Chapter 15
Jealousy and the Terrible Twos

Sybil L. Hart

Jealousy has long been recognized as a cause of intra- and interpersonal conflict. Yet, the twentieth century saw changes in the way it was construed. In parallel with western trends toward regarding it as a sign of psychopathology when manifested in adults (Buss, 2000; Buss & Haselton, 2005), jealousy came to be seen as a sign of maladjustment in children (Stearns, 1989, 2010). The transition is thought to have stemmed from demographic influences involving decreases in family size. As relationships among family members became less numerous they tended to grow more intense, resulting in a reconfiguration of family dynamics that is thought to have encouraged greater parental investment in children, which was increasingly manifested by concerns with mental health that included apprehension over jealousy (Stearns, 1989, 2010). To some extent, these concerns were outgrowths of psychoanalytic tradition in which personality is seen as being shaped during childhood through processes that involve the resolution of intrafamilial rivalry; specifically competition with a same-sex parent (Klein, 1957, 2002; Oberndorf, 1929; Sokoloff, 1947; Winnicott, 1977, 2002). Over time, the focus of attention shifted to concern over rivalry in which the competitor was a sibling rather than a parent (Adler, 1928, 1931; Foster, 1927; Levy, 1934, 1937; McFarland, 1937; Ross, 1931; Sewall, 1930). Eventually, these concerns spawned literature that included ominous depictions of acute jealousy in the context of a newborn sibling's arrival. In line with pronouncements, such as "the coming of a new baby creates a crisis, which affects all of the child's relationships – with the family and the world at large" (Levy, 1934, p. 233), jealousy in children came to be linked with psychopathology.

This notion was reinforced by Bowlby in his seminal work on infant-caregiver attachment. His volume, *Attachment and Loss: Separation Anxiety and Anger* (Bowlby, 1973), opened by discussing material that had been written by Sigmund

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Freud's daughter, Anna Freud, and Sophie Dann (Freud & Dann, 1951), in which they described six Jewish orphans' rehabilitation at the conclusion of World War II following their liberation from harrowing conditions at Tereszin concentration camp. In addition to being described as highly disturbed, the children were depicted as "strongly possessive" and "acutely jealous" (Bowlby, 1973, p. 4). Hence, the linkage between psychopathology and jealousy that had been gaining prominence in clinical literature in the fields of social work and psychiatry eventually spread to mainstream developmental psychology. There it was explained in terms of contextual influences and widely distilled as problem behavior that could be prevented or corrected by proper parenting.

The pathologized view of jealousy and views of it as the outcome of exogenous influences were preceded by a much longer tradition in which jealousy was accepted as an integral feature of human nature. Its presentation in young children was seen as a natural, if not inevitable, sort of human failing (Stearns, 1989, 2010). This charitable interpretation was expressed by Darwin (1877) in a biographical sketch of his son, Doddy; in which Darwin observed that "jealousy was plainly exhibited when I fondled a large doll, and when I weighed his infant sister, he being then 15 ½ months old" (p. 289). Interestingly, unlike other examples of Doddy's negativity that Darwin treated in a section on the emotion of *anger,* jealousy was discussed in a section on the emotion of *affection*. Nor was Doddy described as being in any way flawed or disadvantaged. To the contrary, he was portrayed as a child who was "truthful, open, and tender, as anyone could desire" (Darwin, 1877, p. 292). Thus, in contrast with subsequent work that linked jealousy with maladjustment and exogenously organized risk factors, Doddy's presentation of jealousy was interpreted as an expression of love and linked with psychological well-being and the protective influences of a privileged environment and doting caregivers.

