effects and text, the least. For both negative arousal and cognitive effort, higher arousal and greater cognitive difficulty experienced by deceivers than truth tellers were only evident under audio and face-to-face modalities and not under text (see Table 4.2 for means). Deceivers and truth tellers both experienced very little arousal or cognitive effort in the text condition. Variability in cognitive effort was much greater for deceivers, as indicated by the error bars. Whereas deceivers experienced more *cognitive effort* under the audio condition than other modalities, they experienced the most *arousal* under face-to-face interaction.

These results indicate that incentivizing senders largely made them less detectable, and detectability was poorest under a modality with some nonverbal cues present (audio). Clearly, these results do not support incentives or nonverbal modalities, jointly or separately, leading to universal impairment. Face-to-face interaction elicited the most vocalized pauses and silent pauses and these actually increased during the theft phase of the interview. (A measure of total dysfluencies mirrored this same pattern.)

Discussion

A commonly held belief is that nonverbal behaviors are the carriers of authentic messages, that they reinforce the verisimilitude of verbal content, and that they betray truth when verbal communication is deceitful. And yet, it is also a canon of communication that communicators are intentional in their production of messages, that both nonverbal and verbal elements are enlisted in the service of producing messages that adhere to a sender's goals, and hence, that communicators may employ deceit strategically in their messaging. That is, nonverbal behaviors themselves may be deceptive as well as signaling deficits in the truth of the verbal content they accompany. These paradoxical views invite a closer look at how nonverbal cues may vary from truthful to deceptive and under what conditions.

The current investigation examined key kinesic and vocalic nonverbal signals present during interactive communication between interviewers and interviewees. It also examined two factors that are natural candidates for moderating nonverbal signals: motivation and modality. Two competing views in the literature are (1) that strong motivation impairs the nonverbal components of deceptive messages, or contrariwise, and (2) strong motivation (under nonextreme circumstances) facilitates the performance of nonverbal as well as verbal components of deceptive messages. Hypothesis 1 committed to the latter conjecture. Tested were the performances of several kinesic and vocalic nonverbal signals under low and high motivation during an interview about a mock theft. Also considered was whether the modality through which the interview was conducted—face-to-face, audio, or text—made a difference.

Results showed that motivation had a beneficial effect on illustrators and head movement. More motivated speakers used more and longer illustrator gestures and more and longer head movements. Gesturing also increased over time. These patterns were true of both truth tellers and deceivers, that is, increases in motivation led to more expressivity, regardless of veracity.

The pattern for adaptor behaviors, which presumably would be indicative of discomfort, also evidenced a beneficial effect of motivation for deceivers over time: Motivated deceivers began by displaying the most discomfort but over time converged on roughly the same degree of adaptor use as motivated truth tellers. Only with postural shifts might motivation have had a detrimental effect. High-motivated deceivers, compared to high-motivated truth tellers, were more inclined to stop moving, potentially to the point of postural rigidity. However, the fact that this decline might only have been a matter of one less postural change, and the fact that most interviewees exhibited no postural shifts at all, cautions against overinterpretation of these effects.

As regards vocalics, results were similar to kinesics in that motivation led to more animated speakers. Motivated truth tellers and deceivers alike talked more, and with turns of longer duration, than those who had not been incentivized. Motivation also led to more vocalized pauses by both truth tellers and deceivers. Only on other speech disturbances did motivation make a difference, and it was high-motivation truth tellers, not deceivers, who displayed the most such dysfluencies. Perhaps the personal desire to appear educated and credible may have placed an additional burden on the shoulders of truthful interviewees. Thus, motivation largely served to facilitate rather than impair nonverbal performance, contrary to the motivation impairment hypothesis and more in line with an interpersonal deception theory position.

In sum, Hypothesis 1 was confirmed: Motivation largely facilitated performance. Where deception was involved, motivation either aided deceivers' performance or produced worse effects for truth tellers. Although motivated deceivers exhibited longer adaptor gestures initially, that pattern dissipated over time, demonstrating the importance of not relying on a single snapshot of behavior and of affording time for behaviors to evolve. Measurements taken too soon would have missed the more persistent pattern. Both motivated deceivers and motivated truth tellers had more vocalized and nonvocalized pauses than low-motivation interviewees, but it was truth tellers who displayed the more detrimental speech disturbances. In other respects, deceivers were like truth tellers, which is to say, deception did not cause nonverbal impairments.

As was to be expected, modality also influenced some nonverbal patterns but exerted largely main effects and no interactions with deception. Modality could only be tested on vocalic features. Vocalized pauses and silent pauses occurred at a higher rate in face-to-face than audio interaction and they increased when questioning moved into the theft phase. A measure of total dysfluencies mirrored this same pattern. Turn length did interact with phase such that turns became longer under audio than face-to-face communication during the theft phase.

A partial explanation for that effect comes from Hypotheses 2 and 3, which conjectured that motivation and deception are positively associated with arousal, cognitive effort, and attempted behavioral control. The findings were consistent with these hypotheses. Although deceivers may have experienced some distress, and motivation elevated some of the physiological and cognitive distress, motivated communicators were more likely to attempt to control their behavior, and this resulted in performances by deceivers that likely would have evaded detection.

The implication for detecting deception is that nonverbal behaviors will not be very reliable telltale signs of deception, especially by motivated senders. Separate from deception, motivation generally aids rather than hinders. Motivation also is associated with more efforts to control one's behavior, in the language of interpersonal deception theory, to behave strategically. It becomes essential, then, when trying to detect deception, to gauge the motivation of communicators and to factor that into the expected behavioral patterns of truthful and non-truthful communicators.

These results have important implications for pre-employment interviews, law enforcement, intelligence agency interviews, or even polygraph exams. Motivated communicators will try to appear normal, and motivation will aid them in engaging in normal kinesic and vocalic nonverbal behavior while stifling some of the indicators of nervousness. This will be true of deceptive as well as truthful individuals. In some cases, the heightened activity driven by motivation may even make truthful individuals appear hyperactive, as if "trying too hard," whereas extended wooden head and posture positions might be suggestive of deception. The most useful indicators will be the ones that are not fleeting and that tell the same story as other indicators.

A shortcoming of the current investigation is the limited number of nonverbal behaviors that could be measured. As new technologies become more available to capture and track behavior, it should be possible to measure a wider range of behavioral features and more fine-grained ones. For example, Hamel et al. (2018) report on measuring nonverbal synchrony, or the non-conscious coordination of physical movement between two people, using Motion Energy Analysis (MEA; http://psync.ch/?p=9) software that automatically tracks human behavior. MEA is an objective automated method that continuously monitors the amount of movement occurring in predefined regions of interest. This method tracks full body movement while introducing less error than traditional methods using human coders. Similarly, the automated tracking of nonverbal and verbal behaviors by the AVATAR (Automated Virtual Agent for Truth Assessments in Real-Time; Pentland et al., 2017). These tools should ease the manpower burden of manual behavioral coding.

This investigation is one of the first to measure multimodal behavioral indicators and one of the largest of its kind. The complexities of the combined verbal and nonverbal patterns reveal that communication does not lend itself to simplistic predictions and explanations. All kinesic behaviors do not function identically, neither do vocalic behaviors. Nonverbal behaviors may need to be clustered like the verbal behaviors were in this study, so that the ones related to arousal are treated differently than the ones attempting to convey an engaged demeanor. Only with more nuanced predictions and nuanced measurement will theorizing about what factors impair and what factors facilitate deceptive performance make sense.

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Conflict of Interest The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Notes

1. Proponents of the MIE perspective might argue that the text-only condition offers the purest test of the verbal facilitation aspect of the MIE. However, modality did not interact with veracity, so the motivation

and veracity effects generalize across text, audio, and face-to-face modalities. These results do not fit a *motivation-facilitates-deceptive performance* narrative.

2. Not reported in Burgoon (2018), the directionality of effects was such that relative to the other modalities, text included (a) longest words, (b) the most content word diversity, (c) fewest "you" pronouns, (d) fewest third-person plural pronouns, (e) fewest references to "others," (f) fewest total pronouns, (g) most imagery, (h) most extreme positive pleasantness terms, (i) most positive activation terms, (j) most extreme negative pleasantness terms, (k) least extreme negative imagery, (l) intermediate on affect terms, (m) intermediate on temporal immediacy, (n) intermediate on spatial nonimmediacy, and (o) intermediate on extreme positive imagery.
3. For factorial effects, partial η^2 is reported as the effect size because it provides an estimate of a variable's effect independent of the number of other variables in the models or the variance accounted for by them. For one-way analyses and simple effects, η^2 is reported. For frequency of illustrators, the repeated measures ANOVA produced a main effect for motivation, $F(1,52) = 4.45$, $p = .04$, $\eta_p^2 = .079$, and a significant effect for phase, $F(1,52) = 74.39$, $p < .001$, Wilks' $\Lambda = .411$, but neither a main effect for deception, $F(1,52) = .01$, $p > .20$, $\eta_p^2 < .001$, nor an interaction between deception and motivation.
4. The analysis on frequency of head movement produced significant main effects for motivation, $F(1,57) = 4.18$, $p = .46$, $\eta_p^2 = .068$, and phase, $F(1,57) = 413.51$, $p < .001$, $\eta_p^2 = .878$, but not for deception. A near-significant interaction between deception and motivation on percent of time spent in head movement, $F(1,57) = 3.48$, $p = .067$, $\eta_p^2 = .058$, showed that low-motivation deceivers and high-motivation truth tellers moved their heads a higher percentage of their talk time. Exploratory correlation analysis showed that, as with gestures, higher self-reported motivation was associated with more frequent head movement, $r(64) = .29$, $p = .011$, one-tailed, and longer head movements, $r(64) = .25$, $p = .022$, one-tailed, during the baseline as well as during the theft interview phase, $r(64)$, $= .33$, $p = .004$, one-tailed, for frequency; $r(64) = .33$, $p = .004$, one-tailed, for duration.
5. The repeated measures ANOVA on the mean duration of adaptors produced a near-significant two-way interaction between phase and deception, $F(1,57) = 3.92$, $p = .053$, $\eta_p^2 = .064$, and a three-way interaction among phase, deception, and motivation, $F(1,57) = 4.80$, $p = .033$,

η_p^2 = .078. Exploratory correlation analysis produced no discernible patterns. The analysis for the frequency of postural shifts produced a main effect for phase, $F(1,57) = 87.96$, $p < .001$, $\eta_p^2 = .607$; a phase by motivation interaction, $F(1,57) = 4.93$, $p = .030$, $\eta_p^2 = .080$; a near-significant phase by deception interaction ($p = .070$) and near-significant between-subject effects for motivation (p = .082) and deception by motivation ($p = .092$). The exploratory correlational analysis revealed that more motivated deceivers significantly *suppressed* the frequency of postural shifts, $r(31) = -.41$, $p = .011$, one-tailed. Comparatively, truth tellers were more active; they exhibited both more frequent postural shifts during the baseline period, $r(33) = .40$, $p = .011$, one-tailed, and ones of longer duration, $r(33) = .34$, $p = .027$, one-tailed.

6. The analysis produced significant main effect for deception, Wilks' $\Lambda = .79$, $F\ (4, 166) = 11.14$, $p < .001$, partial $\eta_p^2 = .21$, and a deception by modality interaction, that did not override the deception main effect. Follow-up univariate tests showed that the deception main effects were significant for all four dependent measures.
7. The analysis produced a main effect for modality, Wilks' $\Lambda = .89$, $F\ (8, 332) = 2.40$, $p = .016$, $\eta_p^2 = .06$; and a deception by modality interaction, Wilks' $\Lambda = .87$, $F\ (8,332) = 3.07$, $p = .002$, $\eta_p^2 = .07$. Testing this hypothesis required further focused univariate contrast tests. Results revealed monotonic increases in arousal, $F(1, 181) = 7.94$, $p = .005$, $\eta^2 = .04$, and behavioral control, $F(1, 180) = 11.03$, $p = .001$, $\eta^2 = .06$, as modality richness increased from text to audio to face-to-face (see Table 4.2). The deception and modality effects were qualified by a significant interaction, Wilks' $\Lambda = .87$, $F\ (8, 332) = 3.07$ $p = .002$, $\eta_p^2 = .07$. Significant effects emerged at the univariate level for negative arousal, $F(2, 169) = 4.54$, $p = .012$, $\eta_p^2 = .05$, and cognitive effort, $F(2, 169) = 11.83$, $p < .001$, $\eta_p^2 = .12$.

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5

Nonverbal Communication: Evolution and Today

Mark G. Frank and Anne Solbu

Fifty years ago, scientists first articulated how verbal and nonverbal communication interacted with each other. They noted that, in relation to verbal communication, nonverbal communication can repeat it, substitute for it, complement it, contradict it, accent it, and regulate it (Ekman & Friesen, 1969). If we go back hundreds of thousands of years ago, scientists agree that verbal communication did not even exist; they proposed that language emerged anywhere from 400,000 (Johansson, 2011) to 200,000 years ago (McCrone, 1991). Although the actual form of the language is uncertain, with some suggesting it was a diminished variant of modern languages (Lieberman, 2008), or others suggesting it was expressed entirely with facial and hand gestures (much like sign language through gestures; Corballis, 2002; McNeill, 1992), it is clear that our human forbearers walked the earth as entirely nonverbal beings before the advent of spoken language (up to six million years ago; White et al., 2009). Verbal communication is a far superior communication medium

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than nonverbal communication in most domains due to its efficiency, flexibility, and adaptability. It allows a person to represent objects and ideas symbolically, and unlike nonverbal communication it can span space and time. Ask someone to take in your mail next Thursday or describe the plot of the movie *Casablanca* using only nonverbal signals, it will become pretty clearly impossible. Yet in verbal language it is quite easy (in fact the mail request already registered!). The efficiency of complex verbal communication may have been, according to scientists, what helped tip the scales toward *Homo sapiens* replacing the more robust and stronger, yet more language impoverished, Neanderthals in Europe and the Middle East (Lieberman, 2007).

Despite the capability of verbal communication, the phylogenetically older nonverbal communication system still exists within our species and is an important medium of information transmission. We will argue that the ability to manage, to express, and to detect these nonverbal transmissions or signals may in fact comprise a social 'intelligence' that has been described, or perhaps in part subsumed, by the term "emotional intelligence" (Goleman, 1995; Salovey & Mayer, 1990). Yet not all these signals are of the same origin. Some are deliberate, posed, and used like language (a head nod to indicate "yes"), whereas others are involuntary, unbidden, and shown despite our efforts to conceal (blushing). We intend to outline some of these differences in voluntary and involuntary signals, how culture might have engineered the former, and evolution may have engineered the latter. These signs may have emerged so as part of a specific signaling system, or simply co-occurred due to their aftereffects in service to some other biological need; they thus became signals only to the sharpest of observers—whom we might label the 'emotionally' or 'socially' intelligent.

Producing and detecting these signals are instrumentally involved in the two most essential life tasks—first is survival, which in turn permits the second most essential life task: passing on one's genes (Wilson, 1975). We have chosen to start from these two essential life tasks and describe how they may have engineered many of these signals essential to survival and reproductive fitness (Sznycer, Cosmides, & Tooby, 2017), whereas others simply co-occur with other biological states such as health status, fertility, or dominance of the individual. These co-occurring signals may be instrumental in signaling reproductive value, known as 'reproductive fitness' (Wilson, 1975/2000). Those with higher reproductive fitness would be vied for and hence would pass more of their genes on to a given population. The majority of our ideas will be speculation, of course, as we imagine an ancient world that no longer exists, and deduce whether these signals were selected for or learned.

The individual who detects these signals will of course be more informed as to the actual intentions of others, and thus can act more intelligently when navigating social life within the group. Yet these signals are not always clear and often individuals are motivated to conceal them to mask their own intentions or cover up their past behaviors. Therefore, the individual who can detect the actual signals through the concealment noise designed to deceive—a 'cheater detector' (Cosmides & Tooby, 1992)—would seem to benefit even more than others. However, when it comes to detecting deceit from behavior, the existing research suggests that individuals are not much better than chance at doing so (Bond & DePaulo, 2006; although some groups, under some circumstances, can show higher accuracy; O'Sullivan, Frank, Hurley, & Tiwana, 2009). This repeated finding of low accuracy in the literature suggests the press of evolution was not on creating some specific internal cheating detector, even though it did seem to press for recognizing honest signals of intentions (Ekman, 2003). This apparent conundrum might be resolved through considering how interpersonal societal networks function as an intelligence-gathering network, not dissimilar to how actual governments formally collect information (Solbu & Frank, 2019). Thus, social intelligence for detecting cheaters may reside not within individual's ken but across that individual's social relationships such that he or she has a network of informants that can provide the concrete details which prove cheating and/or deception (as only unimpeachable corroborating evidence can ever prove a lie was told; Ekman, 1985/2001; Novotny et al., 2018). In fact, this social networking may be reflected in the definitions of 'intelligent' in some cultures (e.g., Uganda) where those with the most friends (Wober, 1974) are considered most intelligent, and not instead those with most of some general "*g*" factor (Jensen, 1998; Spearman, 1904). Thus, the socially intelligent may be the collectively intelligent (Smith, 2010). This does not invalidate other models of intelligence (e.g., Sternberg & Detterman, 1986), but it does suggest one type of intelligence for navigating a specific type of problem associated with group living and cooperation. But first, we must consider how evolution presses for the signals that express our inner thoughts, feelings, and intentions; we then turn to our abilities to detect such signals.

Review of Evolutionary Factors

Darwin's theory of natural selection argues that the natural environment—and its presses—creates the conditions that select for those genes that produce the characteristics that allow an organism to survive within that environment (Darwin, 1859). It is these genes that get passed on to their offspring. The process by which nature exerts its presses involves a series of phenomena: first, more individuals are produced than an environment can typically support, thus competition for resources emerges; second, genes vary within populations through assortative mating, and those mutations and particular genes—and their characteristics—that are conducing to exploiting that particular environment are 'selected for' by that environment (nature) because those individuals survive; third, those surviving individuals are now in a position to procreate, and thus more likely pass those genes on to their offspring. Those genes that hinder adaptation to an environment put an organism at a disadvantage, as it is less likely to survive, and survival is (of course) the key to the procreation process. Note that Darwin made plain that characteristics of the environment, not any grand plan, dictated what abilities or characteristics increased the odds for survival. We can see how communication efficiency would be critical to survival in the situation of predator danger. Individuals with fast communication systems can quickly signal to members of their group that danger is imminent, thus maximizing the number of group members who can flee in time and thus survive to reproduce. Those with slow communication systems may not only be dispatched by the predator but fail to warn others so that they too get killed.

Implications

Abilities, programs, and other characteristics of an individual that lead to his or her survival also lead to a chance at reproduction. That chance is improved to the extent that an individual has those characteristics most vied for within the population; hence his or her reproductive years will likely be spent disproportionately passing on his or her genes within that population. This is most important leading up to and during one's reproductive age. Characteristics post reproductive age will likely be less relevant, save for the possibility of additional caretakers/hands within a society who share genes with some younger members (e.g., aunts, uncles, nieces, nephews), which increase the odds of these younger ones surviving (Caspari & Lee, 2004).

Nonverbal communication is instrumental in both survival and reproductive fitness (Frank & Shaw, 2016). In general, nonverbal communication helps to ensure the primary task of survival by expressing danger (fear), imminent attack (anger), contamination (disgust), attention needed (distress), and novelty (surprise). These signals can warn others of danger, avoid a conflict, reject/avoid spoiled food (e.g., Case, Stevenson, Byrne, & Hobaiter, 2019), and approach a group member in distress to attend to their needs; all of these things facilitate survival. We use the word 'expressing' deliberately because it implies communication, which in turn allows for cooperation and coordinated behaviors. This is akin to how turn signals and brake lights in motor vehicles signal a driver's intentions to his or her fellow drivers, thus smoothing the flow of traffic and reducing accidents. Nonverbal communication also facilitates survival and reproductive fitness by indicating with whom to affiliate (kin, friend, or foe) and health, fertility, and strength/dominance (Frank & Shaw, 2016). The interesting thing is that these behaviors communicate information that will influence the actions of others, irrespective of whether they were deliberately expressed or simply an aftereffect from some other biological process (e.g., nervous sweat). Whether or not they were selected for, they certainly were not disadvantageous to the survival and reproductive fitness of our species. What they do provide is information relevant to decision-making regarding avoiding, initiating, maintaining, and terminating interactions.

The extent to which nonverbal communication is adaptive to the world of today is likely happenstance, as it has been proposed that many nonverbal signals—in particular, the emotions—were 'engineered' to meet the challenges of the ancient world (Sznycer et al., 2017). Thus, if our species' first 180,000+ years on the planet were as hunter-gathers, this is clearly enough time to engineer behavior patterns conducive to surviving that ancient world (Tooby & Cosmides, 1990). We note that this does not mean that nonverbal communication is not relevant or adaptive today; it simply means that the signals and behaviors we recognize did not evolve to meet the challenges of things like diet sodas or the dangers posed by electrical outlets. However, nonverbal signals observed today can provide insight into the most severe challenges for survival and reproduction throughout our species' history. Take, for example, the emotion of fear. Fear evolved (was engineered) to motivate humans to escape danger. The threats to survival found in the ancient world may have been predators and other humans with hostile intent (LeBlanc, 2003), but the modern world might be air travel or the aforementioned electrical outlets. Fear works well for these modern threats (Ohman & Mineka, 2001). We can argue that, although emotions today may serve proximal needs, it is their distal environmental pressures that produced them in the first place.

Nonverbal Signals

We can classify nonverbal signals based on our speculation as to their design as a signal. Some nonverbal signals are simple reactions to psychological or physical stimuli; these tend to be unintentional, where no communication intention is inferred (e.g., a cold sweaty handshake). Others straddle both intentional and unintentional, for example, the widening of eyes during facial expression of fear (e.g., Matsumoto & Hwang, 2013). The emotion is unbidden, happens involuntarily, and it produces an expression upon the face. Yet individuals can learn, through culture, group life, or other life experience, to override this reaction and conceal this fear expression if the emotional impulse is weak; however, if the emotional impulse is strong the expression, or fragments of it, will usually leak out despite efforts to conceal it (Frank & Svetieva, 2015; Hurley & Frank, 2011; Matsumoto & Hwang, 2018; Porter & ten Brinke, 2008; Porter, ten Brinke, & Wallace, 2012). Whether then this is an intentional signal, or not, can be debated. The information is there to render a judgment as to the emotional state of the person, even though the expression is often not overtly detected (at least consciously; Shen, Wu, Zhao, & Fu, 2016; Svetieva & Frank, 2016). Individuals can be trained to recognize these expressions, however (Hurley, 2012).

Alternatively, we can intentionally produce nonverbal signals. For example, we can deliberately fabricate the signs of an emotion (e.g., smile to indicate being happy) in order to signal what we want others to see, even if we are not experiencing that emotion. Sometimes this is socially sanctioned (politeness); sometimes it is not (to deceive a would-be lover). These voluntary movements, in fact, can so very closely simulate their involuntary originals (e.g., Frank, Ekman, & Friesen, 1993) that they usually deceive others successfully (e.g., Ekman, Friesen, & O'Sullivan, 1988; Ekman & O'Sullivan, 1991). This raises the question of the honesty of signals, and how detecting a fabricated signal may lead one astray. Therefore, we need to understand how evolution might push to create these honest signals—as it is easy to understand how and why individuals might want to create dishonest signals, and then examine how societal structures may have served as the final backstop toward detecting the dishonest signals.

Implications for Survival

The industrialized world is designed to reduce the dangers of life that were inherent in the ancient world. We have traffic lights and signs, written laws and rules and regulations, and duly authorized groups to enforce the laws in an unbiased a manner as possible, and so on. The ancient world was considerably more hazardous. Ancient human remains of males suggest close to 30% of them died from homicide (LeBlanc, 2003). In more recent times, studies of males in preliterate societies suggest that up to 25% of them died from homicide (Chagnon, 1988). The trend toward less human violence over time is unmistakable (Pinker, 2011).

But it is that violent world in which we need to imagine the advent of these signals.

We believe this means that two aspects of human nature were most amenable to our survival. The first is having a hard-wired response system that would motivate behavior—without much contemplation—to respond quickly and efficiently to potential threats (Sznycer et al., 2017; Tooby & Cosmides, 2008). The second is living in groups, which produces allies in wartime, advanced warnings for threats, aid while sick, and other resources not always at our own disposal (e.g., food). Our emotions impinge upon both aspects of human nature.

The Example of Emotion

Emotions are defined as "transient, bio-psycho-social reactions to events that have consequences for our welfare and potentially require immediate action" (Matsumoto & Hwang, 2013, p. 17). They are intimately tied to our biology, affect our thinking, and have implications for those around us. Emotions affect our autonomic nervous system (ANS), which by altering heart rate, blood pressure, blood flow, and sweat glands produce the sensations we know as emotions (Levenson, Ekman, & Friesen, 1990). Specific emotions appear to have specific patterns of ANS activity (Ekman, Levenson, & Friesen, 1983), and these patterns seem to be universal (Levenson, Ekman, Heider, & Friesen, 1992). These changes in the body triggered by the ANS reorganize our body's priorities to enable quick action (Frijda, 1986). Given the universality of these reactions, we presume emotional responses are part of the wiring of our species. Research also shows these emotions are not exclusive to humans as we see these patterns in other mammals (e.g., Panksepp, 1998), although animal scientists use terms that describe the behavior associated with the emotion—for example, panic and attack (vs. fear and anger for humans)—due to the inability of animals to describe their inner feelings.

Another aspect of the definition of emotion that is important from an evolution point of view is that emotions are reactions to events (including ruminations about past events or thoughts about future events). They are at the interface of the organism with its environment (Ekman, 2003;

LeDoux, 1996; Matsumoto & Hwang, 2013; Panksepp, 1998). This interplay will come into play in more detail later when we discuss the signals associated with these emotions.

Research shows that there are anywhere from five to nine 'basic' human emotions, although the most research has been on these seven—anger, contempt, disgust, fear, enjoyment, sadness/distress, and surprise (e.g., Ekman, 2003). Some include interest (e.g., Izard, 1977), others include embarrassment (e.g., Keltner, 1995), pride (Tracy & Robins, 2008), or shame and guilt (e.g., Keltner & Buswell, 1997). Even now, larger taxonomies are being developed (e.g., 28 emotions; Cowan & Keltner, 2019). Universality and the physiological mediators are just two criteria for emotions being evolutionarily selected for; we would also expect to see some form in lower animals (which we do, see above), and we would expect to see the emotion develop regardless of social-learning opportunities (e.g., in those born blind), which research evidence supports (e.g., Galati, Miceli, & Sini, 2001; Galati, Sini, Schmidt, & Tinti, 2003; Matsumoto & Willingham, 2009).

We believe emotions would facilitate the survival of the organism, and the absence of them would potentially hurt the organism. This is made more clear by examining what each of the basic seven emotions does to the body to facilitate an action (action tendency) that might save an organism (Frijda, 1986). For example, anger moves blood to the upper body and increases muscle tension to prepare to fight and/or attack; disgust slows the heart rate and prepares the body to eject some ingested item; fear moves blood to the large muscles of the legs to facilitate escape; and so forth (see Levenson, 1999). Tooby and Cosmides (2005) argue further that the mechanism producing these emotions evolved in the ancestral environment via events that recurred, required coordinating the body actions to overcome that event, had a repeated and consistent pattern of action that also signaled when it was engaged—and that not having such a reaction could cost the organism potentially its life. Regardless, interacting with nature is what enables us to survive the challenges of the ancient world, and having these emotion 'programs' must have been helpful to our survival in that environment.

The signals. But given the focus on the social intelligence associated with nonverbal communication, we turn our focus to the signals that accompany emotional reactions. The first set of signals is the aftereffects of the physiology of emotion. These are often not easy to see; for example, it is hard to detect a change in heart rate or slight increase in sweat by simply observing another person. On some occasions, a change in blood pressure might be detected in lighter complexioned individuals through changes in skin color due to flushing in the face in (as with anger or embarrassment; Keltner, 1995), but in general these signals are hard to detect.

The second set of signals associated with emotions is presumed to exist *because* they are signals. These are facial-muscle movements in the face, which form particular configurations for each emotion; the configuration is called the facial expression (see Hwang & Matsumoto, 2016, for the mechanics of the musculature underlying the facial expression; they also note that the facial muscles are the only muscles in the body that connect bone to skin; thus one purpose must be to move that skin in a way to be seen by others). To date, Darwin's (1872/1998) identification of three principles underlying the production of facial expressions are still our best understanding of the evolutionary roots of such expressions. First, he argued that the specific configuration of each expression served the action tendency of that emotion—what he called the principle of *serviceable habits*. Second, because he was puzzled by the action tendency for the configuration known as a smile, he developed the principle of *antithesis*, which argued that the purpose of that configuration for the positive emotions was that it looked very different, or appeared to be the opposite, of negative emotions such as anger of fear so as to not confuse them. Third, he argued that the impulses for these facial expressions of emotion were impelled upon the face and thus were involuntary—what he called the principle of *nerve force*. All three of these principles ultimately were considered essential to survival and thus were selected for evolutionarily.

The principle of serviceable habits works along the same line as ANS activation, as it furthers the goal of the emotion (e.g., Levenson, 1999). For example, in anger, the lowering of the eyebrows and raising the upper eyelids produce a glare—and this glare narrows the individual's focus onto the object or individual that needs to be removed or potentially attacked. Moreover, in anger, the curling in and narrowing of the lips moves them out of the way of the teeth to facilitate a bite. In contrast, in fear, the raising of the eyebrows and raising of the upper eye lids permit more information to enter the perceptual realm of the individual, hence enabling better assessment of escape routes, and so on. In disgust, the wrinkling of the nose and the raising of the upper lip reduces the amount of sensory information. This would be important if testing a potentially sickening ingestible item (Case et al., 2019). Advances in technology provide evidence for these assertions. Computerized axial tomography (CAT) scans of individuals who pose fear and disgust expressions show changes in the amount of sinus cavity surface area (a marker of potential sensory input) compared to their neutral faces. As predicted, a posed fear expression expands the surface area, whereas a posed disgust expression reduces the individual's surface area (Susskind et al., 2008).

The principle of antithesis, in Darwin's (1872/1998) original reasoning, existed to ensure that positive emotions won't be confused with negative emotions. For example, the appearance of the human happy smile with its lips turned up would be likely not confused with the downturned lips found in the negative emotions of anger, fear, and sadness. Research supports this notion as the smile expression is least confused with other expressions (e.g., Ekman et al., 1987) and also is the expression that can be seen from the farthest distance away (Hager & Ekman, 1979). More recent work argued that antithesis can also apply to the eyebrows, such that anger (eyebrows down) and fear (eyebrows up) represent two very different negative emotions and hence less likely to be confused (Weisfeld & Goetz, 2013). Research confirms that, when judging emotions, anger and fear are rarely mistaken for one another, and likewise happy and sad (Ekman et al., 1987; Matsumoto, 1993).

The principle of nerve force argued that the facial expression associated with each emotion was simply one part of the entire coherent and coordinated emotional reaction that features the ANS, CNS, and body and vocal actions (Hwang & Matsumoto, 2016). This principle is supported by almost 100 published studies that show when one spontaneously elicits an emotion, the specific expression associated with that emotion also gets elicited (Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008). Darwin (1872/1998) raised the issue that one might not be able to fully mimic a genuine emotional expression, as some facial muscles are harder to move deliberately (e.g., the medial portion of the frontalis muscle—aka, the inner corners of the eyebrows—in sadness; Ekman, Roper, & Hager, 1980). That also meant some facial muscles will be harder to inhibit if activated. Moreover, we now know that spontaneously felt emotions also have different dynamic movement patterns (e.g., the flow of the smile; Frank et al., 1993) caused by the fact they originate in a different part of the brain than posed expressions (see Rinn, 1984, for a review).

Thus, emotional facial expressions are genuine or honest signals of the emotional state, and research has shown time and time again high agreement rates across all cultures when judging particular facial expressions of emotion (see Hwang & Matsumoto, 2016, for a thorough review of this work). However, Darwin also suggests that facial expressions are not just signs of an emotion, and thus a particular behavior is likely to follow, but can also be mimicked, thus moving them into the realm of a deliberate, consciously chosen signal, which can be used to deceive.

The body can also communicate emotions, although it appears its signals are more expressing the action tendency associated with that emotion rather than a more pure signal as seen in the face. When feeling or posing emotions, people move their bodies differently such that those who are angry are distinguishable from those who show other emotions, such as sadness, fear, or joy (Atkinson, Dittrich, Gemmell, & Young, 2004; Crane & Gross, 2007; Montepare, Goldstein, & Clausen, 1987; Walbott, 1998). Angry bodies have more forward lean and greater arm swing, whereas fear has shorter steps and less forward lean (the difference between approaching to attack vs. retreating to escape; de Meijer, 1989). The body can demonstrate antithesis as well; pride (which we can infer also conveys dominance) features upward body posture and arms/hands thrust upward, whereas defeat or shame features the body bent downward and hands in (Tracy, Shariff, & Cheng, 2010; Weisfeld & Dillon, 2012).

Likewise, the voice can also communicate emotions. The preponderance of the research on the vocal signals of emotion shows, like the work on facial expression, cross-cultural agreement on vocal emotion patterns in the voice, even when the groups are relatively isolated from Western culture (e.g., Bryant & Barrett, 2008; Scherer, Banse, Wallbott, & Goldbeck, 1991). Animal research also shows that animals produce vocalizations that communicate threats, danger, nature of relationships, as well as their emotional states (e.g., Kitchen, Cheney, & Seyfarth, 2003). Although anger, fear, happiness, and sadness have received the most study in humans, smaller numbers of studies have examined agreement for emotions such as disgust, contempt, boredom, embarrassment, guilt, shame, and many shades of positive emotion, such as amusement, relief, contentment, and so forth. The results for these emotions do not show the uniform high levels of agreement found in the facial expression judgments, however (Sauter, Eisner, Calder, & Scott, 2010; Simon-Thomas, Keltner, Sauter, Sinicropi-Yao, & Abramson, 2009).

It makes sense that the challenges of the ancient world may have pushed for emotional signal vocalization in humans. Audible signals transmit information in darkness, over distance, or even when the individual has his or her face turned away. It thus makes sense to have a redundant signaling system that can augment or substitute for the primary visually transmitted facial expression (Lavan, Scott & McGettigan, 2016).

Why show these signals? There are good reasons why it would be important, from an evolutionary point of view, to signal one's emotional state. And it may be equally important to have a 'receiver' to detect these emotion signals. Research confirms that there do appear to be sections of the brain that respond to these particular signs of emotion (e.g., Sabatinelli et al., 2011). Because both these systems of producing and processing emotion signals resulted from the same distal process, we can now speculate as to how showing signs of these emotions may have aided our species.

Anger. Although it seems one gives up the element of surprise by signaling attack, it can be an advantage when considering the wider picture. Research has shown that the vast majority of our interactions are with members within our group, and those showing anger—that attack is imminent—have the advantage of often preventing a fight. This often elicits compliance from the other without the risk of injury or infection. Social-conflict researchers have known that threats are effective means for obtaining compliance and are inexpensive to deliver (unless one has to follow through; Pruitt & Kim, 2004). But there are hazards involved with turning the threat into an action. Infections from injuries can be a major problem associated with fighting, particularly in the ancient world where there were no antibiotics. To compare the effects of antibiotics, of every 1000 soldiers, 62 died from infection before antibiotics (US Civil

War) versus 0.6 after (World War II; Gilchrist, 1998). Thus, an actual physical fight could be just as lethal to the winner as the loser. When observing a crowd, the expression of anger is often the first to be noticed (Hansen & Hansen, 1988; Williams & Mattingley, 2006, but see also Calvo & Nummenmaa, 2008), which speaks to its importance for social interaction. Anger expressions change the behaviors of others, including stopping a violation of social norms (e.g., Averill, 1983), or stopping people from acting in general (Winkielman, Berridge, & Wilbarger, 2005), or making others to perform avoidance-like behaviors (Marsh, Adams, & Kleck, 2005), or making others show fear (Dimberg & Ohman, 1996; Esteves, Dimberg, & Öhman, 1994), and/or trigger things like apologies. These then dissipate the sensation of anger (Ohbuchi, Kameda, & Agarie, 1989). Thus, it may have been more advantageous to 'win' by showing anger than to surprise-attack individuals, particularly since most of the targets of anger would be those with which one shared at least some genes.

Contempt. Status is important to indicate to produce stability in groups, as contempt expresses one's status above or below another in a hierarchy. The most stable and least conflict-ridden societies are those with strong social hierarchies (Pruitt & Kim, 2004).

Disgust. Health-inspected grocery stores were not a feature of the ancient world. Our ancestors found or caught all they ate. Much of it also seems to have been scavenged, which recent work suggests may account for our particularly strong disgust reactions compared to other primates (Case et al., 2019). Rancid meat or plant items that are poisonous are a life-or-death matter and thus were a real threat to survival. Even today that threat exists, but advances in science have reduced it immensely. Over the past century, food-borne illnesses have dropped from 100 per 100,000 to less than 2 per 100,000 (CDC, 1999). Thus, we can only imagine how prevalent obtaining a food-borne illness was in the ancient world, where starvation was a constant threat; thus, exploring any possible source of food, including scavenging, may have been indispensable to survival (Case et al., 2019).

Fear. Fear signals a threat or can signal to an angry individual that one will not fight (thus reducing the chance of actual conflict). Fear expressed in the face and voice would clearly broadcast the potential threat to other group members; if this was a hostile being or predator, it would make possible the critical few seconds needed to enable a target to escape from a threat. Even if the person who stumbles onto the snake or other danger does not survive, that signal may warn away others to safety. Vocalizing fear allows the message to cover a wider area, which may help draw allies to battle the threat, or give others enough time to escape.

Happiness (enjoyment). Although there is debate as to whether there are different happy emotions (Cowan & Keltner, 2019; Ekman, 2003), it is important to communicate positive emotions because they signal a person is non-threatening. A person who shows a genuine sign of a positive emotion featuring all the movement components of the genuine smile (or Duchenne smile; Ekman et al., 1988) compared to smiling with just the lips and not the eyes is perceived as more pleasant, more genuine, and generally more positive (Frank et al., 1993). As noted earlier, the extraordinary homicide rates of the ancient world suggest it is a life and death judgment to know whether someone is approachable and friendly.

Sadness. An individual in distress would be advantaged to express that to members of his or her group in order to receive aid. This is indispensable in infancy, as an infant can only express distress nonverbally. However, this emotion carries through adulthood. In fact, research shows adults who display expressions of distress are able to generate help and sympathy from others (Eisenberg et al., 1989).

Surprise. Alerting others to some novel stimulus, and hence obtaining their perspective, would seem to aid in comprehending the true nature of this unusual event. Research shows even infants will react to a mother's surprise expression (Hiatt, Sotomayor, Sanchez, Zombrana, & Knight, 1979). However, the relative neutrality for surprise often affects its interpretation, and it is often followed by another emotion. Opening a gift to find $10,000 might elicit surprise followed by happiness, whereas opening a gift of a dead cat might elicit surprise followed by disgust. There exists some controversy regarding the nature of surprise expression (Reisenzein, Bördgen, Holtbernd, & Matz, 2006), but it seems surprise is readily recognized (Cheal & Rutherford, 2013).

Expressing emotions—hence signaling your intentions—in the give and take of day-to-day life is important. Those unlucky individuals who cannot express emotions through their faces—such as those suffering from Moebius syndrome—can feel and experience emotions, but their social lives are usually awkward and difficult because of their inability to signal to others their emotional states (Bogart & Matsumoto, 2010; Coulson, O'Dwyer, Adams, & Croxson, 2004). There are even more dramatic social consequences for other primates who cannot express with their face. A Rhesus monkey returned to its social group after having its facial nerve surgically severed, rendering it unable to facially express, began to experience more aggressive acts, and eventually lost its place in the social hierarchy (Izard, 1977). Moreover, any disorders that disrupt the expression or perception of emotions in the face or voice, like those on the autism spectrum, routinely impair social functioning (Baron-Cohen, 1999; Heaton et al., 2012). Thus, we can imagine that, in an ancient environment, with its sudden dangers of predators or hostile other humans, those individuals who have an inability to express or process emotional information may be oblivious to the dangers. This leads to slowed reactions, and that leads to lethal outcomes. Therefore, we can conclude that the ability to signal emotions and intention, through the face, voice, or body, when appropriate, would seem very important to survival—and thus we could reasonably expect evolutionary pressure to produce such programs (Sznycer et al., 2017).

Honest signals? Neuroanatomical research confirms Darwin's observation that facial expressions can be biologically driven, involuntary, and harder to control (as in the case of the basic emotions), and thus can be considered signs of that emotion. Given that during the experience of emotions the face, body, and voice produce signs, all of these signs can serve as an honest signal. However, emotions can also be voluntarily posed to function as a *signal* to represent a given emotion, without the individual actually experiencing that emotion. Moreover, there are times in social situations where people attempt to squelch, conceal, or mask their emotional expression by trying to show a different emotion (e.g., showing happiness when someone truly feels sadness). Falsifying emotional expressions may be in the service of politeness, social expediency, or even to mislead. The reason that deliberate signaling of emotion is possible is that there are two distinct neural pathways that mediate facial expressions, each one originating in a different area of the brain. The pyramidal motor system drives the voluntary facial actions and originates in the cortical motor strip; in contrast, the extrapyramidal motor system drives the more involuntary, emotional facial actions and originates in the subcortical areas of the brain (Meihlke, 1973; Myers, 1976; Tschiassny, 1953). The research documenting these differences was reliable enough (see review by Rinn, 1984) that prior to modern soft tissue imaging technology, observations of posed and spontaneous facial expressions served as the primary diagnostic criteria for certain brain lesions (DeMyer, 1980).

Detecting these fabricated emotions is not always easy. In instances of a conflict between an actual felt emotion and its expression, and a fabricated emotion not felt, both the pyramidal and extrapyramidal motor systems can be activated simultaneously. When an emotion is triggered, the subcortical area of the brain sends an involuntary ballistic-like signal to the facial nerve(s). To hide this emotional response, the individual must recruit his or her voluntary cortical motor strip to send a signal to suppress, amplify, or disguise his or her expression in a socially and culturally acceptable way. These competing impulses create a 'tug of war' over control of the face, and when the subcortical impulse is strong enough the expression will leak onto the face for a very brief time before the voluntary motor systems regain control of the expression (Frank & Ekman, 1997; Frank & Svetieva, 2015; Matsumoto & Hwang, 2018). This competitive confluence of signals can produce an emotional facial expression that is under 500 milliseconds in what is called a micro-expression (Ekman & Friesen, 1969; Haggard & Isaacs, 1966). These are brief because the individual is trying to conceal or mask his honest, involuntary signal. Later work showed that individuals do show or express fragments of emotion even when they deliberately attempt to conceal them (e.g., Ekman, O'Sullivan, Friesen, & Scherer, 1991; Frank & Ekman, 2004; Hurley & Frank, 2011; Matsumoto & Hwang, 2018; Porter & ten Brinke, 2008). These different origins for genuine emotions versus posed emotions also mean they have different dynamic qualities; in the case of happiness, the smile shown by genuinely happy people has a smoother onset, more symmetry, and a circumscribed duration lasting between ½ and 5 seconds in length (Ekman & Friesen, 1982; Frank et al., 1993). Thus, honest signals can leak despite the individual not wanting to show that signal.

Honest signaling of body emotions and intentions also happens. As we noted earlier, emotions posed in body action are readily identified (e.g., Montepare et al., 1987; Walbott, 1998), but actions associated with the emotions can involuntarily leak, as in shaky hands, or cold clammy hands, sweat stains, and so forth. Thus, both honest and dishonest signals can be shown or masked.

Honest signaling of emotions in voice also happens. But we also know that most of the research on vocal signals of emotion has come from individuals posing or mimicking the emotions in his or her voice (e.g., Scherer, 2003). Thus, a stimulus subject may be asked to say a phrase "these pretzels are making me thirsty" to sound disgusted, or to sound angry, or to sound happy, or surprised, and so on. In this instance, emotions are not elicited by actions. However, the research shows that this acting is quite effective and people can recognize the emotion attempted at rates greater than 70% agreement (reviewed by Frank, Griffin, Svetieva, & Maroulis, 2015). This means as well one can fake emotions in the voice that one does not feel.

There are many socially acceptable reasons to not honestly reveal signals. Politeness dictates one does not always express what one feels. For example, concealing disgust when someone makes an effort to cook us dinner is one. A child is taught to conceal disappointment and feign happiness when receiving socks from grandma versus the hoped-for video game. One of the primary phenomena that accounts for signaling emotions that one may not feel, or concealing emotions one does feel, are the cultural display rules (see Matsumoto & Hwang, 2013 for more details). That is, we often conceal or falsify our signals to smooth social interaction, and to establish rules, hierarchies, and so forth, to prevent chaos and permit group action as per various cultural norms (Ekman, 1972). This could not be done without having the ability to manage—and mislead—with our signaling. In fact, smoothing social interaction is what allows individuals to cooperate in groups, thus live in groups, with the resultant advantages of that lifestyle (allies in war, food and other resources, etc.; Boyd & Richerson, 2009).

Moreover, people can also use their face and bodies to display symbolic gestures (Ekman & Friesen, 1969), such as winking to indicate "I'm kidding", or giving a thumbs up for good luck. These facial and body expressions are culturally specific, learned like language (Ekman, 1977). They are not necessarily signals of emotional states but also can be symbols for other concepts or objects. These can be falsified as readily as speaking a lie.

Summary. It appears there are clear sets of behaviors—emotions—engineered over time, which evolved to meet the challenges of the ancient world (Sznycer et al., 2017). These behaviors come with signals, which for the most part are readily identified, as it seems that we have not only hard-wired sending abilities but also hard-wired receiving abilities. When the situation is simple, blatant, and clear, there seems to be little confusion in identifying those signals (e.g., Ekman, 2003). However, social life is complex and more often nuanced. There are times when individuals may be at a disadvantage by signaling their actual feelings. Individuals can learn to override these expressions as per one's cultural norms or individual motives. When these signals are used to mislead, to what extent can we detect the dishonest signal, or the honest signal being disguised by a dishonest signal? Would there be evolutionary pressure to develop some internal 'cheater detector' (Cosmides & Tooby, 1992; although they refer more to identify people who are cheaters vs. events that involve cheating; Cosmides, Barrett, & Tooby, 2010) that can intelligently ascertain that one is dealing with dishonest signal, or person? Examining individual abilities and social structures would seem to start us toward an answer to these questions.

Detecting Dishonest Signals

When asked to detect still photos of individuals expressing emotion, research shows laypeople can detect the emotions at around 90% accuracy (Matsumoto & Hwang, 2013). This pattern applies wherever in the world it has been studied (Hwang & Matsumoto, 2016). Thus honest, blatant signals are readily detected.

When the signal and situation are not so blatant, but nuanced, these accuracy rates plummet. Research has examined extensively the ability of individuals to detect dishonest signals, otherwise known as detecting lies. On average, most people are quite poor at detecting deception just from behavior, with approximately 54% accuracy, with chance being 50%

(Bond & DePaulo, 2006). This study found that even most professional lie-catchers, when given 1-minute video clips of individuals lying and telling the truth, tend not to outperform laypeople. Thus, if there is some sort of inborn event-based cheater detector, it should have revealed itself under these simple, uncomplicated judgment conditions. But alas, it has not.

One reason for the low accuracy is that there is no clear, unique signal for a 'lie' per se. There is a clear, distinct signal for an emotion being lied about—that is, the sign of sadness when the person says they were happy for you. But that signal works only to the extent to which an individual is lying about their emotions (Ekman, 1985/2001). Other lies may generate emotions, such as the fear of getting caught, when lying, but those are only likely to show if there are consequences to that lie (Frank & Ekman, 1997). And that also means the extent to which an emotion is elicited in lying, is the extent to which detecting the signal of that emotion would be correlated with accurate signal detection. Research does show a correlation between ability to read micro-expressions and to detect deception (Ekman & O'Sullivan, 1991; Frank & Ekman, 1997). However, when these signals are present, but present as a micro-expression, they are not detected at rates greater than chance by laypeople (Bartlett, Littlewort, Frank, & Lee, 2014; Svetieva & Frank, 2016).

Individual differences. There is great variability in abilities to detect when someone is lying. Some professional groups, like the US Secret Service (Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999) or clinical psychologists with a strong interest to learn about deception (Ekman et al., 1999; O'Sullivan et al., 2009; O'Sullivan & Ekman, 2004), are significantly better than laypeople. Research also showed, as suggested above, when the stakes for lying are higher, then we see law enforcement groups, in general, outperforming laypeople (e.g., 67% accurate when law enforcement judges high-stakes lies vs. 54% accurate when law enforcement judges low-stakes lies; O'Sullivan et al., 2009). There are also some individuals who routinely show high accuracy (Bond, 2008; O'Sullivan & Ekman, 2004). One factor that seems to make individuals better detectors is their ability to maintain an open mind, such that they do not apply the same judgment rules to all targets being judged (Ekman & O'Sullivan, 1991). This open-mindedness may be similar to perspective taking—and research shows when areas of the brain presumed to be important to perspective taking are stimulated with a current, it improves lie detection accuracy when faced with opinions that conflicted with the participant's own opinions (Sowden, Wright, Banissy, Catmur, & Bird, 2015). Susceptibility to emotional changes in others at an early age via neighborhood violence or physical abuse may also improve lie detection ability by calibrating one's signal detectors to identify the most subtle of signals due to the consequences associated with failure to detect (Bugental, Shennum, Frank, & Ekman, 2001; O'Sullivan & Ekman, 2004). Thus, we see accurate lie detectors relying more on nonverbal behaviors than on verbal behavior when the lie is about feelings (Bond, 2008; Ekman & O'Sullivan, 1991). The importance of nonverbal behavior, and facial expressions in particular, for lie detection is further supported by the finding that aphasics—people with left hemisphere brain lesions preventing them from adequately comprehending speech—are significantly more accurate than control groups at detecting lies about feelings (Etcoff, Ekman, Magee, & Frank, 2000). In contrast, persons with poor nonverbal processing, such as those with autism, have a reduced ability to detect (and produce) lies (e.g., Sodian & Frith, 1992). Finally, we note not only that the ability to detect deception can be trained (Frank & Feeley, 2003), but that specific training on emotion detection can also increase lie detection accuracy (e.g., Shaw, Porter, & ten Brinke, 2013). However, these reported accuracy levels do not seem to support the notion of some internal, hard-wired event cheater detector.

Other social skills. Other social skills that could be seen as an aspect of emotional or social intelligence do seem to affect the ability to detect dishonest signals. Adhering to pro-social norms, or feeling empathy, also affects signal detection; socially skilled individuals not only detected but were also able to perpetrate deception more effectively than socially anxious individuals (Riggio, Tucker, & Throckmorton, 1987). Other studies showed those with high social intelligence were actually poorer at detecting deception, because whatever they detected made them feel increased compassion for the liars (Baker, ten Brinke, & Porter, 2013). In contrast, male psychopaths (but not female), whose hallmark is to exploit others, including telling many lies, were better able to detect deception (Lyons, Healy, & Bruno, 2013). Interestingly, those with more realistic views of the world—like depressed people—are more accurate in judging lies (Alloy & Abramson, 1979) than those who are considerably happier (Cummins & Nistico, 2002).

Taken together, there seems to be no strong evidence for an inborn event-based cheater detector in humans. Some individuals can detect accuracy, but they are rare—and if this skill was such an advantage, we should have expected this ability to be more prevalent in a society. But it is not. Even those with higher social and/or emotional intelligence also do not reveal any compelling pattern as to their signal-detection proficiency. Yet it seems clear that the individual who could detect such subtle signals and ascertain reality would be at such an advantage interpersonally compared to others. Thus, why did evolution not engineer this ability? Was it some sort of arms race, where each time a detector identified a signal, the cheaters changed the signal, and so forth (e.g., Dawkins & Krebs, 1979; R. Frank, 1988)? We doubt that, as these emotion programs and their signals would seem to have been too valuable in the ancient world. Maybe the answer is found in our social structures rather than internal biology and psychology.

Socio-cultural Context

Our interpersonal behavior is governed by social and cultural norms (Matsumoto & Hwang, 2013). One of the most important socio-cultural norms is to not make false statements or lie in conversations (Grice, 1989). Almost all cultures have a norm of honesty (Knapp, 2008). We are socialized into adhering to this norm from childhood (Saarni & Weber, 1999). Yet we also have a norm for politeness, which often means lying (and, as noted earlier, we teach our children to tell Grandma he or she loved the gift of socks when the child was hoping for a video game). This finding prompted scientists to classify truth and lies into two subcategories based on these apparently contradictory norms (Dor, 2017; Lee, 2000; Sweetser, 1987). This takes into account the perceived intention of the message and the messenger as well as the socio-cultural context in which it occurs (Lee, 2013). For instance, all messages may be classified into four categories: cooperative honesty (the basic norm), harmful honesty (mean-spirited comments veiled as 'just being honest'), cooperative lying (politeness, smoothing social interaction), or harmful lying (cheating, etc.; Dor, 2017). However, to determine the specific intention (i.e., to harm or to cooperate), we must understand the cultural context (environment). For example, white lies are deliberate misinformation usually uttered for polite reasons, often to save someone from harm or to preserve their feelings; for example, the white lie a guest utters when he or she tells the host that the meal prepared by the host was great, when in fact the guest did not like the food (Sweetser, 1987). However, the line between acceptable and unacceptable lies changes with different cultures. For example, in Ecuador, even white lies were rated considerably more negative than by North Americans (Mealy, Stephan, & Urrutia, 2007). Subcultures also may have different views, as a study showed that members of the Church of Jesus Christ of Latter-day Saints rated lies as less acceptable than nonmembers (Ning & Crossman, 2007). In an extreme case, some cultures, like the Mopan Maya of Southern Belize, view all untrue statements as lying, regardless of whether they are intended to mislead or not (Danziger, 2010). However, there does seem to be a pretty accurate social-exchange monitor system that engages under specific circumstances to look for cheaters (Cosmides et al., 2010).

Generally, our social norms seem to permit lying to enemies, or the out-group, more than to our own group (Dunbar et al., 2016; Mealy et al., 2007; Sweetser, 1987). This phenomenon appears particularly potent in collectivist cultures, such that the concept of a 'blue lie' was advocated (blue lies are lies told on behalf of one's group, which often endears the liar to the group). For example, researchers found that in China, children supported blue lies but viewed truths against their group unfavorably (Fu, Evans, Wang, & Lee, 2008; Lee, 2013). This has also been found that Samoans, but not Americans, will attempt to lie for collectivist purposes (Aune & Waters, 1994). In more recent times we see something similar in politics as well, where politically active individuals seem much more forgiving about lies told on behalf of their own party.

Successful lying and lie-catching by men can enhance their status in some cultures, such as in Lebanon, despite a general disapproval of lying in the culture (Gilsenan, 1976). Successful lying and lie detection can improve one's power and material success, and those values may be the more important value in that society (Hofstede, 1980). Power matters in other situations, in particular the dynamic between high-power individuals and their subordinates (see Hofstede, 1980). For example, four- and five-year-old Italian Catholic children would never believe that a Catholic priest told a lie (Fu et al., 2008).

Summary. It seems that the cultural and societal context and norms works as often against accurate lie detection as for it. Some cultures cast esteem on the person who is a good lie catcher (e.g., the Lebanon example above), but often social situations proscribe detecting lies. Politeness is one situation where one takes a lie at face value. Showing one is a member of a group in good standing by taking a lie at face value is another situation (e.g., in fascist regimes; Snyder, 2017). And, given that we would expect more honest communication within groups (Fitch, 2010), there may be even fewer lies available to catch in those situations. Thus, the variability in acceptability of lying, and variability in norms across situations about detecting lies, strongly suggests that social norms are not a driving force developing any special dishonest signal-detection skills. However, it does seem that social harmony is such an important value that it serves as a tantalizing clue about a significant process that might aid in detecting dishonest signals—and that process is the general fidelity of the social interaction. In other words, the successful, smooth, and positive engagement with group members seems to be a more important ability to demonstrate than an ability to catch dishonest signals at any given point. Therefore, the nature of the interpersonal relationships becomes paramount.

Social Evolution

The same process that pushed humans to evolve the ability to engage in symbolic thought—using sounds (language) to represent ideas or objects (McCrone, 1991)—is the same process that enabled deception because it enabled individuals to represent things that aren't physically present here right now. Given the maxim that assumes that communication is honest (Grice, 1975), a person who states false information is capitalizing on others honoring this maxim, thus they are 'cheating' to obtain some advantage. This has been known as free riding (e.g., Gintis, 2000; Krebs & Dawkins, 1984; Trivers, 1971). Thus, in this sea of honest communication and honest signals are opportunities for cheating, or what might be seen as tactical deception (McNally & Jackson, 2013). Tactical deception fits into the context of the *interdependence hypothesis* (Tomasello, Melis, Tennie, Wyman, & Herrmann, 2012), which is a two-step model proposing the evolution of human cooperation and interdependence. The first step this model proposes is that a group of people develop joint intentionality, form collaborative partnerships, identify roles, and generally help each other and avoid potential cheaters. The second step occurs as the size of the group population grew, where now groups competed for resources—and in the process further developed cognitive skills serving the collective. This was called developing *collective intentionality*, which in turn led to the formation of the various cultural norms and practices (Tomasello et al., 2012). Here is where cheating may become more frequent.

In this first step, tactical deception, or "free riding", was likely not frequent because collaboration of everyone in the small group was necessary for success. Moreover, the size of the group enabled most people to know exactly what each other was doing. The individual who failed to uphold the norms of collaboration was punished; this provided additional incentive to cooperate (Tomasello et al., 2012). Taken together, this meant that taking each other at face value, and hence trusting each other, was central to the survival of the group, even if a few free-riders on occasion exploited that norm (Dunbar, 2004).

Game theory models are consistent with this reasoning. In general, game theory is based upon the assumption that there are different payoff outcomes to individuals who cooperate (altruistic, truthful) or compete (selfish, deceive) with each other during social interactions. The prisoner's dilemma (Tucker, 1950) is a well-known example of a game theory model where if both individuals choose to cooperate, they both benefit; if they both chose to compete, they both suffer; and if one competes, and the other cooperates, then the cooperator suffers greatly. When thousands of iterative (repeated) interactions are computer simulated, it seemed to show that competitors won out in the end, thus eliminating the cooperators. However, this finding seemed to contradict what appears to be the generally cooperative social life of human groups. Scholars rectified this apparent discrepancy by rerunning those iterative models, but this time allowing a cooperators to sanction a known competitor (i.e., upon discovery that one is dealing with a competitor, one can refuse to interact with the competitor). When the ability to sanction was entered into the model, the model now resulted in the cooperators winning out in the end. This reversed the initial finding and now matched what seems to be the case in our present society, as well as the ancient world—the long-term payoff is better to be a cooperator compared to a competitor (Cosmides & Tooby, 1989). What this means for cheating is that as long as the cheating is infrequent, it is likely to go undetected. However, if it is done more frequently, the odds of being detected as a competitor goes up, and then once the sanction is applied, that competitor is ostracized. What this means is that in the first evolutionary step in the interdependence model, *our species did not need* to develop super-perceptive abilities to catch every lie or cheat or dishonest signal. But the group could rely on the fact that over time, a person who lied, cheated, was a free-rider, or frequently displayed dishonest signals would eventually become identified and ostracized. We can only imagine that the consequences of being ostracized in the ancient world, where cooperation was the key to survival, was likely severe and possibly fatal.

Tactical deception/free riding became a bigger problem in the second step of the interdependence model. As the group grew and spread out, it was more difficult to track individuals, in particular in regard to their reputation (Dunbar, 2004; Enquist & Leimar, 1993; Tomasello et al., 2012). This added a layer of complexity into social life, by having to remember more individuals and their history of transgressions and at the same time making more assessments as to who might be a competitor required for some mechanism to help manage this information (Dunbar, 2004). Gossip helps serve this end, as it is an informal exchange of information regarding people's reputations and past actions (e.g. Enquist & Leimar, 1993). Gossip is thought to promote pro-social behavior both by excluding selfish individuals and through stories and descriptions of reactions to those stories, deterring future noncooperative acts (Willer, Feinberg, Irwin, Schultz, & Simpson, 2010). Gossip also allows discussion of individuals one has not met in person and is very resource-efficient means to gather information (Smith, 2010).

As societies became larger and more nearly anonymous, an altruistic punishment for detected free-riders, which benefitted the larger group, likely emerged. This punishment is proposed to have driven the group into a state of *hyper-cooperation*, where all behavioral activities were seen and understood as beneficial to the group (Burkart et al., 2014). Without the threat of punishment, cooperation would have dropped as anonymity grew (e.g., Franzen & Pointner, 2012; Haley & Fessler, 2005; Hoffman, McCabe, Shachat, & Smith, 1994). Norms could be more easily internalized this way, making cooperation almost 'instinctive'. Moreover, the delivery of the threat by usually a minority of enforcers so as to punish the free-riders, further ensured cooperation (Gavrilets & Richerson, 2017).

The surveillance network. The evolution of human social structures, including collaboration and group interdependence, produced a social environment where group members could safely assume that communication and signals were honest most of the time. There was no need for a constant assessment of every utterance as close interaction, and gossip, served a surveillance function to keep tabs on each member to insure they were in good standing as a cooperator. Selfish lies (vs. white lies) were rare, as the cost of discovery was high, and the individual who told too many strongly increased the odds that he or she would eventually be unmasked by the group network.

This also meant the person who forged the greatest number of social connections, who was liked by as many members of the group as possible, would be the person through which most group information (via gossip) passed and thus would have 'intelligence' on virtually all members of the group. Through these relationships, he or she could in essence extend their observational reach farther and wider as the group grew larger and larger. This meant that the socially intelligent person was the person with the greatest number of network links. In other words, the *socially* intelligent had the most complete picture of the *collective* intelligence and thus could capitalize most upon that information. They had knowledge, and the context of that knowledge, beyond that of someone less well connected. Thus, there was no need to develop any individual lie catcher or cheater detector for events, when the development of cooperation and gossip would serve that lie-catching function just as well if not better, because gossip could contain hard, unimpeachable evidence that would allow the person to know with 100% certainty that someone is lying (Ekman, 2001; Novotny et al., 2018). Having more friends means having more access to that unimpeachable evidence, as those with friends likely knew someone who knew someone who saw the cheater/competitor in action and reported it back through the network. Thus, this person with many friends became intelligent in both the psychological way—smart and could make better predictions because they had more information—and the bureaucratic way like a modern intelligence agency. This system is also energy efficient, as the cost to being vigilant 24/7 is enormous and leads to exhaustion (Ekman, 1981; Smith, 2010). Thus, conversations and interactions with friends would seem to be the optimal way to ultimately unmask the competitors.

Social Media and the Modern Village

The societal 'radar' network of surveillance is not foolproof at any given point in time. As the social structures harden, liars have to become more sophisticated to work within those structures, and in return the lie catchers also have to become more sophisticated to keep this balance. Moreover, as the size of the group expands, eventually people move out of specific social networks. This is also one way to escape a bad reputation—leave the village, go to a place where one is not known, and either learn the lesson from being ostracized and this time be a cooperator in the new village or continue in one's competitive ways until being discovered again.

Our twentieth-century society had grown so far and wide that individuals could start new lives in new places and leave their old reputations behind. The advent of quick and easy transportation enabled this. However, the twenty-first century saw the advent of social media, which through online postings, publicly available databases, and information enabled the Internet-connected world to once again serve to turn the globe into a village. This again made it hard to run away from one's reputation, as somewhere, online the accounts of competitive or cheating behavior may exist, either in Facebook postings, news articles, or police blotters, available almost anywhere in the world to people with an Internet connection.

These twenty–first-century social media capabilities seem to allow the dynamics of gossip in the social network to be employed again. One example may be the #MeToo movement, where previously unconnected individuals can share information on competitors/cheaters (in this case, those allegedly committing sexual battery or assault), and through the tally of similar accounts, raise the credibility of the initial account. This global network can allow strangers to build coalitions, insert reputational communication, or even engage in pro-social gossip (i.e., gossip that 'leaks' accurate information to the benefit of the larger group, e.g., government corruption). Therefore, social media can facilitate social intelligence by allowing others to capitalize on the collective intelligence. This, of course, exposes this alleged 'cheater' to the wider community. This communal lie detection network is a concept lacking in recent theories formulated to explain human deception detection (e.g., Levine, 2014; Street, 2015). Moreover, movements such as #MeToo also show that collective gossip may deter future free riding or selfish cheating (see Wilson, Wilczynski, Wells, & Weiser, 2000), as substantiated allegations are often met with guilty verdicts not only in the court of public opinion but in the actual courtroom. At the same time, those who are falsely accused may find that they have little recourse in terms of proving their innocence.

Conclusion

Taken together, it is clear that there are strong signals for various emotions and intentions and a strong rationale for why these signals would be 'engineered' to solve a recurrent problem. And despite being wired to detect these signals, humans are poor detectors of these signals once they become subtle through efforts to conceal them. Yet this ability to spot these dishonest and/or subtle versions of the signals would seem to be of great benefit to any given individual in his or her quest to survive and pass on his or her genes to the next generation. This sense that evolution did not bestow our species with these internal event detectors seems puzzling, until we unpack some of the social structures of the ancient world.

It seems the cooperative structures, and little (at least initially) opportunities to 'cheat', often may have allowed, in essence, an intelligence network to be developed where pejorative information could be passed along easily and cheaply to identify any particular cheater. Thus, the evolution of cooperative behavior was the key to lie-catching. It seems logical that there would be no strong independent press to develop internal cheater detectors, when a strong social network would do the job for at a greatly reduced cost (Smith, 2010).

Importantly, lie detection in the laboratory or in single case studies does not fully translate to the real world, where gossip and relationships with others matter (Haidt, 2001). People rely on gossip, even when accuracy may be limited (Sommerfeld, Krambeck, & Milinski, 2008); it may nevertheless actually improve lie detection (Klein & Epley, 2015). Moreover, it is through the influence from others that we may decide to override our tendency to cooperate (Bear & Rand, 2016) and employ conscious deliberation to make our decisions (Haidt, 2001). The alignment of emotions through empathy, and increased goal sharing (Tomasello, Carpenter, Call, Behne, & Moll, 2005), as evidenced by the #MeToo movement (Rodino-Colocino, 2018), gave rise to the same powerful group thinking and sociality as seen in the emergence of human morality (Jensen, Vaish, & Schmidt, 2014). Haidt (2001) states "A group of judges independently seeking truth is unlikely to reach an effective consensus, but a group of people linked together in a large web of mutual influence may eventually settle into a stable configuration" (p. 826). This becomes, functionally, a long-range radar type system that has agents reporting back actions, behaviors, and relationships to each other, which in turn sets the groundwork for recognizing inconsistencies regarding people not being where they say they are, people being with people they deny knowing, and so forth. The presence of this communication network would reduce the need to make individuals hyper-vigilant in every interaction, or to individually develop super-acute deception detection skills. Likewise, unusual interpersonal behaviors can trigger individuals to search for evidence to verify their hypotheses about someone's veracity, and they can then activate their social networks to verify the information provided by the unusually behaving person (Novotny et al., 2018). These networks are not just passive providers of information. Thus, the socially intelligent person is the one who has the best access to the collective intelligence—and likely the most friends, as believed by the Ugandans (Wober, 1974). We believe the research literature has neglected this larger system in which our social structures exist, which often detect the deception for us. Even as our society expands, social media and movements like #MeToo have become like the global village, where previously unacquainted individuals can now verify the truth or falsity of each other, thus (hopefully) betraying the attempted liar.

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6

Nonverbal Steps to the Origin of Language

David B. Givens

Sternberg and Kostic propose that social intelligence has both verbal and nonverbal dimensions. Social intelligence, they write, "pertains to interactions of a verbal nature—orally or in writing," and nonverbal social intelligence "pertains to interactions that are of a nonverbal nature, such as eye contact, gesture, facial expressions, [and] bodily form and contact" (Sternberg & Kostic, this volume). This chapter further proposes that verbal social intelligence itself evolved from nonverbal social intelligence through a series of 15 adaptive steps, each of which conferred a social advantage through the millennia and continuing to the present day.

Nonverbal messaging preceded linguistic expression by roughly three billion years. The former not only came before but also established the patterns and standards of linguistic communication by word of mouth and gesture. It is proposed below that human language—in both its vocal and gestural forms—was superimposed upon

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the older nonverbal medium of expression. Today's verbal communication reflects the earlier medium's role in self-assertion, species recognition, genetic reproduction, social expression, and attention to objects.

Nonverbal Communication

Medium of the molecule. Biological social communication originated some 3.5 billion years ago in organisms such as *cyanobacteria* (blue-green algae), early life forms inhabiting shallow water communities called *stromatolites*. Voiceless, eyeless, and unable to touch or hear, Earth's first residents communicated chemically through the medium of the molecule.

Chemical cues represent the first of 15 communicative steps that led to the origin of manually signed and spoken language in genus *Homo*. This chapter synthesizes research and outlines each of the adaptive stages that led to language—from the chemical messages of cyanobacteria to the sonorous vocalizations of speech today (Table 6.1).

Table 6.1 Adaptive steps to the origin of language

Step 1: Chemical Messages—"I am here" (3.5 billion years ago)
Step 2: Audiovisual Messages—"I am here" (500 million years ago)
Step 3: Audiovisual Messages—"You are there" (500 million years ago)
Step 4: Emotion Messages (150 million years ago)
Step 5: Acrobatic Tongue (150 million years ago)
Step 6: Binocular Vision (65 million years ago)
Step 7: Grasping Hands (65 million years ago)
Step 8: Dexterous Lips (65 million years ago)
Step 9: Facial Messages (35–40 million years ago)
Step 10: Food Sharing (24 million years ago)
Step 11: Toolmaking (2.6 million years ago)
Step 12: Object Fancy (1.9 million years ago)
Step 13: Pointing (1.9 million years ago)
Step 14: Enlarged Cranial Capacity (1.9 million years ago)
Step 15: Sonorous Larynx (200,000 years ago)

STEP 1 (3.5 Billion Years Ago): Chemical Messages—"I am Here"

Summary. Before neurons or brains existed, it was established that organisms should communicate through messaging molecules about matters of reproductive function. Known as *oligopeptides*, such molecules were used for intercellular *quorum sensing*. In living bacteria (e.g., *Escherichia coli*), Niu and colleagues have characterized quorum sensing as being involved in reproduction, as a form of "sophisticated linguistic communication" (Niu et al., 2013). Today the oligopeptide *neurotensin*, for example, is contained in human-brain circuits, including those of prefrontal cortex, Broca's area, and parts of the limbic system (St-Gelais et al., 2006). The fundamental meaning of early chemical messages was about physical presence: "I am here."

I am here. From the beginning of life, social communication has served a reproductive function. In cyanobacteria, individual organisms emitted chemical signals to announce physical presence—saying, essentially, "I am here"—to fellow bacteria in the community. Emitted messaging molecules (e.g., *acyl-homoserine lactones*) were not addressed to any one bacterium in particular, but rather to bacteria in the stromatolite as a whole. Nor did individual bacteria respond back directly to any one sender. Instead, the entire group responded collectively through a process of quorum sensing. Based on the overall volume of chemical "I am here" messages received, the stromatolite community—as a whole—enacted changes to its reproductive gene expression (Miller & Bassler, 2001).

In cyanobacteria and other organisms, "I am here" messages are in keeping with the basic biology of species recognition. Recognition of one's own species members serves a reproductive function, in that conspecifics must somehow recognize one another as potential mates (Ridley, 2004).

Regarding human language, "I am here" is implicit in every signed movement and spoken word. Present in early life forms, this most basic of self-assertions may be considered a necessary, but not a sufficient, step toward linguistic communication in *Homo*.

STEP 2 (500 million years ago): Vertebrate Messages—"I am Here" (Advent of "I/*Me*")

Summary. In chordates, circuits for vocal-laryngeal and pectoral-movement communication link in a caudal hindbrain, rh8-upper-spinal-cord compartment (Bass & Chagnaud, 2013). The linkage explains why hand gestures and speech are intimately coupled in the evolution of tool-making and speech. Among the earliest audiovisual messages was an assertion of "I/me," viz. that "I am here."

Me again. Retaining chemical messages through scent glands, vertebrates added audiovisual signals to further announce physical presence. It was established early on in chordates that respiratory vocalization and forelimb movements should be key players in audiovisual communication. Beginning 500 million years ago, circuits for vocal and movement communication were linked in a specific compartment of the chordate nervous system. Then, as today, this compartmental linkage explains why vertebrates—from fish to reptiles to human beings—call attention to themselves through respiratory sounds (e.g., vocalizations) and pectoral-area limb movements (e.g., gestures).

From the gorilla's (*Gorilla gorilla*) chest-beating, the catfish's (*Synodontis schoutedeni*) pectoral-fin squeaks, the humpback whale's (*Megaptera novaeangliae*) pectoral flipper slaps, and the human being's (*Homo sapiens*) hand-waving, all such signals are pectoral cues tendered to announce physical presence. All may be accompanied, variously, by laryngeal vocalizations, vocal roars, drumming sounds (produced by swim bladders), and "singing" (emitted from a whale's respiratory system). All are messages designed to announce the fact of "me"—to say, "I am here."

It is I. The word "I" is included in Swadesh's (1971) list of 100 universal vocabulary items. "I" words tend to be phonetically simple and monosyllabic, a testimony, perhaps, to their elementary origin. In African languages, for example, "I/me" is expressed variously by "me" (!Kung "mi"), "nee" (Hausa "ni"), and "tee" (Hottentot "ti"; Ruhlen, 1994, p. 35). (Items in quotes are English pronunciations; items in parentheses are phonetic transcriptions.) In Native American languages, "I/my" is expressed variously by "no" (Resigaro "no"), "see" (Carrier "si"), and "neen" (Micmac "nin"; Ruhlen, 1994, p. 52).

Like a cyanobacterium's chemical expression of "me," audiovisual advertisements-of-self subserve a reproductive function. In human courtship, "I am here" messages are a part of courting's Attention Phase, the first of four stages in a progression leading to sexual contact (Givens, 1978, 2005). Before speaking, unacquainted couples may call attention to themselves with attractive clothing, smiles, conspicuous gestures, and loud laughter. In the first stage of courtship, "I am here" is often expressed nonverbally and apart from words.

Regarding linguistic communication, audiovisual "I am here" messages are implicit in both signed and spoken words. Such messages may be considered a necessary, but not a sufficient, second step toward language in *Homo*.

STEP 3 (500 million years ago): Vertebrate Messages—"You are There" (Advent of "*You*")

Summary. In service to species recognition and reproductive function, sensorimotor systems of the vertebrate brain respond to "I/me" assertions with messages recognizing "you," that is, that "You are there." Ancient "you" messages built a foundation for the back-and-forth, dialogic pattern of speech.

You. Coincidental with Step 2, vertebrate audiovisual communication added a two-way, interpersonal dimension to the one-way chemical signals of cyanobacteria. Vertebrate message receivers could recognize and respond in kind to a sender's nonverbal Attention Phase cues. By responding to an "I am here" message, a recipient implicitly recognizes "you," the sender, and the fact that "you are there." Once again, a great deal of this early messaging served a reproductive function in courtship.

> *In short, my son, note her every action and movement. If you report to me faithfully all these things, I shall be able to make out the hidden secret of her heart and discover how she feels with regard to my love; for I may tell you, Sancho, if you do not know it already, that among lovers exterior signs of this sort are the most reliable couriers that there are, bringing news of what goes on inside the heart.* —Miguel de Cervantes, *Don Quixote* (1605, p. 566)

The second stage in courtship communication has been called the Recognition Phase (Givens, 1978, 2005). In this stage, couples seek nonverbal responses to signs emitted in the preceding Attention Phase. A man's initial bid for attention ("I am here") may be followed, for example, by a woman's direct eye contact, responsive smile, and hair-preening gestures (Scheflen, 1965). These and other nonverbal signs reveal a recipient's unspoken acknowledgment that a sender's message has been seen or heard. They proclaim, apart from words, that "You are there." Recognition cues are the *afferent* (incoming) bodily signals received in response to a sender's *efferent* (outgoing) Attention Phase cues.

Like the "I" word, "you" is included in Swadesh's (1971) list of 100 basic vocabulary items. And indeed, the "you" expression may be a linguistic universal. Like "I," "you" tends to be phonetically simple and monosyllabic. In African languages, for instance, "you" is expressed variously by "yeen" (Dinka "yin"), "kai" (Hausa "kai"), and "coo" (Mbundu "ku"; Ruhlen, 1994, p. 35). In Native American languages, "you" may be expressed as "bee" (Arawak "bi"), "geel" (Micmac "gil"), and "nee" (Navaho "ni"; Ruhlen, 1994, p. 52).

Nonhuman courtship proceeds upon wordless you-like messages. For example, in the hamlet fish (*Hypoplectrus unicolor*), a hermaphroditic "male's" Attention Phase spawning sound—produced by pectoral-girdle muscle contractions and vibrating muscles attached to the swim bladder—may be recognized with fin-spreading and bodily quivering signs returned by the hermaphroditic "female." In diverse species of frogs, a male's mating call and inflated vocal sacs while calling may be recognized by a female's submissively lowered body. In the Puerto Rican dwarf gecko (*Sphaerodactylus nicholsi*), a male's head bob may be met with a female's forelimb-lift of recognition. In the North American moose (*Alces* sp.), a male's grunting call may be returned by a female's higher-pitched wailing sound.

Ancient "you are there" messages predate linguistic communication and build a foundation for the basic dialogic pattern of language. They begin the back-and-forth, give-and-take dialogue that characterizes today's sign languages and vocal speech. Nonverbal "you" may thus be considered a necessary, but not a sufficient, step toward language in *Homo*.

STEP 4 (150 million years ago): Mammalian Emotion

Summary. With mammals, emotion becomes a volatile factor in intra- and interspecies communication. Housed in the limbic system, emotions are mammalian elaborations of vertebrate arousal patterns, in which dopamine, noradrenaline, serotonin, and other neurochemicals step up or step down the brain's activity level as visible in body movements, facial expressions, and gestures. Emotional communication was shaped by social factors that reverberated in the cortex's cingulate gyrus, for grooming with the hands, vocal calling, and maternal care of young (MacLean, 1990).

Affect. Face-to-face conversation is often accompanied by emotions such as happiness, sadness, anger, and uncertainty. These feelings may be telegraphed by nonverbal signs that include smiling, pouting, frowning, and shoulder shrugging. Emotion may also be audible in tone of voice. Spontaneous conversations are rarely dispassionate; more often than not they show affect.

In mammals and primates, affect is displayed by easily read emotion cues such as the cat's (*Felis catus*) arched back, the dog's (*Canis familiaris*) tail wag, and the chimpanzee's (*Pan troglodytes*) fear grin. In humans, linguistic signing and speaking are often accompanied by emotion cues. American Sign Language (ASL)'s hand signs for "Who?," "What?," and "Why?," for example, may be given with a signer's eyebrows lowered in puzzlement or uncertainty.

Social jeopardy. One may choose to speak or remain silent. The former choice can involve a feeling of personal risk. Goffman (1967) maintains that people place themselves in a state of social uncertainty or "jeopardy" when they make a verbal statement. There is an element of fear that receivers might react negatively by laughing, scowling, or smirking in disapproval. As Levinas (1989) writes, "By offering a word, the subject putting himself forward lays himself open and, in a sense, prays [for a positive response]" (p. 149).

Grooming talk. Morris (1967) adds that talk may be informative ("The milk is in the refrigerator"), exploratory ("Where do you work?"), mood sharing ("I feel bad for him"), or polite ("Nice day"). He calls statements in the latter category "grooming talk" and likens their use to the manual grooming contact of primates. Kringelbach and Berridge (2010) note that social pleasures may include "vital sensory features such as visual faces, touch features of grooming and caress, as well as in humans more abstract and cognitive features of social reward and relationship evaluation. These may be especially important triggers for the brain's hedonic networks in human beings."

Story glory. There is an underlying element, as well, of "story glory" (Givens, 2016), the happy state accompanied by smiling and laughing that speakers show when narrating stories or telling jokes at parties. Simply put, talking to others may be intrinsically pleasurable. Story glory is most gratifying when subject matter pertains to oneself, as in self-disclosure. As Functional magnetic resonance imaging (fMRI) studies by Tamir and Mitchell (2012) found: "Self-disclosure was strongly associated with increased activation in brain regions that form the mesolimbic dopamine [pleasure-reward] system, including the nucleus accumbens and ventral tegmental area." Thus, emotion may be yet another necessary, but not sufficient, step toward language in *Homo*.

STEP 5 (150 million years ago): Mammalian Acrobatic Tongue

Summary. In mammals, motor areas of cerebral cortex governing tongue movement enlarged to provide greater control in chewing. Mobile mammalian tongues replaced the more rigid tongues of fish, amphibians, and reptiles. In chewing, the trick for a tongue is not to be bitten in the process. The mammalian tongue's innate dexterity kept it safe from teeth and conferred, as a byproduct, an ability to articulate vowel sounds and consonants.

Food tossing. Before saying words, the tongue had been a humble manager of "food tossing." Through acrobatic maneuvers, chewed morsels were distributed by tongue movements to premolars and molars for finer grinding and pulping.

Before mammals, tongue movements were limited to backward and forward. The mechanical function was to move food morsels in the throat back toward the gullet. In mammals, working through the hypoglossal nerve (cranial 12), voluntary control of tongue movement was enabled by the frontal lobe's primary motor cortex. In humans, voluntary control of mammalian-inspired tongue movements was recruited for speech. Regarding spoken language, therefore, tongue dexterity may be considered a necessary, but not sufficient, step toward vocalizing words in *Homo*.

STEP 6 (65 million years ago): Primate Binocular Vision

Summary. A stereoscopic view makes physical objects more visibly "real." Binocular vision is highly adapted in arboreal, tree climbing primates. Seeing branches, berries, and insects from two angles at once provides a greater depth of field than does monocular vision, and enables greater "object integrity." Seen in the round, physical objects stand out and have a clearer, sharper image, a visually more objective presence to which verbal names may be affixed. In primates, modules of inferior temporal cortex work in tandem with the occipital lobe for better object recognition, heightened response to hand shapes and gestures (Steps 7 and 11), and the ability to recognize facial expressions (Step 9).

One of language's paramount jobs is naming objects and describing their properties in space-time (Steps 11 and 13). Stereoscopic vision may thus be considered a necessary, but not a sufficient, condition for the origin of manually signed and spoken words in language.

STEP 7 (65 million years ago): Primate Grasping Hands

Summary. Object integrity was further enhanced in primates by prehensile hands. In tandem with binocular imaging, grasping a tree limb with fingers and palms makes the branch seem more tangible still, and, eventually in humans, more name worthy as well. Sensorimotor cortical brain areas serving hands enlarged and improved the primate facility of palpating, exploring, and manipulating physical objects.

Evolution. The 27 bones, 33 muscles, and 20 joints of the human hand originated some 400 million years ago from the lobe fins of early fishes known as *rhipidistians*. Primeval swim fins helped our aquatic ancestors paddle through Devonian seas in search of food and mates. In amphibians, forelimbs evolved as weight-bearing platforms for walking on land. In primates, hands became grasping organs and were singled out for upgrade as tactile antennae or "feelers."

Infancy. Human babies are born with the primate ability to grasp objects tightly in a climbing-related power grip. Later, they instinctively reach for items placed in front of them. Between 1.5 and 3 months, reflexive grasping is replaced by an ability to hold-on by choice. Voluntary reaching appears during the 4th and 5th months of age, and coordinated sequences of reaching, grasping, and handling objects are seen by 3–6 months, as fingertips and palms explore the textures, shapes, warmth, wetness, and dryness of the material world in their reach space (Chase and Rubin, 1979).

By 5 months, as a prelude to more expressive mime (pantomime) cues, babies posture with arms and hands as if anticipating the size and hardness or softness of objects (Chase and Rubin, 1979). Between 6 and 9 months, infants learn to grasp food items between the thumb and outer side of the index finger, in an apelike precursor of the precision grip. At this time, babies pull, pound, rub, shake, push, twist, and creatively manipulate objects to determine their look and feel.

Hands and objects. Eventually a baby's hands experiment not only with objects themselves but with component parts, as if curious to learn more about how things fit together (Chase and Rubin, 1979). At one year, infants grasp objects between the tactile pads of thumb and index finger, in a mature, distinctively human precision grip. Pointing with an extended index finger (Step 13) also begins at 12 months, as babies use the cue to refer to novel sights and sounds and speak their first words.

Manual intellect and emotion. Today in humans, fingers (unlike flippers, claws, or hooves) link to intellectual modules and emotion centers of the brain. Not only can we thread a needle, for example, we can also pantomime the act of threading with our fingertips—or reward a child's successful threading with a gentle pat. The primate faculty to palpate, explore, and manipulate physical objects with the hands is yet another necessary, but not sufficient, condition for manual signing and speech.

STEP 8 (65 million years ago): Primate Dexterous Lips

Summary. When not opening or closing a mouth, fish lips are rigidly fixed in place. In mammals, lips become mobile and connected to enlarged sensorimotor centers designed to contract muscles to form a sphincter-like seal around a mother's breast for sucking. In primates, lips become more dexterous still, and are recruited for audiovisual signaling in vocal calls (as in *Alouatta* sp., the howler monkey) and facial expressions (as in chimpanzees).

Precision. To the dexterity of primate lips, humans add even greater precision for speech. Lip movements for speaking are controlled by Broca's premotor area via the frontal lobe's primary motor cortex. The principal lip muscle, *orbicularis oris*, is a sphincter consisting of *pars marginalis* (beneath the margin of the lips themselves), and *pars peripheralis* (around the lips' periphery from the nostril bulbs to the chin). *P. marginalis* is uniquely developed in humans for speech.

Mirror neurons. In humans, mirror neurons are present in the primary motor area, premotor system (including Broca's area), and supplementary motor system (Kilner & Lemon, 2013). In monkeys, mirror neurons have been found to fire both when food is brought to the mouth with a hand and when others are seen performing the same actions. But "the most effective visual stimuli in triggering [the actions]," Ferrari and colleagues note, "are communicative mouth gestures (e.g. lip smacking)" (Ferrari, Gallese, Rizzolatti, & Fogassi, 2003, p. 1703). "Some also fire," they add, "when the monkey makes communicative gestures. These findings extend the notion of mirror system from hand to mouth action and suggest that area F5, the area considered to be the homologue of human Broca's area, is also involved in communicative functions" (p. 1703). Thus, well before vocal or gestural language itself, primate lips and hands had been preadapted for social expression.

Consonants and vowels. In speaking, lips form bilabial English consonants—such as /b/, /p/, /m/, and /w/—in which respiratory airflow is stopped or restricted. Lips also form the rounded English vowels /o/ and /u/. Words with bilabial consonants in Asian languages include "peeyah" (Burmese "pya," bird), "beeyah" (Tibetan "bia," bird), and "barf" (Brahui "barf," snow; Ruhlen, 1994, p. 44). Also, in Asian languages, words with rounded vowels include "shayool" (Yukaghir "seul," stone), "toe" (Tibetan "to," stone), and "geyou" (Yaou "gyou," stone; Ruhlen, 1994, p. 44). Without their dexterous primate lips, humans would be unable to produce such sounds. Thus, dexterous lips may be considered a necessary, but not a sufficient, condition for the origin of language.

STEP 9 (35–40 million years ago): Higher Primate Facial Communication

Summary. Higher primate (*Anthropoidea*) precursors had an enlarged visual cortex on the occipital lobe for processing color vision and depth. Today the anthropoid's is the most complex visual cortex yet developed, with anatomically separate areas for analyzing form, coordinating hand-and-eye movements, and recognizing faces. In human anthropoids, a few nerve cells in the lower temporal lobe are narrowly specialized to respond only to hands and faces (Kandel, 1991, p. 459). Reading hand gestures and facial expressions enabled listeners to discern emotion behind signed and spoken words. Gestures and facial cues add emotion through increased levels of the social bond-stimulating neuropeptides oxytocin and vasopressin. Faces are decoded in the anterior inferotemporal cortex; facial familiarity registers in the superior temporal polysensory area (Young & Yamane, 1992). Emotional impacts of facial messages register in the amygdala.

A synergistic relationship likely obtained between facial messaging and eye contact. Extended eye contact between speaker and listener in face-to-face conversations may have stimulated face reading. Face reading in turn likely promoted eye contact. Reading lips (see Step 8) may be especially germane. Functional magnetic resonance imaging studies show that the linguistic visual cues afforded by lip movements activate areas of auditory cortex in normal hearing individuals (Calvert et al., 1997). Since face-to-face linguistic dialogue would not likely have developed without an ability to read facial expressions, it is proposed that facial cues represent a necessary, but not a sufficient, condition for language.

STEP 10 (24 million years ago): Primate Food Sharing

Summary. Sharing food items provided a model for the give-and-take, back-and-forth turn-taking of language. Physical closeness occasioned by food sharing likely favored maternal-offspring communication. As in later speech, food sharing had a clearly emotional dimension. Both forms of expression are made pleasurable through raised levels of the neuropeptides: oxytocin and vasopressin. The brain's cingulate cortex has been implicated in maternal caring, grooming, and audiovocal signaling (MacLean, 1990), each of which contributes to speech.

Primate food sharing is an extension of the mammalian practice of providing mother's milk. Maternal sharing with offspring of foods in addition to milk is widespread, occurring in 39 species of primates out of 69 sampled (Jaeggi & Gurven, 2013). Old World monkeys and prosimians are least likely, while New World monkeys, all ape species, and humans are most likely to share food with offspring.

Grunts and girneys. Maestripieri (2011) proposes that adult female primates are attracted to an infant's facial appearance and coo vocalizations, finding these signs emotionally pleasing as brain opioids and oxytocin are released. Females may respond to infants by lip-smacking and vocalizing with grunts and *girneys*. Grunts are "brief bark-like atonal sounds," while girneys are "nasal 'singing' noises" (Maestripieri, 2011, p. 520).

Gibson suggests that language evolution may have begun with food sharing and simple one- or two-word sentences exchanged by mothers and offspring. Tool use likely played a role in the exchange. Early hominid mothers, she notes "may have extracted and processed foods using tools and then shared the food with offspring incapable of tool use themselves. Such food sharing may have selected for communication capacities similar to those of children learning to talk" (Gibson, 1993, p. 266). The back-and-forth, turn-taking pattern inherent in sharing food items—combined with emotional closeness—may be necessary, but not sufficient, for turn-taking in language.

STEP 11 (2.6 million years ago): Human Toolmaking

Summary. Humans use and make stone tools. Flaking a tool and uttering a word use some of the same and closely related brain areas. So nearly alike are neural pathways for manual dexterity and articulate speech that a stone tool may be deciphered as if it were a petrified phrase. English "hand axe," for example, and the perception of the worked stone for which it stands, both exist as mental concepts whose neural templates are linked in the brain. "When an object is seen or its name read, knowledge of attributes is activated automatically and without conscious awareness" (Martin et al., 1995, p. 102). Broca's area, the premotor cortex module that governs language production, has been implicated in toolmaking as well (Stout & Chaminade, 2011). As Hauser noted, "When we create an artifact such as a tool, we leave a physical trace of our thoughts" (2000, p. 22).

Intelligently fabricated. In accord with Gibson's (1993) linkage of tool use and food sharing, there is general agreement that human artifacts and tools played a major role in the origin of language (Gibson & Ingold, 1993). An artifact is a material object (e.g., a bifacial stone tool) deliberately fabricated by humankind. Like gestures, artifacts have a great deal to "say." That they are intelligently fabricated is evident in their deliberately patterned shape, grammatical syntax (structured arrangement of parts), and orderly negative entropy in design features.

English *artifact* comes from Latin *arte* ("by skill") and *factum* ("made"; via the ancient Indo-European root *dhe*-, "to set," "put," derivatives of which include *deed*, *did*, and *do*. Skill "by hand" is implied). The earliest-known artifacts come from Africa. At numerous sites from that continent sharply flaked stone tools have been found, dating back some 2.6 million years before present (Gibbons, 1997).

While chimpanzees use stone tools, they do not make them. In Africa, chimpanzees shell panda nuts (*Panda oleosa*) together in the Tai forest of Ivory Coast. The chimps socialize as they crack the nuts' hard shells with heavy, unworked stones, carefully placing each nut in a knothole before smashing it. Young chimpanzees watch their mothers, and after years of trial and error, learn to master the stone technology and crack the shells on their own. The learning curve is steep, but mothers share panda nuts with their own offspring as the latter learn (Boesch & Boesch-Achermann, 2000). While there is a visible give-and-take in the dialogue as mother and offspring share food and the chopping-stone tool, few vocalizations are given by either party.

Mental concepts. Speech involves the ability to pair stored mental concepts with incoming data from the senses. Ivan Pavlov observed dogs in his laboratory as they paired the sound of human footsteps (incoming data) with memories of meat (stored mental concepts). Not only did meat itself cause Pavlov's dogs to salivate, but mental concepts of meat—memories of mealtimes past—were also called up by the sound of human feet. Pairing one sensation with memories of another—the process of *sensitization* or *associative learning*—is a fundamental ability given even to sea slugs (*Nudibranchia*).

In humans, tool use likely increased mental concept formation. MRI studies reveal that children who make early, skilled use of the digits of the right hand (e.g., in playing the piano) develop larger areas in the left sensory cortex devoted to fingering (Karni et al., 1998). Thus, Pleistocene youngsters precociously introduced to toolmaking may have developed enhanced neural circuitry for the task.

Mirror neurons. There is growing evidence, as well, of a role for mirror neurons in speech. "Taken together," Iacoboni (2008) writes, "all these data show that gestures precede speech and that mirror neurons are probably the critical brain cells in language development and language evolution" (p. 87). As Egolf notes: "Gestures lead then speech follows, suggesting further that mirror neurons are critical for speech and language development. The interdependence of speech and gesture dashes some cold water on the espoused dichotomy between verbal and nonverbal communication" (2012, p. 90).

Controlled by the prefrontal cortex, an ability to manage the sequence of body movements required for toolmaking was a likely necessary, but not a sufficient, precursor to articulate sequencing in language.

STEP 12 (1.9 million years ago): Object Fancy

> *In more severe forms [of the grasping reflex], any visual target will elicit manual reaching followed by tight grasping*. —M. Marsel Mesulam (1992, p. 696)

Summary. In genus *Homo* the manufacture of stone, bone, wood, and other material artifacts was followed by a curious attraction to the artifacts themselves called "object fancy" (Givens, 2008, p. 190). Object fancy is the desire to pick up, handle, and hold a material object, especially a consumer product of elegant design. It includes the urge to touch, own, arrange, collect, display, or talk about a manufactured artifact. Rooted in the grasping reflex, object fancy involves a balance between the parietal lobe's control of object handling and the frontal lobe's "thoughtful detachment" from the material world of goods (Mesulam, 1992, p. 697).

Material gestures. Human-made items call attention to themselves through their structured design. Products may "speak" to us nonverbally as tangible, material gestures. Their design features (e.g., the shine, shape, and smoothness of a platinum bracelet) send compelling messages that capture our attention. We pick them up to answer their call.

Names. Dialogue with objects commences in infancy. Communication with and about material things begins around six months of age (Trevarthen, 1997). This early interaction with objects takes place in a context of social communication with caregivers, in tandem with the latter's words. Repeated pairing of diverse objects with parental linguistic labels reinforces the notion that the objects at hand have names.

The linguistic power of object names is clear in the case of Helen Keller. Blind and deaf at 19 months of age, Keller's path to language was severely impaired. To compensate for the disabilities, her teacher would finger-spell letters into Keller's hand for environmental items such as tap water, a household mug, and a toy doll. After weeks of finger-spelling names like "d-o-l-l" into Keller's hand, she grasped the idea that the objects in her world had unique names. Understanding this basic fact enabled Keller ultimately to achieve linguistic competence.

Magnetic effect. According to Mesulam, there exists a "magnetic effect triggered by objects" that originates with the brain's innate grasping reflex (1992, p. 697). Subsequently it involves a balance between the parietal lobe's control of object fancy and the frontal lobe's inattention to material goods. In patients with frontal lobe lesions, the mere sight of an artifact is "likely to elicit the automatic compulsion to use it," while lesions in the parietal network "promote an avoidance of the extrapersonal world" (Mesulam, 1992, p. 697).

Stone tools. The extrapersonal world of artifacts began with stone tools. Dated to 2.6 million years ago, among the earliest known consumer products are intentionally flaked Oldowan pebble tools from Ethiopia, produced by *Homo habilis*. By 1.6 million years ago, a more eloquent, fist-sized hand-axe bearing a standardized, symmetrical, leaf-shaped design was being chipped in East Africa by *Homo erectus*. Known as *Acheulean bifaces*, these artifacts exhibited "elegant bilateral symmetry and overall regularity of form" (Ingold, 1993, p. 337). A likely artistic concern with form may have exceeded functional needs, and these early artifacts—which have been found on three continents—likely had names as well. So beautifully constructed, some Acheulean specimens may have been regarded as heirlooms and exchanged, much as ornamental shell bracelets were given and taken in the Trobriand Island Kula trade (Malinowski, 1922).

Consumer products. Since the Stone Age, the number of consumer products invented and used by *Homo sapiens*—from Silly Putty to interstate highways—has increased at a rate three times greater than biological evolution (Basalla, 1988). As the human brain and body were shaped by natural selection, consumer goods adapted to the mind through a parallel process of *product selection*, rendering them ever more fluent, expressive, and fascinating to the senses.

As shopping malls attest, object fancy prospers in the modern world. The average US household stockpiles a greater supply of consumer goods than its members use. By age five, the average US child has owned 250 toys (Rosemond, 1992). Among three- to five-year-old children in preschools, fights occur over property and little else (Blurton Jones, 1967).

In contrast to Americans, Tasmanian islanders off the southeast coast of Australia are among the people who made and used the fewest number of artifacts. In all, Tasmanians used a total of some 25 stone and wooden tools, fiber baskets, shell necklaces, and bark canoes (Diamond, 1993). And yet, the contrast between US urban consumers and Tasmanians is not marked, since the total time spent handling, repairing, exchanging, and communicating about (and with) artifacts may be roughly the same anywhere.

A case in point is Tibet, where material goods are relatively scarce, yet resident Buddhists spend hours a day spinning prayer wheels. Made of metal, wood, or paper, the wheels have verbal mantras (*Om Mani Padme Hum*) written on the outside and included within. Users turn the cylindrical wheels with their fingers and voice the mantras as they spin. Nowhere is the link between object fancy and spoken word more clearly evident.

STEP 13 (1.9 million years ago): Pointing—"It is there" (Advent of "*That*")

Summary. A referentially pointed finger shows that advanced centers of the neocortex have been engaged. As a skilled gesture, pointing involves the supplementary motor area (SMA, which programs the sequence of arm, hand, and finger movements), the premotor cortex (which orients the arm movements), and the primary motor cortex (which programs the direction a gesture may take). In turn, the frontal cortex receives visual information about persons, places, and things from the posterior parietal lobes. While the left lobe involves language processing, the right processes spatial information to guide a pointed finger in the right direction. Like aphasia (the inability to speak), apraxia is an inability to point. That both are brought on by injuries to the cortex's left side marks the similarity between voluntary pointing and language.

Referential pointing. Extending an index finger to call attention to objects and features of the environment is a gesture unique to human beings and captive chimpanzees (Leavens et al., 2005). Since it refers to the outside world, the referential point is a high-level, language-like gesture. In human infants, the referential point first appears around 12 months of age in tandem with the first use of words. Prior to speech itself, pointing is a reassuring sign of an infant's language ability. While some animals, including honeybees, can refer to environmental features, only humans (and infrequently, chimps) point them out with fingers.

All four fingers (the thumb has its own extensor muscles) may be extended in a coordinated way by contracting the forearm's *extensor digitorum* muscle. The index finger, however, has an extra forearm muscle (*extensor indicis*), which enhances the neural control of its muscular ability to point.

Alternate pathways. Early pointing is clearly emotional as toddlers point to share excitement with adults nearby. An excited child may extend an index finger toward a butterfly or chirping bird as mother watches, smiles, and articulates the creature's name. Later in life, the gesture is controlled by more recent, more advanced nonemotional modules of the brain. Nerve fibers from the latter's primary motor area link directly to motor neurons, enabling the index finger to move deliberately and with precision. Long nerve fibers descend in a "mental expressway" which bypasses ancient brain-stem paths and fall directly onto the pointing digit. This more advanced pointing shows direct cortical control, as its neural pathway detours around older interneuron routes of the spinal cord.

Indexing. In American Sign Language (ASL), "indexing" is the practice of using an extended index finger to point out personal and object pronouns, such as "I/me," "you/you all," "he/she/they," and "it/them." Pointing at persons and objects is also used in Plains Indian Sign Language (PISL). There is agreement among developmental psychologists that referential pointing is a key to the development of language in infants (Leavens et al., 2005). Indeed, Butterworth has called pointing "the royal road to language" (Butterworth, 2003, p. 9).

With pointing, the conceptual transition from a personal "I am here" (see above, Step 2) and "You are there" (Step 3) to an impersonal "It is there" is complete. In addition to calling attention to personal "I/me" and "you," in Step 13 the members of *Homo* call attention to an impersonal "that."

"That," a word used to identify a person, plant, animal, or object observed by a speaker, appears in Swadesh's (1971) list of the world's 100 basic words. Superimposing communication about objects upon the earlier social communication about "I/me" and "you" was a significant step forward in the evolution of language. Like "I" and "you," the elementary origin of "that" words is attested by their often simple phonetic, monosyllabic quality. In Eurasian language families, for instance, "that" is expressed variously by "toe" (Uralic "to"), "ha" (Khoisan "ha"), and "ta" (Altaic "ta"; Ruhlen, 1994, p. 65).

Object words, in contrast, tend to be polysyllabic and phonetically more complex. Examples include "keyahk" (Burmese "kyauk," stone), "dantan" (Avestan "dantan," tooth), and "tooloog" (Altaic "tulug," feather; Ruhlen, 1994). Recall Gibson's suggestion (see Step 10) that language evolution may have begun with food sharing and simple one- or two-word sentences.

Palm-up-and-down gestures. Referential pointing is more recent than, and contrasts with, earlier palm-up and palm-down communicative human signs. The latter hand signals—which are still in use today—may be regarded as gestural fossils left over from the original vertebrate system of communication about matters of social relationship (for an overview, see Givens, 2015). Palm-up-and-down gestures are remnants of the ancestral articulators and may be used to reflect back on the social messages human forebears exchanged before the advent of pointing, languages, and words.

Stimulated by humankind's seeming fascination with tangible objects that can be held in the hand, and by the fabrication of material artifacts and stone tools, ancestors of *Homo sapiens* gradually extended the use of pectoral-related body movements and laryngeal vocalizations for social communication to communication about objects and their features and to the interrelationships of these in space-time. The ancient bodily articulators for linguistic communication were likely there from the very beginning. Indeed, human gestural and spoken language was superimposed upon an earlier prelinguistic system of vertebrate social communication to which—by their current widespread usage in face-to-face conversations—palm-up-and-down gestures strongly allude.

Referential pointing may be considered a necessary, but not a sufficient, mechanism for the development of linguistic communication.

STEP 14 (1.9 million years ago): Human Cranial Capacity Increase

Summary. With *Homo erectus* the human brain enlarged from the apelike size of pre-*erectus* hominids. The corticobulbar nerve tract evolved; corticobulbar pathways to the facial nerve (cranial VII) permitted intentional facial expressions such as the voluntary smile. Broca's cranial pathways grew from a Broca's-area homologue via corticobulbar pathways to multiple cranial nerves, permitting human speech production. Broca's spinal pathways also evolved. Broca's area circuits passing through corticospinal pathways to cervical and thoracic spinal nerves permitted manual sign language and linguistic-like mime (pantomime) cues. A Wernicke's-area homologue grew to process incoming speech-like sounds. As indicated above (Step 4), the limbic system grew in tandem with the cerebral cortex (Armstrong, 1986).

The human brain began to enlarge between Steps 11 and 15—*after* toolmaking and *before* signed/spoken language. Substantial enlargement took place in the cerebral neocortex, in association with cortices responsible for the cognition and motor planning required for manufacturing tools. Motor systems for voluntary control of hand, lip, and tongue movements enlarged. In charge of the sequencing required for toolmaking, and later for speech, the prefrontal cortex also grew.