This interpretation underlines jealousy as a phenomenon that comes in a range of forms, even in children, and the one that is omnipresent (Cicirelli, 1995), perhaps more like that displayed by Doddy, has received scant attention. This commonplace form is the focus of this chapter, and we approach it with the primary aim of ascertaining the potential influence of an endogenously organized element. The chapter starts by identifying and defining a form that can be construed as normative. Toward that end, we examine evidence that has emerged from laboratory research using infants. The normative form is then addressed toward insight into the possibility of an inherited foundation. This issue is approached by considering how it could have originated in ancestral infants under conditions that existed 200,000 to 300,000 years ago, when modern humans lived in clans of nomadic hunters and gatherers (Galway-Witham & Stringer, 2018). In a final section, we discuss jealousy's emergence as a function of ancestral infants' psychosocial, cognitive, and motor development, and we conclude with suggestions for future research. Note that throughout this chapter, infants in the 12- to 36-month age range are referred to as *toddlers.*

15.1 Jealousy Protest in Infants

Our quest for evidence of an evolved foundation of jealousy in infants begins with efforts to identify and define a form that unfolds through a normative process of development. Gesell (1906) described screaming, crying, destructiveness, and physical aggression as evidence of "violent outbreaks of jealousy" (Gesell, 1906, p. 453) in infants as young as 6 months. In his account of institutionalized infants, Renee Spitz observed that "jealousy appears in the ninth and tenth months" (Spitz, 1949, p. 146). These reports were precedents for an operational definition of *jealousy* as the infant's presentations of negatively valenced behavior in response to an eliciting event in which a beloved individual, such as a parent or caregiver, directs attention preferentially toward a third party, such as a child (Hart, 2010, 2015; Hart & Carrington, 2002). This type of definition aligns with notions of jealousy in adults (Parrott, 1991; Pfeiffer & Wong, 1989) in that its key component, that is, the feature by which it is distinguished from other negatively valenced emotions that arise from feelings of loss, is that in the case of jealousy the loss, or perceived loss, occurs at the hands of a rival.

This operational definition formed the basis of laboratory procedures and experimental methodology that sought to rule out the possibility that an infant's negatively valenced response was due to a confounding stressor, and had indeed been precipitated by a rival. This was achieved through use of a differential treatment paradigm that included control conditions which manipulated the object of the adult's preferential attention and/or the nature of the adult. In the experimental jealousy-inducement condition, the infant's mother held a lifelike baby doll while she and a stranger directed attention preferentially toward the baby doll as if it were a real infant. In the control conditions, the mother directed preferential attention toward a musical story book or the stranger directed preferential attention toward the baby doll. The validity of the eliciting condition has been upheld by evidence of continuity in infants' responses across the laboratory and home setting where jealousy has been induced by parents using a real infant (Chapman & Hart, 2017; Chapman et al., 2018; Szabo et al., 2014); perhaps not unlike the description of jealousy in Doddy, which did not seem to depend on whether Darwin had induced it by attending preferentially to a large doll or Doddy's newborn sister.

Using these procedures, laboratory studies have consistently found that infants demonstrate greater negativity in the experimental condition. In 6-month-olds, it was characterized by facial affect of sadness and interest, suggesting desire, accompanied by mother-directed gaze and forward-leaning motor agitation (See Fig. 15.1). Facial affect of fear/wariness was fleeting; when it appeared it was more prominent in females (Hart & Carrington, 2002; Hart et al., 2004).

Mobile 9- to 14-month-olds' responses in the experimental condition were characterized by decreases in play, coupled with sharp increases in efforts to retain exclusive proximal contact with mother. These efforts consisted of negatively charged bids for recouping maternal attention, such as loud vocalizations, vigorous gesturing, swiping at the baby doll, and guarding or physical intrusion between

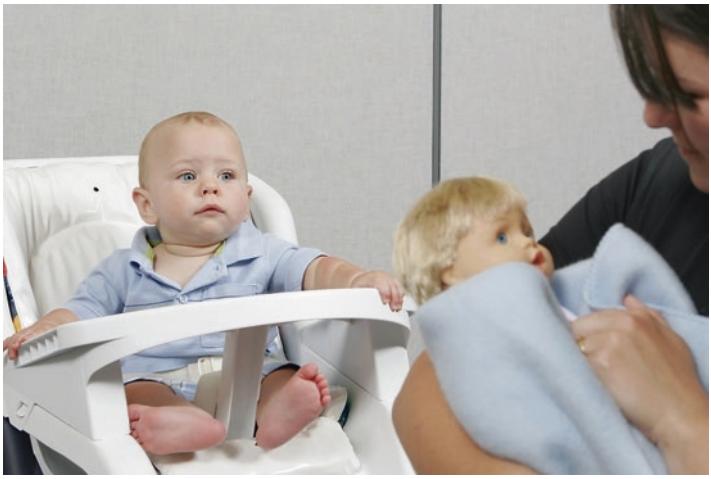

Fig. 15.1 A 6-month-old male exhibits facial affect of sadness and mother-directed visual attention, approach posture, and motor agitation as his mother directs attention preferentially toward a lifelike baby doll as if it were a real infant. (Photo by Kenny Braun, courtesy of Sybil L. Hart, Texas Tech University)