Along with the cortex, diverse subcortical brain areas enlarged for the hand-eye coordination needed in toolmaking. And as indicated, the emotional limbic system grew in tandem with the cerebral cortex. Thus, *Homo sapiens* became the most emotional, intelligent—and fluent—species on earth.

Regarding signed and spoken words, the increase in human cranial capacity may be regarded as a necessary and a sufficient condition for the development of language.

STEP 15 (200,000 years ago): Sonorous Human Larynx

Summary. At this time human vocalization became increasingly melodic, harmonious, and oratorical. The rationale for vocal softness and melody likely involved serenading in courtship. As it became more verbally linguistic in nature, human courtship signaling likely favored vocal tenderness over harshness. The former voice quality is contact-inviting while the latter promotes distance. That speech has a reproductive function is further evidenced in the deepened male voice at puberty.

Unlike the wooden or metal tubes of a pipe organ, the human windpipe is pliable and protean in its ability to change shape. Encased in cartilage, the vibrating vocal folds produce sounds modified by elastic, membranous tissues and supple ligaments, further modified within mobile, mucus-lined pharyngeal, nasal, and oral chambers of the head. The musicality of human voices is processed in the *planum temporale*, a cortical auditory area found only in great apes and *Homo*.

Prosody. Compared to the harsh, often screaming vocalizations of chimpanzees, laryngeal-speech sounds produced by humans are softer, more sonorous, and more melodic in tone. Exemplars of today's voice qualities include the eloquence of Martin Luther King in his "I Have a Dream" speech, Maya Angelou's lyrical reading of her poem, "Phenomenal

Woman," and Luciano Pavarotti's operatic rendition of "Serenade." Each is delivered with vocal melody and lyrical motions of the fingers and hands.

Linguists call the quasi-musical qualities of human speech *prosody*. English "prosody" comes from Greek prosoidia, "song sung to music" or "accent." Linguistic prosody includes accentuation, phrasing, rhythm, stress, and the tonal qualities of speech. On the nonverbal side, prosody includes the duration, muscular tension, and rhythm of hand movements that accompany words. Vocal and gestural prosody play important roles in the production and perception of human communication. Through them we detect emotions such as happiness, sadness, anger, fear, and uncertainty in utterance and gesture.

Serenade. Evolutionary reasons for vocal softness and melody include serenading in courtship. Recall that from the beginning of life, intra-species communication has served a reproductive function (see above, Step 1). In living primates, vocalizations including the gorilla's "pant grunt," the lemur's "moans" and "meows," and the tarsier's "chirruping" calls are auditory courting signals. As courtship became more verbally linguistic in humans, its signaling likely favored vocal tenderness over vocal harshness. Again, the former invites closeness and contact while the latter promotes distance and separation. As *Love Signals* noted, "In courtship a softer, higher-pitched voice—the voice adults use with young children and pets—communicates an attitude of personal caring. Its lighthearted tenor is cheerful, calming, and universally friendly" (Givens, 2005, pp. 85–86).

As noted above, that speech has a reproductive function is evident in changes in the human voice at puberty. At the onset of reproductive age, male voices deepen through a lowering of the larynx and significant enlargement of its vocal folds. Deeper vocalizations are a vertebrate ploy for males to seem stronger, more attractive, and more daunting to rivals. "The more threatened or aggressive an animal becomes," Hopson writes, "the lower and harsher its voice turns—thus, the bigger it seems" (1980, p. 83). In courtship, deeper vocalizations are often attractive. Female bullfrogs, for instance, swim toward males with the deepest calls. In humans, deeper-voiced males have been found to father more offspring (Apicella, Feinberg, & Marlowe, 2007).

Since the sonorous human larynx likely developed after the brain enlargement of *Homo erectus*, it is neither a necessary nor a sufficient reason for the origin of language but rather is a modification after the fact. In this sense, it is like writing an extension of language but not a cause.

Conclusion: Verbal Areas (200,000 years ago)

Added value. Each of the 15 language steps physically worked its way into tissues of the human nervous system. Adaptively, each step added value by conferring greater access to environmental energy (e.g., via tools) and social resources (via communication). Favoring survival—whether through chemical signs of presence, visible signs of emotion, or audible signs of food sharing—each step conferred an adaptive advantage. Through millions of years, those benefitting from innovations within a given step came to outnumber those who did not. Physical changes in the nervous system were thus passed ahead in time to the present day.

Synergy. Language is more than a simple sum of the 15 developmental steps outlined in this chapter. An interplay among and between the steps—a synergy—is evident as well. Gibson (see above, Step 10) suggests a synergy between food sharing and tools. Toolmaking and object fancy (Steps 11 and 12) may be synergistically linked, as may be binocular vision and facial messages (Steps 6 and 9). Emotion messages (Step 4) are synergistically linked to facial messages, food sharing, object fancy, and pointing (Steps 9, 10, 12, and 13, respectively). Future research on the interplay and possible synergy among language steps, played out across vast sums of time, would be helpful to understand the stunning linguistic fluency of our species.

Sequencing. Words are produced by articulated movements of the hands in signing and of the vocal tract in speech. Word order is overseen by circuits of prefrontal cortex, which guide the sequential mental processing needed to build an artifact or compose a worded phrase. Controlled by the frontal lobes, both hands and speech organs follow the correct sequences required to articulate verbal statements and manufacture tools. Recall from Step 4 that emotional communication was shaped by social factors that reverberated in the cingulate gyrus for grooming and vocal calling. There is reliable evidence for distinct grooming sequences—for a richly patterned "grammatical" order—even in the facial-grooming behavior of mice (family *Muridai*; Stilwell & Fentress, 2010).

The supplementary motor area (SMA) of the cerebral neocortex is involved in sequential processing, as well, both for verbal and for some nonverbal articulations (such as mime-cues). In function, SMA coordinates and controls the sequencing of bimanual hand movements. Found only in primates, SMA has been well studied in humans and monkeys. Regarding the latter, "We have found a group of cells in the cerebral cortex of monkeys," Tanji and Shima noted, "whose activity is exclusively related to a sequence of multiple movements performed in a particular order. Such cellular activity exists in the supplementary motor area" (1994, p. 413).

From messaging molecules of cyanobacteria to prosodic features of manual signing and speech, pre-language- and language-scaffolding abilities have been programmed into the neuromuscular system. Human gestural and spoken communication was superimposed upon the earlier nonverbal systems of vertebrate social communication (Givens, 2015). Today's linguistic channel reflects the earlier medium's role in self-assertion, species recognition, genetic reproduction, emotional expression, and attention to objects.

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7

A New Look at Person Memory

Terrence G. Horgan

"Appearances are a glimpse of the unseen."
— Anaxagoras
"Appearances are often deceiving."
— Aesop

Imagine meeting a stranger briefly at a social function. Later, when the stranger is not around, you try remembering his/her appearance and verbal statements. People's memory for what others look like (appearance accuracy) represents a new domain of study in nonverbal communication (Horgan, Schmid Mast, Hall, & Carter, 2004). For the purposes of this chapter, the stranger's physical features, hair, dress, personal artifacts/adornments (e.g., cell phone, jewelry), and static and dynamic nonverbal cues constitute his or her appearance cues. A stranger will hereafter be referred to as a target or other person. Three aspects of this target's

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appearance cues are important to your nonverbal social intelligence. First, do targets communicate diagnostic cues about themselves to you (e.g., their sexual orientation)? Second, if targets do communicate diagnostic cues, can you, as the *perceiver* of such information, categorize targets into socially meaningful groups (e.g., heterosexual female)? Third, does your recall or recognition memory reflect a sensitivity to specific target cues that might enable you to make important life- or reproduction-related decisions about him/her (e.g., should you date him/her?)?

Your memory for targets may have either mundane or fateful consequences for you. Would you recognize a particular man and remember his name if you saw him again? Would you know how to talk to and act around a person based on the social category to which she belongs (e.g., elderly woman)? What life-altering interpersonal goals might you pursue with a target? For example, would you avoid this person or pursue a romantic relationship with him/her? Needless to say, accurate person memory would be *adaptive* if it helped you fulfill your life (staying away from someone who might hurt you) and reproductive goals (approaching a suitable mate for yourself).

Several key points of this chapter must be outlined from the outset. First, your ability to recognize another person requires that you were exposed to him or her at least once; by definition, you cannot *visually* "recognize" someone you have never seen before.[1] The experience of seeing others matters. Second, you can recognize the social categories that another person belongs to because there are cues on him/her that are diagnostic of that categorical information. Third, your experience with these cues is crucial to your ability to categorize other people correctly. For instance, perceivers use targets' appearance and behavioral cues to *automatically* place them into specific social categories, such as their likely age group, biological sex, and racial background, presumably because of their repeated exposure to target cues from members of different age, gender, and racial groups (Macrae & Quadflieg, 2010; Rakić, Steffens, & Wiese, 2018). Fourth, this implies that your recognition accuracy hinges, to some extent, on the degree of your exposure to categorically relevant target cues; more exposure to these cues should lead to an enhanced ability to recognize the social categories a target might belong to in life. The other-race effect illustrates this point nicely. Perceivers recognize the faces of targets from their own racial group better than those from a different racial group when they have had more perceptual exposure to members of the former group than the latter group (Meissner & Brigham, 2001; Thorup et al., 2018).

The above-noted points are brought together to address the adaptive quality of human memory. Specifically, do targets have diagnostic cues to their sexual orientation (e.g., gay vs. not gay) and mating strategy (e.g., their interest in short- vs. long-term sexual relationships)?[2] If so, perceivers should be able to use those cues to categorize their targets correctly, as this might help them fulfill their own life and reproductive goals. And more exposure to such cues should enable perceivers to better recognize a target's sexual orientation and mating goals. The theory of ecological sensitivity captures this enhanced recognition ability (Carter & Hall, 2008)[3]; over time, perceivers build stronger associations in memory between specific target cues and likely target behavior.

As will be discussed later, cues to the sexual and mating orientations of targets exist, and greater exposure to such cues appears to help perceivers categorize their targets quickly and correctly (e.g., as gay or not gay) (Brambilla, Riva, & Rule, 2013; Rule, 2011; Stillman & Maner, 2009).[4] This is an understudied domain of scientific inquiry, though. Furthermore, the research that has been done tends to be limited in ecological validity and scope because the focus is usually on only a limited number of target cues (e.g., facial features). That research, which represents the long-standing but outdated approach to person memory, is contrasted with the *new look at person memory*, where the focus is on people's memory for a number of target cues, both within and across two channels of communication: appearance cues and verbal statements.

Chapter Goals

This chapter covers a domain of research with a very short theoretical history, but a very long practical reach into people's everyday lives. The following question captures that reach: What do perceivers remember about a target's appearance and verbal statements that might have adaptive significance to them (i.e., it helps them fulfill their life or reproductive goals)? This chapter's focus is largely on perceivers' memory for targets' appearance cues.

This domain of research is challenging to cover, given that, as noted in the introduction to this book, our everyday experiences as well as a large body of research show that targets can send accurate, inaccurate, or non-informative cues about themselves to others (Knapp, Hall, & Horgan, 2015). A host of problems accompany this fact. Consider the following possibilities. You can have an accurate or inaccurate memory for the truthful or false statements of others. For example, a woman remembers what another female said to her, but she does not know it is a lie ("I'm not sleeping with your husband"). You also can have accurate or inaccurate memory for the diagnostic or nondiagnostic appearance cues of others. You may, for example, forget a diagnostic appearance cue regarding another person. Imagine an employer trying to decide whether to hire a particular person. What if this employer does not remember that when she met the interviewee weeks ago at a social function, he was unusually neat in appearance and had on expensive, flashy clothes? Forgetting these appearance cues could prove problematic to her if they are diagnostic of his narcissism (Han, Cho, Hong & Park, 2016; Vazire, Naumann, Rentfrow, & Gosling, 2008). Detailing the implications of our accurate or inaccurate memory for the truthful or false statements/diagnostic or nondiagnostic cues of others is well beyond the scope of this chapter. Instead, the focus is primarily on our accurate memory (*recognition, recall*) for the *diagnostic* appearance cues of others and to a much lesser extent their truthful verbal statements.

For you the perceiver, the adaptive significance of remembering another person's appearance cues is predicated on the notion that these cues have diagnostic value to you. As Anaxagoras's and Aesop's quotes suggest, there are conflicting views regarding what a person's appearance can actually tell us. This topic will be addressed shortly and at length (see *The Diagnostic Value of Appearance Cues*).

Before that, it is important to briefly discuss the eyewitness origins of person-memory research as well as clinical examples related to deficits and unusual strengths in one domain of person-memory research—face recognition. These topics need to be covered because they underscore the relevance of perceivers' memory for others' cues, not only to the health of society but also to the individuals who are part of it. Integrated within each section is a discussion of one limitation that they all share, namely, a focus on only a subset of target cues, either their appearance or their verbal statements.

Examples from a new line of research follow, which represent the *new look at person memory*. This research examines perceivers' memory for targets' appearance cues *and* verbal statements, as well as the factors that influence their memory for each one. These factors concern the adaptive significance of particular target cues to perceivers (Fitzgerald, Horgan, & Himes, 2016; Horgan, Broadbent, McKibbin, & Duehring, 2015).

In the last section, gender differences in person memory are reviewed. This topic is important to cover because women tend to outperform men in this domain of social intelligence, namely, memory for the appearance (face, dress, nonverbal cues) and (some) verbal statements of others (Hall, Murphy, & Schmid Mast, 2006; Horgan, McGrath, Bastien, & Wegman, 2017; Horgan, Stein, Southworth, & Swarbrick, 2012).

Person Memory: Eyewitness Research

Historically, perceivers' memory for targets has intrigued basic and applied researchers alike (Wood & Davis, 2018). Perceivers' ability to provide accurate details regarding what a perpetrator of a crime looked like and said is of obvious importance to the criminal justice system. And the grave consequences to those who are wrongly accused of a crime because of the faulty memories of eyewitnesses cannot be overstated (Pezdek, 2012).

Gender differences in person-memory accuracy comprises a substantial portion of eyewitness research, which makes sense, given that women tend to outperform men on many person-memory tasks (Hall, Gunnery, & Horgan, 2016). For example, female eyewitnesses describe targets of a violent crime scene more accurately (especially the victim) than do their male counterparts (Areh, 2011).

Eyewitness research has focused largely on perceivers' memory for perpetrators' physical characteristics and dress, sometimes as one category and other times as separate categories (Butler & Pallone, 2002; Lindholm

& Christianson, 1998; Mazanec & McCall, 1975; Pozzulo & Warren, 2003; Sharps, Hess, Casner, Ranes, & Jones, 2007). Perceivers' memory for specific perpetrator artifacts, such as a weapon, has also been investigated (Sharps, McRae, Partovi, Power, & Newton, 2016). Factors that help or hurt perceivers' memory for one set of appearance cues, such as a target's facial features, are often tested (e.g., face recognition; Topp, McQuiston, & Malpass, 2016; Sporer, Kaminski, Davids, & McQuiston, 2016).

However, focusing on perceivers' memory for one set of target (perpetrator or victim) cues, such as their physical characteristics, represents a limitation to prevailing eyewitness research. Studies testing perceivers' memory for a host of target cues—their physical features, dress, nonverbal cues, and verbal statements—are nowhere to be found. This is problematic, given that computer programs designed for target-identification purposes show that it is the combination of perceivers' descriptions of target-appearance cues (face, body, and clothes) that leads to better target recognition (Nixon et al., 2017).

To be sure, examining a subset of target cues is important, both practically and methodologically speaking. Lindsay, Martin, and Webber (1994) have shown that eyewitnesses to real and staged crimes report less descriptive information about perpetrators' physical characteristics than their clothing. In fact, their descriptions of perpetrators' physical features tend to be vague, incomplete, or inaccurate (Lindsay et al., 1994; Sharps et al., 2007). This distinction is important to know because target dress items can disrupt the person-recognition process (Hanley & Cohen, 2008). For instance, a clothing bias exists whereby perceivers mistakenly believe that a person is the perpetrator of a crime because he or she is seen (e.g., in a lineup) wearing clothing similar to that worn by the actual perpetrator (Lawson & Dysart, 2014; Lindsay, Wallbridge, & Drennan, 1987). This underscores why eyewitness research should be directed at exploring perceivers' memory for a host of target-appearance cues, not to mention for how a target speaks and for what he or she says.

The verbal cues of targets and perceivers have been incorporated into eyewitness research. Pickel and Staller (2012) note that a male perpetrator's accent can impair perceivers' subsequent descriptions of his physical features. For perceivers, does verbally describing a face first aid or impair their subsequent ability to recognize that face? Separate lines of research are examining these two possibilities, which are referred to as the verbal-facilitation effect and the verbal-overshadowing effect, respectively (e.g., Sporer et al., 2016).

Lastly, new theoretical frameworks and technologies are being utilized in an effort to better understand accurate and inaccurate person memory. Helm, Ceci, and Burd (2016) have examined how perceivers' implicit biases—linking a target face to a specific crime—might cause them to have false memories of targets. Werner, Kühnel, and Markowitsch (2013) have discussed the emerging role of neuroimaging (viz., brain activation patterns) techniques in mapping the occurrence of correct target recognition among perceivers.

Person Memory: Deficits and Strengths in Face Recognition

Deficits and strengths in person memory illustrate the practical significance of this social-intelligence skill to people's interpersonal and occupational lives. The ability to process or remember target facial cues is anchored by those who suffer from a neurologic condition called prosopagnosia or face blindness versus those have been called super-recognizers because of their extraordinary ability to recognize others' faces (Russell, Duchaine, & Nakayama, 2009). Kids on the autism spectrum occupy a space along the lower end of this continuum due to deficiencies in how they process and utilize information from their targets' eyes (e.g., Tanaka & Sung, 2016). Of importance, different social, life, and occupational outcomes ensue for super-recognizers and those suffering from either prosopagnosia or autism.

Children with autism show poorer face recognition than children without the disorder (Planche, 2014; Tang et al., 2015). Tanaka and Sung (2016) argue that individuals with autism avoid eye contact with others because it is too threatening to them, and this contributes to their poorer face-recognition abilities. Indeed, perceivers' attention to the eye region of targets is important to their subsequent ability to recognize targets' faces (Royer et al., 2018). Deficits in using targets' facial cues may help explain why adolescents with autism report more loneliness, display poorer social skills, and have more social problems than do their typically developing peers (e.g., Deckers, Muris, & Roelofs, 2017). Interventions are being developed to help children with autism use the facial cues of targets, showing some positive results in terms of these children's socio-emotional functioning (Chen, Lee, & Lin, 2016; Hopkins et al., 2011).

In terms of the psychosocial impact of face blindness, individuals with the condition report experiencing various problems during social interactions. They may become anxious about the possibility of not recognizing people they know; a worry that can negatively impact their social and work lives (Yardley, McDermott, Pisarski, Duchaine, & Nakayama, 2008). They may avoid social or work functions where recognizing others is an important part of the activity.

In terms of occupational outcomes, police departments successfully recruit super-recognizers because their exceptional face-recognition abilities can be put to good use in that setting (Robertson, Noyes, Dowsett, Jenkins, & Burton, 2016). Given the importance of this skill in many domains of life, the question arises as to whether people can be trained to become super-recognizers. Unfortunately, perceivers' face-recognition abilities seem resistant to improvement in adulthood, even with portraiture training or years of experience working as a portrait artist (Tree, Horry, Riley, & Wilmer, 2017).

The Diagnostic Value of Appearance Cues

Our ability to mentally place other people into socially meaningful categories, referred to as social categorization, is a fundamental aspect of human cognition. By doing so, our behavior can be, at least initially, governed by our expectations regarding the behavior we are likely to see from the categorized people. This process allows us to adjust our own behavior, if needed, to successfully meet the demands of interacting with each person (unless, of course, we rely on stereotypic notions that do not apply to the categorized individuals).

The informational value of others' appearance cues to the social-categorization process is thus of importance to basic and applied (e.g., biometrics) researchers. Perceivers' memory for appearance cues would be especially important if they had diagnostic value to the categorization process. If others' appearance cues had no diagnostic value to us, we would be uncertain about the social categories people might belong to, which would not help us interact successfully with similar-looking people in the future. Moreover, the need to categorize targets seems so strong among perceivers that their targets can suffer when they are unable to do so. For instance, when perceivers struggle to categorize the biological sex of physically ambiguous transgender people, they evaluate them more negatively (Stern & Rule, 2018).

A large body of research shows that targets' appearance cues communicate diagnostic information to perceivers. In this section, a broad but limited review of diagnostic appearance cues is covered first, followed by more specific examples pertaining to targets' sexual orientation and mating goals. The latter cues are even more relevant to any discussion regarding the adaptive significance of person memory.

Either consciously or nonconsciously, targets transmit relatively static and dynamic cues about who they are along a number of channels of communication (Hall, Horgan, & Murphy, 2019). The focus here is primarily on appearance cues. In this context, static means that the appearance cues do not typically change during an initial interaction; for example, other people usually do not change their clothes, age appreciably, or alter their facial or bodily features when interacting with you for the first time. Dynamic appearance cues, on the other hand, do change because they are linked to the movements of targets, such as their gestures.

Static and dynamic cues are sometimes called "markers" because, as a consequence of *biological*, *developmental*, *learning*, *social*, *and cultural factors*, they are capable of revealing the unique identity, biological sex, background (cultural, socioeconomic, regional, etc.), health (physical and mental), and social/personality characteristics of targets (see Hall et al., 2019). A target's unique identity may be gleaned from his/her face, voice, gait, hand odor, and iris (e.g., Rodriguez-Lujan, Bailador, Sanchez-Avila, Herrero, & Vidal-de-Miguel, 2013; Sibai et al. 2011; Takemura, Makihara, Moramatsu, Echigo, & Yasushi, 2017). Person memory, such as recognizing a specific person, depends on the conscious and nonconscious processing of such markers. As one example, how does the human brain recognize the unique voices of people? (Maguinness, Roswandowitz, & von Kriegstein, 2018).

With respect to static appearance cues, the dress and facial and bodily features of targets have been linked to their gender and social and personality attributes (Ellis, Das, & Buker, 2008; Han et al., 2016; Li, Heyman, Mei, & Lee, 2019; Valla, Ceci, & Williams, 2011; Vazire et al., 2008). For example, the prosocial characteristic of trustworthiness in children has been related to their facial features (Valla et al., 2011), and the antisocial trait of criminality in adults has been associated with their bodily features (hairiness and muscularity; Ellis et al., 2008). The clothes that a person chooses to wear may provide a clue to the presence of a clinical disorder in him, such as narcissism (Han et al., 2016; Vazire et al., 2008).

The direction of the association between the appearance cues and trait-related attributes of targets is unclear. Underlying differences in androgen exposure might not only influence the development of people's brains—and thus their traits—but manifest itself in differences in their physical features as well (e.g., how muscular they are; Ellis et al., 2008). Diagnostic facial cues could be due to a history of personality-trait-driven expressions and emotional experiences (Adams, Garrido, Albohn, Hess, & Kleck, 2016; Bjornsdottir & Rule, 2017). Perceivers might respond differently to targets with different physical features, as with face-based stereotypes, leading to long-term changes in targets' personality or social attributes. The appearance of targets also could reflect what they think society expects from them based on their given names (Zwebner, Sellier, Rosenfeld, Goldenberg, & Mayo, 2017). Irrespective of the mechanisms involved, perceivers' ability to commit to memory the static appearance cues of targets should enable them to recognize a new target's membership in various social groups more accurately.

The diagnostic value of dynamic appearance cues to the social-categorization process is clear in terms of the gender, personality traits, socioeconomic status, and neurological condition of targets. A number of gestural, postural, eye, gait, and touching cues distinguish men from women (Knapp et al., 2015). Relative to women, men's feet and legs are more restless and their arms and legs more open, whereas women's faces and hands tend to be more expressive than men's. The gait patterns of men and women are different in both younger and older adults, largely due to differences in their average heights and body shapes (Ko, Tolea, Hausdorff, & Ferrucci, 2011). Targets who are more dominant in personality show greater facial expressiveness and bodily openness, and they use louder, more relaxed, and lower-pitched voices (e.g., Hall, Coats, & Smith-LeBeau, 2005). During dyadic interactions, targets from higher socioeconomic status (SES) backgrounds tend to use more cues of disengagement (doodling), whereas those from lower SES backgrounds tend to use more cues of engagement (head nodding, laughter) (Kraus & Keltner, 2009). Greater pitch variability and range appear to be two biomarkers of autism in children (Bonneh, Levanon, Dean-Pardo, Lossos, & Adini, 2010). It is unclear, though, if gaze aversion is a marker of autism (Moriuchi, Klin, & Jones, 2016).

Adaptive Memory: Target Sexual Orientation and Mating Strategy

An extensive body of research exists concerning person memory. But, in keeping with the goals of this chapter, three specific aspects of this research are developed. First, evidence needs to be presented showing that person memory should not be restricted to our memory for one set of target cues (e.g., the face). In order to make that argument, multiple target cues should have diagnostic value in the sense that they offer potential clues about important target characteristics. Second, our person memory should reflect the processing of multiple target cues, as Vernon, Sutherland, Young, and Hartley (2014) demonstrated with respect to our face-based impressions of others. Third, our memories should reflect an attunement to specific target cues that serve our survival and reproductive goals, as suggested by the notion of adaptive memory. The sexual orientation and mating strategy of targets as well as perceivers' mating goals are used to address these three aspects of person memory.

If human memory were designed by evolutionary forces to serve our survival and reproductive goals (Naime & Pandeirada, 2018), targets should be able to communicate, either consciously or nonconsciously, diagnostic cues about their mate value, sexual orientation, and mating strategy to us. These would include their appearance and verbal statements, among other cues. Buss and Schmitt (2019) have detailed the appearance cues related to females' (viz., attractiveness, hair quality, full facial lips, low waist-to-hip ratio—WHR) and males' (viz., tallness, muscularity, leanness) greater mate value to members of the other sex. Women also rate single men's body odor as stronger than that of partnered men's, presumably because single men have higher levels of testosterone, a potentially useful cue for women to detect and remember (Mahmut & Stevenson, 2019).

Human courtship serves the goal of finding a mate, both in mixed-sex and same-sex relationships. In today's world, reproduction is possible in both types of relationships. Each relationship type can thus meet people's reproduction goals. At the individual level, the issue is recognizing a suitable mate for oneself, that is, a person who shares your sexual orientation.

Consider a woman meeting several men at a social gathering. If she does not recognize—because there are no diagnostic cues available to her—that one man's sexual orientation (Man A) is likely different from hers, she might pursue him and miss out on an opportunity to pursue another man who shares her sexual orientation (viz., heterosexual).

Man A may tell the woman that he is gay. After all, he has his own mating goals to pursue and may not want the woman to flirt with him. Yet he may, instead, be reticent about divulging his sexual orientation to her due to fears about being subjected to discrimination or abuse by others. Indeed, the stress associated with concealing one's attraction to members of the same sex could explain why some of the physical markers associated with homosexuality exist (cf. Skorska & Bogaert, 2017). These markers are reviewed next.

Target Cues to Sexual Orientation

A body of research is rapidly growing, documenting the presence of numerous *possible* markers of a person's sexual orientation. In terms of physical features, differences in the facial features, limbs, hands, and bodily characteristics (shape, height, weight) of heterosexuals and homosexuals have been found. Relative to their heterosexual counterparts, lesbians tend to have more turned-up noses, puckered mouths and tubular body shapes, lower second-to-fourth finger ratios in the left hand (i.e., greater masculinization), longer limbs, and heavier bodies (Conron, Mimiaga, & Landers, 2010; Johnson, Gill, Reichman, & Tassinary, 2007; Martin & Nguyen, 2004; Skorska et al., 2015; Tskhay, Feriozzo, & Rule, 2013; Watts, Holmes, Raines, Orbell, & Rieger, 2018). Whether lesbians are more likely to be taller and obese is controversial, though, as some studies have not found differences between lesbians and non-lesbians in these two areas (Bogaert, 2010; Bogaert & Liu, 2013). Relative to their heterosexual counterparts, gay men are less likely to be obese, tend to be shorter in stature, have shorter limbs and more hourglass figures and, in terms of their head and facial features, have less symmetrical faces, more convex cheeks and tilted back foreheads, and less masculine faces or faces with a greater mixture of "masculine" (bigger, rounder jaws) and "feminine" (smaller and shorter noses) features (Bogaert, 2010; Conron et al., 2010; Hughes & Bremme, 2011; Johnson et al., 2007; Martin & Nguyen, 2004; Skorska et al. 2015; Varella, Valentova, Pereira, & Bussab, 2014).

Body odor might be a marker of homosexuality. Gay men prefer the odor of gay men (Martins et al., 2005). More recent evidence from chemosensory event-related potentials/Electroencephalogram readings suggests that both males and females respond differently to the odor of their preferred partner (i.e., the person's sexual orientation is the same as theirs) compared with their non- preferred partners (Lubke, Hoenen, & Pause, 2012).

From perceivers' perspectives, the above-referenced cues appear static and not under targets' conscious control (Hall et al., 2019). Perceivers intuitively understand that a person's standing height will not change during a typical interaction, and that he/she cannot will his/her limbs to be shorter or longer in length. Other physical features of targets are dynamic or under their conscious control, however. These cues also have potential diagnostic value to perceivers.

In the dynamic or consciously controlled realm of communication, there are diagnostic cues in the dress, vocal, and gait characteristics of gay males and females. After "coming out," lesbians may deliberately dress themselves in a less "feminine" way (e.g., wearing more masculine/androgynous clothes and less/no makeup), presumably as a way of signaling their sexual orientation to other lesbians (Krakauer & Rose, 2002).

Men can control their hairstyle to a certain degree, and this appears to be a cue to their sexual orientation (Rule, Ambady, Adams, & Macrae, 2008).

In terms of the voice, the pitch of gay men tends to be higher than that of heterosexual men, but still lower than that of heterosexual women (Baeck, Corthals, & Van Borsel, 2011). Lesbians tend to have a lower pitch and less pitch variation than do heterosexual women (Van Borsel, Vandaele, & Corthals, 2013). There also is evidence that, relative to their heterosexual counterparts, lesbians and gay men produce some vowels differently; for example, gay males appear to use an expanded vowel space (Pierrehumbert, Bent, Munson, Bradlow, & Bailey, 2004). Nonetheless, because these differences in vowel patterns are not similar to their other-sex counterparts (e.g., gay men sounding like heterosexual women), they are not likely due to strictly biological processes (Pierrehumbert et al., 2004). Lastly, degree of nasality does not appear to be a marker of a person's sexual orientation (Vanpoucke, Cosyns, Bettens, & Borsel, 2018).

How a target walks may be related to his/her sexual orientation; gay men show more hip swaying than heterosexual men and gay women show more shoulder swaggering than heterosexual women (Johnson et al., 2007). However, current research on this specific marker of sexual orientation is lacking.

Appearance cues have diagnostic value because perceivers use them, either consciously or nonconsciously, to make accurate judgments about their targets (i.e., recognition accuracy). In terms of nonconscious processing, categorizing a target's sexual orientation seems to be an automatic process for perceivers (Rule, Macrae, & Ambady, 2009). In terms of conscious processing, men's faces can be correctly recognized as gay or not gay by perceivers from different cultural backgrounds (Rule, 2011; Rule, Ishii, Ambady, Rosen, & Hallett, 2011).

Recognition accuracy for the sexual orientation of targets occurs as a function of holistic, configural, and featural processing of their facial cues by perceivers. At the holistic level, the degree to which a target's face appears "gender inverted" may be the cue that perceivers use to correctly recognize him or her as gay or not gay (Freeman, Johnson, Ambady, & Rule, 2010). The degree of facial masculinity may also be a reliable cue to men's sexual orientation; specifically, the more masculine a man's face is, the more likely perceivers are to view him correctly as heterosexual (Hughes & Bremme, 2011). With respect to the processing of specific cues, perceivers use a number of target head cues to accurately recognize other people as gay or lesbian; these include their internal facial features and facial shape and texture (Freeman et al., 2010; Tskhay et al., 2013). The mouth, eyes, hairstyle, and facial symmetry of men are used by perceivers to correctly recognize them as gay or not gay (Rule et al., 2008; Smyth, Jacobs, & Rogers, 2003).

Whether perceivers can actually recognize a man's sexual orientation from his face alone is not without controversy (Cox, Devine, Bischmann, & Hyde, 2016). Some of these concerns center on the use of stereotypes by perceivers as well as the ecological validity of research that fails to take into consideration the base rate of homosexuality in the population. Regarding the latter concern, perceivers are asked, in a laboratory setting, whether a depicted man is gay or not, which artificially inflates the occurrence of male homosexuality to 50%. Nevertheless, Wang and Kosinski (2018) have shown that computer-based visual algorithms are better than human perceivers at distinguishing between gay and not-gay faces because of actual differences in the facial appearance, expressions, and grooming styles of the two groups.

If the human face contains cues to a person's sexual orientation, then greater exposure to a particular group of targets, say gay men, should result in perceivers having more information about the possible meaning of these cues stored in their memory (e.g., Carter & Hall, 2008). This, in turn, should make them better at distinguishing between the faces of gay versus not-gay men. Indeed, men who are more familiar with gay men are better able to use the facial cues of men to correctly categorize their sexual orientation (Brambilla et al., 2013). Once perceivers have correctly categorized a target's sexual orientation, do they show enhanced recall memory for those who share their sexual orientation? For example, do gay male perceivers remember more of the appearance cues and verbal statements of gay than not-gay people? This question has yet to be investigated. To date, it has only been shown that perceivers show better memory for the faces of those they think are members of their sexual-orientation in-group (Rule, Ambady, Adams, & Macrae, 2007).

Target Cues to Mating Orientation

From an evolutionary perspective, targets' appearance cues should signal desirable (approach) and undesirable (avoid) mate qualities to perceivers. A target's genetic fitness represents one desirable quality, whereas his/her unrestricted sociosexual orientation represents one potentially undesirable quality (e.g., Weiser et al., 2018). Regarding the latter, perceivers might need to be especially wary of targets who show signs of being willing to engage in casual sex. The potential risks to women include their male partners diverting some of their shared resources to other female sex partners instead of their offspring. And men run the risk of helping their female partners raise other men's babies. Perceivers' memory for the diagnostic, mating-relevant cues of targets is therefore another critical area of social intelligence.

Women find greater masculinity in the face and body of men (e.g., pronounced jawline; higher shoulder-to-hip ratios) to be more attractive, possibly because it is a marker of superior genetic fitness (Puts, Welling, Burriss, & Dawood, 2012; Rennels, Bronstad, & Langlois, 2008). Men's vocal qualities contain cues to their strength and dominance, attributes that females find desirable as well. Specifically, a lower-pitched male voice has been linked to greater bodily masculinity and strength and perhaps to an enhanced ability to intimidate other men (Hughes, Dispenza, & Gallup, 2004; Puts et al., 2016; Sell et al., 2010).

For women, the appearance of more masculinity in male targets has a downside. These appearance cues might also signal the possibility of seeing more undesirable social behaviors from the men, including a heightened propensity toward criminal conduct, an unrestricted sociosexual orientation, and sexual promiscuity (Boothroyd, Cross, Gray, Coombes, & Gregson-Curtis, 2011; Boothroyd, Jones, Burt, DeBruine, & Perrett, 2008; Ellis et al., 2008). This may be why women do not prefer highly masculine faces in men; such faces may be linked in their memory to a male mating strategy more averse to them, namely, unrestricted sociosexuality (e.g., Boothroyd et al., 2008).

For men, the mate value of a female target with a youthful, attractive face, low waist-to-hip ratio, and firm breasts would be high (Buss & Schmitt, 2019; Havlíček et al., 2017). It is interesting to note that attractive facial and vocal cues are associated with greater reproductive potential in women (Wheatley et al., 2014). In terms of nonappearance cues, women's pitch may signal her sexual maturity and fertility. Although men prefer a higher-pitched female voice due to its association with fertility, they do not prefer a pitch that is too high because of its link to sexual immaturity (Apicella & Feinberg, 2009; Borkowska & Pawlowski, 2011; Hughes et al., 2004).

Although men prefer greater femininity or attractiveness in women, these qualities may be tied to undesirable female sexual behaviors. A greater tendency toward promiscuity or unrestricted sociosexuality has been observed among women with more feminine or attractive facial and bodily features (e.g., waist-to-hip ratio; BMI) (Boothroyd et al., 2011; Fisher, Hahn, DeBruine, & Jones, 2016; Varella, Valentova, Pereira, & Bussab, 2014; cf. Weeden & Sabini, 2007). However, Fisher et al. (2016) argue that the link between female attractiveness and sociosexuality may be too weak to inform men's decision-making in the realm of mating.

Perceivers can misjudge the meaning of females' appearance cues. Even though makeup can enhance female attractiveness, it is mistakenly seen as a cue to greater unrestrictiveness in their sociosexuality (Batres et al., 2018). Nonetheless, women with an unrestricted sexual orientation tend to wear more revealing clothing when they are getting close to ovulating (Durante, Li, & Haselton, 2008).

Other appearance cues, such as the 2D:4D ratio, are not reliable indicators of male or female sociosexuality (Charles & Alexander, 2011; DeLecce, Poheber, & Matchock, 2014). A target's facial-width-to-height ratio is a cue currently mired in controversy regarding whether it signals any meaningful social-sexual information (viz., sex drive and sociosexual orientation) to perceivers (Amocky et al., 2017). Lastly, although previous research suggested that women's vocal pitch gets higher as they near the time of their peak fertility, Fischer et al. (2011) argue that such pitch changes are not likely detectable by men in everyday life.

If appearance cues signal information pertaining to others' likely sociosexuality, then perceivers should be able to correctly recognize those with a restricted or unrestricted orientation. This assumes, of course, that associations between the presence of certain appearance cues and likely sociosexual behavior have been stored in perceivers' memory as a consequence of their exposure to the appearance of targets who later displayed a proclivity for either a restricted or unrestricted sociosexual orientation. Evidence suggests that perceivers can, in fact, accurately recognize the sociosexual orientation of targets at zero acquaintance and when they are viewing only thin slices of their behavior (Boothroyd et al., 2008, 2011; Stillman & Maner, 2009). Perceivers use the facial features and nonverbal behavior of targets to make these judgments. Regarding the latter, they can recognize targets who have had a history of infidelity (or not) from listening to only their vocal qualities (Hughes & Harrison, 2017).

Although multiple cues may reveal another person's sociosexual orientation, this does not imply that they carry equal diagnostic value (e.g., Kramer, Gottwald, Dixon, & Ward, 2012). Stillman and Maner (2009) have found that some target cues are valid cues to their sociosexual orientation (glances), whereas others are poor (gestures) or misleading (provocative dress). Moreover, as can be gleaned from the review of sexual-orientation cues, multiple cues may be diagnostic of whether a person is gay/lesbian, whereas others may not help us recognize this distinction at all. These two facts underscore the importance of testing participants' use of and memory for a host of target cues—appearance and verbal. This point is developed further in the section that follows.

Person Memory: Verbal Cues and Statements

One take-home message of this chapter is that accurate person recognition likely depends on stored associations between targets' cues and target behavior in the memory of perceivers. Recognizing that a target might have an unrestricted sociosexual orientation should come from a history of processing targets' appearance cues (physical features, dress, artifact, nonverbal behavior) and verbal statements, some of which may be diagnostic or nondiagnostic of that particular orientation. Furthermore, perceivers are unlikely to ignore one set of cues coming from the targets they are interacting with in day-to-day life, especially when their life or reproductive goals are at stake. A man who wants to find a woman who, like him, desires a long-term sexual relationship (restricted sociosexuality) with someone is unlikely to ignore her verbal statements and focus exclusively on her appearance. However, research to date often focuses on perceivers' memory for one set of target cues, namely his or her appearance.

Focusing on perceivers' memory for one set of cues is problematic because the informational relationship between the appearance cues and verbal statements of targets is complicated. A target's appearance can reinforce, augment, minimize, contradict, or not impact his or her verbal statements. Sarcasm represents one example; in this case, a person's statement is contradicted by his or her appearance and vocal cues. Similarly, a target's verbal statements can reinforce, augment, minimize, contradict, or not impact at all his or her appearance cues. A person who says, "I'm so depressed," reinforces to others the meaning of his/her poor personal hygiene, slow talking, and weepiness.

A person's verbal statements and vocal cues have additional diagnostic value to perceivers that should not be ignored in person-memory research. This information is useful to perceivers, in both personal and professional settings. A man's decision to start or maintain a relationship with a woman depends on his memory for what she has verbally shared with him, such as her name, age, interests, attitudes, goals, and so on (e.g., he might avoid her if she does not share his personal or life goals). For clinicians, children who talk excessively and use a loud voice may be struggling with attention deficit disorder or hyperactivity, adults whose speech seems impressionistic and lacking in detail may be dealing with histrionic personality disorder, and someone who repeats others' words or phrases may be suffering from major depression with catatonic features (DSM-5, 2013). Exposure to and experience with patients who have various mental disorders would enable seasoned practitioners to *recognize* the actual developmental, personality, or clinical disorders of new patients more quickly if they remember the potential diagnostic value of specific verbal cues or types of statements—along with the appearance cues that tend to accompany them—better than someone with limited clinical experience.

Regrettably, perceivers' memory for targets' verbal statements is seldom tested (cf. Fitzgerald et al., 2016; Horgan et al., 2012, 2015). Instead, the focus has been on how to improve listeners' memory for verbal information. For instance, a person's hand gestures (e.g., pointing in a specific direction) can help your memory for and ability to follow his/her route directions (i.e., spatial information) (Austin, Sweller, & Van Bergen, 2018). If you overhear a conversation, using a timeline format strengthens your memory for what was said and who said what (Hope et al., 2019).

Current Research Trends: The New Look at Person Memory

Perceivers' memory for targets comes from their exposure to a host of target cues along visual (appearance, nonverbal) and auditory (verbal statements, vocal qualities) channels of communication. As has been noted already, cues *within* each channel of communication can reinforce, contradict, augment, minimize, or not impact each other (Hall et al., 2019). There are, for example, diagnostic and misleading appearance cues to women's sociosexuality (Stillman & Maner, 2009); in this situation, appearance cues provide contradictory information to perceivers. Moreover, as stated earlier, cues from one channel (appearance) can reinforce, contradict, augment, minimize, or not impact at all cues from another channel (verbal statements) (Hall et al., 2019).

Let's bring the implications of this knowledge concerning the interplay of cues within and across channels of communication to life using a real-world scenario. Consider a young single woman asking a man she has just met in one of her classes if he would like to go out for drinks with her and her friends. He replies, "Sure. When were you thinking?" She notices that he does not smile or make eye contact with her. Her subsequent memory of him will likely involve the integration of his cues within each channel of communication, namely "sure" and "when were you thinking?" in the verbal domain, and not smiling and not making eye contact in the appearance domain. More important, her subsequent memory of him may include the integration of these two cue sources. This would be evident if she started to wonder if he is the nervous type (i.e., he wants to go out with her, but is nervous around women), ambivalent about going out with her (his words say "yes" to her; his body says "I'm not sure"), or just being polite to her (saying "sure" to spare her feelings but letting her know that he is not really interested in her). Testing her memory for only his facial features, although important, would miss important elements of her person memory for him. This is because all the cues she remembers about the man should ultimately have a greater impact on her subsequent behavior around him than what she recalls about his face. For instance, if she settles on the view that he is the nervous type, she may decide to be more assertive around him. But if she thinks he was just being polite to her, she may decide not to ask him out again. In both cases, her memory for his face could be comparable. Lastly, her memory for the man could be impacted by her current mating goals. For example, would she process his facial features more deeply than his verbal statements if she were interested in only a “hookup” with him?

If human memory is adaptive, then we should be designed to devote extra attentional and memorial resources to target information that is potentially more beneficial to our survival and reproductive goals. An enhanced ability to store information or *recognize* the meaning of targets’ cues (again, by drawing on our memory for covariations between target cues and likely target behavior) would be expected from this perspective. Indeed, evidence is mounting that people have better memory for information that is relevant to their survival (Nairne & Pandeirada, 2008). In terms of people’s reproductive goals, men (but not women) show superior memory for story details when they are first primed with attractive other-sex faces, suggesting that the display of such an ability might be seen as desirable by potential female mates (Baker, Sloan, Hall, Leo, & Maner, 2015). Superior memory for verbal information paired with attractive female features is not always observed from men, though (Grabe & Samson, 2011). Finally, women have better memory for men’s faces when they are first asked to consider how desirable the men would be as long-term mating partners versus long-term work partners (Pandeirada, Fernandez, Vasconcelos, & Nairne, 2017).

In terms of recognition accuracy, when women are primed to think about romance or they are close to the time of their peak fertility, they demonstrate an enhanced ability to detect, from target facial cues alone, men’s but not women’s sexual orientation (Rule, Rosen, Slepian, & Ambady, 2011). Interestingly, perceivers who are high in prejudice toward homosexuality or come from a culture less tolerant of same-sex intimate relationships tend to be worse at correctly categorizing faces as gay/lesbian versus not gay/lesbian (Rule et al., 2015). One wonders if these individuals are afforded fewer opportunities to detect covariations between the appearance cues and sexual behavior of various targets. After all, individuals may conceal their romantic interest in members of the same sex from those who might discriminate against them.

Research on adaptive memory, as with person-memory research is general, tends to be limited in scope because it focuses on only one set of target cues (Smith, 2017). For instance, Nairne, Thompson, and Pandeirada (2007) found that words are recalled better by people when they first rate them for their survival relevance. In terms of reproductive goals, perceivers' memory is better for target faces that show signs of superior genetic fitness (viz., more attractive) (e.g., Tsukiura & Cabeza, 2011).

Sometimes men and women need to make fitness-related decisions as a function of their current mating orientation, specifically whether they are interested in pursuing either a short-term or a long-term mating opportunity with someone. If person memory is adaptive, then the relative importance of specific target cues might vary accordingly. Smith, Jones, and Allan (2013) observed that women's mating orientation impacted their memory for source cues surrounding more versus less masculine male faces. Women who tend to seek more short-term mating opportunities (i.e., an unrestricted sociosexual orientation) had superior memory for the color frame surrounding masculine men's faces, whereas those who tend to seek longer-term mating opportunities showed superior memory for the color frames surrounding men with less masculine faces. A short-term mating strategy can be risky for a woman because, if she becomes pregnant, the man who impregnated her may not be around to help her raise their offspring. Thus, heightened processing of source cues would be expected for those men who showed signs of superior fitness, namely, more masculine faces. Of importance, this research focused on only a limited set of target cues (source memory).

To date, the practical significance of research on person memory/recognition is unclear. In everyday life, your decision to pursue or avoid a person, all in an effort to fulfill your life or reproductive goals, is not likely based on your memory for only one set of his/her cues. A woman who wants to secure the best genes for her offspring is not likely to remember only the faces of potential male mates, whether she is pursuing a short- or long-term mating strategy. What these men have said to her should matter, too. Consider a highly educated, successful business-woman meeting two available men (Man A, Man B) at a social function. She finds Man A to be attractive in appearance and Man B to be *strikingly* attractive in looks. Man A speaks well. He also communicates his interests, values, and attitudes with her, which are similar to hers. Man B's language skills, on the other hand, suggest that he is poorly educated or of limited intelligence, and he verbally shares information about himself that is problematic to the woman, such as dissimilar values or unhealthy behavioral tendencies (e.g., drinking too much alcohol). It may be the case that, if her memory were tested the next day, she would recall details of Man B's face better than Man A's because her attentional resources were more drawn to the former's strikingly attractive features. Nonetheless, her decision to have sex with (if she desires a short-term mating opportunity) or seek a date with (if she desires a long-term mating opportunity) either man would rest on what she remembers about both men's appearance cues and verbal statements. Even in a short-term mating context, one fitness-enhancing set of target cues, such as highly attractive facial features, would be offset by other cues that, in the eyes or ears of the woman, could hurt her reproductive goals. In this case, the highly intelligent woman may not want to reproduce with a man who is not her intellectual equal.

As indicated earlier, research on perceivers' memory for targets' appearance cues and verbal statements is lacking. Two specific studies that have addressed this limitation in the literature are reviewed in detail next, given that they represent the new look at person memory.

A long line of research has shown that men find a woman whose waist is .7 of the size of her hips to be more attractive, presumably because it signals her greater reproductive potential (Dixon, Grimshaw, Linklater, & Dixon, 2011). Men need to pay attention to the verbal statements of women too, because they value female attributes unrelated to their appearance (e.g., Zentner & Mitura, 2012). In a set of experiments, Fitzgerald et al. (2016) digitally modified a female target's waist-to-hip ratio (WHR) to include the following values: .5, .6, .7, .8, and .9. Male participants viewed the woman with one of these values along with biographical statements about herself. As expected, those who saw the woman with a .7 WHR found her more attractive than did men who viewed her in the ratios of .5 or .9. Of greater importance, in both a recognition and a free-recall memory task, those who had viewed the woman with the .7 WHR remembered more details about her physical features *and* biographical information relative to those who had seen her with the .5 or .9 WHR. This provided evidence that not only did men's person memory become better when the target displayed a potentially higher reproductive value, but that this occurred for both her appearance cues and statements. In other words, men were processing, presumably nonconsciously, both sources of target cues—her appearance and statements—as opposed to only one of them.

Even though you are likely to process and remember both the appearance cues and verbal statements of others, the relative importance of each source of information might vary as a function of your mating orientation. Those seeking a short-term mating opportunity might devote relatively more attentional and cognitive resources to a target's appearance cues than statements, whereas the reverse might be true for those seeking a long-term mating opportunity. This does not mean that people will ignore one set of cues; a woman who desires a long-term mating opportunity with a man is not likely to ignore his appearance because she is only interested in whether his traits, values, and interests align with hers.

Horgan et al. (2015) tested this in an experiment that induced women to consider a male target as either a short-term or long-term partner. Afterward, they viewed this man's appearance in video and heard him talking about himself. He shared information about his education, family, future plans, and aspirations. Women who were induced to think of him as a possible long-term partner had comparable memory for his physical appearance *and* verbal statements. Women who were considering him as a possible one-night stand, on the other hand, had better memory for his physical cues than his verbal statements. Moreover, women in the short-term mating mind-set had better memory for his appearance than did those in the long-term mating mind-set, whereas those in the long-term mating mind-set had better memory for his statements than those in the short-term mating mind-set.

The Horgan et al. (2015) and Fitzgerald et al. (2016) studies were important because they tested perceivers' memory for two sets of target cues, namely, appearance and verbal statements. Each study showed that perceivers' person memory involved the processing of both sets of cues. There were limitations to these studies, nonetheless. Other potentially useful target cues to perceivers were not tested, such as his/her vocal qualities, gestures, posture, facial expressions, scent, and so on. Moreover, how the two sets of target cues impacted each other, in terms of perceivers' eventual memory for him/her, was not examined. To illustrate, did the presence of particular appearance cues on the male target affect the type of information that women most remembered him verbally sharing in each mating condition?

Future research should investigate questions concerning the interplay of appearance cues and verbal statements on the memorability of specific target information. Consider women viewing a very masculine man whose appearance suggests to them that he has good genes as well as the possibility of being more inclined toward unrestricted sociosexuality. Would women considering him as a long-term partner have better memory for information he shared about his family values, morality, and long-term relationship goals than women considering him as a one-night stand? These types of research questions need to be explored, for they capture the essence of this new look at person memory.

Gender and Person Memory

Women tend to outperform men on a number of tasks relevant to the person-memory domain of social intelligence. Women show better memory for targets' appearance, nonverbal cues, and verbal statements (about close others) than do men (Hall et al., 2006; Horgan et al., 2004, 2012, 2017). Women also tend to have better face-recognition ability, especially for female targets (Megreya, Bindemann, & Havard, 2011).

Theoretical explanations for gender differences in person memory run the gamut from distal to proximal factors. On the distal side, McGivern et al. (1998) proposed that, relative to men, it would have been adaptive for females to more thoroughly process their immediate surroundings; greater environmental awareness from them was needed for food-gathering and offspring-protection purposes throughout our species' history. Environmental risks to females and their offspring would have included objects and people (viz., dangerous plants or people).