mother and baby doll (See Fig. 15.2). These bids were interspersed with self-comforting behaviors, such as sucking fingers and clinging, to help attenuate stress-induced dysregulation (See Fig. 15.3). This type of coping mechanism was greater among infants who had older siblings, and is the only known report of a distinction between infants who do and those who do *not* have siblings (Hart, 2015; Hart & Behrens, 2013a; Hart et al., 1998a; Mize & Jones, 2012; Mize et al., 2014).

Work with 9-month-olds that examined neurophysiological substrates of jealousy found that negativity being displayed during the experimental condition was associated with approach-style anterior EEG activity (Mize & Jones, 2012; Mize et al., 2014), which is a pattern that has been associated with the emotion of anger in infants (He et al., 2010). Interestingly, this EEG pattern has also been linked with jealousy in adults (Harmon-Jones et al., 2009). Another finding that seems parallel with jealousy in adults was evidence that in the experimental condition (when the object of maternal attention was a lifelike baby doll) *versus* the control condition (when the object of maternal attention was a children's story book), increases in mothers' positive affect were associated with decreases in infants' positive affect (Hart, 2010; Hart et al., 1998a). This instance of *inversed affect sharing* seems consistent with findings on jealousy in adults where, for example, a woman's smile evokes jealousy in her husband if he perceives that the object of her smile is a rival (DeSteno et al., 2006; Sheets et al., 1997).

The experimental condition also elicited atypical patterns of response. Suggesting acute distress and reminiscent of descriptions of "violent outbreaks of jealousy" (Gesell, 1906, p. 453); some infants displayed disinhibited negativity, such as full-blown temper tantrums and hostile acts against their mothers, the baby doll, and/or

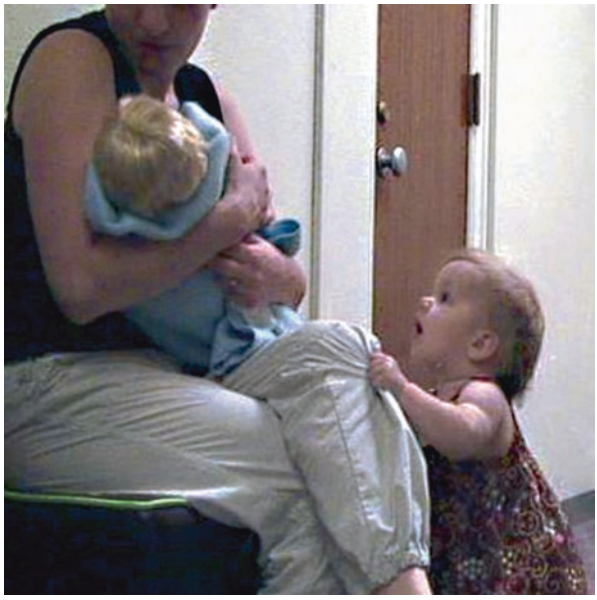

Fig. 15.2 A 10-month-old female demonstrates jealousy protests during an experimental condition in which her mother directs attention preferential toward a lifelike baby doll as if it were a real infant. (Photo courtesy of Sybil L. Hart, Texas Tech University)

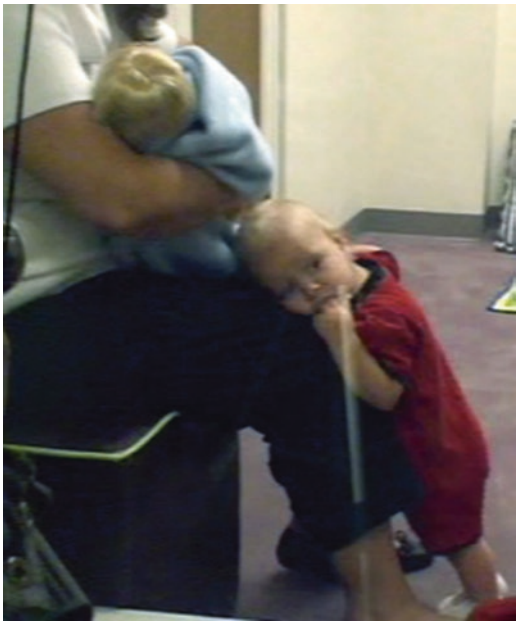

Fig. 15.3 A 10-month-old male exhibits regulatory behaviors, including averted gaze, sucking fingers, and proximal contact with mother, while maternal attention is directed preferentially toward a lifelike baby doll as if it were a real infant. (Photo courtesy of Sybil L. Hart, Texas Tech University)

themselves (which is one reason why a live infant was not used as the stimulus in these studies). Other responses were characterized by a contrasting pattern marked by suppressed emotionality and behavioral inhibition. Some infants recoiled, as if in fear, while others simply remained stuck in place, as if frozen with panic. Still other

atypical responses were characterized by disorganization. In some of these cases, infants displayed negativity, but not until the baby doll had been removed from the room, which was the exact opposite of the typical pattern where the rival's removal and the resumption of exclusive contact with mother were usually met by a decrease, rather than an increase, in negativity. In rare instances, an infant would approach and seek succor from an unfamiliar and impassive adult (a researcher whose presence nearby was required in case an infant's behavior could cause harm to her mother or herself) rather than her mother, which is a behavior that suggests indiscriminate friendliness and is a marker of severe emotional disturbance in infants (Chisholm et al., 1995; Zeanah et al., 2002).

Taken together, laboratory studies discovered that the prototypic response to the experimental condition is the infant's presentation of mother-directed demands for exclusive proximal contact, which occurs with stunning regularity. Such contact is accompanied by various attention-seeking behaviors for protecting exclusive access to mother, emotionality suggesting sadness, anger, and desire, and self-comforting responses for moderating levels of stress. Due to evidence that this pattern of response is triggered specifically by an infant's encounter with a rival for mother's exclusive attention, and in line with common usage of the label *jealousy* in anecdotal accounts (Gesell, 1906; Spitz, 1949) and in similarly designed laboratory research using toddlers- and preschool-aged children (Bauminger et al., 2008; Szabo et al., 2014; Teti & Ablard, 1989; Volling et al., 2002), we refer to it as *jealousy protest* (Hart, 2015; Hart et al., 1998a).

The regularity of jealousy protest's typical pattern of response establishes it as being statistically normative. Further support for this conclusion arose from evidence that it was found linked with the protective influences of secure infant-maternal attachment and maternal sensitivity. In stark contrast, atypical patterns were found associated with risk factors, including insecure quality of infant-maternal attachment, maternal depression, and maternal parenting behavior characterized by disengagement, insensitivity, and hostility (Hart, 2015; Hart et al., 1998b, 2003; Hart & Behrens, 2013a, b). Consistent with a central tenet of developmental psychopathology that knowledge of normative development is informed by knowledge of atypical development (Cicchetti & Toth, 2006) – evidence that the pattern which is statistically typical is also positively associated with protective influences *and* negatively associated with risk factors – establishes that it is the outcome of a normative process of development.

In sum, the findings on individual differences as a function of birth order, quality of attachment security, and variation in the quality of maternal socialization practices showcase learning as a mechanism that plays a role in determining *how* jealousy protest unfolds. However, these influences do not determine *if* it unfolds. This observation led us to attribute jealousy protest to an innately based temperamental characteristic that we refer to as *nascent jealousy* (Hart, 2010, 2015; Hart & Carrington, 2002).