From this perspective, greater person memory among women would merely be a by-product of gender differences in environmental awareness. In a test of this theory, Horgan, McGrath, and Long (2009) had men and women sit in a room with a TV monitor showing a person they were told to pay attention to or not. A female confederate, who participants thought was a research assistant, also was in the room. The room contained objects as well, some of which could have been viewed as potentially dangerous. Women did not show better memory for the objects in their surroundings than men. Women had better memory for only the people in the environment (confederate; person shown in the TV). This was interpreted as evidence that women's greater interpersonal orientation (i.e., relative to men) might better explain their enhanced person memory.

The perceived gender relevance of person-memory tasks (favoring female perceivers) as well as women's tendency to be more interpersonally oriented than men are two proximal factors that might explain why women have better memory for their targets than do men. Horgan et al. (2004) found that women had better overall memory for the appearance of targets than men, both under directed- and incidental-learning conditions. Although the reason for this gender difference has proved elusive (Schmid Mast & Hall, 2006), it has been suggested that how people adorn themselves might be a more female-relevant domain of interest among perceivers (Horgan et al., 2017). In support of this, when perceivers' memory for targets' appearance was separated into two categories, namely their physical features (e.g., eye color) and dress (e.g., color of shirt), women's advantage over men was restricted to the dress items (Horgan et al., 2017).

If women tend to be more interpersonally oriented than men, then information about other people might be more socially relevant to them, because such information could be used for relationship-building purposes. Plenty of evidence exists showing that, relative to men, women demonstrate better memory for social information (Cross & Madson, 1997). Unfortunately, in the domain of person-memory research, gender is often used as a proxy for differences in interpersonal orientation (Horgan et al., 2017). More important, in a study in which participants' interpersonal motivation was manipulated, differences in person memory did not occur (Schmid Mast & Hall, 2006).

However, the nature of the to-be-recalled target cues might matter more in uncovering how women's greater interpersonal orientation could lead to gender differences in person memory. When individuals verbally share information about people they are interpersonally close with, it might be more relevant to women, given that they are more likely than men to define their "self" in terms of their relationships with others (Cross & Madson, 1997). Horgan et al. (2012) had men and women listen to targets verbally sharing information about themselves. Some of the information pertained to only the target, such as his/her major in school or interests, whereas other statements were relational in nature. The relational statements concerned the people who were a part of the target's life, such as his/her parents. As predicted, a gender difference in what the target had verbally shared about himself or herself was not found. But women showed better memory for what the targets had verbally shared about close others.

Our understanding of gender differences in person memory (appearance, verbal statements) is marked by a number of competing theoretical frameworks, each of which lacks a solid empirical base. It is fair to say that why women outperform men on person-memory tasks is unknown. Nevertheless, continued explorations into the source of this gender difference are of paramount importance.

Understanding why women outperform men may shed light on the role that biological and social forces play in producing individual differences in person memory. Neurologic differences, differential learning opportunities, societal expectations, or some combination of all of these may be among the whys. Consider the possibility that, relative to men, women are expected to be more visually attentive to others. They do, in fact, exhibit more interpersonal gazing than men (Hall & Gunnery, 2013). Greater experience in attending to target-appearance cues among women could lead them to have an enhanced ability to commit those cues to memory and, over time, to have stronger associations in memory between the presence of specific target cues and the behavior they are likely to see from their targets.

Perceivers' judgments about their targets as well as their decisions about how to deal with them depend, in both the short and long term, on their memory for the appearance cues of their targets and for what those cues might be communicating to them. Greater attention to a target's appearance cues and better memory for what they might imply about his/her traits and states could explain why women outperform men in judging the meaning of targets' appearance cues. For example, women are better able to determine others' emotion states, personality traits, and behavioral tendencies than men (Hall et al., 2016). Encouraging men to attend to the appearance of others more could, over time, close the gender gap in performance on various person-judgment tasks.

Conclusion

To close this chapter, let us return to the beginning when you first met that stranger at a social function. As the perceiver of this person, what are your current life or reproductive goals? Is this person someone you might want to work with or have a platonic or intimate relationship with? This person also has life and reproductive goals that may be active in his or her mind. Are you someone he or she might want to work with or have a relationship with?

This person is transmitting, both nonconsciously and consciously, a host of information about himself/herself to you via his/her appearance cues and verbal statements. Some of the appearance cues, but not others, offer possible clues to important aspects of his/her personality and social attributes, including his/her sexual and sociosexual orientations. This person is also talking to you.

As the perceiver, you are processing cues within and across these two channels of communication, and you are trying to integrate them as well. Is the person making contradictory statements to you? Does the person's facial appearance match other aspects of his/his appearance, such as his/her dress and gestures? What is the relation between what the person says to you and what he/she looks like? If the person tells you how much he or she likes to socialize, does his or her appearance suggest that as well?

At this point, the task of understanding this person may seem overwhelmingly complicated. Yet you are able to quickly and effortlessly categorize others into socially meaningful groups, sometimes correctly, sometimes incorrectly. Recognizing the social category a person belongs to may hinge on your memory concerning the links between the presence of specific cues on him/her and the behaviors you are likely to see from him/her. Being able to recognize particular social categories, such as a person's sociosexual orientation, may be adaptive to you in the sense that it could help you fulfill your reproductive goal of finding a suitable mate for yourself.

To date, perceivers' memory for one set of appearance cue(s) (e.g., a target's face) has dominated person recognition/memory research. The practical value of this research is questionable, given that perceivers have to make sense of more than one set of target cues in everyday life. In an effort to correct this limitation, a new line of research has emerged—*the new look at person memory*—whereby perceivers' memory for targets' appearance cues (dress, physical features) and verbal statements is tested. More ecologically valid research like this is needed if we want to better understand our ability to recognize and remember the likely social categories of the people we meet in everyday life. This need is great, given the importance of this ability to our social intelligence.

Notes

1. There are, of course, other ways to recognize people (e.g., scent).
2. This chapter deals with only these two sexual orientations. However, human sexual orientation is far more complex. Some people, for example, have sexual feelings for members of both sexes (i.e., bisexuality).
3. The theory of ecological sensitivity pertains to the detection of covariations in target behavior and target membership in specific social groups.
4. The sexual and mating orientations of people can change. This chapter does not address this fact of human sexual and mating behavior.

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8

Communicating with Robots: What We Do Wrong and What We Do Right in Artificial Social Intelligence, and What We Need to Do Better

Arvid Kappas, Rebecca Stower, and Eric J. Vanman

Human interaction involves complex behavioral processes associated with the interplay of verbal and nonverbal communication in particular contexts. Any analysis of these processes requires, on the one hand, an appreciation of the complexity of the relationship between mental and physical states, intentions, and sociocultural background of *senders*, embedded in their present context, and, on the other hand, the attributions and effects on *perceivers*, again, in the light of their sociocultural background (Kappas, 2013). Some of these effects will be accessible to awareness of the interaction partners, and others will not be. This makes any systematic analysis of human interaction a major undertaking.

Artificial agents, whether they are virtual agents, or physically embodied devices, such as robots, often require interaction and communication

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with humans. This means that however large a challenge the analysis of human interaction may be, communication researchers, psychologists, and others are challenged to new paradigms, where behaviors are not just analyzed, but synthesized, where communication is not just observed, but where algorithms have to be employed to react to such behaviors—in real time. In other words, this is a time where social intelligence needs to be put into code and hardware. It is time to discuss the challenges and pitfalls regarding the interaction of humans and machines with a view to (artificial) social intelligence (ASI) and a time of challenging interdisciplinary research (see Cross, Hortensius, & Wykowska, 2019). Concrete examples of such research will be presented and lacunae in empirical data will be pointed out in the present chapter.

A Bit of History

The concept of artificial intelligence (AI) has a long history. The name was first used at a workshop in 1956 at Dartmouth College, where some of the groundwork for the nascent discipline was laid for the years to follow. There was never a unified goal for AI research. For example, there was, and there is, an interest to make computing more efficient, inspired by human intelligence. AI was deemed necessary to allow the communication of computers with humans, particularly via natural language. Researchers also hoped that AI might even help to better understand human cognition. After some ups and downs in popularity (including the "AI winter"), AI is now, over 60 years later, very much at the center of public attention. At the time of writing, there is hardly a magazine or newspaper that does not discuss the challenges and risks of AI in all spheres of life, from work to leisure, from defense to education. However, AI has changed much over the years, and one of the insights to emerge is that as soon as we want to have machines and humans effectively interacting with each other, intelligence alone, in the sense of logical reasoning and natural language processing, is not enough. As engineers started to create programs with which to converse or robots to interact with, it turned out that we might also need *artificial* ***social*** *intelligence* to allow for effective interactions between machines and humans. This chapter will outline some of the research that relates to ASI and contextualize it in the present volume that deals with communication and interaction between humans.

Although Dautenhahn called already in 1995 for a field with the name ASI (Dautenhahn, 1995), the term did not really catch on. Instead, much of what could be subsumed under ASI can be found in the context of *affective computing* (Picard, 1995) and *social robotics* (see, Hegel, Muhl, Wrede, Hielscher-Fastabend, & Sagerer, 2009). The three terms are not mutually interchangeable. First, their use is partially inconsistent in the literature. Second, there are aspects of each concept that describe unique questions and technologies. There is too little space here to review each of these and try to determine common and unique variance. Suffice it to say that (1) there is considerable overlap between these concepts (see Fig. 8.1), (2)

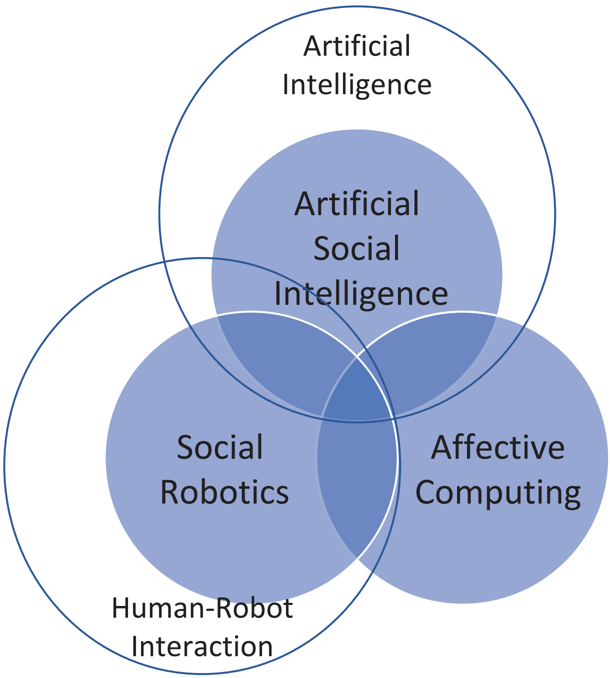

Fig. 8.1 The terms artificial social intelligence, social robotics, and affective computing are distinct but possess considerable overlap

these terms are not used by all authors in an identical fashion, and (3) those interested in artificial social intelligence might find what they are looking for under each of these headings. In the following, there are brief summaries of what these subdisciplines are about and how they relate to ASI.

Affective Computing

The term affective computing was originally introduced in 1995 in a technical report by Rosalind Picard, heavily influenced by Manfred Clynes' concept of Sentics (1977). Picard stated that "[a]ffective computing is a new field, with recent results primarily in the recognition and synthesis of facial expression, and the synthesis of voice inflection. However, these modes are just the tip of the iceberg; a variety of physiological measurements are available which would yield clues to one's hidden affective state" (pp. 14–15). Since then, the concept has found ample application in research and theorizing and has reached maturity as a scientific field with numerous articles and conference presentations, a dedicated journal: *IEEE Transactions on Affective Computing,* and a society: *Association for the Advancement of Affective Computing*. *The Oxford Handbook on Affective Computing* (Calvo, D'Mello, Gratch, & Kappas, 2015) is a good starting point to see the current breadth of issues and methodologies associated with the label Affective Computing. Importantly, nonverbal behavior, whether measured in the human or synthesized in embodied agents is only a subset of the topics currently under study, which also includes topics such as the modeling of emotion generation or brain activity associated with affective states.

Social Robotics

Almost a century after the term *robot* was first introduced by Karel Čapek in his 1920 play "R.U.R. (Rossumovi Univerzální Roboti—Rossum's Universal Robots)," the idea of *social robots* came into play. In 1999, Cynthia Breazeal and Brian Scasselati, two of the pioneers of the field of social robotics, referred to such a system as "to integrate perception, attention, drives, emotions, behavior arbitration, and expressive acts for a robot designed to interact socially with humans" (p. 1146). However, in their work, they preferred the term *sociable robot*. Two decades on, not much has changed regarding what we would expect of a social robot. At the most basic level, a social robot is a robot that can communicate and interact with people and express some form of social behavior, based on some level of social intelligence. However, the term *social behavior* is arguably broad and encompasses many different things. On the technical side, much research has been done on implementing behaviors such as gaze following, joint attention, socially contingent responding, and affective or emotional expression into robotic systems. In many cases, these behaviors are inspired by what is known regarding human social intelligence. Much of the work done by Bilge Mutlu (2009; see Broz, Lehmann, Mutlu, & Nakano, 2015; Ruhland et al., 2015), for example, has focused on the implementation of human gaze behaviors in social robots inspired by nonverbal leakage and the interpretation of intention from gaze behavior. Similarly, Cynthia Breazeal's work (e.g., 2002) has focused on robots' emotional and expressive capabilities and ability to infer human partners' intentions (theory of mind). The technology that allows one to record, store, and analyze nonverbal behavior is constantly developing and likely will open new avenues for the analysis and synthesis of such behavior. For example, Hale, Ward, Buccheri, Oliver, and Hamilton (in press) used high-resolution motion capture in interactants and sampled synchronization of head movement at a rate of 60 hertz. They could establish differences in synchronization, imitation, and mimicry using measures of wavelet coherence that may eventually be implemented in robots and virtual agents. Similar to automatic facial movement assessment (see below), new technologies allow insights into the behavior of humans in interaction that were not possible based on human-coder-based data acquisition based on film and video and should be of interest to researchers in nonverbal behavior even if they are not interested in the interaction of humans and machines.

As social robotics continues to develop, however, a strong secondary focus of research has developed on the human side of human-robot interaction, looking at how people perceive robots and the development of social and emotional relationships with robots. This latter research is more embedded in psychology and communication science than the initial thrust of building social machines. As is the case in affective computing, social robotics shows signs of maturity, such as numerous publications, conferences, and journals (e.g., *Journal of Human-Robot Interaction, International Journal of Social Robotics*).

Some of the major topics currently studied in social robotics relate to nonverbal behavior in the widest sense, but there are also issues, such as the physical embodiment of robots. An excellent summary of current issues in social robotics can be found in Breazeal, Dautenhahn, and Kanda (2016; see also Hegel et al., 2009). Their chapter covers some of the key facets of robot embodiment, social and emotional intelligence, theory of mind, communication, and social responses to social robots.

Social robots have many different applications including education, healthcare/socially assistive robotics, customer service, and entertainment. The first generation of experimental social robots in the new millennium, such as Cynthia Breazeal's Kismet (Breazeal & Scasselati, 1999), or Robovie, developed by Takayuki Kanda's lab (Kanda et al., 2002), were designed with physical and emotional expression in mind. Since then, many other social robots have been developed that have gone beyond the prototype stage and can be bought by developers, including NAO and Pepper robots by SoftBank Robotics, Keepon, RUBI-Q, iCAT, Furhat, and many more (see Fig. 8.2).

However, at this point in time, the number of people who have interacted in real life with social robots is still relatively small, even if media portrayals are ubiquitous. Particularly, if firsthand experience with such machines is missing, some wonder whether robots might really be perceived as social actors in ongoing interaction and not just a puppet. Yet, empirical evidence would not support such concerns. Nass, Steuer, and Tauber (1994) published an influential paper titled *Computers Are Social Actors*, which concluded that people readily apply social rules and expectations to computers. In fact, many of the works that investigate relationships with technologies such as computers is being expanded to encompass social robotics as well. The extent to which human-robot interaction mimics human-human interaction is a question which is at the core of social robotics. However, despite the initial assumption that endowing robots with social capacities equal to that of humans is the

Fig. 8.2 Pepper (Softbank Robotics) interacting with curious onlookers at a public event

most effective way to facilitate human-robot communication, recent research is beginning to question this idea. Tony Belpaeme and his colleagues have conducted research investigating how a robot displaying social behaviors compares to one without these behaviors in educational scenarios with children (see Kennedy, Baxter, & Belpaeme, 2015; Kennedy, Baxter, Senft, & Belpaeme, 2016). They suggest that robots with social behaviors often lead to equivalent, or at times *worse*, learning outcomes than the robot without these social behaviors—questioning the idea that *social* = *good*. However, the reasons for this discrepancy are still as of yet largely unexplored—are social behaviors distracting? Do they undermine the credibility of the robot as a teacher? Embodiments may be tuned to impressions of competence to the detriment of liking and vice versa (Krumhuber, Hall, Hodgson, & Kappas, 2012). Researchers investigating social behaviors should endeavor to become more aware of these and other potential pitfalls associated with endowing robots with more human-like characteristics.

Another case in which social attributes of robots fail to mimic those of human-human interaction is in the case of robots that make mistakes—sometimes referred to as "faulty robots." Counterintuitively, in many cases, robots who behave in unexpected ways (unusual requests, cheating behavior, refusing requests) are liked more and seen as more lifelike than their flawless counterparts (see Mirnig et al., 2017; Salem, Lakatos, Amirabdollahian, & Dautenhahn, 2015; Short, Hart, Vu, & Scassellati, 2010). One reason for this could be that the unexpected behavior makes the robots seem less predictable, and therefore more human-like and engaging. As interactions with robots continue to become more integrated into society, it is unclear how people's expectations of robot's capabilities will shift, and how this may impact their interactions.

From its conception at the turn of the twenty-first century, social robotics has advanced rapidly, bringing many ideas which once belonged only to the realm of science fiction to reality. However, in order to design robots that interact as fluently with humans as possible, we first need to understand human social intelligence—something which anyone who has ever worked in the social sciences (and the other authors of this book) will attest to is a difficult feat. What at first began as a mostly technical endeavor has thus now expanded to encompass computer scientists, engineers, educators, linguists, psychologists, neuroscientists, and others. As research within and across these fields continue to advance, so does our idea of how a social robot can and should behave.

Proximal and Distal Aspects of Interaction: From Expressions to Culture

In the context of interaction with artificial entities, we can consider as proximal aspects how concrete behaviors, such as facial expressions, or gestures, are assessed or produced. More distal is the social context, relevant for the moderating impact of social categories, group memberships, and rules, as well as culture. There are also aspects that are typically not relevant in interaction between humans, such as whether the interaction partner is alive, whether the interaction partner has a soul, or whether they are sentient, but they do affect how humans interact with machines.

Expressive Behavior in the Context of Artificial Social Intelligence

Throughout this volume, there are numerous examples documenting the importance of nonverbal behavior for interaction. Nonverbal behavior does not simply co-occur with verbal communication, it serves a variety of functions and it is not redundant with verbal content. Affective computing, social robotics, and related fields emphasize this importance, based on scientific evidence and on folk theories and intuition. Arguably, the biggest influence, when it comes to the representation of research on facial behavior in the public sphere in the last four decades has been the research of Paul Ekman and his colleagues, and, associated with this issue, his neuro-cultural theory of emotions (see Ekman & Cordaro, 2011). Furthermore, Ekman's work contributes to not only theory and research but also the methodological toolbox available to research interested in nonverbal behavior. Specifically, Ekman and colleagues developed the Facial Action Coding System (FACS, an anatomically based objective system that breaks down possible facial actions into separate *action units*; Ekman & Friesen, 1978) and its derivative Emotional Facial Action Coding System (EMFACS; Friesen & Ekman, 1983), Facial Action Coding System for infants and young children (BabyFACS; Oster, 2004), and a variety of versions to objectively assess facial expressive behavior of different primates, as well as dogs, cats, and horses (see http://www.animalfacs.com/). Given the prominence of Ekman in scientific and public media, it is not surprising that engineers interested in assessing affective states, or synthesizing nonverbal behavior, would take his theory and methodological developments as a primary influence. For example, Noldus (2018) describes its software "FaceReader™ as the premier professional software software for the automatic analysis of facial expressions, providing users with an objective assessment of a person's emotions. FaceReader has been trained to classify basic facial expressions: Happy, Sad, Angry, Surprised, Scared, Disgusted. Additionally, FaceReader can recognize a 'neutral' state and analyze 'contempt' as an emotional state. It also calculates Action Units (see above), valence (positivity-negativity of expressions), arousal, gaze direction, head orientation, and personal characteristics such as gender and age." Affectiva Affdex (7 emotions, 20 facial expressions) and Emotient Facet (7 basic emotions, 2 advanced emotions) provide similar services. The problem here is of course that these full-blown patterns are rarely found in the real world, they are also found when there is no convergent physiological arousal, or self-report, or inversely, when there is such self-report of objective experience, these patterns are not reliably found. In other words, the presence of such full-blown patterns is not a reliable indicator of emotional states (e.g., Feldman Barrett, Adolphs, Marsella, Martinez, & Pollak, 2019; see also Fridlund, 2017; Russell, 2017). Not only is the coherence between emotions and facial expressions low (Durán, Reisenzein, & Fernández-Dols, 2017) but between all emotional components (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). The lack of coherence is on the one hand a blow to basic emotion theories (BET) that assume that there are certain states, special or privileged in a way, which can be characterized by a pattern across physiology, expression, behavior, and feeling. On the other hand, it also makes life very difficult when it comes to diagnosing emotions. If there is no clear signature pattern, then what is one to do? For some, subjective experience is the criterion that an emotion is occurring, but it appears difficult to accept the presence of an emotion if there is *nothing* detectable at the level of changes in physiological activation or in expression. As the technological advances in social robotics accelerate, it is easy to be distracted by flashy demonstrations of a robot making faces because they seem so clever. But to be clear, most of the systems that are published and/or shown on mass media do *not* represent what we know about how humans interact with each other, but instead folk theory, or overly simplified theories. Just the fact that it is fun watching a robot smile or wiggle ears, does not mean that this would hold up in extended interactions over time as valid social behaviors. Surely, there is something intriguing about interacting with a machine using facial movements, such as smiling to open the door of a refrigerator (Tsujita & Rekimoto, 2011), or using smiles and frowns to control a little rolling ball (Ulanoff, 2017)—but if we would make the same grimaces the machines require toward human interaction partners, we'd be perceived as somewhat deranged. They are surely not natural. One of the biggest problems in ASI is adherence to simplistic theories of how observable behaviors are linked to emotional and motivational states. Commercial systems and most research applications of "diagnosing" affective states are completely oblivious of social context and social motivations. Here much work needs to be done.

Group Processes

As social robots become pervasive, humans will begin to see robots and other forms of AI as comprising distinct groups themselves. Humans are prone to categorizing others in their social world automatically, and the typical result of such categorization is in-group bias, where in-group members are viewed more favorably than out-group members (Kawakami, Amodio, & Hugenberg, 2017). Thus, such bias against robots poses another challenge to ASI—how can robot communication be optimized to reduce prejudice against robots? Vanman and Kappas (2019) recently reviewed research relevant to this question and discussed some possible paths forward.

First, robots as a group may be viewed as threatening because they could potentially replace human workers and are often portrayed in the media as poised to take over the world. Another potential threat is that the presence of robots threatens our distinctiveness as humans (Ferrari, Paladino, & Jetten, 2016). This is especially true, the more the boundary between human and robot appearance is blurred. If we are not able to distinguish who is a human and who is a robot, humans could lose their uniqueness and thus suffer existential worry. Moreover, the physical appearance of the robot may be less critical to the threat to distinctiveness than is the perception that robots have a mind and can act autonomously (Gray & Wegner, 2012; Złotowski, Yogeeswaran, & Bartneck, 2017). Any of these perceived intergroup threats is likely to induce anxiety when people interact with robots.

Second, humans are also capable of showing positive emotions toward robots, including feelings of sympathy and empathy. In film, robotic characters such as Star Wars' R2-D2 and C-3PO or Disney's eponymous WALL-E have entranced audiences as they engaged in dangerous missions and interacted with humans. In the laboratory, adults and children have expressed sympathy for various kinds of robots that appeared to be tortured or had endured other hardships (Ceh & Vanman, 2018; Rosenthal-von der Pütten, Krämer, Hoffmann, Sobieraj, & Eimler, 2013; Sommer et al., 2019). When robots become more human-like, humans will sometimes categorize them as part of the human in-group and afford to them the same in-group empathy they would extend to other humans (Riek, Rabinowitch, Chakrabarti, & Robinson, 2009). Thus, when robots appear to act more autonomously or human-like, they are viewed as more threatening but, rather paradoxically, they are also more likely to cause humans to empathize with them. Indeed, perhaps it is when we feel empathy for more autonomous robots that we are also more threatened by them.

The design of robots and the advancement of ASI can be enhanced if one attends to these intergroup concerns. For example, robots can be recategorized as in-group members by giving them names or assigning them to the same team as the human (Eyssel & Kuchenbrandt, 2012; Kuchenbrandt, Eyssel, Bobinger, & Neufeld, 2013). Acceptance of robots may also depend on planned interventions of intergroup contact, where robots are introduced to humans in controlled settings and the contact is sustained and personalized. Indeed, some preliminary research has demonstrated that mere contact may be sufficient in reducing prejudiced feelings toward robots (Wullenkord, Fraune, Eyssel, & Sabanovic, 2016). Research to date, however, has largely focused on brief, one-off exposures of robots to humans. We do not know much at all about the long-term effects of interacting with social robots. When humans interact with each other, even when they come from different groups, their relationship evolves because both sides change their beliefs and attitudes as they learn about each other. Unless robots are similarly equipped to have an evolving social intelligence, intergroup contact may be thwarted by the resulting one-sidedness of it, where the human is expected to do all the work to bridge the divide.

Culture

Various forms of media, such as the news, films, documentaries, and novels provide a corpus of knowledge about beings that we have not personally encountered (Atwell Seate & Mastro, 2016). For much of the past century, in fact, very few humans have had direct contact with robots, but people still hold several general beliefs about robots, including that they threaten jobs, they can kill without remorse, and they will eventually become so sophisticated they will take over the world and subjugate humans. On the other hand, many fictional films and books have also presented more positive images of robots. How humans integrate this information into their beliefs may be culture specific, as Japanese culture, for example, tends to have more positive fictional examples about robots. In Japan, even those robots that are autonomous are seen as having no bearing on the distinctiveness of humans (Kaplan, 2004). Perhaps more importantly, Japan has viewed robotics as an important driver of its economy, thus attracting more students to engineering and spurring on the use of robots in healthcare and eldercare (MacDorman, Vasudevan, & Ho, 2009). Thus, it is important to acknowledge that cultures may be differentially predisposed to accepting robots as interaction partners from the start (see also Bartneck, Suzuki, Kanda, & Nomura, 2007).

Of course, the cultural rules that govern human-human communication need to be considered when human-computer communication takes place. For example, when a robot gave its opinion in a price judgment task in a laboratory study, German participants preferred the robot that had a more explicit communication style whereas Chinese participants preferred a more implicit communication style (Rau & Ye Li, 2009). Even cultural differences in what is "acceptable" for the interpersonal distance between conversing humans can be found in human-robot interaction. For example, participants with a German cultural background preferred greater distance between themselves and the robot than those with an Arab cultural background, who generally preferred closer interactions (Eresha, Häring, Endrass, Andé, & Obaid, 2013). Still, the number of relevant comparative studies is small and more research is urgently needed on cultural differences in nonverbal behavior as it can be applied to human-robot interactions (Papadopoulos & Koulouglioti, 2018), surely an important facet of artificial social intelligence.

Finally, a large body of research in psychology has found cultural variations in both the expression and recognition of human facial expressions. For example, Ekman and Friesen (1969) described how display rules in a particular culture can amplify or minimize one's facial expressions depending on the cultural norms of the situation (e.g., a funeral or a party). More recently, Crivelli and Fridlund (2018), in a comparison of indigenous societies, have found a diversity of facial expressions and in how people interpret their meaning. Such variation suggests that it would be an error to assume that robots could be designed to express emotions that would be unambiguously understood across cultures. Instead, this research highlights how it will be important to consider how the cultural background of the robot designers affects how the robot expresses emotion or other nonverbal behaviors, as well as the cultural background of the humans who will be interacting with the robot. If, instead, these findings are ignored, the culture of the designer might create specific biases (Koda, Rehm, & André, 2008). Cultural diversity thus should be a goal when designing culturally aware artificial systems.

Major Challenges

Only a few years ago, synthetic faces were crude and clearly recognizable as such. Today, it is possible to create offline faces and whole bodies that cannot be distinguished from real humans. These have become a common place in Hollywood to change features of facial morphology from the subtle to the extreme, fix blemishes or remove tattoos, and at times apparently revive actors that died years ago. However, this level of quality is not yet available from consumer devices in real time, but it is obvious that this is just a matter of computing power. It takes only a few years until they will. Already there are Augmented Reality features in entertainment contexts that add hats, glasses, or moustaches for chats and fit them dynamically to a moving head on handheld devices. It is very plausible that dynamic modifications of nonverbal displays can be achieved realistically in real time. Imagine real-time amplification or attenuation of nonverbal behavior to correct for personality differences or cultural context directly added in your mobile device. Selective filtering of affective content is already a reality in social media in the form of text (a controversial example is the study by Kramer, Guillory, Jeffrey, & Hancock, 2014)—the step to nonverbal filtering is not far. The major challenge here is not technical, but it is theoretical—oftentimes we do not know what the proper rules would be. But perhaps we would not need to know what the rules would be. Welcome to the theory-free world of machine learning! Of course, aided by massive data sets and the power of machine learning, filters could be created that allow online modulation of nonverbal behavior to adjust to typical parameters, such as a function of age, gender, culture. A brave new world with much potential for abuse. Already, so-called *Deepfake* systems exist that create synthetic videos of talking heads, based on deep learning techniques (Hsu, 2019). Thus, given enough data, it is already today possible to create a realistic-looking video of a person stating things the person never said. As of the time of writing, there are no cases of Deepfake emotional expressions systematically grafted onto videos, but it cannot be far. Then it would be easily possible to "correct" nonverbal expressions of public figures in film clips so that they show the "appropriate" level of excitement, the "adequate" level of concern, and the "right" level of sadness. We are already used to consume public figures made up with cosmetics, false hair, and teeth. Print media, including advertising, include regularly manipulated images. So the step to dynamic modification of nonverbal behavior is conceptually not that far away. What will happen when people have no way to know what is real and what is fake? Chances are that there will be a bias in that people will believe that they can in fact detect what has been doctored with (Ekman & O'Sullivan, 1991). The social implications of such modifications are considerable and merit an open discussion.

In a more positive vein, there are also ideas to use *Augmented Reality* to provide visual labels alongside faces or bodies that would highlight the potential meaning for those who might have difficulties perceiving and interpreting nonverbal behavior. For example, users could wear glasses that project such labels, or receive comments via some audio cue. Perhaps even some tactile cues, such as a smart watch, might give: "your interaction partner is stressed." Here too, the challenge is conceptual. All too often the labels refer to whether patterns of expression fit stereotypes. It bears repeating that not everybody who smiles is happy. Even if expensive high-tech tools suggest to their users that such detection is possible, it is not. Even if a system might be better at picking up on co-activation of certain muscles, or dynamic features, at present, *there is no reliable detection of "genuine" versus "fake" expressions*, just as the detection of deception in the real world is not possible, based on existing, published, and replicated science. Suddenly, technology to detect affective and motivational states is of great interest for companies and governmental agencies alike. This means that money is spent where interest in nonverbal behavior used to be only peripheral, but it is also an environment where competition for significant research money and income changes the climate among researchers as well as public discourse. Ethics and open science become more important than ever under conditions where a formula describing behavior or a few lines of code decide who gets a job, whose insurance company pays, or who gets sentenced.

Future Outlook

As *big data* approaches become more common, including in nonverbal behavior research, it is quite likely that realistic-looking virtual agents and social robots will become commonplace that look convincing because they do what humans might do and not because of what theorists tell them what they think they should do. The question is how critical contexts really are for the perception of such expressions.

Chances are that artificial systems will in some cases supersede the social intelligence of humans. For example, in pain perception, artificial systems have been shown to be better than humans in distinguishing real from fake expressions (see, D'Mello, Kappas, & Gratch, 2018). What ethical issues will we have to come to terms with? Social robots feel alive, users want to share intimate details with them—so what legal status are we going to give to such robots? Will such robots have rights?

While there is reason to believe that ASI will be able to help individuals who cannot interpret social behavior well via training, or by creating an ever-present service *translating* what others may mean or imply—could that affect social intelligence at large? If mathematical skills went down when pocket calculators were widely available, what about social skills if we all could be augmented?

Some of these issues sound like science fiction, and they might not become fully relevant in the next decade or two, but they should be of interest for any current researcher in social intelligence today. Some of the methods raised here, as well as some of the applications, will move in the very near future into the day-to-day business of researchers interested in social intelligence.

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9

Reading Faces: Ability to Recognise True and False Emotion

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Introduction

Emotions often have an opportunity to "become involved" in our relations with others and to determine the structure, characteristics, goals, and dynamics of those relations. Sometimes emotions enable us to feel a strong connection and closeness with others, but other times, they lead to remoteness and division (Ekman, 2003). Even when several of us experience the same emotions, especially primary ones, our emotional

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experiences are at the same time both universal and individually different (Ekman, 1982, 1984, 2003, 2016; Izard, 1990; Wallbott & Scherer, 1986).

Emotions make up a framework in which we view, review, and evaluate our relations and communications, and in which we try to guess and understand our own and other people's emotional states during interaction (Chovil, 1991; Ekman & Friesen, 2003; Frijda & Mesquita, 1994; Malatesta & Wilson, 1988). Observational experience with one's own emotions can be a significant prerequisite of accurate observation and understanding of other people's emotions, which can make us more socially adaptable and adequate. They also can make our relations with other people more predictable and stable (Eibl-Eibesfeldt, 1989; Ekman, 1992; Hochschild, 1983; Keltner, 2004).

The empirically proven connection between inner emotional states and their external manifestations indicates a high informational value of facial expressions and their important role in the exchange of emotions (Ekman, 2003; Kostić, 2014; Kostić & Chadee, 2015; Matsumoto & Hwang, 2011). This fact initiates significant questions on the inborn or acquired ability of the observer to accurately register and decipher presented emotions, thus making a clear distinction between the facial signals of spontaneously experienced emotions, on the one hand, and simulated emotions, on the other (Kostić, 1995).

In most social interactions, the human face is the most revealed and the most available region for our conversational partner to look at. In accordance with its rich expressive and communicative potentials, which are built by combining influences of biological and social factors, the human face attracts the attention of those who interact. It has an irreplaceable role in people's social life (Buck, 1988; Ekman, 1982; Frijda & Mesquita, 1994; Tomkins, 1962, 1963).

By emitting facial signals, social interaction is established and regulated (Chovil, 1991; Fridlund et al., 1990), whereby information, emotions, interpersonal attitudes, and influences are exchanged. In face-to-face interaction, when the participants can use both verbal and non-verbal modes of communication, emotions are more often guessed on the basis of non-verbal signals than on the basis of what is said, which is usually consciously controlled, unlike non-verbal means.

Ekman and Friesen (2003) emphasise that the human face is a complex system which uses different categories of facial signals (static and slow, artificial and rapid). These categories enable the face to send diverse messages—about gender, age, health, interpersonal attitudes, and emotions (Harper, Wiens, & Matarazzo, 1978; Knapp, Hall, & Horgan, 2014; Pantic & Bartlett, 2007). Our interest in this chapter is especially in moving faces, that is, rapid, dynamic facial signals that convey a conversational partner's emotions, and which those who interact try to bring into connection with the inner state of an individual. Unwilling and spontaneous emitting of these signals has an informative function, and willing emitting of the signals has a communicative one (Ekman, 1997; Kostić, 2014).

Because each participant in an interaction understands that the interlocutor's emotions influence the course, outcome, and quality of an interaction (Keltner, 2004), external signs of both positive and negative emotional states of the conversational partner represent equally precious social information that he/she tries to perceive, decipher, and understand in the right (accurate) way (Darwin, 1998; Ekman, 1993; Keltner & Ekman, 2000; Rosenberg & Ekman, 1994). This means that all who tend to establish efficient and fruitful social interactions have to be *sensitive* enough to notice visible signs of emotions on the faces of their conversational partners (Keltner & Kring, 1998). Do the participants of the interaction manage to accurately decipher the observed facial behaviours that are connected to sincere or false emotions of the conversational partner, and are there factors which disturb the process of interpretation of facial behaviours?

If the facial expressions of spontaneously experienced primary emotions have an evolutionary base (Ekman, 1993; Fridlund, 1994) and if they are universal (Ekman, Sorenson, & Friesen, 1969; Izard, 1971, 1990; Kostić, 1995) and independent of any differences that exist among people (Ekman, 1984; Lazarus, 1991; Levenson, 1992; Levenson, Ekman, & Friesen, 1990), is the ability for accurate interpretation of observed expressions also inborn? If the answer is affirmative, then, perhaps, a successful distinction between true and false expressions of emotions is not such a difficult task.

Deciphering Facial Expressions of Emotions: Easy or Difficult Task?

In what circumstances can the accurate deciphering of facial expressions of emotions be questioned? Can it become a complex and difficult task? The answer probably depends on certain characteristics of the observer, characteristics of the observed individual, and the conditions under which they meet (Ekman & Friesen, 2003). Besides the observer's interactive competence, and social and emotional intelligence (Salovey & Mayer, 1990), also significant is his/her early affective experiences (Bowlby, 1980), motives (Ekman & O'Sullivan, 1991), intrinsic interest in his/her conversational partner, profession, observational experience with his or her own emotions, and his culture background. The observed individual, on the other hand, can differ depending on his/her established individual emotional profile determined by antecedents of emotions, the speed of experiencing and expressing emotions, their intensity, duration, and the style of expression of an individual (Ekman, 2003).

Early Affective Experiences

Having taken into consideration the hard empirical evidence of universality, Ekman (2003) claimed that anyone who spontaneously experienced a certain primary emotion did not need to learn the way (how) to express it facially. Although he was not completely sure, Ekman (2003) believed that the ability of humans to accurately decipher facial signs of emotions was biologically determined. He also mentioned the possibility that the deciphering of facial behaviours connected to emotions was learned in early childhood, during which, among other things, "the preset instructions may be damaged or destroyed by severely disturbed early experience" (Ekman, 2003, p. 219).

In his evolution-ethological theory about the origin and development of human sensitivity, Bowlby (1982) pointed out the significance of the specific relationship between the mother and the child, which is formed in early childhood, and is maintained throughout the whole life, as a dominant and consistent style of behaviour and interactive functioning of an individual. Early experiences and established patterns of affective attachment will be important for further development and formation of one's personality, and for its capacity to maintain behavioural and affective regulation (Stefanović Stanojević, 2014). In this sense, the *Theory of affective attachment* (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969), represents a good basis for understanding the capacity for emotional, social, and behavioural adaptiveness and adequacy of an individual.

What can ruin and jeopardise the inborn capacities of successful deciphering of the facial expressions of emotions during early childhood (Niedenthal, Brauer, Robin, & Innes-Ker, 2002)? To begin with, one factor is inadequate communication with a significant figure—the mother who is cold, distant, unreliable, not responsive enough, and who does not understand her baby's signals (Bartholomew, 1990; Cooper, Shaver, & Collins, 1998; Kobak & Sceery, 1988; Main & Weston, 1981; Masten & Palmer, 2019; Mikulincer & Florian, 1998; Rholes, Simpson, & Orina, 1999; Simpson, Rholes, & Nelligan, 1992; Sroufe & Waters, 1977; Stefanović Stanojević, Kostić, Steele, & Nedeljković, 2019). During the first months of life, daily interactive experiences with the mother build one's inner representation of the self as a being who deserves care, attention, and the mother's love. During this period, the child builds a positive model of himself/herself. Contrary to that, the negative inner model of the self comes from the experienced that a child is a being who does not receive attention from his/her mother because they are not worthy. According to the quality of the interaction, a positive idea is formed of the mother who is present, available, and who can recognise her child's signals. Thus, the inner representation of the mother is negative. The positive inner representations of the self and the mother reflect generalised expectations of the child about the positive functioning of the given affective relation in different situations, that is, about what the child can expect as a form of his/her own behaviour and the anticipated mother's response. Based on this, the child feels secure and has full trust in other people. In contrast, with negative inner models of the self and the mother, a child becomes insecure and does not believe that he/she will be protected and satisfied. Models are mostly complementary; they remain throughout adulthood and have influence on one's relations with other people. Within the concept of affective attachment, a classification of individual differences has been made: the pattern of secure affective attachment, the pattern of avoidant affective attachment, and the pattern of ambivalent affective attachment (Ainsworth et al., 1978). Main also added the fourth pattern of "disorganised/disoriented" to this classification (Main & Solomon, 1986).

According to the theory of affective attachment (Ainsworth et al., 1978; Bowlby, 1969), certain strategies that the child builds and uses in his/her communication with an inadequate caregiver can compromise the child's inborn capacity for accurate identification of emotions. A child who notices on a caregiver's face the emotions that frighten or confuse him/her, and with which he/she cannot deal, does not recognise these emotions in order to protect himself/herself. Early-acquired strategies of self-protection can block or jeopardise the level of success in recognising facial expressions of emotions in adulthood as well.

This has been shown by the results of the research of relations between the recognition of emotion and adult attachment, on the population of students in Serbia (Stefanović Stanojević et al., 2019). The assumption on the differences in the accuracy of recognising emotions has been confirmed in students who belong to different patterns of affective attachment. The subjects who belonged to the secure affective pattern were more successful in identifying facial expressions of primary emotions in relation to the subjects who belonged to the insecure pattern (disorganised, preoccupied, and avoidant). It turned out that one of the important conditions that enables a successful interpretation of facial expressions of primary emotions (anger, contempt, disgust, fear, happiness, sadness, surprise) is the pattern of secure affective attachment. On the contrary, a high level of anxiety and avoidance in respondents disrupted the accuracy of observing basic emotions because their inner working models of the self and the others were more negative, and, therefore, the probability of their accurately recognising emotions was smaller.

Respondents with insecure patterns show higher scores on dimensions of anxiety and avoidance, affecting formation of a stable and integrated image of the self and maintenance of level of self-esteem (Kohut & Wolf, 1978; Stefanović Stanojević et al., 2019). Although similar to the problem of self-cohesion that occurs with those respondents with the high scores on the aforementioned dimensions, Mikulincer and Shaver (2007) believe that they use different secondary strategies which reflect negatively on the accuracy of observing emotions in both of these groups. Those with a higher level of anxiety more often choose hyper-activating strategies, which contribute to even higher insecurity in one's self and the existing capacities, with increased doubt that they will be rejected socially. This high anxiety and insecurity lead to disorientation in observing social entities and expressions of emotions, especially the negative ones. That is why these subjects are not successful in recognising emotions (such as sadness, anger and contempt, disgust, happiness, fear, surprise) (Stefanović Stanojević et al., 2019).

Different secondary strategies, deactivating strategies, are used by individuals who have attained a high score on the dimension of avoidance. Such individuals are narcissistic, self-sufficient, non-emphatic, and defensive. They try to remove their fears of rejection by focusing on themselves and on their lack of interest in other people. A defensive, pseudo-positive image of oneself and a negative image of others reduce their need to observe other people and to decipher facial expressions of their emotional states, which is quite obvious in their unsuccessful interpretations of other people's emotions.

Lying About Emotions

> *We are neither transparent as the infant nor perfectly disguised. We can lie or be truthful, spot deceit or miss it, be misled or know the truth. We have a choice, that is our nature.* (Paul Ekman, *Telling Lies*, 2009b, p. 364)

Besides the signs of spontaneously experienced emotions on the individual's face, there are also signs of emotions which that individual has not yet experienced. There are also more complex situations, in which the signs of both experienced and non-experienced emotions occur simultaneously (Ekman, 2009b). The unwilling expressions of emotions are the result of changes in the neuromuscular activity. The willing, deceptive, facial expressions are the product of an individual's conscious intention to show what, in fact, one does not feel. The reasons for the occurrence of facial signs of a simulated emotion can be very different. Sometimes they are entirely personal and connected to the motives and interests of an individual, and sometimes they come from the demands of the culture in which he/she lives. Although the functions of true and simulated facial expressions are completely different (i.e., informative, opposite to communicative), facial signs can be very similar, and sometimes they hardly can be distinguished (Ekman, 1997, 2009b). Failure to differentiate between the aforementioned categories of facial signs can aggravate the accurate observation and understanding of emotions, which can lead to negative interactive outcomes. The participant of the interaction who is not able to make a clear distinction between true and false facial expressions of emotions brings into question the structure and the quality of communication because he/she becomes interactively inadequate.

In most public situations, each culture usually tends to control, to a certain extent, the expressions of emotions of its members, especially when it comes to negative emotions. Members of a particular culture learn which emotion, and its intensity, is appropriate and which is inappropriate for expression in a situation (i.e., feeling rules, Hochschild, 1983). At the same time, each socialised member of a certain culture knows to whom he/she is allowed or not allowed to show emotion expressions. Culture-specific social norms guide members of that culture to hide signs of undesirable emotions, to weaken or strengthen their intensity, and to mask or block the visible signs of what they have felt. The norms are learned during childhood, and they become habits that are automatically applied and have been labelled as "display rules" of emotions (Ekman & Friesen, 1969). In what ways do the "display rules" change facial expression?

Signs of Hiding or Falsifying Emotions

In his book *Telling Lies* (2009b), Ekman states that the results of his multi-year research on facial behaviour and lying suggest two groups of signs that indicate lying through hiding or falsifying of an emotion. The first group of signs includes micro-expressions, squelched expressions, and muscle reflexes such as blinking, dilated pupils, redness, and paleness.

Such reflexes are not under the control of the will and are, therefore, good indicators of possible false expressions. The second group encompasses asymmetry, inconsistent duration, inconsistent location, and a false smile. One group of signs can point to an emotion that an individual has experienced and tried to hide, and another group tells us that an individual struggles to inhibit or mask the emotion he/she has experienced, although the observer is not clear as to what emotion it is. The latter group of signs is undoubtedly connected to a simulated unexperienced emotion.

There are many situations in which people tend not to express an "inappropriate" but still experienced emotion, investing all their effort in replacing and masking it with some other "more appropriate" one, which, in fact, they have not experienced. As we can see, the facial expression can be unwilling and true, but also willing and false. How can people manage to willingly control what appears automatically and unwillingly on their faces when they feel a certain emotion? Due to social acquisition and knowledge of the valid norms of the expression of emotions, an individual consciously tends to modify his/her facial expression and coordinate it with the appropriate social situation.

In an established hierarchy with defined status differences and superior and subordinate participants, the communication of subordinate individuals is inhibited displaying a lower level of openness and freedom. Let us imagine the moment in which a student is facing the fact that he/she has not passed an exam. He/she feels anger because he/she thinks that the professor was not objective and fair. The emotion of anger is awakened and nerve impulses automatically and unstoppably reach the facial muscles. The student could perhaps prevent those movements of his/her body that show the professor that he/she is angry, but he/she cannot prevent the activity of facial muscles which pull down the eyebrows, cause the tension in the lower eyelid, dilated nostrils, or tight lips. As a result of the acquired behaviour towards authority, the student can try to supress or mask the angry expression on his/her face by adding some other facial movements, such as stretching the lips into a smile. As a result of the easiness with which it is performed (only one muscle is activated—the zygomaticus major), a smile is often used as a mask to hide the negative emotion, but the presence of signs of the experienced negative emotion and the unexperienced positive emotion provoke doubt in the conversational partner and perplexes him/her (Kostić, 2014).

Contrary to the need to hide an experienced but inappropriate emotion, there can be an interest in showing a certain unexperienced emotion, that is, in falsifying the existence of that emotion. Let us assume that a girl received an expensive gift in a luxurious package that has not made her feel joyous at all. She is astonished because the gift made her feel indifferent. She quickly concludes that the gift-giver does not reflect a refined taste, does not understand her needs, loves kitsch, and likes to emphasise his material wealth. She knows that it would be inappropriate not to be delighted. Therefore, she expresses joyous surprise, with fake laughter, loudly and for too long, thus rolling her eyes and forcefully lifting her eyebrows, pronouncing several meaningless sentences, including, among other things, that "she cannot believe that she has received exactly what she has wanted for so many years". It cannot be denied that she was full of good intentions. She did not want to openly hurt the person who had brought her a gift, so she felt the need to show an emotion that she did not feel. According to what she was taught, she should have shown both joy and gratitude. In order for all that to be more convincing, her reaction had to be more intensive. Any careful observer in this situation could have revealed that there was no genuine excitement. The girl tried to act out joyfulness, and on her face there appeared a configuration of features that only seemed to reflect expression of experienced joy. Willing, intentional movements of her facial muscles only looked like the movements of a joyous person. They were not the same.

In both situations, these individuals tried to *hide* or *falsify* their true feelings. They consciously aimed to deceive their conversational partner and lead him/her down the wrong path. The success of their lie directly depended on their ability to willingly control their facial muscles, to hide the presence of the revealing signs of true feelings, or to try to convincingly act out the emotion they had not actually experienced. In his book *Telling Lies*, Ekman (2009b) points out that lying is an integral part of social life and that it is hard to believe that there is someone who has never done it. Among those who "practise" lying, there are significant individual differences when it comes to frequency and success of lying. A small number of individuals can be labelled as perfectly controlled and as very talented liars, while there are many more of those who are not, nor can they become. Still, from an early childhood, children are faced with the demands of adults to manage the expression of their emotions through hiding and falsifying emotions, strengthening or weakening the expressed emotions. Most people are more or less willing to meet these demands and to practise deceiving others (Ekman, 2009b). Due to the demands of their environment, people gain certain experience in coding fake facial expressions, but despite their self-confidence, they do not seem trained enough to decode them. Certain researchers examined the connection between one's confidence in one's own ability to discover lies and one's achieved success in detecting the signs of lying (Hartwig, Granhag, Strömwall, & Vrij, 2004; Strömwall & Granhag, 2003; Vrij & Baxter, 1999). The correlations were mostly low. Those individuals who were overly convinced that they were able to discover the hints of deceiving just by observing someone's behaviour did not achieve significantly higher scores than those people who did not have such confidence.

Motives—Professional Interests to Discover a Lie

Numerous researchers have tried to answer the question of whether people are able to reveal the signs of deception by observing someone's behaviour (DePaulo, 1994; DePaulo & Pfeifer, 1986; DePaulo, Stone, & Lassiter, 1985; Ekman & Friesen, 1974; Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999; Zuckerman & Driver, 1985). The results did not indicate high skills of the observer.

Based on her own research in this field, DePaulo (1994) states that respondents mostly believe what they see or hear in presented video materials. In these studies, the respondents had the task to estimate who behaved sincerely and who lied and to what extent. Although the stimulus material included an equal number of true and false video messages, the respondents believed that there were more truthful messages than false ones. They were also more prone to believe in the truthfulness of expressed feelings towards an individual, as well as the validity of stated preferences. However, they managed to perceive, to a certain extent, some differences between truthful and false statements of the stimulus individuals by estimating that false messages are more deceptive than true ones and less truthful than sincere ones. They were misled by false expressions and became convinced that the sincere individuals were the ones who were actually lying. The respondents did not manage to reveal facial signs testifying about the experienced emotion.

Toris and DePaulo (1984) also found that warnings about potential lies during an interview do not increase success in discrimination between truth and lie. The observers did not manage to see the difference between interviewed conversational partners who were sincere and those who were not. The individuals who had the assignment to lie were not perceived by observers as greater deceivers than were individuals who behaved sincerely. By examining gender differences in the ability to discover deception, researchers (DePaulo, 1994; Rosenthal & DePaulo, 1979) found that men were less prone to believe in the truthfulness of what they observed, and they thought that it was exaggerated, while women were convinced that the reaction was sincere. There were no significant gender differences in the ability of discriminating between the truth and the lie. The respondents of both genders perceived those who were insincere only as less reliable.

Ekman (2009b) analysed the results of the aforementioned studies in which the number of accurate evaluations was almost identical to the number of random guesses. He believed that there were reasons which led to these results, the first being the lack of intense emotional excitement in those who lied. A liar who expects great gain in case his/her lie "works", that is, great punishment in case the lie is discovered, is usually very excited about the actual act of lying and the uncertainty of the outcome.