15.2 The Psychological Weapon

Like other early and easily acquired motivational states (Nesse, 1990; Ohman & Mineka, 2003), nascent jealousy is construed as an outcome of psychological preparedness that was shaped by events that took place as modern humans arose. As for other evolved features of personality, it is likely to have been sculpted over deep time by selection pressures (Panksepp, 2010). The nature of these pressures has been recognized in light of thought in evolutionary developmental psychology (Bjorklund, 2021; Bjorklund & Yunger, 2001; Bjorklund, Chap. 2, this volume) that, as an evolved behavior, jealousy protest can be unpacked by examining ancestral habitats for life-threatening events that would have been encountered routinely by ancestral infants, and by then asking how these infants' presentations of jealousy protest would have been adaptive toward managing that particular threat. These notions have called attention to the fact that jealousy protest unfolds in infants just as the 9-month period of human gestation concludes. Dovetailing between the conclusion of the human gestational period and the onset of jealousy protest has led us to interpret jealousy protest as a mechanism that was compelled by the life-threatening consequences of usurpation by a newborn sibling which could have been met by infants following interbirth intervals (IBIs) as brief as 9 months (Hart, 2016a).

Of course, mortal threats were likely to have been precipitated by events other than usurpation. Migration exposed humans to a wide range of conditions that entailed any number of mortal dangers (Simpson, 1999; Simpson & Jaeger, Chap. 11, this volume). In addition to environmental dangers involving predation and accidents (Bowlby, 1969/1984), humans would have encountered extreme climate conditions that resulted in floods, drought, and famine, as well as natural disasters, such as epidemics and infestation, in addition to social conditions that posed threat of conflict and displacement. However, it seems unlikely that any of these sorts of dangers could have been responsible for nascent jealousy. As consequential as any might have been, none could have been encountered as regularly by ancestral toddlers as the birth of a sibling.

Insight into this type of recurrent threat can be approached by appreciating the scale of its impact on toddlers' vulnerability to morbidity and mortality. In extant traditional societies, where individuals live in bands of nomadic hunter-gatherers that resemble those of our evolutionary ancestors, almost one half of children do not survive. Mortality rates among children are highest among those under 5 years of age (Christian, 2008; Volk & Atkinson, 2008, 2013), and over half of those deaths involve toddlers in the 12- to 23-month age range. In fact, the probability of dying during the second year can match or even exceed the probability of dying in the first year (Dyson, 1977), which can be as great as 40% (McDowell & Volk, Chapter, 5, this volume). In such settings, the leading cause of death is infectious disease, and since malnutrition adds to the burden of disease, malnourished children are especially susceptible to disease, which can account for mortality rates that are 7 times greater than those of well-nourished children.

Due to their immature digestive and immune systems, and the fact that these systems are strained further by malnourishment, toddlers are exceptionally vulnerable to malnutrition (Alberda et al., 2006; Christian, 2008; Dyson, 1977; Khoshed et al., 2000; Worthman, 2010). Malnutrition in toddlers is often attributable to a sequence of events that starts with close birth spacing. In regions where food scarcity is prevalent, suboptimal outcomes have frequently been observed in neonates and young infants as consequences of prenatal conditions *in utero* during preceding IBIs (Conde-Agudelo et al., 2006; Dadi, 2014; Kozuki & Walker, 2013; Whitworth & Stephenson, 2002). Importantly, some have also discovered suboptimal outcomes as consequences of *subsequent* IBIs that start at parturition. These intervals culminate upon a subsequent birth, and so they vary in duration. Those which are short in duration, and result in close birth spacing, are especially hazardous for toddlers (Bøhler & Bergström, 1995, 1996; Bøhler et al., 1995; Hailemariam & Tesfaye, 1997; Koenig et al., 1990; St. George et al., 2000). For example, mortality rates of toddlers in Kenya were found doubled among those who had encountered a sibling's birth by the age of 20 months (Fotso et al., 2013). Work in Senegal reported a fourfold increase in mortality rates among 2-year-olds if their mothers had already given birth to a sibling (Ronsmans, 1996). Research conducted in Bangladesh found that malnutrition was increased among toddlers who had encountered the birth of a sibling by their second birthday (Khoshed, et al., 2000).

Dire outcomes of short subsequent IBIs are most prevalent in environments marked by acute food insecurity where it is customary for toddlers to be weaned prior to a sibling's birth. Deprived of the nutritional and immunological benefits of breast milk in settings where healthy substitutes for breast milk and effective health systems are scarce, prematurely weaned toddlers succumb to morbidity and mortality (Christian, 2008; de Onis, 2008; Jakobsen et al., 2003; Konner, 2010; Nath et al., 1994; Thapa et al., 1988). These tragic outcomes occur with such regularity that the life-threatening severe acute malnutrition disease, *Kwashiorkor*, takes its name from language spoken in Ghana that literally means, "the disease the deposed baby gets when the next one is born" (Williams et al., 1935, pg. 1151). In a similar vein, it seems likely that ancestral toddlers were not fully weaned until a subsequent IBI had ended or was near conclusion. At that juncture, substitutes for mothers' milk were limited or entirely nonexistent (Dettwyler, 1995; Ellison, 1995). It would take hundreds of millennia for even substandard substitutes to become available in large scale through the advent of agriculture and animal husbandry during the Neolithic era (Bocquet-Appel, 2011; Davis, 1986).

Until that era, allomaternal breastfeeding would have been an option, but only on a limited basis. The hunter-gatherer clans where modern humans lived were thinly populated (Eibl-Eibesfeldt, 1989; Narvaez et al., 2014), and so lactating mothers could not have been numerous. Moreover, allomaternal caregiving was rarely provided to the detriment of biological offspring (Hrdy, 2007). Thus, as in harsh contemporary settings (Gray et al., 2002; Lancy, 2015), the few lactating mothers who may have been present would have been reluctant to share their precious breast milk with nonbiological offspring. Indeed, given the metabolic demands of breastfeeding two children at the same time, many contemporary traditional societies prohibit

suckling more than one infant at a time. In some, giving birth to twins or the existence of an unweaned toddler has been linked to infanticide. In these cases, an undernourished mother can feel compelled to sacrifice one of her offspring in order to keep from placing both at risk of malnutrition (Daly & Wilson, 1988; Lancy, 2015; Scrimshaw, 1984). It seems likely that similar perils and prohibitions were in effect in ancestral societies. Given that these customs would have kept an ancestral mother from suckling an additional biological child, it seems even less likely that she would agree to breastfeed an additional *non*biological child. Overall, it must have been unusual for ancestral women to divide their breast milk among biological or nonbiological offspring (Hart, 2016a; Chap. 7, this volume).

This had implications for ancestral infants' relationships with their mothers who were sources of a constellation of salient proximate stimuli associated with breastfeeding (Hart, Chap. 7, this volume). In addition to pleasure of satiety and physical well-being, the constellation included enjoyment of breast milk's sweet taste, intimacy of skin-to-skin contact, as well as comfort of heat transfer and feelings of safety due to the common practice of breastfeeding while co-sleeping during night time hours when heat loss and feelings of vulnerability would have been exacerbated by darkness and cold. Because bed sharing was practiced universally by breastfeeding dyads, and because physical contact is an inherent feature of lactation, ancestral infants must have experienced proximal contact with their mothers for substantial amounts of time each day. Given the importance of proximal contact to attachment formation, affectional ties between mother and infant (Ainsworth et al., 1978; Bowlby, 1969/1984) would have been guaranteed by lactation, thereby ensuring that mothers were sources not only of breast milk but also of affection. Furthermore, by also being an exclusive relationship, the bond of affection could have endowed infants with feelings of "specialness" (Cohen, 1974, p. 207). This construct has been viewed as a core feature of the construct of attachment (Cohen, 1974) that is thought to characterize nurslings' experiences of the breastfeeding relationship (Bottorf, 1990) since it is still the case that women usually breastfeed only one infant at a time (Hart, 2016a; Chap. 7, this volume).

Conceivably, history of exclusive access to a steady source of physically and psychologically pleasurable care endowed infants with expectations of continuing to have exclusive access to their mothers for breast milk that, over deep time, coevolved with expectations of continuing to have unrivaled access to mother herself along with exquisite sensitivity to violations of those expectations. Support for this suggestion can be derived from evidence that ancestral infants were endowed with cognitive capacities that enabled the formation of expectations with regard to the nature of upcoming events (Buttelmann, Chap. 13, this volume). Indeed, infants form expectations about upcoming desirable events, and when these are violated, as in situations that involve goal blockage, they display anger or sadness (Lewis & Ramsay, 2005; Lewis et al., 1990). They also form expectations regarding the nature of social exchanges. Drawing on history of interactions with caregivers, they form expectations with respect to the nature of upcoming care. By the age of 9 months, infants are able to process triadic social exchanges (Buttelmann, Chap. 13, this volume; Tomasello, 2019), and so they are able to form expectations about the nature

of upcoming care that is to be directed toward infants other than themselves (Fivaz-Depeursinge et al., 2005; Hamlin et al., 2007; Jin et al., 2018). Interestingly, violations of such expectations precipitate disturbances (Gekoski et al., 1983; Mcquaid et al., 2009; Mesman et al., 2009) that are especially pronounced in infants with history of skin-to-skin contact with their mothers (Bigelow & Power, 2012).