During the process of lying, he/she can experience different feelings—the fear that his/her lie will be discovered and the feeling of guilt and exaltation that he/she has managed to deceive someone. If any of the awaken feelings is strong, it is very hard to control facial expression (Ekman & Frank, 1993). The face will reveal "treacherous" indicators of what is happening inside and what the liar has to hide or falsify. If those who lie are not motivated enough by expected gains or punishments, which, in turn, lowers their excitement, they will not have problems because there will be no signs of emotions with which they will have to do something. This explanation sounds logical, because it is in accordance with the results of another research (DePaulo & Kirkendol, 1989) in which liars were highly motivated to be successful. They experienced strong emotions which were supposed to be hidden or falsified, so there were a lot of signs of deception on their faces, which the observers could have easily noticed.

Ekman states another significant explanation of the obtained. Namely, it is possible that the observers were not successful enough in discovering the lies because the facial behaviours of the individuals who were given directions to lie, that is, to behave sincerely, did not differ enough. Most researchers did not do the analysis of the recorded facial behaviour of individuals who were given the task to lie, so the experimenters did not know how many signs of deception actually there were on the individuals' faces. This was corrected in the research by Ekman and O'Sullivan (1991), in which the researchers conducted the analysis of the recorded material with the use of the measuring instrument Facial Action Coding System (FACS) (Ekman & Friesen, 1978).

By examining the ability of discovering the signs of deception in people who are in charge of law enforcement and highly motivated to discover the truth, and in psychiatrists, students, and other employees, Ekman and O'Sullivan (1991) state that only the Secret Service agents were significantly more accurate than others. The presented video material represented recordings of ten individuals who either lied or told the truth. The selected recordings were not particularly significant for respondents' occupations.

When the whole sample is considered, the research did not find significant correlations between accuracy of evaluation and gender, age, and professional experience of respondents. However, with those who were the best evaluators and who achieved the accuracy of 80% or higher (Secret Service and Federal polygraphers), it was concluded that age was negatively correlated with the ability to discover deception. Those who achieved the highest accuracy were under 40 years of age.

The study by Ekman and O'Sullivan (1991) provided evidence that some respondents, especially those who were highly motivated by their occupations, were capable of "catching" a lie, while they relied on both non-verbal and verbal signs, showing pronounced sensitivity for noticing and deciphering subtle facial expressions.

Eight years after the aforementioned research, in the article "A Few Can Catch a Liar", Ekman, O'Sullivan, and Frank (1999) revealed the results of their new study. The respondents were members of three professional groups: two groups which included individuals who work at different law enforcement institutions and a group of clinical psychologists. What was common for these respondents was the professional motivation to successfully differentiate signs of insincere from sincere behaviour. Non-verbal sensitivity, experience, and training surely represented a significant basis for successful accomplishment of their job. When they evaluated the video recordings of individuals who spoke only the truth or who lied, the members of these professional groups achieved very high accuracy. The research showed that the members of the examined groups were capable of spotting very accurately the hints of deception and differentiate them from the elements of sincere behaviour, during the first showing of the presented video recordings in real time, without pausing, slowing down, or rewinding. This was the confirmation of earlier findings about the superior ability of agents employed at the Secret Service (Ekman & O'Sullivan, 1991). The sample of examined agents which was used at the time was small, and the researchers could not allow for wide generalisations. Moreover, there were many respondents within different groups who were unable to differentiate true from false behaviour.

Rehm and Andre (2005) also confirmed that respondents often do not know when other people are lying to them. This time, any artificial scenario was avoided. The offered scenario looked like a simulated natural social interaction and informal communication. The researchers allowed the respondents to act spontaneously, and they were not given instructions for what they should look at and what to notice during their face-to-face interaction. It turned out that when occupied with the conversation with the people opposite them, the respondents disregarded facial signs of deceit by not paying attention to what was happening on the face. There were a lot of obvious signs of deception—inconsistency between facial behaviour and the verbal framework of the conversation, facial expression asymmetry, false smiles, and subtle expressions that the respondents did not manage to notice and decipher.

Micro-expressions that last less than a quarter of a second and that appear suddenly are the biggest problem for the observer. Although all the elements of experienced emotion are present in these expressions, the observer usually misses them because of their rapidity. Hiding or attempting to superimpose on to a micro-expression with another emotion, especially unexperienced and inconsistent with the particular situation, makes the situation even more complicated.

Mladenov (2016) tested the differences in the accuracy of spotting facial micro-expressions of primary emotions in relation to the professions of the assessors, which were dominantly directed at the work with people or with objects. The research made use of a set of 14 photographs that showed weak or controlled expressions of emotions of a single stimulus person (Ekman, 2003) and that were presented to the respondents for 60 milliseconds and provided the effect of micro-expressions. It was determined that the respondents oriented towards work with people spotted the emotions, on average, more accurately than did the respondents dominantly oriented towards work with objects. Thus it can be concluded that frequent direct communication with people is an important condition for a more successful recognition of facial expressions of emotions. People who work in healthcare recognised more accurately primary emotions than did laboratory technicians, IT engineers, engineers of technology, and blue-collar workers who dominantly use objects in their professions.

The scenario of presenting attitudes that are completely opposite to what the respondent may have imagined was used in unpublished research for a master's thesis (Stamenković, 2016) on a sample of students from Serbia in 2016. With the help of the FACS (Facial Action Coding System, Ekman & Friesen, 1978), the analysis of the recorded facial behaviour of the respondents in two situations was done: when they present their attitudes honestly and when they lie about their attitudes. The results of this research showed differences in facial behaviour of respondents in the two aforementioned situations. In the situation of lying, there were signs on the respondents' faces of suppressing and falsifying emotions, which testified to their dishonest behaviour. The following facial indicators of false behaviour were established: micro-expressions, repressed expressions, false smiles, the asymmetry of the action of facial muscles, incongruity of the place in relation to verbal behaviour, more intensive movements of the head, neck, and look direction. There were no significant gender differences in facial behaviour of men and women in the situation of presenting attitudes dishonestly. When the ability of the new group of respondents to spot the signs of lying on the faces of the respondents who were presenting false attitudes was tested, it was at the level of random guesses.

Another unpublished research which was conducted for the master's thesis (Savić, 2014) utilised a sample of Serbian students. The main aim of this research was to test the hypothesis that in the presence of authority, the respondents would be insincerely laughing at jokes which they did not find funny, even at the jokes that are considered to be completely meaningless. The research was conducted in the following way: the person who could, according to his/her position, be the authority and who could exert social pressure showed the respondents a series of jokes, while their facial reactions were recorded by a hidden video camera. While the person who was the authority for the respondents was telling them jokes that were not funny at all, they reacted with "false", dishonest smiles. The false smile was asymmetric, without the equal activation of facial muscles on the left and the right sides of the face relative to the vertical axis, without wrinkles in the area around the outer eye angles, and without the appropriate duration (Frank, Ekman, & Friesen, 1993). The facial configuration of a false smile, which was voluntarily and consciously simulated, was completely different from the configuration of the honest smile—when the respondents were told really funny jokes (Ekman, Davidson, & Friesen, 1990; Frank & Ekman, 1993). The respondents' dishonest smiling, when they were told jokes that did not contain enough humorous elements, occurred just because they thought they were expected to laugh in a particular situation (i.e., the respondents experienced social pressure).

Video recordings of true and false smiles, which were obtained in the aforementioned research, were shown to another group of respondents. Their task was to tell the difference between these two categories of smiles. Despite clear differences which were determined with the help of FACS

(Facial Action Coding System, Ekman & Friesen, 1978), the respondents did not achieve the expected success.

How to Become a More Successful "Lie Catcher"?

The research results have shown that, in general, people are not very skilful in differentiating between facial expressions of experienced and unexperienced emotions (Ekman, 2009a). At least, they are not as skilful as they believe they are. It turns out that the achieved level of accuracy most often falls slightly above the level of random guessing.

The process of noticing differences between lies and the truth is a complex task that requires careful observation and search for the signs that tell us about deception (Ekman, 2003), as well as the analysis of the level of differentiation of signs, which point to specific information (Ekman, 2009a). The accurate recognition of signs of insincere behaviour is a useful skill because it provides a better understanding of important personal relations and better social adaptation (Kemeney et al., 2012). This is also a very important ability for those who deal with discovering lies professionally.

The difficulty of the task presented to the observer can grow due to several reasons, primarily because of an individually specific emotional profile of the observed person. The observed person can, for instance, be introverted and not expressive enough, can pay much attention to the regulation of his/her facial behaviour in public situations, and can be prone to systematic hiding or falsifying of emotions. The observer has to be able to overcome all of the aforementioned obstacles in order to reach an accurate interpretation of the observed facial behaviour. Individual differences regarding the situations that cause a particular emotion, as well as the differences in the time necessary for an emotion to be awakened and its duration and intensity can in the frequent occurrence of mixed emotions (blends), make the task of deciphering expressions quite difficult. All the controlled, masked, supressed, micro-expressions, and subtle expressions also make this process more complicated. Additionally, early experience of being neglected or abused, as well as the insecure pattern of affective attachment and existing prejudices, negatively affect basic abilities of emotion interpretation.

Similarly, as there is a category of people who are naturally talented and perfectly controlled liars, there is also a category of those who have a very high ability for accurate recognition of false expressions—for example, Secret Service agents (Ekman et al., 1999; Ekman & O'Sullivan, 1991). But we do not know whether it is innate or developed or both.

By considering the possibilities for advancing this ability, Ekman (2004) suggests the procedure of formal training and individual practice of people in order to master efficient ways of discovering facial signs of deception. People should learn to carefully observe faces (Ekman, 2004; Frank & Ekman, 1997) and search for certain categories of facial signs that are clearly different from the visible indicators of a true emotion. Ekman (2009a, 2009b) argues that, by employing training and practice, it is possible to improve the ability of noticing signs that only appear to be the signs of a true emotion, although they are essentially different. Noticing the conflict between the experienced emotion and the tendency of an individual to stop its expression represents a precious experience for the observer as well. By observing the stopping, supressing, masking, and "leaking" of emotions, the observer learns about his/her own inner conflicts (Ekman, 2009a, 2009b).

Besides the aforementioned points, the following ones are also important: the observer's motivation to deal with the results of the conflict between the unwilling experience of emotion and the willing attempt to hide it, the observer's interest in facing the results of the imperfect hiding, the unsuccessful control of a bad simulation of emotion, and placing all that into a certain social context, free from the stereotypes about the recognisable behaviour of liars.

Social Intelligence and Deception

Social intelligence, according to the classic definition by Vernon (1933:44), is the "ability to get along with people in general, social technique or ease in society, knowledge of social matters, susceptibility to stimuli from other members of a group, as well as insight into the temporary moods or underlying personality traits of strangers". Social intelligence facilitates positive behaviour and enhances relationships. The question that this chapter raises relates to the dark side of social intelligence; that is, what is the potential versatility that social intelligence gives to an individual to be deceitful and to control body language inclusive of facial features. Research by Sarzyńska et al. (2017) suggested that persons who were higher in cognitive ability, one dimension of intelligence, were better liars in both quality and effectiveness. Citing the work of Macfarlane, Allen, and Honzik (1954), they postulated a positive relationship between intelligence and deceptive frequency. Their research provides proxy support for the notion of people as socially adaptive beings who are able to negotiate, positively or negatively, for best outcomes, with social intelligence as a core determining factor of success. Trust, as an attribute of social intelligence (Yamagishi, 2001), assists in creating competencies for detecting lying. Carter and Mark Weber (2010) assessed this hypothetical relationship utilising Yamagishi's model. Yamagishi's model (2001: 275) suggests that "high trusters, who take more social risks and are, therefore, more vulnerable to exploitation, obtain more differentiating social data and learn more. In contrast, by defending themselves from possible exploitation, low trusters seem to be suspicious of everyone". The authors found that higher-trusting persons were better lie detectors. They attributed their findings to the relationship between trusting and social intelligence. The authors argued that the greater the trust seeking, the higher the social risk taking and the more intense is the drive to identify anomalies, that is, liars. Thus, high trusting builds an internal sensitivity as a protectivity to avert any detrimental consequence. Is it, therefore, that high trusting, and social intelligence, is associated with a greater sensitivity to access non-verbal cues including facial asymmetrical features?

Further, sensitivity to inconsistency between facial emotion and verbal content can also be appreciated in the context of social intelligence. For example, Wojciechowski, Stolarski, and Matthews (2014) assessed emotional intelligence in the detection of "emotional liars". Referring to Mayer and Salovey (1997), the authors identified important emotional competences associated with detection of emotional lying, including perception, appraisal, and expression of emotion, emotional facilitation of thinking, understanding and analysing emotions, and employing emotional knowledge and reflective regulation of emotion. A fair question to ask is whether more highly emotionally intelligent persons are better at deception than are persons who are lower in emotional intelligence? Porter, ten Brinke, Baker, and Wallace (2011) found that persons higher in emotional intelligence were better able to control their expression of emotions and displayed and maintained more credible deceptive emotions for a longer period of time. However, they were not as efficient in their concealment of emotions as they felt.

As Porter et al. (2011) suggested, individual differences influence discriminatory assessments of truthfulness from falsehood. However, whereas their study found that high emotional intelligence can control emotional expressions that can lead to being deceptive, Baker, ten Brinke, and Porter (2012) found that high emotional intelligence can also result in vulnerability towards being deceived. Their research found that the level of emotionality experience by highly emotionally intelligent persons may have impaired evaluation and decision-making on deception. In fact, these participants were even more confident in their assessment of sincerity of the facial and emotional expressions of deceptive persons. The study suggested that inhibited decision-making may have resulted from increased empathy towards the deceptive pleaders.

Social and emotional intelligence in the identification of truthfulness and falsehood is a double-edged sword. On the one hand, high competencies in these intelligences lead to identification and possible intervention. However, on the other hand, vulnerability can emerge, which can inhibit or distort the discernment of truth from falsehood. Even a well-intended highly socially and emotionally person may be duped.

It is hard to imagine any social interaction, especially the ones we care about, which does not offer the possibility of exchanging true and false feelings, as well as their combinations. The constant change of different facial signs that we are trying to "catch" and understand or, on the other hand, ignore and push away, is encouraging us to test our abilities for deciphering or quitting such a task. Our skill sets to identify truth from falsehood, in facial appearance, allow us to intelligently interact and function adapting to our constantly changing social environment.

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10

Hidden Tears and Scrambled Joy: On the Adaptive Costs of Unguarded Nonverbal Social Signals

Dennis Küster

Highlights

- *Basic* or *discrete emotions theory* has overestimated the role and accuracy of human receivers in understanding real-life nonverbal behavior.
- Human nonverbal emotional signaling is finely tuned to its *evolutionary context*, which involved ample need for reliable as well as deceptive signaling of emotions to conspecifics.
- Costs of nonverbal signaling of emotions are likely to play a key role at a very young age, and infants are preadapted for social interaction well before there could be any culturally overlearned *display rules*.
- Contrary to classic views of *display rules*, human nonverbal signaling of emotions may have evolved to support mechanisms for flexible coupling and decoupling between subjective feelings and emotional displays.

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- Emotional tears and infant crying may represent examples of "honest" biological signals that could reflect self-imposed *biological handicaps*.
- Future research should aim to identify evidence of *socially intelligent signaling* that considers possible adaptive tradeoffs for senders as well as receivers.

Social Intelligence, as defined by Sternberg and Kostic (this volume), equally concerns senders and receivers. However, discussions about the potential benefits of social intelligence often tend to focus first on the perspective of the recipients of nonverbal communication. In general, it is assumed that a socially intelligent individual should be adept at perceiving and understanding what others think or feel. This understanding should, in turn, be strongly associated with the receiver's expertise in managing an interaction. Thus, while any discussion of nonverbal interaction will have to consider both sides, it often appears to be simpler to begin the discussion of this complex interactive loop from the perspective of the recipient. Likewise, it is often easier to obtain convincingly controlled experimental data on how participants perceive different types of nonverbal cues than it is to conduct well-controlled studies in which naïve subjects systematically change their natural nonverbal signaling behavior. It is therefore not surprising that much of the attention of research on emotional nonverbal behavior has gravitated toward attempts to analyze and improve social intelligence by first examining a receiver's ability to perceive what a speaker is (really) feeling.

Nevertheless, this raises the question if we might not be overlooking something important by keeping most of our attention focused on receiver abilities. What are the motivations for senders to be cooperative in this process at all? Is what appears to be "poor" or inconsistent signaling quality merely a sign of poor sender abilities or is it an indication that we are dealing with a liar? Instead, I argue that some level of guarding of social signals may often be an indication of social intelligence. No matter what may be the final answer, a better theoretical understanding of sender motivations, or their underlying social and evolutionary context, may help to shed more light on the complex processes involved in emotional nonverbal communication and interpersonal emotion regulation (c.f., Kappas, 2011, 2013). First, however, we should re-examine what we know about perceivers' nonverbal decoding abilities and their limits.

Receiver abilities tend to be overestimated. When defining the role of decoding abilities for social intelligence, there is little doubt that superior nonverbal decoding abilities *should* be a hallmark of social intelligence. Indeed, it appears almost trivial that such abilities would have been of substantial adaptive value in our evolutionary and social history, as individuals who were particularly skilled at understanding another's emotional states would have had a clear advantage, for example, when making decisions about social support, trade, or conflict. However, the question arises, if focusing on receiver abilities is indeed the most fruitful approach to understanding socially intelligent nonverbal signaling as a part of complex human communication. In other words, might the search for more accurate translations of nonverbal social signals have led us to neglect to search for mechanisms by which senders could intuitively lead receivers astray?

In view of the often lofty goals and assumptions about what socially intelligent receivers *should* be capable of, it might be rather surprising that (1) individuals typically tend to vastly overestimate the ability of others to correctly read their emotions (Gilovich, Savitsky, & Medvec, 1998), (2) that very few of us appear to be adept at successfully employing nonverbal behavior to catch liars (Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999), and (3) that decades of research have consistently demonstrated only rather loose couplings between subjective emotional states and visible, or even invisible, bodily makers or behaviors (Hollenstein & Lanteigne, 2014; Mauss & Robinson, 2009). These findings appear to provide some support to the notion that the predominant focus on attempts to enhance receiver capabilities, for example, by providing training to recognize specific action units (AUs; Ekman, Friesen, & Hager, 2002), may be doomed to fail unless we also understand the expression of the AUs as part of the social and adaptive context of the sender. Even in parent-infant communication, researchers have encountered a surprisingly rich and varied repertoire of young infants' facial expressions (Oster, 2005). As Oster (e.g., 1997, 2005) emphasizes, infant facial expressions should be regarded in their own right, as adaptations that are crucial for the infant's survival and development.

A similar picture emerges for work on the concept of "empathic accuracy", that is, the measure of one's ability to infer another's thoughts and feelings (see Ickes, 1993, 1997, 2010). The degree to which perceivers are empathically accurate is believed to be of fundamental importance for social intelligence (e.g., Ickes, 1997). It is also often regarded as a cornerstone of empathy, for example, in psychotherapy (e.g., Elliott, Bohart, Watson, & Greenberg, 2011). Based on this notion of empathic accuracy as a crucial receiver ability, numerous studies have examined individual and gender differences (see, e.g., Ickes, Gesn, & Graham, 2000). Other research has gone yet one step further in the endeavor to pinpoint the neural basis of empathic accuracy (Zaki, Weber, Bolger, & Ochsner, 2009). However, although receivers have been shown to perform at above-chance levels, their overall decoding accuracy is typically rather low (e.g., Gesn & Ickes, 1999; Hall & Schmid Mast, 2007; North, Todorov, & Osherson, 2010; Zaki, Bolger, & Ochsner, 2009). For example, Hall and Schmid Mast (2007) reported an overall mean accuracy of 6.87 (*SD* = 3.26) out of a theoretical maximum score of 32! In addition, nonverbal cues, albeit significant, may not contribute as much to empathic accuracy as verbal or vocal cues (Gesn & Ickes, 1999; Hall & Schmid Mast, 2007). Again, these results emphasize that receivers typically fall short of expectations generated by the hope of increasing one's "mind reading" abilities through more proficient decoding of nonverbal cues. Intriguingly, however, this pattern might change when encoders are highly expressive (Zaki, Bolger, & Ochsner, 2008), or when more spontaneous and dynamic displays of emotions are being examined (Buck, Powers, & Hull, 2017).

Thus, instead of using crystallized recognition abilities as the main springboard into *social intelligence*, we should revisit the complexity and effectiveness of sender abilities to keep themselves attuned to affordances of the rapidly changing social contexts in which facial expressions are displayed. This chapter therefore aims to turn the tables on this discussion by examining how such early, noisy, context-sensitive, and often ambiguous social signaling might reflect adaptations to some potentially more general tradeoffs faced by the sender of emotional nonverbal signals.

Sender-receiver conundrums in major emotion theories. Before examining the potential adaptive costs of unguarded social signaling in more detail, we might ask *why* so much of the previous work on decoding abilities has often found such surprisingly poor performance. Perhaps an important initial intuition to nurture here is that we are all *both*, senders and receivers, and that any ability for "intelligent obfuscation" of social signaling might be just as valuable (or more) for socially intelligent behavior as signal decoding per se. In other words, the apparent lack of highly intelligent receivers might merely reflect the presence of similarly intelligent human senders.

Beyond this intuition, the question of low coherence between emotional expressions and self-reported feelings touches upon some deeply ingrained theoretical trenches of the field. There are indeed many different theories about emotion and their expression, including both discrete and dimensional approaches (see Kappas, Krumhuber, & Küster, 2013). In consequence, many multifaceted controversies could be outlined here. However, the key controversies with respect to the functions and meaning of nonverbal social signals can perhaps be best illustrated by examining some of the differences between discrete emotion theories such as Ekman's neuro-cultural model (e.g., Ekman, 1971; Ekman & Friesen, 1969) and the behavioral ecology view proposed by Fridlund and others (Crivelli & Fridlund, 2018; Fridlund, 1991, 1994). In particular, we examine the neuro-cultural model's classic *Display Rule* concept, which assumes that senders acquire some basic skills at masking their emotions from others through a slow process of cultural learning, rather than through more universal mechanisms that might help to attune senders to relevant affordances of different social contexts.

Discrete emotions or behavioral ecology? For many years since the groundbreaking work by Paul Ekman and others on the universality of facial expressions between cultures (e.g., Ekman & Friesen, 1971; Ekman, 1992), the dominant models of emotions have assumed that there must be some kind of hardwired relationship, or at least invariant mediating factors or rules, between subjective feelings and nonverbal expressions of emotions. Indeed, if such invariants or rules could be reliably identified, it should be possible for socially intelligent individuals to correctly infer the underlying states from said social signals. However, the empirical data on this question has been rather mixed at best. As already noted, we rather tend to be surprisingly poor at recognizing lies in others. Likewise, we are not even very good at recognizing extremely stereotypical and exaggerated displays of facial expressions other than sadness (Russell, 1994), a pattern-matching task in which machines are beginning to outperform humans (Dente, Küster, Skora, & Krumhuber, 2017).

Culture-specific *display rules*. The notion of emotional leakage is rooted in so-called *basic* emotion theories, such as Ekman's neuro-cultural model (e.g., Ekman, 1984; Tomkins, 1978, 1984). This family of theories essentially assumes the existence of an essentially *hard-coded* relationship between internal affect and its expression. In this view, emotions are basic building blocks of human interaction, and their expressions are culturally universal (e.g., Ekman & Friesen, 1971). On top of this foundation of honest signaling of *basic emotions*, the long-standing assumption in this view has been that there then emerges a secondary layer of culture-specific *display rules*. These rules require heavy amounts of cultural training to become so heavily overlearned that they may occur largely involuntary. However, cultural *display rules* can essentially still only play upon the surface of the underlying and hardwired affect programs. For example, cultural *display rules* could eventually teach members of a culture to involuntarily *mask* culturally inappropriate expressions of amusement at a funeral (Boucher, 1977). Yet as such learning of *display rules* may lead to an appearance of learned behavior, a highly socially intelligent and trained observer should still be able to pick up upon subtle discrepancies between the underlying, true, emotion and the merely learned social display. As from the moment we are born, all of us undoubtedly undergo substantial cultural learning about what is appropriate and, more importantly, what is *not* appropriate to say or do in any given situation, this notion still has a lot of intuitive appeal. Clearly, it also offers a lot of marketing potential, in particular if combined with the notion that being trained to pick up on signs of leakage of the true emotion could enable adept perceivers to slough away the cultural façade to detect when someone is lying or otherwise managing his or her expression (see, e.g., Ekman, 2001).

Limitations of the display rule concept. The original notion of *display rules* can be, and has been, criticized from several different angles. First, they appear to present a rather inflexible and rather list-like approach to defining the influence of social context on facial displays (e.g., Kappas, 1999). Second, as is detailed in the next section, overlearned *display rules* about what to show and hide in specific social situations appear to be poorly suited to explain the social impact of *implicit audiences*, that is, the phenomenon that even thinking about other people who are not physically present can modulate the link between feelings and displays. Third, by designating *display rules* as the prototypical example of the role of culture-specific learning in nonverbal social signaling, we may have turned a blind eye on evidence for adaptive tradeoffs between providing accurate readouts of one's internal emotional states and the immediate or social adaptive costs of being too easy to read. Here, I argue that there appear to be at least some social signals, for example, emotional tears and crying, where there is now reason to believe that their powerful social functions may have developed in the context of potentially substantial adaptive costs to the sender.

From *display rules* to understanding expressions as adaptations. The long-standing struggle to identify reliable biological or behavioral one-to-one markers of human emotions does not mean that humans are generally poor at applying *Social Intelligence* to nonverbal interaction. Instead, the observation of loose, and therefore flexible, couplings between feelings and expressions may suggest that more attention should be paid to the mechanisms by which senders of nonverbal signals behave intelligently in how they communicate when, why, and with whom. Further, instead of simply assuming there should be evolutionary vestiges and emotional *leakage* from times in the distant past, we should reconsider under which circumstances reliable signaling about emotions may or may not have remained adaptive for our increasingly social hominid ancestors. Such evidence might be found at either the level of individual or inclusive fitness.

As already agued by Darwin (1872/2005), facial expressions may originally have become associated with previously adaptive behaviors via mechanisms such as *the principle of serviceable associated habits* or on the basis of opposing functional adaptations for the sender. Indeed, some recent work has pointed to the presence of tradeoffs between certain opposing expressive facial actions. For example, as suggested by Lee et al. (Lee, Mirza, Flanagan, & Anderson, 2014), the widening of the eyes in fear and the narrowing of the eyes in disgust may reflect an optical tradeoff between sensitivity (stimulus localization) and acuity (stimulus discrimination). These are doubtlessly fascinating findings, demonstrating that eye widening may enhance sensitivity, whereas eye narrowing enhanced acuity. However, it appears likely that these and other facial actions would have been subject to substantial adaptive pressure to not unambiguously reveal anything substantial about the sender's internal states and intentions that would not already be available to a potentially threatening observer via other channels. In this sense, it is of great value for a predator to recognize when its prey is about to detect its approach. However, for the same reason, it would be of immense survival value to the sender to create as much noise and ambiguity in such signaling as possible. In consequence, the predator might either fail to notice the signal entirely, or it might initiate its final charge prematurely, giving the prey a chance to escape.

While, for our evolutionary ancestors, signaling to members of other species is likely to have receded in importance behind signaling to conspecifics at some point, it still appears reasonable to assume that capabilities to hide and obfuscate the meaning of nonverbal social signals would have remained valuable across a wide range of competitive and threat contexts. This would suggest that increasing competence for social communication should include rather advanced capabilities to create ambiguity, noise, or at least plausible deniability (e.g., Pinker, 2007) with respect to being able to adjust the implied meaning of initial social signals as an interaction develops within a given context. As Fridlund (1994) has claimed, any signs of evident emotion *leakage* would have been decidedly maladaptive. In consequence, any evidence of such *leakage* should have disappeared rapidly. Indeed, the very notion that there should be any unambiguous signals of emotion *leakage*, for example, via *microexpressions* appears to underestimate the potential adaptive costs of unsuccessfully suppressing such leakage in high-stakes situations. Therefore, even if there are simple nonverbal signals that can relatively reliably indicate a sender's overall emotional state in favorable contexts, it would be of great importance for senders to be able to seamlessly and rapidly adapt their overall signaling behavior in response to less favorable situations. Further, while this would certainly benefit from cultural learning, there may also be more universal mechanisms with regard to how loosely or tightly socio-emotional signaling may be coupled facial actions. Notably, this might also create further room with regard to relevant interpersonal differences. That is, while many or most people may feel that the need to exert a lot of effort to suppress potential nonverbal giveaways when lying (even if no one successfully manages to recognize them as such), certain individuals might be able to effortlessly decouple, for example, their facial behavior from their feelings at the time. Doctors are known to have to learn a certain detachment from negative feelings while performing their work. On the other end of the spectrum, psychopaths and murderers are only rarely, if ever, identified on the basis of any abnormal facial expressions. Rather, they often appear to be perceived as "perfectly normal".

When senders and receivers are coupled tightly. Despite these and other examples of expressive decoupling from feelings, there may still be contexts in which reliable signaling of one's emotional state carries little to no risk to the sender. Such a situation of tight or even perfect coupling between the social and adaptive interests of senders and receivers may be a relatively rare but, nonetheless, very interesting case. Such a tight coupling is, for example, likely to be the case during times in which we have no or only limited other means to communicate, when we are strongly dependent on the social support of others, or when we need to strengthen our social bonds with significant others. The prime example for this type of context is the situation faced by newborn infants. However, even here we need to be cautious because the presence of greater reliability in emotional signaling between mother and child does not have to imply that *leakage* from this early time in life would persist into adulthood, nor that there may not also be situations where it would be adaptive for infants and young children if their caregivers overestimated their physical or socio-emotional needs. In addition, we should not confuse today's standard of the "academic single child" that is nurtured and raised from an overabundance of resources with the situations in which our distant ancestors raised our just slightly less distant ancestors. Notably, however, we can assume that infants are already quite skilled at interacting with their social world before they could have learned about cultural *display rules*. Thus, despite differing theoretical agreements, there is a wide agreement that infants are *preadapted* for social interaction (Oster, 2005), rendering them highly skilled senders and receivers in mother-infant interaction.

Is there "honest" emotional signaling in infancy? In general, honest and unaltered signaling behavior is most typically attributed to infants and young children because infants have had minimal time to have been influenced by cultural learning. At this early age, humans are severely limited in how they can affect and interact with the world, and they are completely dependent on frequent support by caregivers to ensure their survival. Early infant crying is further assumed to be largely reflexive, and to be occurring in response to hunger, pain, or separation from caregivers (Soltis, 2004; Young et al., 2016). Arguably, this time of dependency is also when the adaptive needs of mother and child are maximally aligned. Infant vocalizations are believed to promote proximity between infant and caregiver (Young et al., 2016). While the time of emergence and true extent of neonates' abilities to imitate human facial expressions and gestures (Meltzoff & Moore, 1977) has been subject to some debate (e.g., Anisfeld, 1996; Koepke, Hamm, Legerstee, & Russell, 1983), the more general observation that infants very rapidly develop and refine their nonverbal communication abilities is uncontested (Oster, 2005). Infants as young as six months have been shown an early ability to regulate their facial expressions of distress (O'Neill, Ahola Kohut, Pillai Riddell, & Oster, 2019). Finally, as shown by Dondi et al. (2012), distress expressions may already be found during prenatal development and at least from 20 weeks of gestational age.

Indeed, during this special and critical time in our lives, we may assume a maximal degree of alignment in signaling between mother and infant. Thus, a mother who is better able to correctly read the socio-emotional signals of her infant may be able better and more timely care than a less sensitive parent who misreads some of the cues. Likewise, an infant with better signaling abilities might be able to elicit more adequate care from its mother as well as other caregivers. However, even here, some caution may be advised before declaring the mother-infant bond as one of perfect harmony and synchronicity. Again, the reason for this caution is that few of our ancestors will have had a single child. Instead, we should consider the possibility of competitive social signaling in infancy, and in particular the phenomena associated with *sibling rivalry* that may quickly result in "honest" emotional signaling no longer being the individually most adaptive behavioral strategy. Instead, as likely anyone who has had more than one young child at a time can attest, getting more than your brother or sister can often be more important than getting enough. So, despite early infancy appearing to be such a stellar candidate for a situation where everyone just expresses their feelings as accurately as possible, waiting for a sensitive decoder to perform an accurate readout, even at this early age, we should not expect to find perfect correspondence between bodily expressions of emotions and subjective feeling states.

Overall, depending on factors such as the number and relative age of siblings, we can assume the presence of often rather fierce competition between siblings, as well as substantial potential for parent-offspring conflict during later phases of childhood. (see also Godfray, 1995; Trivers, 1974). Infant crying has been suggested to be related to increased breastfeeding behavior of the mother, which, in turn, is associated with hormonal changes that prevent the mother from becoming pregnant again while still feeding a healthily crying infant (Barr, 1999; see also Vingerhoets, 2013).

Nonverbal signals of emotions based on the handicap principle. Unchecked and direct emotional signaling may only rarely have been of substantial adaptive value to senders in our evolutionary history. Indeed, the concept of "honest" and reliable biological signals has been strongly associated with the *handicap principle* in biological signaling (Zahavi, 1975, 1977). Socio-emotional signaling is not necessarily about providing immediate benefits to the sender; instead, our emotional signals appear likely to have evolved on the basis of several tradeoffs. In our more evolutionary history, our ancestors are likely to have had ample need for both honest and deceptive forms of nonverbal communication about emotions. In evolutionary theory, the colorfully adorned peacock is often used as a vivid example of a self-imposed biological handicap. As the handicap principle suggests, the presence of an otherwise costly trait becomes a reliable signal of biological fitness because signalers who are less fit would not be able to produce the trait in question at the same level of quality. It can be observed both as a signal directed at members of the same species, for example, as in the example of the peacock trying to attract the attention and favor of a potential mate through its feathers, and as a signal to predators indicating that the signaling individual is too fit and healthy to be worth the effort of an attempt at hunting it. For example, as Dennett and others have pointed out (Dennett, 2017; Haig & Dennett, 2017), healthy gazelles are known to signal their readiness to escape predators (e.g., hunting dogs) by briefly jumping up and down in a phenomenon known as stotting. Here, stotting may signal that the gazelle would likely outlast the hunting dog in an extended chase and that the would-be hunter may be better advised to try to hunt another, less fit, gazelle instead (Haig & Dennett, 2017). According to Zahavi and Zahavi (1999), the handicap principle represents an important missing piece of previous evolutionary theory. Indeed, it is widely believed to explain at least some aspects of animal signaling behavior. Importantly, with regard to human nonverbal signaling of emotions, it suggests that one should search for evidence of honest social signaling where there would be some relevant cost to the sender.

While a few of these signals, for example, infant crying (Furlow, 1997) and emotional tears (Hasson, 2009; Küster, 2018), have been speculated to reflect a biological *handicap* associated with honest signaling (Zahavi, 1975, 1977), most facial expressions of emotions are more likely to reflect more direct tradeoffs (e.g., Lee et al., 2014).

On the value of "honest" signaling for a sender-based approach to nonverbal social intelligence. The handicap principle alone will certainly prove insufficient to explain intelligent social signaling from the perspective of the sender. However, whenever we examine a present-day social situation, or an application that strives to perform some function on the basis of providing some assessment of an individual's emotional or engagement state, we should consider whether the situation is one where "honest signaling" might actually occur. In a wider sense, these might be signals where the sender is aware that displaying a given expression might have negative consequences unless the receiver can be trusted not to exploit the information. If, in such a situation, costly emotional signaling occurs anyway, then such signals might be of much greater value and reliability. Consistent application of such a filtering principle might have far-reaching implications for future work on emotional social intelligence. Most likely, if future examinations of coherence between biological expression and self-report of emotions were to focus on situations where the expression arises from a well-understood tradeoff in a given context, a much better agreement between expressions and self-report might be observed. Thus, when a person shows anger toward an adversary whom she understands is likely to respond with aggression to such a signal, we can be much more confident in our assumption that she really felt anger in that situation—as opposed to a situation where participants are instructed to react emotionally to different types of film clips for the purposes of research on emotions. In other words, our decontextualized decoding skills for a large number of psychological research paradigms may be surprisingly poor, yet this may not tell us as much about sending and decoding abilities in the heat of real-life interaction.

Summary. Much has been learned in recent decades about the relevance of social and biological signals to suggest that humans are remarkably adept at automatically "retuning" both the manner and meaning of social signaling to meet the demands of the social context of an interaction. The foundations of more static and hardwired views, such as the *basic emotions* account, have been seriously shaken, if not terminally eroded (Fridlund, 1994; Crivelli & Fridlund, 2018; but see Scarantino & Griffiths, 2011). Thus, despite over 35 years of research, the facial expressions hypothesized to be associated with basic emotions have only rarely been observed in individuals who reported to experience these emotions (Reisenzein, 2019). I argue that it is time to accept these results and to take them seriously also with regard to how we conceptualize the more general levels of interaction between senders and receivers. Clearly, we still do not know enough about when and how humans may actively "scramble" their socio-emotional signaling in everyday interaction. However, I would regard it as dangerous to simply continue to summarily explain any such behaviors with a vague reference to culturally overlearned *display rules*. Certainly, *display rules* still have something to contribute to our understanding of emotional sender behaviors (see Kappas, 1999). However, long lists of *display rules* cannot hold all of the answers, as evidenced by the remarkable signaling abilities of young infants (Oster, 1997, 2005), and possibly even fetuses (Dondi et al., 2012) who appear to arrive on this world already at least somewhat prepared or preadapted to engage in the increasingly complex social dance that is the signaling, and sometimes scrambling, of socio-emotional states.

Nevertheless, and despite all valid concerns, the underlying notion that we are hardwired to express our "true" emotions, unless forced into self-suppression by cultural demands (e.g., Tomkins, 1995), still appears to be rather firmly established in how most of us think about the complex processes involved in human nonverbal interaction. It might therefore bear reiterating one more time that humans, overall, appear to be notoriously poor deception detectors (Ekman & O'Sullivan, 1991; Porter & ten Brinke, 2008). We are simply much worse at *reading* other people's feelings than we might like to think! However, what may be important to realize here is that we might be able to learn much more if we learn to better understand the perspective, and tradeoffs, faced by the sender. We should consider if relatively tight, or even automatic, control over nonverbal signaling of private internal states might have been the norm, rather than the exception, throughout most of our evolutionary and cultural history. In this chapter, I have argued that it is time for a fresh and unbiased examination of the motivations, benefits, and costs faced by senders across different social and evolutionary contexts. It is by understanding these contextual forces, or tradeoffs, that we may be able to shed more light on socially intelligent communication and not, I believe, by continuing to search for expressions of basic emotions or microexpressions.

Conclusions

Admittedly, hypotheses about the role of socio-emotional signaling in our distant ancestral environment often risk becoming hopelessly entangled in open-ended post hoc speculation. This often renders evolutionary considerations unattractive as a basis for cutting-edge research in social psychology and communication research. What consideration of socio-evolutionary pressures can provide, however, is to increase our awareness of likely tradeoffs that might still be testable by other means in emotion and communication research today. Furthermore, we can, and should, try to design more insightful experiments that aim at better understanding the "knobs and levers" that modulate social sending behaviors.

To take one of the favorite examples of a long tradition of emotion researchers since William James (1922), we may briefly revisit the case of fear. Fear expressions are generally assumed to signal the presence of a potential danger in the environment (Marsh, Ambady, & Kleck, 2005; Whalen et al., 2001). To alert conspecifics to the presence of a threat or predator, there are some obvious tradeoffs on behalf of the sender: When signaling too loudly or clearly, the sender may risk drawing (further) attention from predators, whereas signaling too quietly or ambiguously could greatly reduce the signal's value for its intended audience. In either case, immediate and intuitive sharing of such vital emotional information can be assumed to represent altruistic social behaviors and contributes to inclusive rather than individual fitness of the sender (see Abbot et al., 2011; Hamilton, 1964). Yet in many other instances, such as facing a stranger rather than a bear, the tradeoffs involved with showing or hiding fear quickly become much more complicated. Most likely, a social fear signal may still be of adaptive value—but so would be the ability to make others believe we were in a different emotional state than we actually are, as well as the ability to channel our signaling only to specific recipients, while aiming to confuse others.

Starting from the notion that an ability to effortlessly "scramble" emotional signals might have been just as important to our ancestors as the capacity to clearly encode nonverbal signals when such unambiguous encoding is needed, it would appear plausible that humans should possess some carefully balanced mechanisms to account for these tradeoffs. For example, we should be able to attune our default nonverbal signaling behavior to characteristics of our immediate social environment.

While many of the more fine-grained mechanisms responsible for an intelligent attuning of our social signaling to a social context would appear to require substantial cultural learning, some other distinctions might indeed be relatively basic and universal. For example, almost any intelligent social signaling mechanisms should likely be sensitive to the demarcation lines between friend and foe. At a very general level, there would be many applications of such preadapted friend-stranger distinctions, ranging from macro-level effects such as the sharing of collective emotions across a nation (e.g., Garcia & Rimé, 2019) to the dyadic or even individual level of social signaling. For example, being primed with in-group-related personal pronouns such as "we", "our", and "us" may elevate the intensity of smiles of enjoyment in comparison to being briefly exposed to pronouns associated with strangers, such as "they", "them", and "their" (Kappas & Küster, 2006). Likewise, in a replication of the original study by Fridlund (1991), a study conducted by Hess, Banse, and Kappas (1995) revealed a surprising "decoupling" of smiling in the implicit presence of strangers. Thus, when participants had reason to believe that a good friend of theirs was watching the same funny movies elsewhere, their own smiling behavior increased. Further, participants in these conditions smiled even more when they watched very funny rather than only somewhat funny films. Yet when the same films were viewed by participants who believed that a stranger was simultaneously watching the same funny films, this same relationship between stimulus intensity and smiling dissolved into noise.

As illustrated by the above example, much clever empirical work is still needed if we are to effectively investigate the notion of scrambled joy and hidden tears in social interaction. Indeed, in this chapter, I have provided only a few and sometimes still sketchy examples of what this might mean. It is, in fact, likely that there are many much better examples than the ones I have mentioned here. Nevertheless, the most important points that I have aimed to make is that (1) we should not be too narrow in our definition of social intelligence by understanding it, primarily, as an ability of receivers; (2) social signaling about emotions is an ability that already matters very early in life, and even before any significant cultural learning might take place; (3) intelligent social signaling of senders may be less about "truth" than about eliciting adaptive responses from conspecifics; (4) a fresh consideration of evolutionary and contemporary social signaling contexts may provide a better basis for the next generation of research on emotion and communication than certain famous but disproven emotion theories; (5) despite everything, there might still also be some "honest" biological signals that might enable us to make much stronger "guesses" about another's emotional state, provided we have a sufficient understanding of the eliciting social context. The challenge, in other words, is to understand when others might indeed be in a state and situation that favors a stronger-than-average relationship between emotional displays and their self-reported feelings and to recognize and be sensitive to any experimental or real-life conditions that could be prone to eliciting consciously posed or intuitively scrambled signaling. In practice, the temptation here will often be to regard any given elicited expression or bodily response as "objective" and "emotional". However, given how deeply sociality appears to be ingrained in human nature, it seems likely that much of the literature that has aimed to study emotional signals has in fact been shaped at least partially by explicit or implicit social effects, many of which are difficult to measure and quantify. Therefore, to better understand intelligently and intuitively scrambled emotions in the future, we need to let go of some fond but simplistic ideas that there might be some highly skilled decoders that can literally read someone's face and tell us what that person truly feels. Instead, as I have argued in this chapter, more work is still needed to understand the social and evolutionary underpinnings of socio-emotional signaling in everyday interaction.

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11

Interpersonal Accuracy and Interaction Outcomes: Why and How Reading Others Correctly Has Adaptive Advantages in Social Interactions

Tristan Palese and Marianne Schmid Mast

Back in the nineteenth century, Darwin (1872) highlighted that there are intra- and interspecies continuities in the way individuals are expressing emotions and that emotion expressions should have evolutionary functions. Through emotion expressions, individuals were able to communicate internal states to others, such as fear to signal danger in the environment, and therefore increase their chances of survival. However, in order to take advantage of others' emotion expressions, it was essential for individuals to be able to recognize those emotion expressions. Expressing an emotion would have been pointless if the person toward whom it was directed did not recognize it. Therefore, the evolutionary advantages of emotion expressions only work if individuals are able to correctly recognize them.

Emotion expressions are combinations of different nonverbal behaviors (Ekman, 2003). One can thus argue that collecting information about others' nonverbal behavior and making correct inferences about

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others based on these nonverbal behaviors is important for people to navigate in the world more efficiently. Indeed, making correct inferences about others has long been highlighted as a skill that has adaptive benefits (Barrett, Todd, Miller, & Blythe, 2005). For instance, scholars in the field of emotion recognition emphasized that some emotions more so than others are universally recognized because they may be important from an adaptive point of view (Martens, Tracy, & Shariff, 2012). In the context of personality judgment, Haselton and Funder (2006) even characterized this propensity of humans to make inferences about others as an "instinct" stemming from an evolutionary heritage.

Empirical evidence shows that individuals, already at an early age, tend to make correct inferences about others in a spontaneous way. Past research has shown that people are able to correctly recognize others' emotions and personality traits above chance level (Elfenbein & Ambady, 2002; Hall, Andrzejewski, Murphy, Schmid Mast, & Feinstein, 2008) and that, from the age of four, children are already able to correctly infer others' intentions (Barrett et al., 2005). Young children further can use information they have about others to make inferences about the others' mental states, such as their motives or emotional responses (Heyman & Gelman, 1999; Tracy, Robins, & Lagattuta, 2005). Furthermore, these inferences are made spontaneously, without effort, and outside of conscious awareness (Winter & Uleman, 1984). Finally, the fact that already from the age of 26 months, children start using words such as "nice" and "mean" to describe people (Bretherton & Beeghly, 1982) shows that paying attention to each other and trying to figure out others is "an irresistible inclination" (Hall, Schmid Mast, & West, 2016, p. 4) that we develop early in childhood.

In this chapter, we investigate whether making correct inferences about others based on the behavior they express is still advantageous in today's world. To do so, we first describe the concept of interpersonal accuracy using a Brunswikian perspective. Then, we review the empirical findings showing, in different contexts, the positive relation of interpersonal accuracy with desirable social interaction outcomes. Finally, we introduce the Behavioral Adaptability Model, explaining the processes by which interpersonal accuracy helps in reaching more positive social interaction outcomes.

What Is Interpersonal Accuracy?

Definition

We spend a large portion of our time awake in social interactions (Mehl & Pennebaker, 2003). The increased geographical and social mobility as well as the digitalization of our social relations put us in a situation in which we encounter new people at an increased pace throughout our lifetime. But how do we know what is the best way to interact with each of our social interaction partners in order to obtain the desired outcome of the interaction? We need to be able to "read" our social interaction partners, understand their personality, know what kind of situation they are in, how they feel, what their goals and motives are, and what the relationships among them are.

Scholars in the field of social perception have long used different terms, such as interpersonal sensitivity (Hall & Bernieri, 2001), empathic accuracy (Ickes, 1997), or mind reading (Ickes, 2003), to describe the ability to make correct inferences about others.[1] Hall et al. (2016) argued that the different terms previously used in the literature were not optimal, as they were either too broad (e.g., interpersonal sensitivity) or too specific (e.g., empathic accuracy). Therefore, these authors introduced a new term called *interpersonal accuracy*—IA—and defined it as the ability to accurately assess others' emotions, personality, intentions, motives, and thoughts (Hall et al., 2016; Schlegel, Boone, & Hall, 2017; Schmid Mast & Hall, 2018). Importantly, IA is most of the time conceptualized as a skill (Schmid Mast & Hall, 2018) because it improves over the life span (Isaacowitz, Vicaria, & Murry, 2016) and is trainable (Blanch-Hartigan, Andrzejewski, & Hill, 2012; Schlegel, Vicaria, Isaacowitz, & Hall, 2017).

The Process of Social Inferences During Social Interaction

To better understand what IA is, it is necessary to describe the processes by which individuals make social inferences. What we mean by *social* inferences is any inference that concerns other individuals' states or traits.

Social inferences, and more generally social perceptions, are usually described using a Brunswikian lens model perspective (Brunswik, 1956). According to this perspective, individuals perceive others only indirectly with the help of environmental cues that are used to make sense of those others (Breil, Osterholz, Nestler, & Back, in press; Elfenbein & Luckman, 2016). Such environmental cues are typically the behavior expressed by others. For instance, if a person (a target) talks a lot during an interaction, the interaction partner (the perceiver) will use the speaking time of the target as a behavioral cue to infer how dominant that target is (Schmid Mast, 2002). Specifically, behavioral cues are important when inferring the states or traits of other people we meet for the first time, so-called zero-acquaintance situations (Ambady, Hallahan, & Rosenthal, 1995), because we only have very limited information (i.e., their behavior and their appearance) about them available.

According to the Brunswik lens model (Brunswik, 1956) social inferences can be decomposed into two processes (Elfenbein & Luckman, 2016). First, a target expresses his or her actual states or traits through behavioral cues—the encoding process. Second, an observer perceives and interprets the behavioral cues expressed by the target in order to infer that target's states or traits—the decoding process (Elfenbein & Luckman, 2016; Schmid Mast, 2010) (Fig. 11.1).

IA refers to the success of the decoding process. In other words, interpersonally accurate people are those who are able to make correct inferences about others based on those others' behavior. However, to make correct inferences, not only the observer's IA plays a role. Indeed, the Realistic Accuracy Model (Funder, 1995) states that making correct

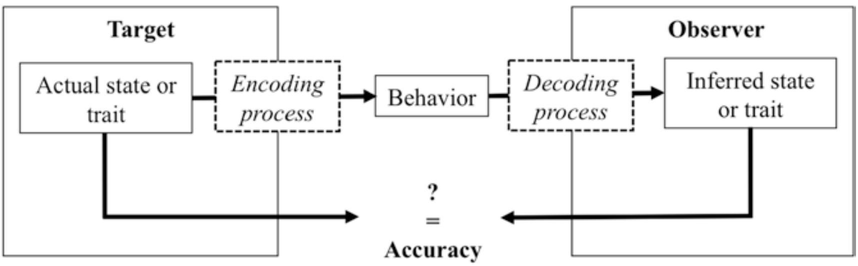

Fig. 11.1 The process of social inferences according to the Brunswik lens model

inferences about others also depends on how the targets encode their states and traits through the behavior they express. Two aspects are particularly important in the encoding stage (on the target side) in order to facilitate the decoding process (on the observer side).

First, the *validity* of the behavioral cues, that is, the extent to which the cues are indicative of someone's actual states or traits, is essential for making correct inferences about others' (Elfenbein & Luckman, 2016). Targets therefore need to express behaviors that are consistent with their internal states and traits. For instance, if a target is feeling sad but has a smile on his or her face, it would be more difficult for an observer to make correct inferences about that target's actual emotional state because his or her facial expression would not be in line with the emotion actually felt (i.e., sadness). Without valid behavioral cues, it becomes more difficult, if not impossible, for an observer to make correct inferences about a target.

Second, the *availability* of the behavioral cues is also essential for an observer to be able to draw inferences about a target. For instance, in a zero-acquaintance situation, people will not be able to draw any inferences about others' internal states or traits without any perceptible behavioral cues (e.g., a person showing a poker face). This notion of availability is an important aspect in the context of social interactions because people differ in how expressive they are (Kring, Smith, & Neale, 1994), and some people may communicate more behavioral cues about their internal states and traits than others during social interactions. Therefore, targets' expressiveness can influence how observers are able to make correct inferences about those targets' internal states or traits (Snodgrass, Hecht, & Ploutz-Snyder, 1998), and individual differences in expressiveness need to be taken into account when assessing IA. Indeed, without controlling for targets' expressiveness, it is impossible to know whether individual differences in IA arise from individual differences in terms of decoding abilities or from targets' individual differences in terms of expressiveness (Snodgrass et al., 1998). Thus, a target's encoding processes impact the accuracy of the inferences made by observers and it is essential to control for variance at the level of the targets' encoding processes if one wants to measure an observer's real ability to make correct inferences about others based on the behavior they express. In the next section, we will summarize how IA is generally measured and how researchers can control for the impact of targets' encoding process when measuring IA.

Measurement of IA

Although self-report assessment of IA is sometimes used, past research has shown that it is poorly related to IA performance-based assessments (Hall, Andrzejewski, & Yopchick, 2009; B. A. Murphy & Lilienfeld, 2019). People tend to overestimate their skill in making correct inferences about others (Ames & Kammrath, 2004). Moreover, because self-reported assessments of IA typically represent more what people think about their skills than their actual skills, we focus on the literature using performance-based test of IA in this chapter.

A performance-based test means that a person's inferences about a target (*inferred* states or traits) are compared to a criterion (*actual* states or traits) known by the researcher (Schmid Mast & Hall, 2018; Schmid Mast & Latu, 2016). The criterion is important in IA assessment because it allows researchers to check whether inferences are correct or not and, thus, to identify how interpersonally accurate people are (Schmid Mast, Murphy, & Hall, 2006). According to Schmid Mast and Latu (2016), the criterion can come from an objective fact (e.g., the actual hierarchical position between two people), subjective measures (e.g., self-report personality), or consensus (e.g., third observers agreeing upon a target's emotion expression).

Two main paradigms have been used to assess IA with performance-based tests, the testing paradigm and the in vivo paradigm (Hall, Schmid Mast, & Latu, 2015). The testing paradigm is similar to how general mental ability is assessed in standardized intelligence tests (Schmid Mast & Latu, 2016). In this paradigm, a set of target stimuli (typically in the form of short videos or photos showing a person involved in a social interaction) is presented to participants who assess the targets with respect to specific dimensions (e.g., emotions, personality, or status). Because all test-takers see the same target stimuli, these tests are standardized. In addition, because the researchers know the targets' actual states or traits, they can score the answers of the test-takers as correct or incorrect

(Schmid Mast & Latu, 2016). Typical examples of standardized performance-based tests that are used often, are the Profile of Nonverbal Sensitivity (PONS; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979), the Geneva Emotion Recognition Test (GERT; Schlegel, Grandjean, & Scherer, 2014), the Diagnostic Analysis of Nonverbal Accuracy (DANVA; Nowicki & Duke, 1994), the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002), or the Reading Mind in the Eyes Test (RMET; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Although all of these more frequently used tests are somewhat related to recognition of emotions, it is important to note that IA is not limited to emotion-recognition ability. Indeed, IA is a skill that plays a role in different domains of social perceptions such as judgment of personality traits, social relationships, cognitions, or intentions (Schmid Mast, Murphy, & Hall, 2006). The Interpersonal Perception Task (Costanzo & Archer, 1989), for instance, is a standardized test measuring IA with respect to social-relationship judgments. Finally, researchers can also make their own standardized test, as long as they know the criterion. Thanks to the use of standardized stimuli, researchers can isolate participants' decoding ability without any bias that could potentially appear at the level of the targets' encoding processes, which is not always the case for in vivo paradigm.

In an in vivo paradigm, participants have to infer the states or traits of a person with whom they previously interacted (Hall et al., 2015). IA scores are obtained by comparing participants' inferences of their interaction partner's states or traits with their interaction partner's self-reported states and traits. Even if the in vivo paradigm enables researchers to measure IA in a more "ecologically valid way" as it occurs in a face-to-face social interaction, this paradigm is not without problems because the accuracy of the inferences is not only defined by the observers' IA but also by the targets' expressive clarity. As stated above, this is problematic because without controlling for target expressiveness, it becomes impossible to know to what extent individual differences in IA arise from differences in target expressiveness (Snodgrass et al., 1998) or from IA skills. One way of controlling for target expressiveness in in vivo paradigms is to code for target expressiveness and to control for it in the analyses. Given this complication, most researchers use a testing paradigm with standardized tests in which all perceivers are presented with the same targets.

IA and Positive Social Interaction Outcomes

Although making correct inferences about others may have been particularly important for our ancestors' survival, it is unquestioned that IA remains an important skill in today's world (Byron, 2007; Hall et al., 2009). Indeed, it has been highlighted that IA is an important skill for being effective in social interactions (Nowicki & Duke, 1994; Schmid Mast & Hall, 2018) and empirical evidence supports this view.

For instance, meta-analytic evidence shows that individuals who are high in IA have more socially desirable and fewer socially undesirable personality traits than do individuals who are low in IA (Hall et al., 2009). Desirable personality traits include traits such as empathy, affiliation, extraversion, or tolerance, whereas undesirable personality traits include traits such as neuroticism and shyness (Hall et al., 2009). Moreover, individuals who are high in IA are perceived as more cooperative and as more likable (Schlegel, Mehu, van Peer, & Scherer, 2018). Evidence suggests that making correct inferences about others plays an important role for the development of good social relationships from childhood on. Nowicki and Duke (1994) reviewed different studies showing that children who are low in IA are less popular and obtain more negative teacher evaluations about their social behavior than do children who are high in IA. Thus, individuals who are able to make correct inferences about others are also the ones who seem to be the best "equipped" to develop and maintain good social relationships. In fact, Hall et al. (2009)'s meta-analysis shows that IA is positively related to better quality of social relationships.

In sum, IA is a skill related to socially desirable personality traits and to better quality social relationships. In the next section, we review empirical evidence showing that IA is an important skill in three different contexts in which social interactions are particularly important: the clinical settings, the workplace, and the educational context.

IA in Clinical Settings

IA has been highlighted as an important skill for health-care providers such as physicians or therapists (Ruben, 2016). Health-care professionals are involved in social interactions with patients and making inferences about patients is an integral part of their job (e.g., diagnosis). They make inferences about their patient's pain or their felt distress, and they infer their patients' adherence to medical instructions or simply their patients' satisfaction (Ruben, 2016). Research shows that physicians who are high in IA pay more attention to anxiety and depression signals in their patients and are marginally more accurate at detecting these states than physicians who are low in IA (Robbins, Kirmayer, Cathébras, Yaffe, & Dworkind, 1994).

Moreover, IA is an important skill in light of obtaining better interaction outcomes in health-care settings. To illustrate, physicians who are higher in IA have more satisfied (DiMatteo, Taranta, Friedman, & Prince, 1980) and more returning patients (DiMatteo, Hays, & Prince, 1986). Empathically accurate psychotherapists are evaluated by their supervisors as having better clinical skills (Rosenthal et al., 1979). Also, medical students who are more interpersonally accurate receive better ratings on interpersonal skills (Hall et al., 2014). IA is also positively related to performance in clinical fieldwork examinations in occupational therapy students (Tickle-Degnen, 1998).

Thus, making correct inferences about others is an important skill for people working in the health-care sector. It allows them to be more effective and to have more satisfied patients and also to be evaluated more positively. Maybe making correct inferences about others is part of the job description of health-care providers, but what about the importance of IA in the workplace beyond health care?

IA and Workplace Outcomes

Meta-analytic evidence highlights that IA is, overall, positively related to job performance (Hall et al., 2009). The role of IA for job performance might be more important for jobs involving social interactions and for those in which performance depends on the quality of social interactions (Byron, 2007; Schmid Mast & Latu, 2016).

Research shows that IA is important for sales professions and in personnel selection. With regard to sales professions, IA might enable salespeople to better understand their customers' needs and preferences. They thus can adapt their sales and communication strategies (Schmid Mast & Latu, 2016). Byron, Terranova, and Nowicki (2007) showed that salespeople's IA is positively related to sales performances. Regarding personnel selection, IA may also be an important skill for recruiters because it could help them to take hiring decisions that are less biased. Indeed, it has been shown that people who are higher in IA were less likely to make hiring decisions based on the stereotypes concerning job applicants than people lower in IA (Frauendorfer & Schmid Mast, 2013). Furthermore, in these two contexts of sales and recruitment, IA is linked to better negotiation performance (Elfenbein, Der Foo, White, Tan, & Aik, 2007; Schlegel et al., 2018).

But not only sales and recruitment rely on social interactions. People in management positions spend about 80% of their working time in social interactions (Kotter, 1999). Moreover, successful managers are the ones who spend more time on tasks involving social interactions, such as conflict resolution or networking (Luthans, Rosenkrantz, & Hennessey, 1985). Because social interactions are so important for managers, IA should therefore be a skill related to leadership outcomes. Indeed, there is empirical evidence confirming this.

For instance, people in a leadership position who are high in IA have more satisfied subordinates. This has been shown with participants taking on the role of the leader in a problem-solving task (Schmid Mast, Jonas, Cronauer, & Darioly, 2012) and for real female (but not male) managers (Byron, 2007). Moreover, managers' IA is a significant predictor of transformational leadership (Rubin, Munz, & Bommer, 2005), which is related to subordinate satisfaction and trust in the leader (Lowe, Kroeck, & Sivasubramaniam, 1996; Podsakoff, MacKenzie, Moorman, & Fetter, 1990). Finally, managers higher in IA are rated higher by their superiors at building effective work relationships (Rosete & Ciarrochi, 2005), which is in line with the fact that transformational leadership is associated with better leadership effectiveness and group productivity (Lowe et al., 1996).

IA in Education

Even though there is not much research looking at the role of IA in education (Murphy, 2016), some evidence shows that IA is related to positive outcomes in a learning context. Kurkul (2007) has shown that the higher music teachers were in IA, the better the ratings were that they received by their students. Particularly, interpersonally accurate teachers were evaluated as having more communication and pedagogical skills (Kurkul, 2007). IA is also beneficial in terms of learning outcomes. Bernieri (1991) demonstrated that the higher high school students were on IA, the better their learning outcomes was after a dyadic interaction situation. Therefore, in the educational context, IA is related to positive outcomes on both the teacher and the learner side. Yet, recent meta-analytic evidence showed that IA is not related to academic achievement measures (e.g., SAT scores) (Schlegel et al., 2019). It is therefore possible that IA may have an impact on learning outcomes only when the learning situation involves a personal interaction between the learner and the teacher, which is not necessarily the case in class at schools or universities.

Summary

In this section, we reviewed empirical results showing that IA is an important skill in social interactions. Interpersonally accurate people seem to be better "equipped" to manage social interactions and to have, overall, social relationships of higher quality. More specifically, IA is related to many positive outcomes in different contexts, such as the clinical, the corporate, and the educational domains, domains in which social interactions are omnipresent. In light of these results, we can affirm that, even in today's world, making correct inferences about others' states and traits is still an adaptive skill because it is related to positive interaction outcomes.

One might wonder how such a perceptual skill can affect social interaction outcomes. Indeed, even if researchers have suggested and showed that IA is beneficial in reaching better social interaction outcomes, it remains unclear what is happening at the behavioral level that could explain why interpersonally accurate individuals have more positive social interaction outcomes (Schmid Mast & Hall, 2018). In the next section, we will shed light on the potential mechanism behind the link between IA and interaction outcomes.

Why Is IA Related to Positive Interaction Outcomes?

Schmid Mast and Hall (2018) highlighted that there is a "black box" between making correct inferences about others and social interaction outcomes and that only little research has been dedicated to understand the processes by which IA leads to better social interaction outcomes. Even if past research has shown that IA is related to positive social interaction outcomes, it is still unclear how individuals who are high in IA behave in a social interaction and how this then affects interaction outcomes.

Research suggests that IA does not have any systematic link to how individuals behave in social interactions, especially for behavior supposedly related to positive social interaction outcomes such as smiling, nodding, or back-channeling during a social interaction (Hall et al., 2009). Being high in IA therefore does not predict the extent to which individuals express behavior that should lead to better social interaction outcomes. However, people high in IA are more skilled at expressing desired emotions (Elfenbein et al., 2010). Schmid Mast and Hall (2018), therefore, suggested that it might not be a certain behavioral style that goes with being high in IA; instead, it might be the ability to flexibly adapt one's interpersonal behavior according to each specific interaction partner. Behavioral adaptability—instead of specific behavior expressed by people high in IA—might be the missing link explaining the relation between IA and positive social interaction outcomes (Schmid Mast & Hall, 2018).

The Behavioral Adaptability Model

Bernieri (2001) defined interpersonal sensitivity as the ability to perceive and respond adequately to others' internal states. This author therefore pointed out that navigating effectively in social interactions not only requires perceptual skills but also behavioral skills. In line with Bernieri's definition, we think that being able to make correct inferences about others and to adapt one's behavior according to others' expectations stems from an underlying common skill in the interpersonal domain. We further believe that IA and behavioral adaptability are different manifestations of this skill, manifestations on a perceptual and on a behavioral level, respectively.

The Behavioral Adaptability Model (Fig. 11.2) describes how these two skills are related to each other. The main idea of this model is that IA leads to better social interaction outcomes because it enables individuals to understand their interaction partners' expectations and to adapt their behavior accordingly. Expectation Confirmation Theory posits that satisfaction increases when a person's expectations are met (Jiang & Klein, 2009). Thus, in order to have effective social interactions and therefore reach better social interaction outcomes, people should adapt their behavior to match their interaction partner's expectations. At the workplace, for instance, employees harbor different expectations regarding how managers should behave toward them. For example, extrovert and conscientious people prefer a more transforma-

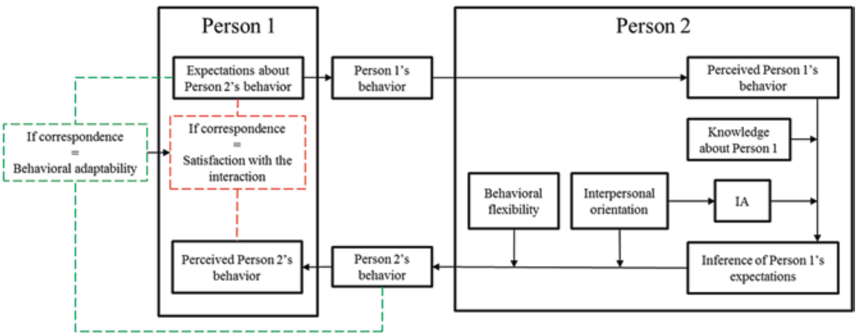

Fig. 11.2 The Behavioral Adaptability Model

tional leadership style (Moss & Ngu, 2006) and women prefer more considerate leaders than do men (Vecchio & Boatwright, 2002). If a manager wants to have satisfied employees, he or she should therefore express behavioral adaptability and change his or her leadership style according to the preferences or needs of his or her employees (Palese, Schmid Mast, & Bachmann, 2019).

In line with the Physician Behavioral Adaptability Model (Carrard & Schmid Mast, 2015), we conceptualize behavioral adaptability as the results of a dyadic process occurring during an interaction between two persons. First, a person (Person 1) harbors expectations about how his or her interaction partner (Person 2) should behave during the interaction. These expectations influence how Person 1 will interact with Person 2. For instance, in the workplace, if an employee expects his or her manager to express participative leadership style, he or she will signal this expectation by showing that he or she wants to be involved in decision-making, by proposing solutions and suggestions during group meetings.

Then, Person 2 will perceive Person 1's behavior and will use this information to make inferences about Person's 1 expectations. As we have discussed previously in this chapter, whether these inferences will be in line with Person 1's actual expectations will depend, first, on how Person 1 encodes his or her expectations with relevant and available behavior[2] and, second, on the Person 2's ability to decode the behavior of Person 1. Two aspects are important to predict Person 2's ability to decode Person 1's behavior: Person 2's knowledge about Person 1 and Person 2's IA, which is his or her ability to make correct inferences about others.

Regarding the knowledge Person 2 has about Person 1, we argue that the more Person 2 knows about Person 1, the easier it will be for Person 2 to make accurate inferences about Person 1's expectations. For instance, it would be easier for a manager to interpret the behavior and therefore to make correct inferences about an employee with whom he or she has been working for a long time than with an employee who just arrived in the company. In a zero-acquaintance situation in which Person 2 does not have any knowledge about Person 1, the behavior expressed by Person 1 will be the only available source of information. Therefore, in zero-acquaintance situations, Person 2's IA will play an important role in inferring Person 1's expectations based on the behavior expressed by

Person 1. Thus, this model predicts that the importance of IA in making correct inferences about others may depend on the knowledge people have about others.[3]

Making correct inferences about Person 1's expectations is a prerequisite for Person 2 to express behaviors that are in line with Person 1's expectations and therefore to show behavioral adaptability. However, we argue that making accurate inferences about Person 1's expectations is not sufficient for showing behavioral adaptability. Also, Person 2 needs to be motivated to behave in an adaptive and flexible way. With regard to motivation, Person 2 might prefer not to change his or her behavior according to Person's 1 expectations in some situations. For instance, in the workplace, some managers might choose to show the same leadership style regardless of the differences in employee's preferences for the sake of equality; they are thus not motivated to behave in an adaptive way. We propose that people who are more interpersonally oriented, meaning that they are more motivated to develop and maintain good social relationships (Vogt & Colvin, 2003), should be more motivated to adapt their behavior in order to fulfill their interaction partners' expectations.[4] With regard to behavioral flexibility, even if Person 2 is motivated to adapt his or her behavior according to Person 1's expectations, he or she will not be able to do so if he or she is unable to change his or her interpersonal behavior during the course of the interaction. Therefore, we argue that interpersonal orientation and behavioral flexibility should moderate the relationship between Person 2's inferences about Person 1's expectations and Person 2's actual behavior.

Finally, in our model, behavioral adaptability is conceptualized as the correspondence between Person 1's expectations about the behavior that should be expressed by Person 2 and the actual behavior of Person 2 during the interaction. As highlighted above, behavioral adaptability is expected to increase Person 2's satisfaction with the interaction and therefore lead to better social interaction outcomes. Yet, we posit that Person 1's satisfaction with the interaction will increase only when he or she perceives that Person 2 has adapted his or her behavior.

In sum, according to the Behavioral Adaptability Model, IA is related to positive social interaction outcomes because it enables individuals to infer their interaction partner's expectations and to adapt their behavior accordingly. Indeed, as highlighted by Carrard and Schmid Mast (2015) in the context of physician-patient interaction, IA is a prerequisite for behavioral adaptability, especially in a zero-acquaintance situation in which one has no knowledge about his or her interaction partner.

Empirical Evidence for the Behavioral Adaptability Model

The Behavioral Adaptability Model offers a theoretical model that can guide researchers in the field of social perception in order to investigate the processes through which IA is related to positive social interaction outcomes. In this section, we review first empirical evidence supporting this theoretical model.

IA and behavioral adaptability. To our knowledge, only two studies investigated whether IA is related to behavioral adaptability. First, Carrard, Schmid Mast, Jaunin-Stalder, Junod Perron, and Sommer (2018) investigated in the context of physician-patient interaction whether interpersonally accurate physicians were showing behavioral adaptability toward their patients during medical consultations. Results show that behavioral adaptability was related to better IA for female (but not for male) physicians (Carrard et al., 2018). Second, Palese et al. (2019) investigated whether IA was related to behavioral adaptability in a leadership context. In two studies, they asked participants to play the role of a leader who had to give two different pep talks to two subordinates who showed a decrease in performance. Subordinates were described as preferring different leadership styles. Researchers coded whether participants showed the preferred leadership style to each of the two subordinates. Results showed that IA was positively related to behavioral adaptability above and beyond personality and intelligence in women but not in men (Palese et al., 2019). In sum, similar results have been found in different contexts (physician-patient and leader-subordinate interactions), with IA related to behavioral adaptability in women but not in men.

Even though we did not include gender in our theoretical model, results showing a stronger link between IA and behavioral adaptability in women are maybe not so surprising. Women are more relationship oriented and spend more time developing and maintaining social relationships than do men (Wong & Csikszentmihalyi, 1991). Therefore, women are more interpersonally oriented than are men. Their motivation for having good social relationships may lead women to develop adaptive interpersonal skills both at the perceptual (e.g., IA) and the behavioral (e.g., behavioral adaptability) levels (Palese et al., 2019). Meta-analytic evidence shows that making correct inferences about others is indeed more connected to psychosocial functioning in women than in men (Hall et al., 2009). In the model, this is captured by the interpersonal-orientation variable.

Both the Carrard et al. (2018) and Palese et al. (2019) studies used emotion-recognition accuracy performance tests. Future research should therefore investigate whether IA is related to behavioral adaptability when assessing IA with other types of tests. For instance, testing whether being able to make correct inferences about personality traits is related to behavioral adaptability would enable researchers to better understand which "type" of IA may be more predictive of behavioral adaptability. Moreover, using others tests beyond emotion-recognition tests would enable to investigate whether the fact that there was no link between IA and behavioral adaptability in men (Carrard et al., 2018; Palese et al., 2019) was due to the way in which IA was assessed or whether, in fact, there is really no link between IA and behavioral adaptability in men.

In addition, future research might also want to take advantage of the fact that IA is trainable (Blanch-Hartigan et al., 2012; Schlegel, Vicaria, et al., 2017) to uncover the direction of the IA—behavioral adaptability link. So far, the evidence provided is only correlational and no studies have really tested whether IA is a prerequisite for behavioral adaptability. Participants could randomly be assigned either to an IA training or to a control group. For both groups, their baseline behavioral adaptability skills would be measured at the outset of the study and then again after the intervention group had the IA training. If the training group showed an increase in behavioral adaptability from the initial to the second measure and the waiting control group did not, this would be a strong indicator of IA being responsible for more behavioral adaptability.

Finally, future non-experimental studies on the topic must be careful when testing whether IA predicts behavioral adaptability. Indeed, personality traits such as extraversion and conscientiousness, openness to experience, and emotional stability, but also intelligence, are positively related to IA (Davis & Kraus, 1997; Hall et al., 2009; Schlegel et al., 2019). Moreover, personality impacts the quality of social relationships (Asendorpf & Wilpers, 1998), and intelligence is positively related to personality traits that are adaptive in terms of social adjustment (Austin et al., 2002). It is therefore important to add personality and intelligence measures in future analyses to ensure that IA explains variance in behavioral adaptability above and beyond what is explained by personality and intelligence (Palese et al., 2019).

Behavioral adaptability and positive social interaction outcomes. To our knowledge, only a few studies investigated whether behavioral adaptability is related to positive social interaction outcomes. Carrard and colleagues first investigated this question in the context of physician-patient interactions and showed that physicians who were adapting their communication to their patients' preferences during consultations had more satisfied patients (Carrard et al., 2018; Carrard, Schmid Mast, & Cousin, 2016). In addition, Palese and Schmid Mast (2019) did an experiment in which they manipulated the behavioral adaptability of a manager while he was interacting separately with two employees. Results of this study showed that managers who show behavioral adaptability are perceived as more competent, at least under certain conditions.

Summary

Past research has shown that IA is related to behavioral adaptability in women and that behavioral adaptability seems to be related to positive social interaction outcomes. These results are therefore in line, at least for women, with the Behavioral Adaptability Model introduced in this chapter. However, more research needs to be conducted in order to test others aspects of the model, such as the impact of interpersonal orientation and the role of different aspects of IA (e.g., accurate assessment of emotions, personality, intentions) on behavioral adaptability.

Conclusion

The aim of this chapter was to investigate whether being able to make correct inferences about others is beneficial in today's world. Our review of the literature shows that IA is a skill that is important because it is related to better social interaction outcomes in different contexts both for the people who are interpersonally accurate and for their interaction partner (Schmid Mast & Hall, 2018). However, the reason why IA is related to more success in social interactions has been under-researched and little is known about how interpersonally accurate people behave in social interaction. To fill this gap in the literature, we introduced the Behavioral Adaptability Model explaining the processes by which IA is related to better social interaction outcomes. We hope this model will guide future research in the field of social perception to shed light on why IA is related to positive social interaction outcomes.

Notes

1. See Hall et al. (2016) for a review of the different terms that have been generally used in the literature before 2016.
2. In this model, we assumed that Person 1 always shows behaviors that are indicative of his or her expectations. This model therefore assumes that the availability and the relevance of the behavior after Person 1's encoding process are always present. It is important to have this a priori assumption if one wants to test this model in a clean way because it forces researchers to use standardized IA performance-based tests that are controlling for the expressivity of the targets (i.e., Person 1 in the model).
3. We acknowledge that the knowledge Person 2 has about Person 1 depends on Person 2's IA and therefore evolves over time and over the number of social interactions encountered. However, for the sake of simplicity, we have chosen to restrict this model to a unique social interaction without any temporal dynamic. In this model, we therefore consider the knowledge Person 2 has about Person 1 to be fixed over time.
4. Interpersonal orientation is positively related to IA (Vogt & Colvin, 2003), which is why interpersonal orientation of Person 2 is related to Person 2's IA in our model.

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12

Skill in Social Situations: The Essence of Savoir-Faire

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Sociologists and social psychologists have long been interested in how individuals manage social impressions. This line of research began with the work of renowned US sociologist Charles Horton Cooley (1902) and

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was followed up by the work of social psychologist, George Herbert Mead (1934). Both scholars examined the role of controlling and manipulating impressions in social interaction. Perhaps the strongest voice arguing that impression management is fundamental to human social interaction was the seminal work of Erving Goffman (1959) and his "dramaturgical approach," which portrayed social life as a "stage" and humans as "actors" engaged in elaborate role-playing behaviors. Modern social psychological research in impression formation owes much to the lifelong work of Edward E. Jones (1990), who elucidated types of strategic self-presentation.

Many early scholars showed interest in individual differences as well, describing impression management as an ability, an aspect of personality functioning, and a skill. Cooley (1902) observed, "Some of them [girls] have a marked tendency to finesse and posing, while others have almost none. The latter have a less vivid personal imagination; they are unaffected chiefly, perhaps, because they have no vivid idea of how they seem to others, and so are not moved to seem rather than to be" (p. 173). Carl Jung posted the concept of a persona as "a kind of mask, designed on the one hand to make a definite impression upon others, and on the other to conceal the true nature of the individual" (1949, p. 190). Similarly, Goffman (1959) referred to the varying skills of social actors. The work of Jung and Goffman continue to be relevant, for example, toward understanding best practices in public relations (Fawkes, 2015).

In social-personality psychology, the most prominent line of research on individual differences is that of Mark Snyder (1974, 1987) on the construct of *self-monitoring*. Following Jones (1990), self-monitoring refers to individual differences in strategic self-presentation. The construct of self-monitoring, and the self-report Self-Monitoring Scale, spawned an enormous amount of research. Individuals who self-monitor deliberately monitor their expressive behavior, with the goal of creating a favorable impression on others (Gangestad & Snyder, 2000). Although self-monitoring appears to support social effectiveness, outcomes related to self-monitoring have been somewhat inconsistent (Kudret, Erdogan, & Bauer, 2019; Rauthmann, 2011). For example, individuals with relatively high self-monitoring scores tend to appear less authentic when dealing with others (Ilies, Morgeson, & Nahrgang, 2005). Appearing authentic would seem to be an important part of social skills.

More than a century ago, Cooley observed, “To be normal, to be at home in the world, with a prospect of power, usefulness, or success, the person must have that imaginative insight into other minds that underlies tact and *savoir-faire*…This insight involves sophistication, some understanding and sharing of the clandestine impulses of human nature. A simplicity that is merely the lack of this insight indicates a sort of defect” (1902, italics added). In this chapter, we use empirical data to examine *savoir-faire*, which literally translated means “to know (what) to do.” Savoir-faire has been used in the English lexicon as a label indicative of a sureness or tact in social behavior, a concept most closely related to what developmental psychologists refer to as social competence (dating back to Thorndike, 1920). Social competence refers to effectiveness in social interaction, including social skills, depth and breadth of social network(s), relationship quality, and functional outcomes of interpersonal encounters (Ladd, 1999; Rose-Krasnor, 1997). Savoir-faire, *knowing how to* act in a variety of social settings, is a distinct category of social skills necessary for social competence (Schneider, Ackerman, & Kanfer, 1996). Although savoir-faire has not been treated as a psychological construct per se, the social skills model proposed by Riggio (1986; Riggio & Carney, 2003) contains key dimensions that appear to fit Cooley’s original description of this social skill.

The *Social Skills Inventory* (SSI; Riggio, 1986; Riggio & Carney, 2003) is a 90-item self-report inventory of social skill. The SSI items originate from a hierarchical model; the SSI measures both social and emotional social skills. Operating within each of these two domains, social and emotional, are three foundational skills expressiveness (i.e., encoding skill), sensitivity (i.e., decoding skill), and control (i.e., regulatory skill). Further research using the SSI supports the reliability and validity of the SSI model (Riggio, 2014; Riggio & Carney, 2003). The full social skills model is displayed in Fig. 12.1.

Emotional intelligence (Mayer & Salovey, 1997; Mayer, Salovey, & Caruso, 2000), is conceptually related to emotional skills measured by the SSI. The MSCEIT (Mayer-Salovey-Caruso Emotional Intelligence Test) abilities measure of emotional intelligence (Mayer, Salovey, Caruso, & Sitarenios, 2003) contains subscales that assess *perceiving emotions* and

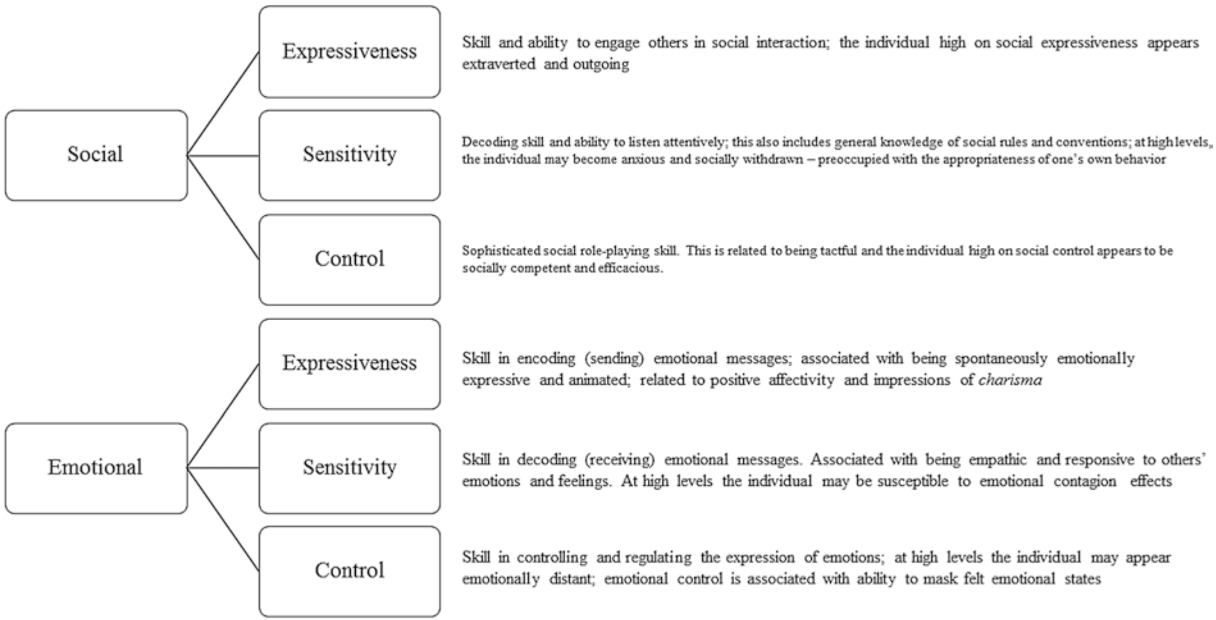

Fig. 12.1 Model of social skills measured by *The Social Skills Inventory*. (Riggio, R. E. (1986). Assessment of basic social skills. *Journal of Personality & Social Psychology, 51*, 649–660)

managing emotions, which are analogous to the SSI domains of emotional sensitivity and emotional control. Whereas the emotional side of the SSI model likely relates to emotional intelligence, the social side of the SSI model represents core elements of social intelligence.

We propose herein that two of the social subscales of the *SSI* capture the essence of savoir-faire. *Social Expressiveness (SE)* represents the desire and ability to express oneself in social interactions, with representative items including enjoyment of social gatherings, initiating conversations, and using gestures to help get the point across. *Social Control (SC)* measures the desire to engage in skillful public speaking, leading group discussions, and easily adjusting to any social situation. SC is related to being tactful and socially adept—it allows skilled individuals to adjust *their* personal behavior to fit in with what *they* consider appropriate in a social situation (Riggio, 1986). In this way, SC is conceptually related to self-monitoring (Gangestad & Snyder, 2000; Riggio, 1986), excluding other-directedness, which relates to the desire to impress others (Briggs, Cheek, & Buss, 1980; Snyder, 1974).

Savoir-Faire's Relationship to Global Personality Traits

In terms of the five-factor model of personality (Big 5; Costa & McCrae, 1992), global social skills are a facet of extraversion. However, it is clear from our previous description of savoir-faire that this construct is likely to implicate personal characteristics beyond extraversion. In addition to the gregariousness of the extravert, individuals with savoir-faire should possess the flexibility and cultural sophistication of the individual who is high on openness to experience. Individuals with savoir-faire should also possess a lack of social anxiety and affect intensity that would be present for an individual high on neuroticism, and would possess the social awareness of the individual high on agreeableness. To the extent that the combination of skills of social expressiveness and social control is a reasonable representation of savoir-faire, we would not expect this set of social skills to fit cleanly into the five-factor personality traits (Flett, Blankstein, Bator, & Pliner, 1989; Gurtman, 1999; Riggio, Throckmorton,

& DePaola, 1990; Schneider et al., 1996). Rather, savoir-faire is expected to manifest in a broad set of social behaviors. Our analyses will examine 64 mid-level expressive social behaviors (e.g., is talkative), which combine into three domains, involvement, interpersonal positive affectivity, and confidence.

Involvement. One key aspect of savoir-faire is the ability to become successfully engaged or involved in a breadth of social interactions. As one element of our savoir-faire composite, social expressiveness should predict involvement in virtually any social situation. Moreover, both social expressiveness and social control should facilitate networking and the development of social relationships. Prior research indicates that persons scoring higher on both SE and SC report larger social networks of close friends and acquaintances (Riggio, 1986).

Interpersonal positive affectivity. Individuals with savoir-faire should favor approaching interactions with others and feel comfortable in a wide range of interpersonal settings. We expect individuals with relatively high savoir-faire scores to express positivity toward other people. As a result, we expect other people will act positively toward them in return. Previous research indicates that both SE and SC are related to social intelligence, particularly the ability to assess interpersonal relationships and understand the meaning of behavioral cues in different contexts (Riggio, Messamer, & Throckmorton, 1991).

Research has also shown these two SSI subscales are positively associated with observer and experimenter ratings of likability after two minutes of acquaintanceship (Riggio, 1986). Savoir-faire has been shown to be related positively with reports of positive emotion (Miller, 1986), results that are replicated in our data $r = .36$, $p < .001$ (Positive and Negative Affect Scale; Watson, Clark, & Tellegen, 1988). Moreover, persons possessing high levels of savoir-faire are more successful at both posed and spontaneous sending (encoding) of basic emotional expressions (Tucker & Riggio, 1988).

Confidence. Another essential aspect of savoir-faire is social confidence (Lawson, Marshall, & McGrath, 1979) and self-esteem (Riggio et al., 1990). In these data, savior-faire is positively associated with social self-esteem $r = .74$, $p < .001$ (Bohon Self-esteem Scale; Bohon, 1991). Previous research indicates that these factors are negatively related to susceptibility to embarrassment and shyness (Miller, 1986). In these data, the savoir-faire construct is negatively related to social anxiety ($r = -.66$, $p < .001$), as measured by the Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975).

These individuals' level of social confidence may stem, at least in part, from relatively higher levels of verbal intelligence quotient (IQ), but certainly not fully from IQ (Englund, Levy, Hyson, & Sroufe, 2000). SC (alone) has been found to be related positively with verbal Scholastic Aptitude Test (SAT) scores and the verbal subscale of the Wechsler Adult Intelligence Scale (WAIS) (Riggio et al., 1991). Those results are replicated in these data, $r = .18$, $p < .05$ (IQ measured by the Shipley Institute of Living Scale; Shipley & Burlingame, 1941). However, the savior-faire construct (SC+SE) is unrelated to verbal intelligence in our data. Savoir-faire is related with abstraction intelligence (abstract reasoning), $r = .21$, $p < .05$, an association that remains virtually unchanged when controlling for verbal intelligence ($r = .21$, $p < .01$). Relations among emotional intelligence (i.e., MSCEIT), savoir-faire (SSI SC+SE), nonverbal decoding ability (e.g., Bänziger, Scherer, Hall, & Rosenthal, 2011), and multiple measures of traditional intelligence are an important arena for future research.

Savoir-faire and Social Outcomes

Savoir-faire should be related to positive social outcomes, such as social acceptance and the availability of social support. The bulk of the evidence to support this contention comes from the literature concerning peer relations in childhood (for a review of this literature, refer to Ladd, 1999). There is both observational and experimental evidence to indicate that social competence include behaviors that enhance peer acceptance, friendship, and other positive interpersonal outcomes. The social skills acquired through experiences with peers during development affect later interpersonal competence, and individuals' long-term psychological adjustment (Ladd, 1999). It is likely that these processes, grounded in the social behaviors manifested by individuals with savoir-faire, continue throughout the lifespan.

Savoir-faire may be particularly important in highly unstructured social situations where role-playing skill is critical to social success. Persons possessing savoir-faire should make positive first impressions, particularly in situations where they are explicitly evaluated. Two studies examining students' performance in mock hiring interviews suggest that students possessing high levels of SC are rated as more "hirable" (Riggio & Mayes, 2016; Riggio & Throckmorton, 1988). In addition, there is recent evidence that savoir-faire (both SE and SC) predicts leader emergence in small groups (Riggio, Riggio, Salinas, & Cole, 2003). We will discuss the relationship between savoir-faire and leadership in more depth later.

Perhaps one of the more interesting findings from previous research is the strong positive relationship between savoir-faire and overall perceptions of honesty of participants in a posed deception study (Riggio, Tucker, & Throckmorton, 1987). Persons scoring high on savoir-faire (SE and SC) in this study were more likely to be judged as truthful, regardless of whether they were lying or telling the truth. In other words, participants high in savoir-faire had an honest *demeanor bias* (Riggio & Friedman, 1983; Zuckerman, DeFrank, Hall, Larrance, & Rosenthal, 1979), which led to higher evaluations of honesty/credibility than persons with less savoir-faire.

Support for the Construct of Savoir-Faire

There is a good amount of piecemeal evidence that can be found to support the contention that this combination of social expressiveness and social control/role-playing skill is an important social skill for successful social interactions and satisfying relationships with others. We propose that savoir-faire is what developmental psychologists consider to be the heart of social competence, and in adulthood is a core element of the larger construct of social intelligence. In addition to the previous research examining the relationships between the SSI dimensions of SE and SC, we will present additional, unpublished research exploring the role that savoir-faire played in three different social contexts, and then review research on savoir-faire in social relationships and networks and leadership. We argue that these existing and well-validated self-report social skill measures do a good job of capturing a core element of social intelligence that we are labeling *savoir-faire*.

Savoir-Faire in Social Settings

The Riverside Accuracy Project

A series of studies was conducted as a part of the Riverside Accuracy Project (National Institute of Mental Health grant R01-MH42427 to David C. Funder), which has gathered a wide variety of data from a sample of 182 target participants (91 women and 91 men), all undergraduates at the University of California, Riverside. The specific aim of this study was to develop and test the Realistic Accuracy Model (Funder, 1995, 1999). Portions of this large data set have been used to examine a variety of issues germane to social and personality psychology, such as the determinants of inter-judge agreement (consensus) and self-other agreement (accuracy in personality judgment) (see Eaton & Funder, 2003; Funder, Kolar, & Blackman, 1995), emotional experience in daily life (Eaton & Funder, 2001; Spain, Eaton, & Funder, 2000), public and private self-consciousness (Creed & Funder, 1998), and the basis of self-esteem (Blackman & Funder, 1996). These studies do not overlap with the research presented in this chapter; all of the data analyses are new.

Overview. As part of this larger study, participants (targets) completed several self-report measures of personality, including the full *Social Skills Inventory* (Riggio, 1986; Riggio & Carney, 2003) (see Fig. 12.1). The Social Expressiveness (SE) and Social Control (SC) scales were added together to create our target participants' *savoir-faire* score. These participants nominated two college friends, who reported about the personality of our targets. The two college friends' personality ratings were averaged to provide a composite *friends-report*. Data from the first in-laboratory session is the cornerstone of the results we are reporting in this chapter. These data include *first-impressions* of personality and behaviors coded from three dyadic interactions (*Getting Acquainted*, *Cooperative*, and *Competitive*).

Session One. At the first session, opposite-sex student participants, not previously acquainted, arrived to separate locations where self-report measures were completed. These two students were introduced for the first time in the laboratory and immediately began the first of three five-minute interactions (*Getting Acquainted*). Next, each participant completed personality ratings about their interaction partner (at five minutes of acquaintanceship). Thereafter, the dyad participated in two additional five-minute interactions (*Cooperative* and *Competitive*).

Getting Acquainted Interaction. After the introduction, they were asked to sit on a two-person couch, in front of a visible video camera. The participants were instructed to "talk about whatever you'd like"; the experimenter turned on the camera and departed, to return five minutes later. Next, the participants completed several questionnaires. On one of these, they recorded their immediate first impressions of their partner's personality using a form on which slightly abbreviated California Q-Sort items (Block, 1978) were rated using a 5-point Likert-type scale (1 = *uncharacteristic of partner* to 5 = *characteristic of partner*).

Cooperative Interaction. A few minutes later, the same pair of participants were seated at a table, again in front of a clearly visible video camera. The participants were told that they would be "working together to build a model." They were provided with a set of Tinkertoy® pieces, consisting of circular wooden spools with holes, and colored dowel sticks of varying lengths. From the instruction manual, the pair was provided with a picture of the model they were to build. They were told they would have five minutes in which to complete the model. The video camera was turned on and the experimenter left the room and then returned after the five minutes had expired.

Competitive Interaction. After the cooperative interaction, the same pair of participants remained at the table. The Tinkertoy® was removed from the table and was replaced with the popular sound-repetition Simon® game. This game consists of four multicolored buttons that light up accompanied by a tone. The game begins with one lighted button and a single accompanying tone. The player presses the button that was lighted, and then the game progresses to two lighted buttons/tones. The player is to then mimic the pattern. The game continues in this manner, in increasing complexity and numbers of tones until the player can no longer correctly mimic the pattern. Then the game begins again. The participants were instructed on the rules of the Simon® game and were told they would be competing against each other, playing the Simon® game, for a US $1.00 cash prize that was placed on the table in front of the players. The experimenter then turned on the video camera and left the room and returned after the five minutes had expired.

The videotaped behaviors were subsequently coded using a 64-item Riverside Behavioral Q-sort (RBQ; Funder, Furr, & Colvin, 2000). The RBQ was modeled after the California Q-Sort (CAQ; Block, 1978) designed to provide some behavioral cognates for the personality attributes the CAQ measures. This instrument allows us to code information about behavior on our videotapes at a psychologically meaningful mid-level of analysis. For example, the RBQ includes behaviors such as "acts irritated" or "expresses warmth." These behaviors were rated by trained coders who sorted the 64 RBQ items into a nine-step, forced-choice, approximately normal distribution ranging from *not at all descriptive of the participant's behavior* (category 1) to *highly descriptive of the participant's behavior* (category 9). In this way, each of the 64 behavioral items received a rating from 1 to 9.

Four trained research assistants independently coded one randomly assigned participant, on one of the three videotaped interactions. The behavioral codes for each participant, in each session, were averaged across the four coders. As a preliminary quality control check, each coder's ratings were compared with the other three sets of ratings for the session, and were entered into the overall composite only if they correlated at least .30 with two other coders and at least .25 with the third coder. If a coder's RBQ failed to achieve this threshold, the participant was randomly assigned to another coder. This procedure ensured a minimum alpha reliability of .60 for each composite behavioral coding (for more information, see Funder et al., 2000). These behavioral ratings result in three principal components, displays of positive affectivity, involvement in the interaction, and personal confidence (Eaton & Funder, 2003).

Savoir-Faire Behaviors

Tables 12.1, 12.2, and 12.3 present the results for the *Getting Acquainted*, *Cooperative*, and *Competitive* interactions, respectively. In each table, we present significant positive and negative correlations between savoir-faire (SE + SC), each behavioral item and the three component scores. When a correlation was significant for any one of the three interactions, the direction of the relationship with savoir-faire was consistent. Across the

Table 12.1 Behavioral correlates of savoir-faire: *Getting Acquainted* situation

Behavioral Q-sort Item	*r*
Positive correlates	
Shows high enthusiasm and energy level	0.29**
Is talkative (as observed in this situation)	0.28**
Exhibits social skills	0.28**
Is expressive in face, voice, or gestures	0.27**
Speaks fluently and expresses ideas well	0.23**
Seems to enjoy the interaction	0.23**
Speaks in a loud voice	0.21**
Is physically animated	0.20*
Appears to be relaxed and comfortable	0.20*
Seems likable (to other(s) present)	0.18*
Volunteers a large amount of information	0.17*
Appears to regard self as attractive	0.16*
Behaves in a cheerful manner	0.16*
Negative correlates	
Is reserved and unexpressive	–0.39**
Exhibits an awkward interpersonal style	–0.34**
Behaves in a fearful or timid manner	–0.32**
Keeps partner(s) at a distance	–0.28**
Expresses insecurity	–0.28**
Shows physical signs of tension or anxiety	–0.28**
Seems detached from the interaction	–0.26**
Expresses criticism	–0.19*
Gives up when faced with obstacles	–0.19*
Acts irritated	–0.18*
Expresses guilt (about anything)	–0.18*
BQ component correlates	
Involvement in the interaction	0.39**
Positive affectivity toward partner	0.08
Personal confidence	0.13

Table 12.2 Behavioral correlates of savoir-faire: *Cooperative* situation

Behavioral Q-sort Item	*r*
Positive correlates	
Is expressive in face, voice, or gestures	0.31**
Is talkative (as observed in this situation)	0.30**
Dominates the interaction	0.24**
Shows high enthusiasm and energy level	0.24**
Exhibits social skills	0.23**
Is physically animated	0.23**
Acts playful	0.22**
Tries to control the interaction	0.18*
Speaks fluently and expresses ideas well	0.17*
Initiates humor	0.17*
Volunteers a large amount of information	0.17*
Negative correlates	
Exhibits an awkward interpersonal style	–0.36**
Behaves in a fearful or timid manner	–0.36**
Is reserved and unexpressive	–0.29**
Is unusual or unconventional in appearance	–0.28**
Seems detached from the interaction	–0.26**
Expresses agreement frequently	–0.25**
Expresses insecurity	–0.22**
Shows physical signs of tension or anxiety	–0.20**
Seeks advice from partner(s)	–0.19*
Seems interested in what partner(s) says	–0.18*
Keeps partner(s) at a distance	–0.16*
BQ component correlates	
Involvement in the interaction	0.32**
Positive affectivity toward partner	–0.10
Personal confidence	0.18*

three situations, the behaviors consistently and significantly correlated with savoir-faire are noteworthy. Positive correlates include *exhibits social skills*, *is talkative*, and *volunteers a lot of information*, along with a host of behaviors pertaining to skill in nonverbal communication. These consistent behaviors include *shows high enthusiasm and energy level*, *is expressive in face, voice or gestures*, and *is physically animated.* Consistent negative behavioral correlates include *is reserved and unexpressive*, *exhibits an awkward interpersonal style*, *behaves in a fearful or timid manner*, *keeps partner(s) at a distance*, *expresses insecurity*, and *seems detached from the interaction.*

Table 12.3 Behavioral correlates of savoir-faire: *Competitive* situation

Behavioral Q-sort Item	*r*
Positive correlates	
Acts playful	0.33**
Shows high enthusiasm and energy level	0.32**
Is physically animated	0.29**
Initiates humor	0.23**
Volunteers a large amount of information	0.23**
Is expressive in face, voice or gestures	0.22**
Tries to control the interaction	0.22**
Aware of being on camera or in an experiment	0.21**
Behaves in a cheerful manner	0.21**
Speaks in a loud voice	0.20*
Dominates the interaction	0.19*
Says or does interesting things	0.18*
Exhibits social skills	0.18*
Is talkative (as observed in this situation)	0.18*
Seems to enjoy the interaction	0.17*
Negative correlates	
Seeks reassurance from partner(s)	–0.28**
Gives up when faced with obstacles	–0.27**
Is reserved and unexpressive	–0.27**
Expresses insecurity	–0.25**
Seeks advice from partner(s)	–0.24**
Exhibits an awkward interpersonal style	–0.23**
Seems detached from the interaction	–0.23**
Keeps partner(s) at a distance	–0.22**
Behaves in a fearful or timid manner	–0.20**
Partner(s) seeks advice from subject	–0.19*
Expresses agreement frequently	–0.18*
Blames others (for anything)	–0.18*
Expresses criticism	–0.18*
Self-pity or feelings of victimization	–0.17*
Acts irritated	–0.16*
Talks at rather than with partner(s)	–0.16*
Compares self to other(s)	–0.16*
BQ component correlates	
Involvement in the interaction	0.29**
Positive affectivity toward partner	–0.02
Personal confidence	0.16*

These data demonstrate that behaviors indicative of *involvement* in all three of our experimental social situations were associated with savoir-faire. Furthermore, the personality attributes associated with savoir-faire indicate that these individuals possess relatively greater social self-esteem, extraversion, warmth, assertiveness, gregariousness, and ego-resilience. Previous research has shown savoir-faire social skills are associated with initiating conversation, engaging in self-disclosure, and willingness to provide social support. Individuals relatively high on savoir-faire are not concerned with expressing negative assertions (e.g., telling a companion they don't like a certain way he or she has been treated, turning down requests, confronting a close companion when he or she has broken a promise, etc.) (Buhrmester, Furman, Wittenberg, & Reis, 1988). It is likely the case that, when expressing negative assertions, individuals with savoir-faire can choose among alternative ways of saying things, so that they express themselves in ways that are tactful and non-offensive (Daly, Vangelisti, & Daughton, 1987).

The *Getting Acquainted* interaction was unstructured, meaning that participants were only instructed to talk with each other for five minutes. The *Cooperative* and *Competitive* situations were structured. In each of these situations, participants were asked to complete a task (cooperative or competitive). The consistent positive correlations across the two structured interactions include *tries to control the interaction*, *dominates the interaction*, *initiates humor*, and *acts playful*; negative correlations include *expresses agreement frequently* and *seeks advice from partner(s).* The personal confidence behavioral composite was consistently, positively correlated in the cooperative and competitive interactions. The Behavioral Q-sort does not have an item for coding leadership, per se. The collection of behaviors uniquely correlated in the two task-related situations may be indicative of individuals who assume leadership roles in a task-related context.

Social Outcomes of Savoir-faire

One would imagine, from the previous discussion, that there would be a host of positive social outcomes for individuals high on savoir-faire. In the present study, we considered two types of social outcomes. First, we considered ratings provided by the participants' interaction partner (*first impressions*). After only five minutes of acquaintanceship, these ratings were highly favorable and conform to what would be expected. The interaction partners describe individuals relatively higher on savoir-faire as relatively more talkative, having social poise and presence, having a rapid personal tempo, having a wide range of interests, power oriented, assertive, and verbally fluent, among other attributes of a similar tenor. These attributions possibly underlie the findings of Riggio and Throckmorton (1988), who found that individuals high on social control were rated as more desirable job candidates in a mock interview, even after controlling for speaking errors (linguistic and content errors) and the applicant's style of dress.

However, first impressions may not necessarily stand the test of time. Therefore, we also examined the personality descriptions provided by the college friends of our participants. In general, the *friends-report* correlates of *savoir-faire* were highly similar to those of the interaction partners' descriptions, and highly similar to the participants' own self-report personality ratings. This would indicate that the behaviors associated with savoir-faire are readily visible to others and lead to similar personality judgments, regardless of the length of acquaintanceship. This seems to imply that individuals with savoir-faire are easy to spot in a crowd and are likely to be judged in a favorable way by most of the people they know.

This present study is limited to interactions involving unacquainted opposite-sex dyads. Some of the behavioral manifestations of savoir-faire in our social situations may be context specific, generalizable only to this type of interaction partner. Further research is needed to determine which behaviors generalize to other interaction contexts and other types of interaction partners (e.g., unacquainted same-sex dyads). In light of such data, social skills training programs might be developed that specifically target for intervention universal behavioral markers of savoir-faire. Furthermore, it would be interesting and important to note the degree to which such interventions change context-specific behavior, and/or the degree to which such interventions alter both an individual's behavior and the individual's underlying personality structure (e.g., an individual's relative standing on the traits of neuroticism, extraversion, openness, and agreeableness).

Savoir-Faire and Leadership

As mentioned earlier, our SSI measure of savoir-faire (SE +SC) was found to be related to leader emergence in a laboratory setting. Elaborating on this study (Riggio et al., 2003), 315 undergraduate students participated in small groups. In a prior session, all participants completed the SSI. Leaders were assigned based on their total score on the SSI, so that there would be a range of high, medium, and low socially skilled leaders. They then led their groups through two tasks: (1) a group discussion problem-solving task and, (2) a simulation of a small assembly line. Group members rated their leaders using the Leader Behavior Description Questionnaire, Version XII-R (LBDQ; Stogdill & Coons, 1957). Trained judges viewed the videotaped group interactions and rated the leaders on their performance on both tasks. The two SSI components of savoir-faire, SE and SC, were both correlated with both the team members' LBDQ ratings (*r*'s = .32-.46), and with the trained judges' ratings, but only on the rating of the discussion task (*r*'s = .42 and .46, for SE and SC, respectively). Correlations between savoir-faire and leader ratings on the assembly task were positive, but nonsignificant (see Riggio et al., 2003). We can argue that the assembly task did not offer much opportunity for social interaction, so savoir-faire may not have mattered as much.

Given that the entire SSI was used in these laboratory studies of leadership, an obvious question is whether the emotional scales of the SSI are also related to effective leadership. The answer is mixed. Yes, scores on the Emotional Expressiveness (EE) SSI subscale were significantly correlated with group members' LBDQ ratings (*r*'s = .32-.42) and Emotional Sensitivity (ES) and Emotional Control (EC) were significantly positively correlated with judges' ratings of leaders during the discussion task (*r*'s = .34 and .40, respectively), but in other research on practicing managers/leaders, the emotion scales of the SSI rarely predict leader effectiveness, except in this way: followers tend to like emotionally skilled leaders, but the emotional skills rarely relate to leader effectiveness measured either objectively or through standardized leadership measures (such as the MLQ, which assesses transformational leadership; see Bass & Riggio, 2006). Yet, the SSI scales of Social Expressiveness and Social Control, either independently, or combined in our measure of savoir-faire, are consistently predictive of both follower ratings of leaders and standardized measures of leader performance. We surmise that emotional skills are important in a leader's appeal, and perhaps in their "charisma," but the strongest correlates of leader effectiveness consistently turn out to be the two scales that make up savoir-faire. For leadership, which is a complex social role, it is more about social intelligence than it is about emotional skill/emotional intelligence.

The most recent evidence that savoir-faire plays an important role in leadership comes from our longitudinal research with the Fullerton Longitudinal Study (FLS). This research, started in 1979 with 130 one-year-old children and their parents, began to look at the role that social skills/social intelligence (represented as the two scales assessing savoir-faire) played in predicting leader emergence and effectiveness as adults at age 29. The goal originally was to examine early precursors of leadership. In one study (Guerin et al., 2011), we explored the well-known finding that extraverts are more likely to attain leadership positions than introverts, and also to examine the role that such individual differences played in effective leadership. We did indeed find that extraversion, as measured by the NEO Big Five personality inventory, predicted both our measures of leader emergence and leader effectiveness. However, the relationship between extraversion and effective leadership was completely mediated by the individual's possession of savoir-faire. In other words, the "advantage" that extraverts have in leadership disappears if they do not possess savoir-faire (see Guerin et al., 2011).

Savoir-Faire: What It Is, What It Is Not, What Is Next

The construct of social intelligence is no doubt quite broad. As Sternberg and Kostic point out in the Introduction, it includes the ability to understand, manage, and control social interactions. It incorporates both verbal behavior and nonverbal behavior. It cross-cuts other areas of individual differences, particularly traditional intelligence, personality, and communication skill. Our data indicates that a socially intelligent individual can get along well in a variety of social contexts. The behavioral correlates indicate that our measure of savoir-faire captures the defining essence of this social intelligence. These individuals enjoy social engagements and appear to benefit from social successes. Individuals with savoir-faire know what is appropriate in a social setting; they manage themselves and social situations with flexibility and grace; they possess a willingness to enter new and novel situations; they are in control of themselves (self-possession) in social settings; and they are at ease in difficult situations (Merriam-Webster synonyms, 2019). In short, savoir-faire may represent most facets of social intelligence. Owed to the fact that social intelligence encompasses a large number of skills, future research is required to establish convergent and discriminant validity of savoir-faire against performance measures of social intelligence, emotional intelligence, and nonverbal tests of cognitive intelligence.

The SSI is a reliable and valid self-report measure that correlated in meaningful ways with behavior in our research. Nonetheless, self-report is limited in that scores represent the individual's impression of their social skill. A standardized performance test of savoir-faire would be a tremendous contribution to research and practice. Ultimately, we suggest that future research aim toward the development of a standardized aptitude or ability test for savoir-faire, one that could be used in tandem with the MSCEIT (emotional intelligence). Perhaps the greatest obstacle to this kind of test development lies in the very definition of savoir-faire. The behavioral performer is the test-taker, and the test-taker's social behavior is the unit of measurement. The BQ proved to be a valuable assessment tool for behavior in our research. Based on our BQ results, we conclude that the ideal circumstance would be structured (i.e., our cooperative and competitive situations). However, as compared to scoring standardized tests of intelligence and emotional intelligence (e.g., WAIS, MSCEIT), the BQ coding process is probably too time-consuming for applied contexts (clinicians, counselors, and industry) (see Funder et al., 2000).

What is *not* included in our construct of savoir-faire that could be part of the larger social intelligence domain? Recall that the SSI (see Fig. 12.1) measures two social domains (emotional, social), with each possessing *three* foundational skills (expressivity, control, and sensitivity). The SSI emotional domain was excluded from the computation of savoir-faire, not because these foundational skills are unimportant. The item content was not central to the savoir-faire construct.

The SSI social sensitivity subscale was also not included in the savoir-faire construct. However, an examination of social sensitivity as compared to savoir-faire is informative. Social sensitivity is quite different from savoir-faire. These two variables, in fact, are negatively correlated in our data ($r = -.20$, $p < .009$). The pattern of personality correlates for these two social skills illustrates a distinction worthy of deeper exploration in future research. Social sensitivity may capture social skills, motivated by a desire to withdraw from social interactions as gracefully as possible. For example, social sensitivity is positively related to public self-consciousness ($r = .48$, $p < .001$), social anxiety ($r = .41$, $p < .001$), and neuroticism ($r = .42$, $p < .001$).

Perhaps the most telling of the difference between the SSI measure of savoir-faire (SE+SC) and the SSI social sensitivity scale is the pattern of their correlates with the Davis Empathy Scale variables (Davis, 1983). The Davis measure of empathy includes four subscales. *Fantasy* captures an individual's inclination/ability to project their thoughts and feelings onto fictitious characters. The fantasy subscale was not correlated with SSI savoir-faire or social sensitivity. *Empathic concern*, measuring sympathy and concern for those less fortunate, is correlated positively with both savoir-faire ($r = .43$, $p < .001$) and social sensitivity ($r = .33$, $p < .001$). The *personal distress* subscale assesses unease and tension in interpersonal settings. Personal distress is correlated negatively with savoir-faire ($r = -.22$, $p < .001$) and positively with social sensitivity ($r = .34$, $p < .001$) (correlates are significantly different, $Z = 4.908$, $p < .001$). *Perspective taking* measures an individual's propensity to take the psychological perspective of others (spontaneously). Perspective taking was found to be correlated with savoir-faire ($r = .31$, $p < .001$) and was not significantly correlated with social sensitivity, $r = -.09$, *ns* (correlates are significantly different, $Z = 3.497$, $p < .001$).

To reiterate, we do not wish to leave the reader with the impression that SSI socially sensitive individuals are lacking in social intelligence. We believe the difference between social sensitivity and savoir-faire may be found in individuals' motivation in social situations and attitudes toward entering social settings. By definition, individuals with savoir-faire possess a positive, approach-related relationship with people and social situations. Correlates of SSI social sensitivity are akin to general measures of sensitivity (Aron & Aron, 1997).

In summary, our research on the construct of savoir-faire suggests that it is a good representation of *social intelligence*. There are relatively few self-report measures of social intelligence, and the combination of the two SSI subscales—Social Expressiveness and Social Control—seems to do a good job in capturing the key elements expressed in social behavior. We look forward to future research on the savoir-faire construct.

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13

Inter- and Intrapersonal Downsides of Accurately Perceiving Others' Emotions

Katja Schlegel

Emotions are an essential part of our daily life. Most of us experience, express, and perceive a variety of different feelings throughout the day. For example, we may feel stressed when we are running late for work in the morning and we may feel relieved when we make it to our first meeting in time. We may express excitement to our coworker who brings muffins for everyone and show irritation toward another colleague who misses a deadline for a joint project. We may also perceive the pride and joy of a friend who is celebrating a major success or see the disappointment and

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sadness of another friend who is telling us about a recent breakup. In a large-scale diary study conducted in Switzerland, more than 90% of the respondents reported having experienced at least four emotions per day, and about one-third reported 15 or more emotions per day (Wilhelm, Schoebi, & Perrez, 2004).

One main function of experiencing, expressing, and perceiving emotions is to guide our social encounters and facilitate the navigation of the social environment. Specifically, emotions may communicate people's intentions, attitudes, and relationships (Hwang & Matsumoto, 2019; Keltner & Haidt, 2001). Often, this information is expressed nonverbally through facial expressions, vocal tone, posture, or gestures. Accurately recognizing nonverbal signals that others send out is therefore important for understanding the causes and potential consequences of the associated emotions and for predicting what someone will do next. Only if a person successfully interprets nonverbal messages will he or she be able to use the information they contain for the benefit of his or her interpersonal goals, such as to smooth an interaction or to prevent conflict (Elfenbein, Marsh, & Ambady, 2002; McArthur & Baron, 1983).

Previous research showed that people differ substantially in their ability to accurately perceive and label emotions such as sadness, happiness, anger, and disgust. This ability is labeled emotion recognition ability, or ERA (for an overview, see Bänziger, 2016). These individual differences are often measured with performance-based tests in which participants are presented with pictures of faces, videos, or voice recordings in which actors display various emotions or affective states. For each stimulus, participants choose which emotion or state they believe was expressed. The higher the number of correctly recognized stimuli, the higher the participant's measured ERA. Widely used ERA tests include the Diagnostic Analysis of Nonverbal Accuracy (DANVA; Nowicki & Duke, 1994), Profile of Nonverbal Sensitivity (PONS; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; Bänziger, Scherer, Hall, & Rosenthal, 2011), Multimodal Emotion Recognition Test (MERT; Bänziger, Grandjean, & Scherer, 2009), and Geneva Emotion Recognition Test (GERT; Schlegel, Grandjean, & Scherer, 2014).

Because of its crucial role in navigating the social environment, ERA has been proposed as a fundamental component of broader constructs of interpersonal effectiveness such as emotional intelligence (e.g., Mayer & Salovey, 1997), emotional competence (e.g., Scherer, 2007), affective social competence (Halberstadt, Denham, & Dunsmore, 2001), or nonverbal social intelligence (Sternberg and Kostic, Chap. 1 in this volume). For example, ERA is part of the "perceiving and expressing" emotions branch in Mayer and Salovey's emotional intelligence (EI) model (1997; Mayer, Caruso, & Salovey, 2016), which hierarchically precedes the ability to use and manage emotions effectively.

As such, ERA is typically conceptualized as an adaptive skill (see Chap. 11 by Palese and Schmid Mast in this volume). Numerous studies showed that being better able to recognize others' emotions predicts better social and professional outcomes, such as better workplace performance and better quality of social and romantic relationships (for reviews, see Schmid Mast & Hall, 2018; Hall, Andrzejewski, & Yopchick, 2009; Elfenbein, Foo, White, Tan, & Aik, 2007). As a fundamental component of emotional intelligence or competence, ERA is also expected to promote personal growth, psychological well-being, and mental health (e.g., Brackett, Rivers, & Salovey, 2011). Indeed, various mental disorders, including depression, borderline personality disorder, schizophrenia, or autism spectrum disorders, are characterized by moderate to strong deficits in ERA (see meta-analyses by Cotter et al., 2018; Trevisan & Birmingham, 2016; Dalili, Penton-Voak, Harmer, & Munafò, 2015; Kohler, Walker, Martin, Healey, & Moberg, 2009).

But are there really only benefits to high ERA, or can it also be detrimental? If so, under what circumstances? This chapter attempts to answer these questions by reviewing research into the negative inter- and intrapersonal effects that the accurate recognition of others' emotions might have in nonclinical healthy adults.

For emotional intelligence more broadly, Davis and Nichols (2016) and Lea, Davis, Mahoney, and Qualter (2019) identified several areas in which high levels can have harmful or deleterious effects. First, on an interpersonal level, there is increasing evidence that high emotional intelligence can be successfully used for morally questionable purposes, such as manipulating, deceiving, or harming others when paired with "dark" personality traits such as Machiavellianism (which reflects a duplicitous and manipulative interpersonal style) and psychopathy (Côté, DeCelles, McCarthy, van Kleef, & Hideg, 2011; Grieve & Mahar, 2010). However, zero-order correlations between emotional intelligence and such traits are typically non-significant, suggesting that emotional intelligence by itself is neither "dark" nor prosocial (Austin, Farrelly, Black, & Moore, 2007).

Second, on an intrapersonal level, individuals with high EI seem to be more vulnerable to anxiety and depressive symptoms in stressful situations, for example, when watching a distressing film (Petrides & Furnham, 2003), after completing a very difficult cognitive task (Matthews et al., 2006), or when experiencing economic deprivation (Davis & Humphrey, 2012). It may be that an excessive awareness of one's emotions, particularly negative ones, can amplify the effects of stressors, leading to worse mental health.

However, the reviews by Davis and Nichols (2016) and Lea et al. (2019) did not cover studies that focused on ERA specifically, and they included mostly studies that measured emotional intelligence via self-report questionnaires that tap into personality traits rather than actual abilities (e.g., Roberts, MacCann, Matthews, & Zeidner, 2010). This chapter attempts to close this gap by summarizing the increasing number of studies that examined potentially detrimental or harmful correlates of ERA, on both inter- and intrapersonal level. The first section discusses whether high ERA can be bad for other people (i.e., whether ERA can be used to hurt or manipulate others) and whether high ERA can impair relationships with others because of "knowing too much." The second section explores whether high ERA can be bad for oneself, in particular for one's own well-being.

Negative Interpersonal Consequences of High ERA

Does ERA have a "dark side"? In the organizational context, several researchers have proposed that two facets of emotional intelligence, namely, the ability to influence what other people feel (i.e., emotion management) and the ability to use emotional information, may be used to manipulate, deceive, exploit, control, or harm others (Austin et al., 2007; Mayer, 2001). For example, Kilduff, Chiaburu, and Menges (2010) proposed that these abilities may help a person to better disguise his or her own feelings, to stir emotions in others, and to strategically control emotionally -laden information in order to promote his or her own interests at the expense of others. However, other authors emphasized that this should only be the case when high EI is paired with "dark" personality traits or motivations (Chaganti & Ravi Prakash, 2014). In line with this reasoning, Côté et al. (2011) found that emotion management positively predicted deviant behavior in the workplace, such as embarrassing a colleague or calling in sick when one is not, but only when the person scored high on Machiavellianism (a personality trait characterized by a disregard for morality, a cynical view of human nature, and the tendency to manipulate others).

For ERA, studies along the lines of Côté et al. (2011) are missing, and theoretical accounts on the dark side of emotional intelligence are mostly silent with regard to this ability (e.g., Kilduff et al. 2010). Although ERA has not explicitly been conceptualized as prosocial, several researchers consider ERA an important element of empathy (for a review, see Hall & Schwartz, 2019), which, depending on the specific definition, may encompass the willingness to help others. On the other hand, Konrath, Corneille, Bushman, and Luminet (2014) found that high ERA positively correlated with both dispositional empathy and self-reported trait exploitativeness (measured with items such as "I find it easy to manipulate people"), suggesting that ERA might be associated with both desirable and undesirable characteristics.

Overall, an increasing number of studies suggest that being good at recognizing others' emotions is directly related to more prosocial and cooperative behavior, even when personality traits or other motivations are not taken into account. In a study by Marsh, Kozak, and Ambady (2007), individuals with higher accuracy in recognizing facial emotions (particularly fear) pledged more money and time to a person in need whose voice they heard on a tape. In a second experiment, high-ERA individuals rated the attractiveness of strangers as higher when they believed that the strangers were receiving feedback on their attractiveness, suggesting that they were "nicer." In contrast, when participants believed that the target individuals would not receive feedback about their attractiveness, participants high in ERA did not provide more favorable ratings.

Better emotion recognition also fosters cooperative behavior in socio-economic interactions. Kaltwasser, Hildebrandt, Wilhelm, and Sommer (2017) found that the accurate recognition of fear and sadness predicted cooperative behavior in three computerized socio-economic games in which participants could win money. Interestingly, even in a face-to-face negotiation in which participants were specifically instructed and motivated to maximize their own financial gains, there was no evidence for malevolent or manipulative behaviors in people with high ERA (Schlegel, Mehu, van Peer, & Scherer, 2018). In contrast, when high-ERA individuals were in the "recruiter" role, they allowed the "candidates" to leave with a better deal for themselves. Notably, these recruiters did not sacrifice their own gains, but increased the pie for both negotiators, using more collaborative and integrative negotiation strategies (Schlegel, 2013). In addition, these individuals were also rated as more likeable and cooperative by the candidates (Schlegel et al., 2018).

Another study corroborated these results by experimentally manipulating ERA through a brief computerized training program (Schlegel, Vicaria, Isaacowitz, & Hall, 2017). Results showed that negotiators that completed the ERA training prior to the negotiation rated each other as less competitive than untrained negotiators, displayed significantly more positive affect, and used less forcing (Schlegel & Hall, 2019). In line with these findings, ERA was also related to lower self-reported Machiavellianism (Schlegel & Mortillaro, 2018; Simon, Francis, & Lombardo, 1990; Wai & Tiliopoulos, 2012).

Taken together, the available evidence implies that being more accurate at identifying others' emotions is generally related to being more prosocial, benevolent, and cooperative. This is in line with the finding that high-ERA individuals are also rated as more socially and emotionally competent by others (Hall et al., 2009). There may be several explanations for the link between ERA and prosociality. As suggested by Simon et al. (1990), it may be that the accurate recognition of others' feelings makes it harder to disregard negative feelings such as disappointment, irritation, or suffering that may be expressed by the individuals that one denies help, manipulates, or deceives. In a similar vein, Antonakis (in

Antonakis, Ashkanasy, & Dasborough, 2009) suggested that the more sensitive leaders are to others' emotions, the more difficult they may find it to ignore them when they need to take unpopular, but necessary courses of action for their organization. In an organizational context, high ERA may therefore represent a "curse" (Antonakis et al., 2009).

A related explanation for the link between ERA and prosociality may be that individuals with high ERA are nice to others in order to avoid perceiving negative emotions for the sake of preserving their own well-being. In addition, they may also seek positive emotional displays from third parties that witness their helping or prosocial behavior. Perceiving more positive emotions and less negative emotions in others may be a particularly important interpersonal goal for high-ERA individuals because they may be more strongly affected by them than people with low ERA (see also the next section on intrapersonal consequences of high ERA). Some studies found that individuals with higher ERA tend to mimic or imitate facial expressions of others more strongly than those with lower ERA (Drimalla, Landwehr, Hess, & Dziobek, 2019; Künecke, Hildebrandt, Recio, Sommer, & Wilhelm, 2014; Stel & van Knippenberg, 2008). Mimicking others' emotions can foster emotion contagion, that is, the sharing of the targets' emotional state (Hess & Fischer, 2017), and has been shown to impact well-being (Duffy & Chartrand, 2015) and interaction quality (Stel & Vonk, 2010). Further, more mimicry is associated with more affective empathy and more prosocial behavior (Stel, van Baaren, & Vonk, 2008), which may reinforce the link between accurate emotion perception and prosociality. Finally, it is also possible that higher prosociality contributes to the development of more accurate person-perception skills because prosocial people may be more attuned to the needs of others and thus pay more attention to others' nonverbal expressions.

Do these findings imply that ERA does not have a dark side at all? Following the reasoning of Konrath et al. (2014) or Carr (2000), one may argue that high ERA, similarly to other "objective" emotional abilities or knowledge, could very well be used to engage in deviant or morally questionable behavior if a person has manipulative behavioral tendencies or disregards the well-being of others. For example, high ERA may help in recognizing intentions or feelings another person is trying to hide; this information could then be used against a person for one's own advantage. It may also be that individuals with high ERA engage in deviant behavior in order to help or please a close other. High ERA may also allow monitoring whether another person believes a false story one is telling them and thus make deception more successful. One study in which accurate emotion perception was positively correlated with deviant workplace behavior supports the idea that it may be easier to get away with antisocial actions when one is good at recognizing emotions (Winkel, Wyland, Shaffer, & Clason, 2011). On the other hand, Lee, Hardin, Parmar, and Gino (2019) found that dishonest and unethical behavior reduced ERA, possibly because dishonesty led to higher self-focused attention, distancing from others, and moral disengagement.

Porter, ten Brinke, Baker, and Wallace (2011) also found that participants with higher ERA were able to feign emotions more convincingly than others when they were instructed to do so. This finding does not necessarily imply that these individuals would also use this skill to achieve malevolent goals, but it does show that they can do it when they attempt it. Another piece of evidence comes from two studies showing that sex offenders scored higher on emotion recognition tests than control groups and nonsex offending prisoners, implying that these individuals may have used their ability to select victims that were trusting and unsuspicious (Giannini & Fellows, 1986; Puglia, Stough, Carter, & Joseph, 2005).

Taken together, one may expect ERA to have a dark side, but many more studies are needed to further investigate this possibility, for example, in the workplace. Such studies should specifically examine whether dark traits such as Machiavellianism, trait exploitativeness, or psychopathy interact with ERA in predicting deviant behaviors, using designs like Côté et al. (2011). A direct positive effect of ERA on dark behaviors, however, seems less likely, given the increasing evidence linking ERA and prosociality reviewed earlier.

Can one be too good at recognizing others' emotions? Although ERA is typically conceptualized as a skill that benefits interpersonal interactions because it fosters better understanding of other people's thoughts and feelings, some researchers have also suggested that high levels of ERA may not always be adaptive (e.g., Elfenbein et al., 2002; Ickes & Simpson, 2001; Sabatelli, Buck, & Dreyer, 1982). The general reasoning of these authors is that accurately perceiving and interpreting nonverbal cues can sometimes reveal information that negatively impacts a relationship or conversation. For example, recognizing that one's boss is bored or annoyed during one's presentation (although he or she may have attempted to mask these feelings) may make a person insecure and lead to an awkward situation. In this case, not detecting the boss' negative feelings, that is, not "knowing too much," may in fact be more beneficial for the interaction.

The available literature focused mainly on two questions: First, whether detrimental effects of high ERA depend on the nonverbal channel (i.e., face, voice, or body) a person is especially accurate in; and second, whether there are specific professional contexts and situations in close relationships in which high accuracy is suboptimal.

It has long been suggested that nonverbal channels differ in how well they can be voluntarily controlled and, hence, how much information they "leak" inadvertently (e.g., Rosenthal & DePaulo, 1979). The face is considered the most controllable and least leaky channel, whereas the tone of voice, postures, and gestures are harder to control and hence leakier. Therefore, being very accurate at recognizing nonverbal cues in the voice and body may be potentially disruptive to interpersonal rapport because it allows a person to "eavesdrop" on others' hidden or masked true feelings. In contrast, being very accurate in detecting emotions in the face may facilitate smooth social functioning because one perceives mostly those signals that were intentionally sent by the other person in line with norms of politeness (Puccinelli & Tickle-Degnen, 2004). Given that ERA is not a uniform ability, it is likely that individuals can have relative strengths in either the leaky or the controllable channels and that this individual profile affects their interpersonal outcomes (Schlegel, Boone, & Hall, 2017).

However, whether higher accuracy in more leaky channels is detrimental may depend on the context and goals of an interpersonal interaction. Regarding romantic relationships, accuracy in the leaky channels may be harmful in some situations (e.g., when discussing a topic that poses a threat to the relationship) but not in others (e.g., discussing a conflict; Ickes & Simpson, 2001). In the workplace, some professions, but not others, may benefit from the ability to recognize emotions in less controllable channels. Tickle-Degnen (1998) found that medical doctors achieved better outcomes (e.g., supervisor ratings) when they were good at recognizing emotions from the body (a leaky channel), whereas facial ERA was unrelated to supervisor ratings. It may be that reading emotions that patients hesitate or are unable to express positively affects the doctor-patient relationship and therapy outcomes. In contrast, public service employees received worse ratings from colleagues and supervisors when they were relatively better in recognizing emotions in the "leaky" voice channel as opposed to the controllable face channel, particularly negative emotions (Elfenbein & Ambady, 2002). The authors argued that, in this specific professional context, being somewhat oblivious to negative feelings that are expressed unintentionally might smooth over the noise of everyday workplace interactions and prevent unproductive conflicts over minor issues. However, because only few studies examined whether a relative advantage in recognizing vocal or bodily cues over facial cues (termed "eavesdropping ability" by Elfenbein & Ambady, 2002) is related to professional or interpersonal outcomes, such findings should be treated with caution.

With respect to romantic relationships, Ickes and Simpson (2001) proposed an interesting theoretical model in which the accuracy of judgments about the partner's feelings and thoughts (labeled "empathic accuracy") can vary, depending on the type of situation and the motivation of the perceiver. Specifically, the "Empathic Accuracy Model" proposes that in everyday interactions (such as coordinating goals and plans), partners are typically highly motivated to be accurate, whereas in interactions that may threaten the relationship (such as discussing potential unfaithfulness), partners are motivated to be inaccurate, for example, by paying less attention (see Ickes & Hodges, 2013). This "motivated inaccuracy" is considered to be adaptive as it may stabilize the relationship.

Consequently, the model predicts that accuracy will positively correlate with relationship satisfaction in situations that are not threatening and will negatively correlate with satisfaction when a situation represents a potential relationship threat. Notably, in contrast to the previously described research, this model considers empathic accuracy as a situation-dependent phenomenon and not necessarily as an ability that manifests itself across all situations. This might mean that, for a person with high general ERA, it may be more difficult to "switch off" accuracy in relationship-threatening interactions, potentially causing the negative effects of "emotional eavesdropping" described earlier in studies on the workplace. To my knowledge, no study to date has examined the effects of ERA on motivated empathic (in)accuracy. However, Simpson et al. (2011) and Ickes and Hodges (2013) reported on other characteristics shaping empathic accuracy. In particular, they showed that partners with an avoidant attachment style display lower levels of empathic accuracy across all situations, even the ones in which high accuracy contributes to higher relationship satisfaction. In contrast, anxiously attached individuals were more accurate compared to less anxious individuals in situations posing a threat to their relationship (i.e., observing their partner rate the attractiveness of very attractive potential sexual partners). By using this "hyperactivating tactic," anxious individuals attempt to gain control over the relationship; however, as a consequence of focusing on the distressing aspects, they also ruminate more (Simpson et al., 2011).

Taken together, this section showed that high ERA may be a double-edged sword when it comes to successful social interactions: Whereas it is often beneficial for creating rapport and for smooth interactions with clients, partners, or colleagues, it can also be detrimental when one eavesdrops on information that is relationship threatening.

Consequently, Ickes and Hodges (2013) suggested that there might be a minimal threshold in ERA beyond which higher levels do not lead to additional social success or are even detrimental; that is, it should suffice to be "good enough." Similarly, Davis and Nichols (2016) proposed that emotional traits and abilities may have an optimum level before effects plateau or become negative. There is support for optimum levels and curvilinear relationships in personality, where too high levels of a generally desirable trait such as conscientiousness translate into maladaptive behavior and undesirable work and life outcomes (Carter, Miller, & Widiger, 2018).

In contrast to this position, Scherer (2007) argued that because ERA is an ability, the more should be the better. Although he did not reject the possibility that, under some circumstances, lower competence in recognizing others' emotions may make a person or a relationship happier, he pointed out that competence as a criterion for an ability should not be confused with happiness or satisfaction. Relatedly, Ashkanasy and Daus (in Antonakis et al., 2009) argued that a high level of accuracy is always preferable, but that negative consequences occur when the "leaked" emotions are not managed or regulated optimally. That is, when paired with high skill in regulating one's own and others' emotions, high ERA may benefit one's social success.

In order to decide which of the described positions is more adequate, studies examining curvilinear in addition to linear associations between ERA (in different channels) and interpersonal interactions would be useful. Such studies could distinguish between competence (e.g., using the empathic accuracy paradigm in which a participant is asked to judge the thoughts and feelings of their interaction partner from their videotaped conversation) and relational variables such as satisfaction or rapport as criteria. Additionally, they could measure participants' emotion regulation and management skills and test the proposition of Ashkanasy and Daus by examining possible interaction effects with ERA.

ERA and interpersonal judgments. Two studies suggested that high ERA can, under certain conditions, bias interpersonal judgments in a way that is potentially harmful to one's social and professional relationships. Fiori and Ortony (2016) aimed to test Antonakis' (2009) "curse of emotion" hypothesis that individuals with high emotional intelligence may be hypersensitive to emotions, show excessive emotional involvement, and thus take suboptimal decisions. To this end, they induced anger in their participants by letting them work on a very difficult task with annoying loud music playing in the background. In a seemingly unrelated second part of the study, they assessed to what extent participants formed positive or negative impressions of a fictional character in a written script with ambiguous information. They found that individuals scoring higher on an ERA task were more irritated as a result of the anger induction and also rated the fictional character as more negative than individuals with lower ERA scores.

This result implies that high ERA may indeed predispose individuals to be more affected by their own emotions when making judgments of others, even when their feelings should be unrelated to the target person. This may lead to negative interpersonal consequences, for example, when one jumps to unwarranted conclusions about an employee, colleague, or one's partner when being in a bad mood. However, more studies are needed to examine whether judgments are also biased under real-life conditions when one already knows the other person.

Bechtoldt, Beersma, Rohrmann, and Sanchez-Burks (2011) provided another example linking potentially harmful interpersonal judgments to high ERA in the workplace. They showed that over a period of 2.5 months, team members who were better at recognizing emotions attributed conflicts more often in a relationship-oriented than a task-oriented fashion, maybe because they were more sensitive to subtle affective dynamics and tension in the team. Given that relationship conflicts are considered much more disruptive to team functioning than task conflicts, the authors concluded that ERA, although often being a gift, may take its toll in conflict situations at work. Notably, however, ERA was not linked to generally inflated conflict perceptions.

Negative Intrapersonal Consequences of High ERA

The relationship between ERA and psychological well-being. In theory, emotional skills, including ERA, should increase the frequency and maintenance of positive emotions over time (Zeidner, Matthews, & Roberts, 2012). Therefore, emotional intelligence is considered a precursor of psychological well-being including life satisfaction, as well as a precursor of physical and mental health among typically developing adults (Petrides et al., 2016; Zeidner et al., 2012). Meta-analyses by Sánchez-Álvarez, Extremera, and Fernández-Berrocal (2015) and Martins, Ramalho, and Morin (2010) largely confirmed these predictions. Some mechanisms underlying these associations include better stress adaption and coping, a healthier lifestyle, and better adherence to medical treatments (Keefer, Parker, & Saklofske, 2009).

However, the meta-analyses excluded studies measuring single facets of emotional intelligence such as ERA, and most included studies used self-report measures that do not capture objective ability. To date, very few studies have specifically examined whether positive correlations between

ERA and well-being or health are found in normally developing adults (i.e., in nonclinical samples). In their meta-analysis, Hall et al. (2009) found a small negative association between interpersonal sensitivity (a construct including ERA) and depressive symptoms in healthy adults, which mirrors the meta-analytic findings in clinical samples (Dalili et al., 2015). However, heterogeneity in the effect sizes among the nine studies of nonclinical adults was significant and the number of null results required to render the association non-significant was only three.

In order to shed more light on the association between ERA and well-being among healthy adults, I meta-analyzed 17 published and unpublished effect sizes from studies conducted by my collaborators and me, which examined well-being, life satisfaction, self-reported health, and depression as correlates of ERA (see Table 13.1).

Table 13.1 includes a total of 17 published and unpublished effect sizes from 8 samples with a total N of 1653. Using these effect sizes, I conducted two mini meta-analyses according to the procedures outlined by Goh, Hall, and Rosenthal (2016) with fixed and random effects to assess the overall association between ERA and subjective well-being and health. The fixed effects analysis (weighted by sample size) yielded an effect of $r = .03$, and the random effects analysis (unweighted by sample size) yielded an effect of $r = .00$. Stouffer's Z was 0.693 ($p = .488$), suggesting that ERA is unrelated to well-being and health. This finding is in contrast to the positive correlations found for emotional intelligence in general. It seems that although high ERA contributes to better interpersonal outcomes, adjustment, and desirable traits such as tolerance or conscientiousness (Hall et al., 2009), individuals with high ERA do not describe themselves as happier, more satisfied, or healthier than individuals with low ERA. How can this finding be explained?

One answer may be that being good at recognizing others' feelings can simultaneously have both positive and negative effects on one's well-being that cancel each other out. Further, it might be that it depends on an individual's personality whether ERA has a positive or detrimental effect—in combination with some traits or skills, ERA may foster higher well-being, and in combination with others, the gift of ERA may become detrimental.

Table 13.1 Correlations between emotion recognition ability tests and self-report measures of psychological well-being and health

Study	Sample description	Emotion recognition ability test	Well-being / health measure	Pearson correlation (*r*)
Schlegel, Grandjean, and Scherer (2014)	109 French-speaking students	MERT	Well-being Scale (TEIQue)	.10
Schlegel, Grandjean, and Scherer (2014)	109 French-speaking students	MiniPONS	Well-being Scale (TEIQue)	.11
Schlegel, Grandjean, and Scherer (2014)	102 French-speaking students	MSCEIT perceiving emotions	Well-being Scale (TEIQue)	.00
Schlegel, Fontaine, and Scherer (2017) Study 2	789 Flemish-speaking community sample	GERT	Well-being Scale (TEIQue)	.05
Schlegel, Fontaine, and Scherer (2017) Study 4	117 French-speaking students	GERT	Well-being Scale (TEIQue)	−.03
Schlegel, Vicaria, et al. (2017) Study 3	82 English-speaking college students[a]	GERT-S	Well-being Scale (TEIQue)	−.05
Schlegel, Vicaria, et al. (2017) Study 3	82 English-speaking college students[a]	GERT-S	Well-being (WHO5)	.17
Schlegel, Goh, and Hall (unpublished data)	78 English-speaking college students	GERT-S	Well-being (WHO5)	.18
Schlegel and Mortillaro (2018)	211 English-speaking online sample	GERT-S	Well-being (WHO5)	−.07
Schlegel and Scherer (2017) Study 1	193 English-speaking online sample	GERT-S	Life satisfaction (SWLS)	−.23
Schlegel, Goh, and Hall (unpublished data)	87 English-speaking college students	GERT-S	Life satisfaction (SWLS)	−.12

(*continued*)

Table 13.1 (continued)

Study	Sample description	Emotion recognition ability test	Well-being / health measure	Pearson correlation (*r*)
Schlegel and Mortillaro (2018)	211 English-speaking online sample	GERT-S	Life satisfaction (SWLS)	−.10
Schlegel, Goh, and Hall (unpublished data)	78 English-speaking college students	GERT-S	Life satisfaction (SWLS)	.01
Schlegel, Fontaine, and Scherer (2017) Study 2	789 Flemish community sample	GERT	Somatic symptoms (ASR)	.07
Frühholz, Schlegel, and Grandjean (2017)	65 French-speaking students and university employees	GERT	General health (GHQ-12)	.04
Schlegel, Fontaine, and Scherer (2017) Study 2	789 Flemish community sample	GERT	Depressive symptoms (ASR)	.09
Frühholz, Schlegel, and Grandjean (2017)	65 French-speaking students and university employees	GERT	Depressive symptoms (BDI II)	2212.15

Note: *MERT* Multimodal Emotion Recognition Test (Bänziger et al., 2009), *MiniPONS* brief version of the Profile of Nonverbal Sensitivity (Bänziger et al., 2011), *MSCEIT* Mayer Salovey Caruso Emotional Intelligence Test (Mayer, Salovey, Caruso, & Sitarenios, 2003), *GERT/GERT-S* Geneva Emotion Recognition Test (full and short versions; Schlegel et al., 2014; Schlegel & Scherer, 2016), *TEIQue* Trait Emotional Intelligence Questionnaire (Petrides & Furnham, 2003), *WHO5* 5-item well-being questionnaire of the World Health Organization (Topp, Østergaard, Søndergaard, & Bech, 2015), *SWLS* Satisfaction With Life Scale (Diener, Emmons, Larsen, & Griffin, 1985∗), *ASR* Adult Self-Report (Rescorla & Achenbach, 2004), *GHQ-12* General Health Questionnaire 12-item version (Goldberg & Williams, 1988∗), *BDI II* Beck Depression Inventory, Second Edition; Beck, Steer, & Brown, 1996)

[a]Participants completed either an ERA training or a control training four weeks prior to the administration of the well-being and GERT-S measures reported here. Reported correlations are controlled for the effects of training

ERA and increased emotional awareness. One mechanism involved in the link between ERA and well-being appears to be that individuals with higher accuracy in decoding others' emotions are more attuned to emotional information in their social environments.

For example, Elfenbein, Jang, Sharma, and Sanchez-Burks (2017) showed that more accurate emotion recognition correlated with a higher capacity to "tune in" to emotional information when several competing types of stimuli were presented simultaneously in an experimental paradigm. At the same time, highly accurate individuals were not better at "tuning out" of emotional information, suggesting that they do not necessarily possess a higher ability for emotional attention regulation. These findings are supported by studies showing that self-reported emotional intelligence was related to a heightened awareness for emotions regardless of their valence and to a higher attention toward emotional relative to nonemotional words (Coffey, Berenbaum, & Kerns, 2003; Sevdalis, Petrides, & Harvey, 2007).

In a more naturalistic setting, Schlegel and Hall (in preparation) presented participants with excerpts of movies, sports events, and documentaries and asked them to freely describe everything they saw and heard. They then coded these descriptions for emotion-related statements (e.g., "The woman sitting on the right seemed worried") as well as references to nonverbal behaviors shown in the clips (e.g., "The man stood there with drooping shoulders"). Results showed that participants with higher ERA provided more emotional and nonverbal descriptions, that is, had higher emotional attunement.

As a consequence of being more aware of emotional information in their surroundings, individuals with higher ERA observe more emotions (shown by others) that they need to process, think about, and manage. In addition, it is likely that their own felt emotions are more affected by seeing life through an "emotional lens." This assumption is supported, for example, by studies showing that higher ERA is related to more facial mimicry, which in turn relates to emotional contagion (Drimalla et al., 2019; Künecke et al., 2014). Further, in the study by Fiori and Ortony (2016) described earlier, the anger induction was more effective in high-ERA participants than low-ERA participants. Finally, the positive correlations between neuroticism and ERA found in some studies (Schlegel, Fontaine, & Scherer, 2017; Schlegel & Mortillaro, 2018) fit into this picture because other-directed emotional sensitivity and being affected by other people's emotions are considered important components of neuroticism by some authors (Guarino, Roger, & Olason, 2007).

Detrimental effects of increased emotional awareness in stressful situations. When it comes to unpleasant or stressful situations, an increased emotional awareness and highly accurate perception of the negative aspects may become a burden, facilitating, for example, a ruminative and worrying response style that can contribute to depression or anxiety-related disorders (Mor & Winquist, 2002). This potential "curse" of high accuracy is consistent with the depressive realism literature, which suggests that depressed persons do not wear "rose-colored glasses" when they evaluate their performance or estimate the extent to which they can control a situation. In contrast to nondepressed individuals, they seem to make rather accurate or realistic judgments, which may be "depressing" (see Moore & Fresco, 2012, for a review).

In line with this literature, Scherer (2007) suggested that individuals with high ERA might be more realistic in their perceptions of the social world, which makes them "wiser but sadder" (Alloy & Abramson, 1988). Indeed, Harkness, Sabbagh, Jacobson, Chowdrey, and Chen (2005) found that college students performing better on an emotion recognition task were more dysphoric. They argued that mildly depressed individuals become more sensitive and vigilant observers because they aim to regain control over their social world, but that the large amount of available emotional information presents them with a higher opportunity to deploy maladaptive biases in interpreting the related events (e.g., "This person looks angry because I did something wrong and there is nothing I can do about it"). As a result, the elevated sensitivity contributes to a downward spiral that may increase the depressive symptoms.

Although the causal direction of this association has not been investigated, it seems plausible that higher ERA makes individuals more vulnerable for developing depressive symptoms. This may happen especially in situations or life phases when they perceive and experience more negative emotions than usual, for example, due to financial, work, or relationship problems. Related to the previous section of this chapter, high-ERA individuals may then also be exposed to and experience more negative emotions due to their higher ability to "eavesdrop" on (negative) feelings and their lower ability to show "motivated inaccuracy" in situations when accuracy can hurt a relationship.

Consistent with this idea, Ciarrochi, Deane, and Anderson (2002) found that higher ERA was related to a higher vulnerability for internalizing symptoms, including depression and hopelessness in adults facing chronic stress, such as from socio-economic adversity and daily hassles. ERA has also been linked to higher cortisol reactivity as well as slower recovery when completing a stressful task (Bechtoldt & Schneider, 2016). Furthermore, individuals with high ERA tend to evaluate negative situations, such as failing an exam, as more negative and see their coping potential as lower than individuals with lower ERA, which can additionally amplify the effects of stressors (Scherer, 2019). Despite the potentially negative consequences, Scherer (2019) argued that these appraisals might nevertheless be more realistic as compared to the evaluations provided by individuals with lower emotional competence, which may be overly optimistic.

Detrimental effects of high empathic concern for others. The increased emotional awareness of individuals high in ERA may also affect their well-being due to a higher tendency to "suffer with" others in distress. If a person accurately perceives negative feelings such as sadness, despair, or anxiety in others and is generally more attuned to observing such feelings in their surroundings (Schlegel & Hall, in preparation), he or she may also likely be more affected by them and, thus, experience more empathic concern and/or show more compassion for others. Although ERA shows only a low positive correlation with self-report questionnaires of empathic concern (Murphy & Lilienfeld, 2019), the studies regarding ERA, prosociality, and facial mimicry described earlier (e.g., Marsh et al., 2007) speak to this possibility. In addition, Lim and DeSteno (2016) found that individuals who experienced adversity tend to show more empathy and compassion for others in need. One may speculate that to the extent that high-ERA persons are more aware of their own negative feelings, especially in stressful periods, they may also be willing to empathize with others because they "know how it feels."

Higher empathy in the sense of "experience sharing" comes with cognitive costs, as it requires effort and motivation (Cameron et al., 2019).

Cameron et al. (2019) proposed that people might find it hard to generate empathy toward others (especially strangers) because they may not feel familiar with their feelings or situation, and as a result tend to avoid empathy when given the choice. It could be that individuals high in ERA find generating empathy easier and less effortful than others do because they are more highly attuned to emotions. They may also be less motivated to dehumanize suffering individuals, which is a strategy often used to avoid empathizing (Cameron, Harris, & Payne, 2016), potentially increasing their propensity to show empathic concern.

However, high empathy can lead to emotional exhaustion and fatigue (Cameron et al., 2016). In helping or medical professions, high empathy, as "feeling into" clients or patients, has been linked to exhaustion and burnout when it is not balanced with high detachment (Lampert & Glaser, 2018). It may thus be that one pathway linking ERA to lower psychological well-being involves generating more empathy in the sense of "feeling others' pain," also termed empathic distress (Singer & Klimecki, 2014). However, this assumption still remains to be studied, for example, using novel experimental paradigms that measure motivated empathy avoidance by letting participants select situations based upon the emotions that they want to feel (Cameron et al., 2019). Furthermore, it should be noted that individuals with high ERA might also be more likely to engage in empathy strategies that appear to increase one's own well-being, such as compassion (Singer & Klimecki, 2014).

Is an increased emotional awareness always harmful? Overall, the results presented above are largely in line with those of Davis and Nichols (2016), who concluded that higher self-reported emotional intelligence relates to a "hyperawareness" for emotions that can cause lower well-being and worse mental health. However, this "hyperawareness" may not only be detrimental, as it also seems to involve positive emotions (Coffey et al., 2003; Sevdalis et al., 2007). In pleasant situations, higher ERA may thus amplify the effects of positive emotions expressed by others, thus positively affecting well-being. There is also some evidence that high emotional intelligence is related to a higher "positivity offset," where positive affect is stronger than negative affect in neutral situations (Ito & Cacioppo, 2005): In Fiori and Ortony's (2016) second study, individuals with high emotional understanding had more positive impressions of a fictitious person that had been described in a neutral fashion. In addition, Lea, Qualter, Davis, Pérez-González, and Bangee (2018) found an attention bias for positive emotions in individuals with higher self-reported emotional intelligence.

Furthermore, studies investigating emotion differentiation (the degree of complexity with which one describes emotional experiences) and emodiversity (the breadth and abundance of emotions experienced in daily life) suggest that being more aware of, or more attuned to, emotional experiences can be beneficial (Kashdan, Feldman Barrett, & McKnight, 2015). For example, Ong, Benson, Zautra, and Ram (2018) found that greater diversity in daily positive emotions was related to lower inflammatory responses in the body. Starr, Hershenberg, Shaw, Li, and Santee (2019) reported that adolescents with a more fine-grained differentiation of negative emotions had a less depressed mood when facing daily hassles. As Israelashvili, Oosterwijk, Sauter, and Fischer (2019) could show, emotion differentiation is higher in individuals with higher ERA, suggesting a possible positive pathway from ERA to psychological well-being.

Taken together, although some studies described above did not examine ERA directly, one may speculate that when leading a stable life in a nurturing environment, high ERA is an adaptive skill fostering positive affect and well-being. However, when facing very stressful situations or even chronic stress, high ERA can become detrimental, leaving individuals overwhelmed with negative feelings (unless they have exceptional emotion regulation skills). A similar "fish out of water" phenomenon has been described for high prosociality, which, as described in the previous section, appears to be related to ERA. Wilson and Csikszentmihalyi (2007) found that highly prosocial individuals experienced more stress and coped less well when facing adversity, although they were thriving in stable nurturing environments.

Emotion regulation as a buffer for the detrimental effects of high ERA. Being more aware of and more affected by others' emotions arguably places higher demands on one's skills and resources for regulating one's own emotions and managing others' emotions (Elfenbein et al., 2002). Whereas individuals with lower ERA and emotional attunement may "filter out" many emotions at an early stage of perception (Fiori & Ortony, 2016) and thus not require exceptional emotion regulation or management skills, individuals with high ERA may need high levels of these skills in order to face the heightened amount of information in a way that preserves their well-being.

Given that ERA and emotion management or regulation are all considered facets of a general emotional intelligence (e.g., Mayer & Salovey, 1997), one may assume that when a person has higher ERA, he or she should also be better at managing emotions. However, correlations between ERA and emotion management tend to be low. For example, Rossen, Kranzler, and Algina (2008) reported a correlation of only $r = .17$ between the perceiving and managing own and others' emotions branches of a widely used ability test of emotional intelligence. Similarly, Schlegel and Mortillaro (2018) found that ERA and the self-reported use of adaptive and maladaptive emotion regulation strategies (e.g., reappraisal, acceptance, focusing only on planning versus rumination, catastrophizing, and suppression) were largely unrelated. These findings suggest that high ERA and effective emotion management in oneself and others do not necessarily go hand in hand.

It would therefore be very interesting to investigate whether ERA and emotion management or regulation interact in predicting well-being and health (Elfenbein et al., 2002). One may speculate that low levels of emotion management and regulation are less problematic for a person's well-being when he or she has low ERA as compared to when he or she has high ERA. For individuals with high ERA, high emotion management and regulation skills may buffer negative effects on well-being, which low-ERA individuals would be less affected by.

One study that comes close to this idea was conducted by Bechtoldt, Rohrmann, De Pater, and Beersma (2011). It examined how self-reported deep and surface acting (two emotion regulation strategies helping workers to display desired emotions to clients) and ERA interacted in predicting work engagement in police officers and nurses. Results suggested that deep and surface acting were positively related to work engagement when ERA was high and negatively related to work engagement when ERA was low, suggesting that ERA acted as a buffer for the potential negative effects of emotional labor. However, studies examining the reverse idea that high emotion regulation skills may buffer negative effects of high ERA are still lacking.

One caveat for such studies is that available tests for emotion regulation and management measure either the declarative (crystallized) knowledge about which strategies are the most effective ones (e.g., MacCann & Roberts, 2008) or the self-reported habitual use of these strategies (e.g., Garnefski & Kraaij, 2006). However, they do not capture the real-time use of these strategies (Vesely Maillefer, Udayar, & Fiori, 2018). It could thus be that although a high-ERA person theoretically knows what to do or think in a stressful situation, he or she may have difficulties implementing it because the "hyperawareness" for emotional information leaves him or her overwhelmed and takes up resources needed for emotion regulation (Fiori & Ortony, 2016).

Summary and Conclusion

The ability to accurately recognize others' emotions from the face, voice, and body is typically considered to be an adaptive skill contributing to social and professional success. This has been supported by various studies (see Schmid Mast & Hall, 2018; Hall et al., 2009; Elfenbein et al., 2007, for reviews). Much less research has looked into the potential downsides or disadvantages of high ERA for oneself (i.e., for one's well-being) and for others (i.e., by manipulating other people or hampering smooth interactions with others). The present chapter reviewed this research in non-clinical adults, specifically focusing on the following questions: Is there a "dark" side to high ERA in that people use it to hurt others? Can high ERA negatively affect the quality of relationships? Why is high ERA uncorrelated with psychological well-being? Finally, is there an optimal level of ERA?

Although more research is clearly needed to answer these questions with more confidence, the current state of the literature suggests that ERA is a double-edged sword that affects one's well-being and social outcomes both positively and negatively. One common theme that emerged as a possible explanation for both positive and negative pathways is the heightened emotional awareness of or attunement to others' feelings in persons with high ERA. Because high-ERA individuals are more perceptive of others' positive and negative emotions, their own emotions also appear be more affected by what is happening around them, contributing to various inter- and intrapersonal outcomes.

For instance, high-ERA individuals seem to be more prosocial and cooperative, maybe in order to perceive more positive emotions in others and to preserve their own psychological well-being. Heightened emotional awareness for others' feelings can also explain the positive associations between ERA and social and workplace effectiveness found in many studies. On the other hand, "hyperawareness" in high-ERA individuals can inadvertently contribute to lower rapport, less favorable impressions in others, and lower relationship quality due to "eavesdropping" and the failure to show "motivated inaccuracy" when it might be adaptive.

Because high emotional awareness appears to amplify the effects of perceived positive and negative emotions, in stable environments with only few stressors, the adaptive advantages of high ERA may outweigh the downsides. However, as adversity or instability increases, the higher proportion of perceived and experienced negative affect may contribute to lower well-being and the development of depressive symptoms. A higher tendency to suffer with others in distress might represent one possible mechanism negatively influencing psychological well-being.

Taken together, the various positive and negative pathways between high ERA and well-being as well as interpersonal relationships may explain why ERA does not appear to be positively correlated with well-being, although this had been found for emotional intelligence more broadly (e.g., Sánchez-Álvarez et al., 2015). One may speculate that other components of emotional intelligence such as the ability to regulate one's own negative emotions efficiently or the ability to manage others' emotions have fewer potential downsides than ERA with respect to one's own well-being, although they may be more "useful" when it comes to manipulating others (e.g., Côté et al., 2011).

An interesting question is whether the terms "emotional hyperawareness" (e.g., Davis & Nichols, 2016) or "hypersensitivity" (Fiori & Ortony, 2016) are appropriate to describe high-ERA individuals. These terms are often used to describe an exaggerated, maladaptive reactivity of neurophysiological structures related to mental disorders (e.g., Frick et al., 2012; Neuner et al., 2010). In healthy individuals with high ERA, however, the elevated attunement to emotions might represent a more realistic and holistic view of the social world rather than a bias (Scherer, 2007). If this is the case, then the absence of a correlation between ERA and well-being or life satisfaction may also reflect that those high in ERA evaluate these constructs more realistically and thus more negatively, although they might be "happier" than others if different criteria were used. It may also be that high-ERA individuals, compared to low-ERA individuals, are relatively more satisfied with some life domains (e.g., friendships) and less satisfied with others (e.g., work), which may cancel each other out when global well-being or life satisfaction is considered.

The current literature can be expanded in several ways. In particular, more studies that examine the moderating effects of personality traits on the link between ERA and outcomes are needed. In particular, traits related to the processing and regulation of emotions in oneself and others might moderate the effects of ERA not only on intrapersonal outcomes such as psychological well-being but also on interpersonal outcomes such as relationship quality. For example, it would be interesting to examine how ERA, empathic concern, and detachment interact in predicting stress, emotional exhaustion, or work engagement in helping professions. One can hypothesize that a high ability to detach oneself from stressful negative work experiences protects professionals that are highly perceptive of clients' negative feelings and express empathic concern from negative effects on well-being. Other possible moderating variables include "positivity offset" (Ito & Cacioppo, 2005) and stable appraisal biases (Scherer, 2019). In addition, "dark" personality traits might moderate the effects on interpersonal behaviors such as deception, such that high ERA may, for example, amplify the effects of high Machiavellianism or trait exploitativeness (Konrath et al., 2014). Future studies should also look into curvilinear relationships to examine which levels of ERA are the most beneficial or detrimental for various outcomes and situations.

Furthermore, longitudinal studies may shed light on the causality underlying ERA and the development of psychological well-being over time as a function of a person's environment. For example, it could be tested whether Wilson and Csikszentmihalyi's (2007) finding that prosociality is beneficial in stable environments but detrimental in adverse ones also holds for ERA. Such studies would also allow investigating the causal pathways linking ERA and depressive symptoms, including testing the possibilities that dysphoria increases ERA (Harkness et al., 2005) and that ERA, due to a more realistic perception of the social world, makes people "wiser but sadder" (Scherer, 2007).

Many of the above conclusions rely on the assumption that high ERA relates to a higher attunement to emotions in our surroundings. However, only few studies to date examined this association. Fiori and Ortony (2016) and Freudenthaler and Neubauer (2007) pointed out that ability tests of emotional intelligence measure maximal performance and crystallized knowledge, but do not necessarily capture typical performance and more fluid emotion processing. More research is thus needed to corroborate the idea that being good at accurately labeling emotional expressions when one is explicitly instructed to do so is related to paying more attention to emotions in everyday life when an abundance of different types of information is available. Future research should involve the development of new standard tests tapping into typical performance regarding emotion perception. Future studies could also benefit from using methods such as portable eye tracking or experience sampling to be able to study more real-life situations. Finally, future studies may examine satisfaction in specific life domains as outcome measures of ERA in addition to general measures of well-being.

The current review also raises the question whether available trainings for increasing ERA (see Blanch-Hartigan, Andrzejewski, & Hill, 2012 for a meta-analysis) are useful if high ERA can have detrimental effects. The answer may depend on what outcomes are considered. If an ERA training improves law enforcement officers' job performance (Hurley, Anker, Frank, Matsumoto, & Hwang, 2014) or helps doctors to better understand their patients (Blanch-Hartigan, 2012), the answer would be that trainings are useful. When psychological well-being is considered as the outcome, stand-alone ERA trainings may not always be useful, for example, if a person is experiencing chronic stress or depressive symptoms. In these cases, it may be beneficial to combine an ERA training with a training targeted at the use of adaptive emotion regulation strategies to prevent potentially detrimental effects.

To conclude, I would like to emphasize that, overall, ERA should still be considered an adaptive and valuable skill, especially when effective interpersonal interactions in the workplace or close relationships are considered (e.g., reviews by Elfenbein et al., 2007; Schmid Mast & Hall, 2018). High-ERA individuals receive better ratings from others on various positive traits (e.g., socio-emotional competence) and report being more open, more conscientious, and more tolerant (Hall et al., 2009). The interpersonal downsides and "dark" aspects of high ERA in healthy adults discussed in the present chapter seem to be limited to relatively specific situations or ERA profiles, although more research is needed. With respect to psychological well-being, however, the picture seems to be more nuanced, implying both positive and negative pathways that may be more or less influential based on a person's life situation and personality traits. More sophisticated study designs, novel data collection methods, and more complex statistical analyses can help us better understand these mechanisms.

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14

Trait Impressions from Faces Demonstrate Preserved Social Intelligence in Older Adulthood

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Given the oft-repeated warning 'don't judge a book by its cover,' a chapter on first impressions from faces may seem out of place in a book about social intelligence unless the aim is to show that this is an indicator of low social intelligence. However, that is not our aim. Rather, we will argue that first impressions of faces overgeneralize adaptive impressions of categories of people that those faces resemble, and we will address the question of whether this adaptive overgeneralization persists into older adulthood.

Evidence that first impressions from faces must serve some adaptive function is provided by the fact that they are fast and automatic, with impressions elicited by exposure as brief as 50 milliseconds, significantly, albeit not perfectly, correlated with those shown at longer exposures (Bar,

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Neta, & Linz, 2006; Rule & Ambady, 2008; Willis & Todorov, 2006). Such effects suggest an origin in evolutionarily adaptive systems, which is supported by the remarkable consensus in such judgments, including cross-cultural agreement that extends even to indigenous people from the remote Bolivian rain forest (Zebrowitz et al., 2012), and evidence that infants' and young children's responses to faces are similar to those of adults (for reviews, see Zebrowitz & Montepare, 2014; Zebrowitz, 2017).

To explain the strong and widespread associations between facial appearance and character traits, it is instructive to consider that faces do provide useful and accurate information about the social interactions people afford. In particular, faces reveal demographic qualities, such as age, sex, and race, as well as more transient states of emotion and physical fitness, all of which provide guides to adaptive social interactions. For example, the 'cute' face of a baby elicits adaptive approach and protective responses, and an angry face potentiates adaptive avoidance and defensive responses. A set of overgeneralization hypotheses generated by the ecological theory of social perception (McArthur & Baron, 1983; Zebrowitz & Collins, 1997) builds on these diagnostic aspects of faces to explain perceived links between appearance and traits in the absence of actual demographic or state differences.

In babyface overgeneralization, the adaptive value of responding appropriately to babies, such as giving protection or inhibiting aggression, produces a strong tendency to respond to facial qualities that identify babies, and this is overgeneralized to impressions of people whose faces resemble a baby's, regardless of their actual age. In anomalous face overgeneralization, the adaptive value of recognizing unfit people with disease or bad genes, such as rejecting them as mates or avoiding contagion, produces a strong tendency to respond to facial qualities that mark low fitness, and this is overgeneralized to impressions of normal unattractive people whose facial structure resembles individuals low in fitness. This gives rise to what has been dubbed the 'attractiveness halo effect,' sometimes summarized as 'what is beautiful is good' (Eagly, Ashmore, Makhijani, & Longo, 1991). However, consistent with the anomalous face overgeneralization hypothesis, research has shown a stronger tendency for trait impressions to derogate unattractive people than to esteem attractive ones (Griffin & Langlois, 2006). In emotion face overgeneralization, the adaptive value of responding appropriately to emotional expressions, such as avoiding an angry person or approaching a happy one, produces a strong tendency to respond to facial qualities that reveal emotions, and this is overgeneralized to impressions of people whose facial structure resembles a particular emotional expression even with a neutral expression. In familiar face overgeneralization, the adaptive value of differentiating friends from foes or known individuals from strangers produces a strong tendency to respond to face familiarity, and this is overgeneralized to impressions of people who vary in their resemblance to known individuals even when all are strangers.

Possible Effects of Aging on First Impressions from Faces

Aging has been associated with changes in motivation, cognitive capacity, neural functioning, and sensory declines. In the case of the latter changes, it is possible that older adults (OA) are less able to see facial qualities that influence impressions, like emotion resemblance or attractiveness. For this reason, age differences in visual acuity and contrast sensitivity have been ruled out as possible mediators of age differences in first impressions from faces in all of the studies from our lab reported in this chapter. Possible influences of age-related changes in motivation, cognitive capacity, and neural processing, which are not mutually exclusive, are discussed below.

Socio-emotional selectivity. An influential motivational theory in the psychology of aging is socio-emotional selectivity theory (Carstensen & Mikels, 2005). According to this theory, a shorter future time perspective in OA yields greater concern with emotionally meaningful goals and greater motivation to engage in emotion regulation aimed at maintaining a positive mood. This theory has been applied to explain evidence for greater positivity in attention to and memory of various stimuli among older than younger adults (YA) (Murphy & Isaacowitz, 2008; Reed, Chan, & Mikels, 2014). Specifically, the OA positivity effect has been attributed to less processing of negative stimuli and/or greater processing of positive stimuli in the service of emotion regulation. Such effects could yield more positive trait impressions for OA than YA.

Behavioral relevance of facial cues. Another possible motivational change with aging that could affect first impressions from faces is a change in the cues that are most behaviorally relevant. According to the ecological theory of perception (Gibson, 1979), perceiving is for doing—that is, perceptions inform adaptive actions. Insofar as behavioral goals change with age, first impressions from faces may reflect attention to different cues in OA and YA. As social interactions tend to be segregated by age, there also may be an own-age bias in which particular facial cues have more impact on impressions when displayed in own-age faces, where they are more behaviorally relevant than in other-age faces. Indeed, OA show better performance for older than younger faces on face recognition (Anastasi & Rhodes, 2005; Fulton & Bartlett, 1991), age recognition (Voelkle, Ebner, Lindenberger, & Riediger, 2011), emotion recognition (Malatesta, Izard, Culver, & Nicolich, 1987), and recognition of criminals in lineups (Wright & Stroud, 2002). This 'own-age bias' may also be shown in the domain of face impressions, in which case OA will be more sensitive to variations in the appearance of older than younger faces, with the reverse true for YA.

Information-processing capacity. Aging is associated with multiple changes in cognitive function. One significant age-related change is a reduction in information-processing capacity in OA, with slowed processing speed as one important component of this reduced capacity (Salthouse, 1996). For example, OA perform more slowly than YA on tests that require deciding whether pairs of digits or line patterns are the same or different. Furthermore, processing speed on tests like these accounts for considerable variance in the age differences in performance on a variety of cognitive measures. These range from mathematical and memory tests to the Stroop test, which requires controlling a prepotent response in order to make the nondominant correct response, a hallmark of age-related declines in executive function (Salthouse, 2000). The proposed mechanisms for these adverse effects of slowing are that relevant operations cannot be executed due to limited time and that the products of early processing may be lost by the time later processing is performed. Extrapolating to the domain of first impressions from faces, reduced information-processing capacity in OA may produce impressions that rely on the most easily processed facial cues. This effect may be amplified under conditions of distraction and it may be particularly influential in the case of impressions that match social stereotypes, such as race or gender, since there is considerable evidence that YA often control their initial stereotyped impressions (Devine, 1989).

Neural dedifferentiation. Theories of life-span cognition propose that development is marked by the differentiation of abilities from childhood through adulthood with dedifferentiation in older adulthood, when cognitive abilities become less distinctive and more homogeneous (Balinsky, 1941; Baltes, 1987; Ghisletta & de Ribaupierre, 2005). Age-related neural dedifferentiation can be conceptualized as an increasingly shared neural substrate for particular stimuli or tasks that yield less specificity in the activation pattern with increasing age. Two non-mutually exclusive explanations for these age-related changes in specificity have been suggested: (1) functional compensation for neural decline that may yield age-related changes in recruitment of additional regions of activation, and (2) difficulty recruiting specialized neural mechanisms that may yield age-related decreases in the 'tuning' of activation.

Neural dedifferentiation relevant to face perception has been shown in greater OA than YA fusiform face area (FFA) adaptation to faces that are moderately similar (Goh et al., 2010). Thus, the neural region that is specifically attuned to faces shows less differentiation between similar faces in OA than YA. OA also show a smaller difference in activation to faces versus other stimulus categories in the FFA than do YA (Park et al., 2004, 2012). These effects are consistent with the idea that OA have difficulty recruiting neural mechanisms specialized for face perception. Consistent with this suggestion, OA showed lower resting blood flow than YA in the FFA, which is specialized for face processing, but not in regions specialized for recognizing places or objects (Zebrowitz, Ward, Boshyan, Gutchess, & Hadjikhani, 2016). Mediation analyses further revealed that FFA resting-state blood flow mediated age differences in the specificity of FFA activation to faces, whereas age differences in visual and cognitive function and cortical thickness did not (Zebrowitz et al., 2016). Increased neural dedifferentiation in OA may have behavioral effects in the domain of face perception, including impressions that make fewer distinctions among faces.

Actual Effects of Aging on First Impressions from Faces

In the following sections, we discuss evidence regarding effects of normal aging on several aspects of first impressions from faces, including positivity, differentiation, anomalous face overgeneralization, babyface overgeneralization, emotion face overgeneralization, familiar face overgeneralization, inter-rater agreement, and accuracy. Where data are available, we also discuss own-age biases. Due to space limitations, this review focuses primarily on research from the Zebrowitz Face Perception Lab. Younger adults in this research were largely college students. The older adults were community dwelling with an average age of 76.25 years (range 65–93 years). Notably, the duration of exposure to the faces varied from two to three seconds, which allowed for either low-effort, automatic processing of the information or more effortful, controlled processing, a distinction that is discussed in more detail below.

Perceiver age and impression positivity. Like the OA positivity effect in attention and memory noted above, an OA positivity effect is also revealed in trait impressions from faces. Compared with YA, OA showed more positive impressions of neutral-expression faces, including less hostility and greater health and trustworthiness (Zebrowitz, Boshyan, Ward, Gutchess, & Hadjikhani, 2017; Zebrowitz, Franklin, Hillman, & Boc, 2013; Zebrowitz, Ward, Boshyan, Gutchess, & Hadjikhani, 2018). When assessing potential mediators for age differences, the OA positivity effect lost significance when controlling for processing speed (as assessed by a timed pattern-comparison test), whereas it was not affected when controlling mood or other sensory and cognitive age differences (visual acuity, contrast sensitivity, and executive function, as assessed by a card sort test and a letter-number sequencing test; Zebrowitz et al., 2013).

In addition to investigating age differences in overall impression positivity, some research has examined whether this effect is moderated by the valence of the faces. A socio-emotional selectivity account would predict a stronger OA positivity effect for the most negatively valenced faces, which should engage more emotion regulation among OA than YA. However, the results are mixed. One study found that higher-trustworthy ratings by OA than YA was limited to faces independently assessed as low trustworthy, although that study did not control the distribution of face age and sex across the high- and low-trustworthy faces, leaving open the possibility that OA's greater positivity for low-trustworthy faces reflected age differences in evaluations of face sex or age rather than trustworthiness per se (Castle et al., 2012). Using a representative sample of faces and controlling face age and sex, another study found that the greater positivity of OA than YA impressions was stronger for faces that were below rather than above the median in impressions of health and for faces above rather than below the median in impressions of untrustworthiness (Zebrowitz et al., 2013). On the other hand, the OA positivity effect in impressions of trustworthiness was not stronger for faces preselected to be very low in trustworthiness as compared with those selected to be very high, with sex and age controlled (Zebrowitz et al., 2017, Study 2). Further evidence that OA positivity is not systematically greater for more negatively valenced faces was the finding that it was absent in impressions of trustworthiness of extremely unattractive disfigured faces as well as for extremely attractive faces of high-fashion models, but present for faces medium in attractiveness (Zebrowitz et al., 2017, Study 1). Similarly, the tendency for OA to perceive more positive affect in faces was shown for faces with ambiguous expressions, but not for those with clearly positive or negative expressions (Kellough & Knight, 2011). The exceptions to an OA positivity effect in impressions from faces may be linked to the finding that the effect is mediated by OA's reduced cognitive capacity. Specifically, impressions of faces at the extremes of trustworthiness, attractiveness, or emotion expressions may be largely determined by automatic processes that require less cognitive capacity than impressions of more ambiguous faces, which provide more conflicting cues.

The finding that reduced cognitive capacity can explain greater OA positivity in trait impressions from faces is consistent with evidence that the processing of negative stimuli requires more cognitive resources, because they are more cognitively elaborated than positive ones (Rozin &

Royzman, 2001; Taylor, 1991). Supporting this point is the finding that both OA and YA show more effortful processing when viewing negative than positive images, as indexed by pupil dilation (Ziaei, von Hippel, Henry, & Becker, 2015). Factors that interfere with such processing should decrease negative evaluations. This could be a reduced cognitive capacity in OA or cognitive load imposed by other tasks for either YA or OA. Evidence consistent with this suggestion is provided by the finding that cognitive load increased self-enhancing self-descriptions in YA (Beer, Chester, & Hughes, 2013; Paulhus, Graf, & Van Selst, 1989). It is noteworthy that self-descriptions are drawn from a wealth of information that includes both negative and positive cues, which is also true for impressions of most faces. Cognitive load may impair the ability to extract and elaborate the negative cues

Like the effects of cognitive load on the positivity of YA self-descriptions, it also serves to increase both YA and OA positivity in impressions of faces. In two studies, YA and OA rated the trustworthiness of faces that varied in valence both with their cognitive capacity reduced by a distracting backward counting task and in a control condition (Zebrowitz et al., 2017). As described earlier, face valence was manipulated by pre-ratings of attractiveness in the first study (low/disfigured faces, medium, high/fashion models' faces). In the second study, face valence was manipulated by pre-ratings of trustworthiness (low, medium, high). In both studies, face age and sex were controlled across the three valence conditions. The results revealed that cognitive load increased OA impressions of trustworthiness, including negatively valenced faces, and it did the same for YA. These results are inconsistent with an emotion-regulation explanation for OA positivity, which would predict a decrease in OA impressions of trustworthiness when their capacity to regulate emotions was diminished by distraction. On the other hand, the results are consistent with theory and research arguing that more cognitive resources are required to process negative cues, because they are more cognitively elaborated than positive ones. It appears that under cognitive load, whatever negative cues are available in faces are processed less by both YA and OA, yielding more positive impressions. The finding that increased age and increased cognitive load both enhanced the positivity of trustworthy ratings supports the argument that the OA positivity effect in evaluative ratings of faces reflects age-related declines in cognitive capacity, which impacts the processing of negative cues more than it does positive ones.[1]

Perceiver age and differentiation of impressions. Age-related increases in neural dedifferentiation in brain regions involved in face processing that were discussed above are paralleled by age-related reductions in accurate face recognition (Bartlett & Leslie, 1986; Bartlett, Leslie, Tubb, & Fulton, 1989; Goh et al., 2010) and emotion recognition (Orgeta & Phillips, 2008; Ruffman, Henry, Livingstone, & Phillips, 2008; Slessor, Laird, Phillips, Bull, & Filippou, 2010) that reflect a decreased ability to differentiate one face or emotion expression from another. Research examining trait impressions from faces has also shown age-related dedifferentiation (Ng, Zebrowitz, & Franklin, 2014). More specifically, a differentiation index that assessed OA and YA likelihood of assigning different faces to different levels on trait scales revealed that OA showed less differentiated ratings of the competence, health, hostility, and untrustworthiness of older and younger faces from representative samples. In addition to the lower differentiation of OA than YA impressions, OA showed an own-age bias in health impressions, which were more differentiated for older than younger faces. A particular sensitivity to variations in health-related cues in their peers is likely more adaptive for OA than YA, who did not show this bias.

Whereas lower processing capacity in OA could arguably reduce the ability to make fine distinctions among faces, the slower processing speed found in OA did not mediate the age differences in trait impression differentiation and neither did any of the other sensory and cognitive age differences, including visual acuity, contrast sensitivity, and executive function. Although research that includes additional measures of processing capacity may support a role for reduced cognitive capacity as a mediator of the dedifferentiation of OA trait impressions from faces, it is also possible that it is directly associated with OA neural dedifferentiation in the face-processing area. Interestingly, the lesser differentiation of OA trait impressions was positively associated with their greater positivity. This is consistent with the argument that positive impressions require less cognitive elaboration than do negative ones, and that this accounts for the OA positivity effect.

Perceiver age and responses to attractiveness. Hundreds of studies have documented that YA show more positive impressions of attractive than unattractive faces, an effect that has been dubbed 'the attractiveness halo.' Some have argued that a preference for attractive faces derives from attractiveness as an honest signal of mate quality (for a review, see Rhodes, 2006). Given that OA are less likely to be seeking fertile mates, this position would predict that OA first impressions from faces may show weaker effects of attractiveness than YA impressions, and so would the idea that OA have developed the wisdom to ignore attractiveness as a basis for forming impressions (cf. Baltes & Smith, 2008). Conversely, several lines of research suggest that OA and YA may have similar responses to attractiveness. Although mate quality may have less impact on OA first impressions, facial attractiveness judgments reflect not only sexual but also aesthetic value (Franklin & Adams, 2009, 2010), in which case, attractiveness may equally influence the first impressions of OA and YA. Another reason to expect comparable effects across age groups is theory and research indicating that the preference for attractive faces derives from the adaptive value of eschewing people whose unattractive faces resemble people who are unfit, either due to genetic anomalies or due to poor health-anomalous face overgeneralization (Zebrowitz, Fellous, Mignault, & Andreoletti, 2003). On this account, OA first impressions should be as responsive to attractiveness as those of YA.

Apart from possible age differences in the adaptive value of attractiveness cues, OA and YA may also show differences in the attractiveness halo due to the OA 'positivity effect' as well as due to an own-age bias effect. In the case of positivity, OA lower responsiveness to negative stimuli may translate to a weaker influence of low attractiveness on their impressions, whereas their higher responsiveness to positive stimuli may translate to a stronger influence of high attractiveness. In the case of own-age bias, it is possible that attractiveness will have a greater impact on impressions of own-age faces, paralleling previously discussed own-age biases in face recognition (Anastasi & Rhodes, 2005; Fulton & Bartlett, 1991; Malatesta et al., 1987; Voelkle et al., 2011; Wright & Stroud, 2002).

Although a huge amount of literature has documented more positive impressions of attractive than unattractive people, only a handful of studies have examined whether this holds true for OA perceivers. An early study (Larose & Standing, 1998) found an OA halo effect, but it did not include YA judges, older and younger faces, or compare high or low to medium attractive faces. Thus, that study shed no light on whether the halo effect was moderated by rater age, face age, or cue positivity. More recent research addresses these questions.

Investigations of rater age effects in response to attractiveness have found no overall differences. OA, like YA, show attractiveness halo effects where attractiveness positively influences perceptions of other traits. A study discussed above investigated YA and OA judges' impressions of faces that were extremely low in attractiveness (disfigured faces), medium in attractiveness, or extremely high in attractiveness (fashion models' faces) (Zebrowitz et al., 2017, Study 1). Both YA and OA showed an attractiveness halo effect, rating more attractive faces as more trustworthy, and the magnitude of this effect did not vary with rater age. Another study investigated how variations in attractiveness among older and younger adult faces drawn from representative samples influenced trait impressions (Zebrowitz & Franklin, 2014). The results revealed a significant attractiveness halo effect for OA as well as YA, with more attractive faces rated as less hostile and less untrustworthy as well as more competent and more healthy.

Whereas both OA and YA show the attractiveness halo effect, the strength of some effects in the Zebrowitz and Franklin (2014) study were moderated by rater age or face age. Specifically, the halo effect was weaker for OA than YA in the case of untrustworthy and competent ratings, and stronger for OA than YA in the case of health ratings. Importantly, the age differences for competence and health were moderated by face age, consistent with an own-age bias. OA health ratings showed a stronger halo effect than YA for older faces, whereas YA health ratings showed a stronger halo effect than OA for younger faces. Similarly, YA competence ratings showed a stronger halo effect than OA for younger faces, but not for older faces. OA greater sensitivity to cues conveying the health and competence of own-age faces is consistent with the greater behavioral relevance of these traits in peers with whom they are more likely to interact. The fact that the own-age bias was shown for these trait impressions, but not for impressions of untrustworthiness and hostility, may reflect the fact that detecting those traits has strong adaptive value regardless of the frequency of interacting with people of that age. Notably, although the strength of the halo effect on impressions of competence, health, and untrustworthiness was moderated by rater age and/or face age, it was significant in all cases.

A closer look at the impact of high versus low attractiveness on impressions that showed age differences in the halo effect provided mixed support for an OA positivity bias characterized by a greater influence of high attractiveness on OA than YA and/or the reverse for the influence of low attractiveness (Zebrowitz & Franklin, 2014). There was greater OA positivity in the effect of attractiveness on impressions of health. The stronger halo effect for OA than YA when rating the health of older faces was due to more positive impressions of high-attractive faces by OA than YA, and the weaker halo effect for OA than YA when rating the health of younger faces was due to more positive impressions of low-attractive faces by OA than YA. Effects of attractiveness on impressions of untrustworthiness in the same sample of faces also showed greater OA positivity. The weaker OA halo was due to more positive impressions of low-attractive faces by OA than YA, with no age differences for the high-attractive faces. In contrast, the study with more extreme variations in attractiveness, ranging from disfigured faces to models' faces (Zebrowitz et al., 2017, Study 1), found an equal influence of low and high attractiveness on OA and YA, consistent with the argument that these faces engage automatic processing that eliminates age differences in the capacity required to process negative cues. In contrast to support for an OA positivity effect in the influence of high and low attractiveness on impressions of trustworthiness and health, there was no support in the influence on impressions of competence. The weaker OA halo effect for impressions of the competence of younger faces was due to more positive impressions of high-attractive faces by YA than OA, opposite to what an OA positivity effect would predict, with no age difference in the influence of low attractiveness. In sum, the current results provide mixed support for the suggestion that the OA positivity in trait impressions is driven by a greater influence of high attractiveness and/or a lesser influence of low attractiveness, with such effects moderated by face age and the particular impression.

A great deal of evidence has demonstrated that the effect of facial attractiveness on YA goes beyond trait impressions to include more impactful behaviors. One domain in which this has been shown is in electoral politics, where YA ratings of a candidate's facial attractiveness predict electoral success in Senate races (Todorov, Mandisodza, Goren, & Hall, 2005; Verhulst, Lodge, & Lavine, 2010). This is also true for OA. Both OA and YA attractiveness ratings of opposing candidates in Senate elections predicted their personal voting choices (Franklin & Zebrowitz, 2016). Moreover, OA but not YA attractiveness ratings predicted the actual election outcomes in this study. The greater predictive validity of OA ratings may be related to the fact that OA attractiveness ratings equally predicted the individual voting preferences of older and younger participants in our study, whereas YA attractiveness ratings showed somewhat weaker prediction of the older than younger participants' preferences. Extrapolating to the actual election outcomes, OA attractiveness ratings may be more predictive because they better capture the preferences of voters of all ages.

Perceiver age and responses to babyfaceness. Consistent with babyface overgeneralization, YA impressions of childlike traits, including low threat and low competence, are elicited by faces that look more babyish, regardless of their age and ethnicity (Zebrowitz & Montepare, 1992; Zebrowitz, Montepare, & Lee, 1993; Zebrowitz et al., 2012). Babyface overgeneralization also may contribute to impressions of more masculine faces as more aggressive and violent (Stillman, Maner, & Baumeister, 2010), since women's faces resemble babies' more than men's do, and perceived facial masculinity and facial maturity are positively correlated (Boshyan, Zebrowitz, Franklin, McCormick, & Carré, 2014). Whereas many studies have examined how babyfaceness influences YA impressions, only two studies have investigated babyface overgeneralization in OA. One study found that OA, like YA, judged more babyfaced individuals as less threatening—less hostile and less untrustworthy (Zebrowitz & Franklin, 2014). Although neither YA nor OA showed significant effects of babyfaceness on perceived competence in this study, another study found that both YA and OA rated more babyfaced individuals as higher in naivete, with no significant age difference in the magnitude of this effect (Franklin & Zebrowitz, 2013).

The tendency for babyfaceness to diminish impressions of untrustworthiness and hostility was stronger when people were rating faces from their own age group (Zebrowitz & Franklin, 2014). This greater sensitivity to variations in babyfaceness in faces from one's own age group is consistent with other evidence for an own-age bias effect. However, it contrasts with the effect of attractiveness on impressions of untrustworthiness and hostility, which did not vary across own- and other-age faces. It thus appears that perceivers are less attuned to the threat implications of low babyfaceness in other-age faces than to the threat implications of low attractiveness. Other evidence for an own-age bias was provided by the effect of babyfaceness on perceived health, a trait not previously examined in research on babyface overgeneralization. Perceivers of both ages attributed greater health to more babyfaced older individuals, but not to more babyfaced younger individuals, and this effect was stronger for OA than YA. This own-age bias effect suggests that OA are more attuned than YA to the positive implications of a more youthful appearance for health in older individuals. Indeed, there is evidence that older people who look younger for their age are healthier (Gunn et al., 2013). This result parallels OA greater attunement than YA to the positive implications of a more attractive appearance for health in older individuals.

YA impressions of babyfaceness, like attractiveness, have been shown to predict not only impressions but also many real-life outcomes (for reviews, see Zebrowitz, 1997; Zebrowitz & Montepare, 2014). There is little research examining prediction from OA impressions. However, one study comparing the impact of babyfaceness on YA and OA voting preferences as well as election outcomes revealed that OA preferred mature-faced Senate candidates to their more babyfaced opponents, whereas candidate babyfaceness had no effect on YA preferences (Franklin & Zebrowitz, 2016). Candidate babyfaceness, as judged by either YA or OA, had no effect on a candidate's actual electoral success. This is consistent with some previous research investigating YA, where one study found no evidence that YA impressions of babyfaceness predicted US election outcomes (Olivola & Todorov, 2010), although other studies have suggested a possible relationship (e.g., Rule et al., 2010; Poutvaara, Jordahl, & Berggren, 2009).

Perceiver age and responses to emotion resemblance. Research investigating age-related changes in emotion recognition has yielded well-documented age-related declines in the ability to accurately label facial expressions of emotion (e.g., Ruffman et al., 2008). Nevertheless, OA do remain sensitive to emotion expressions, as they typically perform at above chance levels in labeling anger and other expressions, even when their accuracy is significantly lower than that of YA (Isaacowitz et al., 2007). Additionally, OA, like YA, consistently show a 'pop out' effect, whereby they are quicker to locate an angry schematic face among an array of neutral schematic faces than to locate a happy schematic face (Hahn, Neef, & Thiele, 2006; Mather & Knight, 2006; Ruffman, Halberstadt, & Murray, 2009). OA also show the emotion overgeneralization effect documented in YA (Franklin & Zebrowitz, 2013).

As noted above, in emotion overgeneralization, impressions of emotion-related traits are stronger for faces whose neutral facial structure shows greater resemblance to an emotion expression as assessed objectively by computer modeling (e.g., Said, Sebe, & Todorov, 2009; Zebrowitz, Kikuchi, & Fellous, 2010), among other methods (Keating, Mazur, & Segal, 1981; Montepare & Dobish, 2003). Impressions of young adult faces with objectively assessed variations in resemblance to emotion expressions revealed equally strong emotion overgeneralization effects for OA and YA (Franklin & Zebrowitz, 2013). More specifically, both OA and YA attributed greater danger (hostile, untrustworthy) to neutral-expression faces that computer modeling had determined to show more resemblance to anger, and they attributed greater naivete to faces that the computer modeling had determined to show more resemblance to surprise, with no significant differences in the strength of the effects for the two age groups.

The finding that OA trait impressions are sensitive to very subtle emotion information conveyed in neutral-expression faces, with emotion overgeneralization effects equal to those shown by YA, stands in contrast to the well-documented OA deficits in labeling basic emotion expressions as well as more complex mental states and traits on the Reading the Mind in the Eyes test (e.g., Franklin & Zebrowitz, 2016; Pardini & Nichelli, 2009). This contrast suggests a dissociation in the processes that are engaged by traditional emotion labeling tasks and the Reading the Mind in the Eyes test and those tapped in the emotion overgeneralization task.

One possible explanation for the discrepancies between OA emotion labeling deficits and tasks that show intact emotional processing is that the labeling tasks involve controlled processing aimed at getting the 'correct' response, whereas the anger 'pop out' effects and the first impressions of emotion overgeneralization may both engage more automatic processing. Studies of YA neural activation during emotion labeling tasks support the argument that they involve controlled processing. Compared with passive viewing, which is an automatic processing task, emotion labeling yields a reduction in amygdala activation and an increase in prefrontal cortex activation, a signature of controlled processing (Hariri, Bookheimer, & Mazziotta, 2000; Lange et al., 2003). As considerable research demonstrates the automatic nature of trait inferences (Bar et al. 2006; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Rule & Ambady, 2008; Willis & Todorov, 2006), OA emotion overgeneralization may be due to intact automatic processing of subtle cues to emotion in their first impressions of faces.

Perceiver age and responses to unfamiliarity. Consistent with familiar face overgeneralization, people not only prefer faces of strangers with which they have been familiarized, the *mere exposure* effect (Bornstein, 1989; Zajonc, 1968), but also they prefer faces of strangers that are similar to familiarized ones, a familiar face overgeneralization effect (Zebrowitz, White, & Wieneke, 2008). In addition, more familiar-looking strangers are judged as more trustworthy than those who look less familiar (Debruine, 2002). Familiar face overgeneralization effects tend to be positive when the faces have no prior associations, but they can also be negative, depending on the source of familiarity. For example, a stranger who looks familiar because she resembles a person who had treated the perceiver kindly is treated favorably, while one who looks familiar because she resembles someone who had treated the perceiver irritably is avoided (Lewicki, 1985).

Familiar face overgeneralization has particular relevance to racial stereotyping and prejudice, with the lesser familiarity of other-race faces partially mediating perceivers' stereotyped impressions and lower liking (Zebrowitz, Bronstad, & Lee, 2007). Other evidence for a contribution of familiar face overgeneralization to racial animus is provided by White judges' reactions to faces that have more prototypically Black features. Regardless of their actual race, such faces are perceived to have more negative traits (Blair, Judd, Sadler, & Jenkins, 2002).

Whereas the foregoing research evidence pertains to YA perceivers, research examining age differences in racial stereotyping also is pertinent to familiar face overgeneralization. OA show stronger racial stereotypes than YA (e.g., Danigelis & Cutler, 1991). In addition to possible cohort effects, this finding may be due to deficits in executive control in OA. Racial stereotyping is a two-step process. In US culture, for example, White perceivers initially respond with more negative associations to Black than White faces (Greenwald, McGhee, & Schwartz, 1998). However, less prejudiced White perceivers often engage controlled processing that mitigates these associations (Devine, 1989). The fact that White OA perceivers show stronger racial stereotypes than do YA may therefore reflect reduced executive function in OA (Spreng, Shoemaker, & Turner, 2017) that weakens their ability to regulate automatic associations to other races that are shared by OA and YA alike (Gonsalkorale, Sherman, & Klauer, 2009). Evidence consistent with this suggestion is provided by the finding that, compared to YA and OA with high executive function, OA with lower executive function show more amygdala activity to Black versus White faces, indicative of a threat response. This effect is ostensibly due to less frontal-amygdalar connectivity in the OA with lower executive function that diminishes the ability of controlled processing in the frontal lobe to dampen the automatic processing in the amygdala (Cassidy, Lee, & Krendl, 2016). Thus, the stronger racial stereotypes shown by OA may reflect a stronger influence of unfamiliarity or salient social stereotypes, due to inadequate cognitive capacity to control those effects. Ironically, this mechanism is similar to the effect of lower cognitive capacity to increase the positivity of OA impressions of own-race faces. It remains to be determined whether the stronger racial stereotyping by OA than YA extends to stronger familiar face overgeneralization shown in more negative impressions of in-group faces that more closely resemble an out-group race. Effects of familiar face overgeneralization on OA impressions apart from racial stereotypes also remain to be investigated.

Inter-rater agreement in impressions. OA show significant inter-rater agreement in their impressions of competence, health, hostility, and trustworthiness from faces, replicating the large body of research showing YA consensual impressions from faces (Zebrowitz et al., 2013). More specifically, when each participant's impressions of the faces were correlated with the mean of all individuals in their own and the other age group, the mean agreement across all impressions was significantly greater than zero both for OA and YA. OA and YA showed similar levels of within-age agreement in trait impressions, and both groups had lower between-age agreement. Thus, trait impressions of OA agreed more with those of other OA than with those of YA and vice versa. Interestingly, there was no stronger agreement in impressions of own-age than other-age faces. Nevertheless, the greater within-age agreement suggests age differences in the criteria for judging faces that warrant further study. At the same time, the significant between-age agreement indicates that OA positivity and dedifferentiation are not sufficient to eliminate a similar ordering of faces on trait dimensions to that shown by YA. This similarity across age likely reflects a common influence of the face overgeneralization effects associated with attractiveness, babyfaceness, emotion resemblance, and face familiarity, which influence OA and YA, alike.

Perceiver age and the accuracy of impressions. Although one may expect face overgeneralization effects to bias impressions toward inaccuracy, research has documented surprising accuracy in YA impressions from faces, and this accuracy is shown equally by OA. Moreover, accurate impressions are often driven by facial cues implicated in the overgeneralization effects, indicating that there is a kernel of truth to the impressions they foster (see Zebrowitz & Collins, 1997, for a model of developmental paths to actual associations between appearance and psychological qualities).

Young men who were judged by YA or OA as more aggressive based on facial photos actually showed more retaliatory aggressiveness in a competitive game (Boshyan et al., 2014; Carré, McCormick, & Mondlach, 2009). Also, health impressions of facial photographs from representative samples of older men and women ranging in age from 60 to 74 years and younger men and women ranging in age from 25 to 39 years were significantly correlated with self-reported physical fitness, and this accuracy was equally strong for OA and YA raters (Zebrowitz et al., 2014). In addition, competence ratings of the same samples of faces were significantly correlated with various measures of cognitive competence (vocabulary, processing speed, reasoning ability, short-term memory) and comparisons across rater age revealed no differences in accuracy (Zebrowitz et al., 2014). There also was no own-age bias, with the accuracy of health and competence impressions equal for faces closer to and farther from the rater's own age.

Analyses of the mechanisms by which raters achieve accurate impressions of young men's aggressiveness from faces revealed that a broader facial width to height ratio provided a valid cue to aggressiveness (i.e., positively correlated with aggressiveness), and this cue was utilized by both YA and OA (i.e., positively correlated with their impressions) (Boshyan et al., 2014; Carré & McCormick, 2008; Carré, Morrissey, Mondloch, & McCormick, 2010). Both YA and OA also used the valid cues of low attractiveness and high masculinity in their impressions of aggressiveness (Boshyan et al., 2014).

The facial cues contributing to accurate impressions of health and competence were also similar for YA and OA. Specifically, perceived attractiveness was positively related to OA and YA impressions of the competence and health of both younger and older targets' faces. Moreover, attractiveness provided a valid cue to measures of actual cognitive competence for these targets, suggesting that utilization of the valid cue of attractiveness contributed to accurate impressions of competence. On the other hand, attractiveness was related to actual health for older but not younger targets, suggesting that utilization of this cue contributed to accurate impressions of the health of older targets, while biasing those impressions for younger targets. Another biasing cue was facial expression. Although a more positive expression was unrelated to actual health for either younger or older targets, it was positively related to OA and YA health impressions. How old faces looked contributed to both OA and YA accurate impressions of the health of older targets, as looking older was negatively correlated both with their impressions of health as well as older targets' actual health. Although looking older was also negatively correlated with OA and YA impressions of older targets' competence, it was a misleading cue, as measures of actual competence were uncorrelated with looking older. Perhaps not surprising, looking older was not negatively correlated with the perceived health or competence of the younger targets, who, as noted above, were aged 25–39 years. Interestingly, however, looking older was a valid cue to lower scores on measures of cognitive competence among these targets.

Conclusions

The social intelligence manifested when forming first impressions from faces is generally preserved in normal aging. OA trait impressions agree with those of YA, and this is consistent with the persistence of face overgeneralization effects into older adulthood, as shown in influences on trait impressions of attractiveness, babyfacenss, and emotion resemblance. OA trait impressions also match those of YA in accuracy, which reflects, at least in part, similar utilization of the cues of attractiveness and apparent age, both when they are valid and invalid. At the same time, OA and YA trait impressions from faces differ in some interesting ways. Although both age groups use attractiveness and babyfaceness, these qualities often influence trait impressions of own-age faces more than other-age faces. Thus, there is greater sensitivity to these facial cues and/or their trait implications when they appear in own-age faces, which is consistent with their greater relevance for adaptive social interactions. Another age difference is that YA and OA show stronger agreement with own-age than other-age perceivers. In addition, the pattern of results across several studies supports the conclusion that OA trait impressions from faces show greater reliance on automatic processing due to their lesser cognitive capacity, whereas YA impressions show evidence of greater modulation by more cognitively demanding controlled processing. First, OA impressions are more positive, consistent with evidence that processing negative information is more cognitively demanding. Second, greater OA positivity was mediated by their slower processing speed. In addition, cognitive load, which reduces processing capacity, increased positivity for both YA and OA. Third, greater OA positivity was absent for faces at the extremes of the attractiveness dimension, which arguably elicit automatic processing for both YA and OA, in contrast to more ambiguous faces, which likely elicit controlled processing in YA that is more difficult for OA. Fourth, OA trait impressions make less fine distinctions among faces, which may also indicate less controlled processing. In addition, this lesser differentiation of OA trait impressions was positively associated with their greater positivity, which is consistent with evidence for more cognitive elaboration of negative than positive judgments. Fifth, the argument that OA trait impressions from faces are more reliant on automatic processes is also consistent with the finding that OA show emotion overgeneralization effects in trait impressions similar to YA, despite performing more poorly on emotion recognition tasks that are arguably more cognitively demanding. Finally, the argument that OA trait impressions from faces are more reliant on automatic processing is consistent with the finding that OA show stronger racial stereotypes. This would be expected if they are less likely to engage in the controlled processes that mitigate YA stereotypes. It is notable that despite the evidence that a reduction in cognitive capacity in OA yields some age differences in trait impressions from faces, there remain strong similarities across age. This is likely due to the fact that YA first impressions from faces often rely on the automatic processes that are more obligatory for OA. Thus, despite some age differences that can be explained by age-related reductions in cognitive capacity or the greater behavioral relevance of own-age faces, first impressions from faces are largely unchanged in healthy aging, and this reflects the preserved tendency for those impressions to overgeneralize adaptive reactions to categories of people that the faces resemble.

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Note

1. It is noteworthy that the effect of cognitive load to increase OA positivity in the case of trait impressions is contrary to some effects in tasks assessing attention and incidental memory (Knight et al., 2007; Mather & Knight, 2005). The fact that cognitive load has sometimes decreased OA positivity on these tasks has been taken as support for its disruption of emotion

regulation, consistent with predictions of socio-emotional selectivity theory. Although the evidence for this effect is mixed (see Allard & Issacowitz, 2008; Thomas & Hasher, 2006), a detailed analysis is beyond the scope of this review.

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Postscript: Social Intelligence as the Social Construction of Reality—An Augmented Agenda for Social-Intelligence Research

Robert J. Sternberg

If one were to try to distinguish cognitive intelligence from social intelligence, it might make sense to say that, ultimately, cognitive intelligence is about the cognitive construction of reality and social intelligence is about the social construction of reality. It is this difference that makes social-intelligence tests so much harder to score than cognitive-intelligence tests. There is more consensus about cognitive constructions of reality than there is about social constructions of reality. Both, however, are constructions.

Charles Spearman (1923), a pioneer in the study of cognitive intelligence, believed that analogical reasoning represented the essence of the application of intelligence. One has to figure out how some fourth term is related to a third term in an analogy in the same way that the second term is related to the first term. For example, one could construct the analogy, "Washington : 1 :: Lincoln : 16" as a reasonable problem, with the analogy dependent (as all analogies are) on both knowledge and

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reasoning—the knowledge that Washington was the 1st president of the United States and Lincoln the 16th president. This analogy also points out how cognitive reality, like social reality, is constructed. One could as easily have as an analogy "Washington : 1 :: Lincoln : 5," in that Washington's portrait appears on the US $1 bill and Lincoln's on the US $5 bill. Or one could have as an analogy "Washington : 25 :: Lincoln : 1," as Washington's bust appears on the 25c coin in the United States and Lincoln's bust appears on the 1c coin.

If one were to pursue things more deeply, many different analogies could appear relating Washington to Lincoln, or really, anyone or anything to anyone or anything else. But at least there would be some degree of consensus as to why all these analogies are, in some sense, "correct." Other kinds of induction problems, of course, such as number series, have the same problem. Although number series problems have "preferred" answers, such as "1, 2, 4, 8, ____," some mathematical formula could be constructed that would yield any number at all. So the agreed-upon answer might be "16," but the series might just as well start over again at "1," go backward from "8" to "1," or do whatever.

The social construction of reality, like the cognitive construction of reality, is ambiguous. But it is far more ambiguous and there is far less consensus about it, which is why it is hard to construct the social-intelligence tests. For example, where one person sees a smile, another might see a smirk. What one person hears as a racist comment, another hears as possibly offensive but definitely not exclusionary. The validity of social-intelligence tests suggests that some interpretations are more widely accepted than others, but there is always ambiguity in what a facial expression conveys or is intended to convey. Much of this book is about attempts to assign meaning to facial and other nonverbal expressions and about how to evaluate people's skill in assigning such meaning.

The Pressing Problem of Socially Derived Assignments of Meaning

Today, the problem of socially assigned meanings has taken on an urgency that it perhaps did not have even five to ten years ago. This problem is illustrated in a newspaper article appearing on the day that these words are being written (Peters, Grynbaum, Collins, & Harris, 2019). The article points out how, again and again, right-wing pundits in the United States, especially on Fox News, use words such as "invasion" and "replacement" in their broadcasts. It then goes on to show how, in a screed left by a gunman who killed large numbers of people in El Paso, Texas, the words of the pundits were taken, without attribution, and woven into the text.

The question here is not, I would argue, one for studies of cognitive intelligence. It is not a matter of comprehending or later of remembering what the pundits said. Those would be issues for a cognitive-intelligence test. Nor is the issue really even one of what the purveyors of the broadcasts "really" meant: There is no way to know for sure what they really meant and even if one knew, it is not clear what one would do with the information. The critical question, I believe, is how listeners construct social reality, based on what they hear or see.

Someone with certain strong sympathies, perhaps right-wing, repeatedly hearing about "invasion" and "replacement," might socially construct a reality in which the United States is in serious danger. After all, when a country is being invaded, people in that country may well believe the time has come to fight back against the invaders before those invaders replace them, as largely happened with Native Americans when immigrants came from the shores of Europe. Today, those immigrants, invaders, or whatever one wants to call them, represent a far higher percentage of the US population than do the descendants of Native Americans. The confirmed right-winger might construct a reality in which hatred of immigrants, especially so-called illegal ones, leads to hatred of the groups, because they are invading the country, perhaps with the goal of a takeover.

The same script is being used throughout the world for similar purposes, not just by pundits but by world leaders.

> Here is the president of the United States:
>
> When Mexico sends its people, they're not sending their best. They're not sending you. They're not sending you. They're sending people that have lots of problems, and they're bringing those problems with us. They're bringing drugs. They're bringing crime. They're rapists. And some, I assume, are good people. (Donald Trump, presidential announcement speech, June 16, 2015)

Here is the prime minister of Hungary:

> We openly divulge and acknowledge our objectives. We want a Hungarian Hungary and a European Europe. This is only possible if we also affirm that we want a Christian Hungary in a Christian Europe. (Victor Orban, September 16, 2017, during speech at meeting of the Alliance of Christian Intellectuals in Budapest, translated)
>
> We do not want a multicultural society. (Victor Orban, February 5, 2015, during interview with the German newspaper *Frankfurter Allgemeine Zeitung*, translated)

Here is the prime minister of Poland:

> "We are a part of the European Union but we want to transform it, to re-Christianize it. This is my dream," he said. (Mateusz Morawiecki, Prime Minister of Poland, December 9, 2017, during interview with Catholic Telewizja Trwam television channel)

Here is the prime minister of Italy:

> As the generous millionaire [Richard Gere] airs his demands about the fate of the Open Arms immigrants, we thank him: he will be able to bring everyone in his private jet to Hollywood and keep them in his villas. (Mario Salvini, August 9, 2019, in a statement after Richard Gere's press conference)

The question that arises from these quotations and literally hundreds like them from important political figures is what kind of *social reality* they lead people to construct. That is, how do people use their social intelligence to construct a social reality, based on what they hear or see? One person in, say, Poland, who has repeatedly heard the Prime Minister or other high officials in government refer to the need to re-Christianize Europe might see a woman in a hijab who is likely a Muslim; another might see a Muslim woman but also an invader who is part of a movement or even a conspiracy to replace Christians in Poland. In the United States, one person who has listened to right-wing pundits may see an individual as a Mexican-American immigrant or perhaps second- or third-generation citizen; another may see an invader or, in Donald Trump's words, a "rapist."

Although we may think of people seeing different things as right- or left-wing, that distinction no longer applies well at all. For example, Jeremy Corbyn, leader of the left-wing Labor Party in the UK, wrote a preface for a book, *Imperialism: A Study,* authored by John A. Hobson in 1902, containing anti-Semitic tropes, such as that of finance in Europe being directed "by men of a singular and peculiar race who have behind them many centuries of financial experience." One individual might see such a move as a tacit acceptance or even approval of anti-Semitism, another as simply recognizing that people in 1902 saw the world differently from the way people do today. But the move was seen by some as part of a pattern on Corbyn's part, and there indeed has been a rise in anti-Semitic incidents in Great Britain (Reuters, 2019), as well as elsewhere in Europe (Cosse, 2019).

What is happening, I would argue, is that people are using their social intelligence to generate constructions of social reality that are highly divergent across individuals and groups. Oddly, perhaps, they are using exactly the same information. The problem, therefore, is somewhat different from that in traditional social-intelligence research. The question now is not what cues people are using, but rather, what their meaning is for the viewers or listeners. Whereas experts may agree that certain faces are sad or happy, they may have less agreement as to what constitutes a racist statement. For example, the quotations of Donald Trump that some view as racist, others view as perhaps offensive but in no way as racist (Wright, 2019, July 31).

At a collective level, different social constructions of reality are having enormous consequences for societies, in the United States and elsewhere. Speech that incites, especially by leaders, polarizes people in a way that conciliatory speech probably never will. The big question social-intelligence research has asked is something like, "What cues do people use to encode or decode social signals, both verbal and nonverbal, and how well do they use them?" A future question might pertain to the situation where everyone agrees on what cues certain people use (e.g., speech that shows strong views, bias, prejudice, or even hate) and how they use them (e.g., either to conclude that others are merely different or rather than they are different and dangerous). The question then is: "Given the identical cues, what leads some people to construct social reality in one way and others to construct it entirely differently?" All these people believe, although they may not use the exact words, they are using social intelligence correctly to construct social reality. But their constructions are different and sometimes diametrically opposed to each other. How and why does this happen? What can we do about it? And how can we find common ground between people whose constructions of social reality are so different? Are there "right" answers here? With social-intelligence tests, right answers are usually actually consensus-based answers. But in a new paradigm for social-intelligence research, such consensus is not possible because people come to such different conclusions regarding what the identical signals mean. One can attribute differences to ideology (Edlund, 2015), to personality (e.g., authoritarian personality—MacWilliams, 2016), or to even to brain differences (Hibbing, Smith, & Alford, 2014), but one still needs to ascertain how and why people process the same information to come to such different conclusions. Measures of cognitive intelligence obviously have not provided and will not provide answers, and both liberals and conservatives are susceptible to believing information that supports what they previously believe (so-called myside bias—Kaufman, 2019). In other words, regardless of how smart or how rational your thinking is, you construct your social world differently depending on the assumptions with which you start. The question is what goes on in terms of social intelligence that leads people to take the same information and reach such different conclusions about it?

I realize that calls for evolution of paradigms are rarely heeded. But the problems facing the world now, many of which give rise to hatred among people, are so serious that I wonder whether the field does not actually need a paradigm change to achieve even greater relevance to the serious and pressing problems confronting the world today. It is not viable to have a world where people come to isolate themselves from, and even hate each other, based on their different constructions of social reality. World War II provided an example of how such different constructions of social reality can lead to highly aversive consequences. Social-intelligence researchers have a chance, I believe, to make an expanded difference to the world by helping us all understand how it is possible for people to interpret and then utilize the same cues so differently.

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