Consequently, it seems tenable that by the age of 9 months, ancestral infants' cognitive capacities allowed them to process history of maternal caregiving so as to have formed expectations of exclusivity in the infant-maternal relationship. These capacities would have also supported the ability to process triadic social exchanges involving mother and another infant, and to interpret maternal caregiving toward another infant as a violation of those expectations. Hence, we have proposed that ancestral infants' expectations of exclusive access to their mothers represents the ultimate foundation of nascent jealousy, and violations of those expectations, typically upon the birth of a sibling, compelled adaptations resulting in jealousy protest, a behavioral mechanism, also known as a "psychological weapon" (Trivers, 1974, p. 249), for protecting exclusivity in the infant-maternal relationship (Hart, 2016a, b).

15.3 Jealousy Protest and the Attachment System

Jealousy protest was not the only mechanism for managing the consequences of usurpation. It has been construed as part of an arsenal of mother-directed protests that unfolded in tandem (Hart, 2018; Chap. 7, this volume). The arsenal would have included weaning distress, defined as protest behavior that is deployed by nurslings to impede breastfeeding discontinuation. Weaning distress by 12-month-olds was observed in Uganda by Ainsworth and Tracy (1972) who found it "as great a trauma as traditional psychoanalysts have always claimed weaning to be… They behaved like children after a traumatic institutional separation" (pp. 7–8). In modern Western settings where breast milk substitutes, such as commercially available formulas and easily digestible complementary foods, are readily available and can be delivered to infants by caregivers other than mothers, weaning distress is rarely as intense. This reality informed Ainsworth's practical decision to turn attention from weaning distress to separation distress, a caregiver-directed presentation of protest behavior that was more accessible at the time and place of her writing (Bowlby, 1973; Heinicke & Westheimer, 1966; Robertson & Robertson, 1971). Through attention to individual differences in infants' responses to mothers' departure, Ainsworth identified a normative pattern, which came to be recognized as secure attachment, and two atypical patterns, insecure-avoidant and insecure-resistant attachment (Ainsworth et al., 1978).

Separation protest is presented in a manner that is remarkably similar to jealousy protest. Both patterns of protest are caregiver directed. They also match in terms of their affective tone, the timing of their unfolding, and the ways in which typical and atypical variations are organized and patterned in relation to risk and protective influences. Such commonality has led to conceptualizing jealousy protest, like

separation protest, as a member of a class of caregiver-directed behaviors, known as the attachment system. The system is theorized as having been compelled by altricial infants' dependence on caregivers' resources for survival due to infant vulnerability to mortal threat (Bowbly, 1969/1984), which is a concept that has been interpreted in light of attention to the timing of its unfolding. Its onset in accord with the 9-month period of human gestation points to the possibility that the mortal threat responsible for the system's unfolding was the birth of a sibling (Hart, 2016a, 2018; Chap. 7, this volume).

Oddly, the overlaps between jealousy protest and separation protest have led some to overlook distinctions. For example, in a volume on attachment and bonding in which Thompson and associates (2005) listed several scenarios involving behavior problems that are common among young children, the list ends with a description of protest behavior provoked by favoritism. To explain it, the authors state, "we might colloquially call the latter 'jealousy,' the activation of attention-seeking behaviors" (Thompson et al., 2005, p. 355, quotes in the original). In our view, narrow focus on jealousy protest's outward appearance, that is, discounting it as simply another example of "attention-seeking behavior," dismisses critical distinctions that pertain to factors that underlie its function and adaptiveness (Campos et al., 2010; Frijda, 2004, 2016). Whereas the function of an attachment behavior other than jealousy protest is to access a primary caregiver's resources by maintaining proximal contact with the caregiver (Bowlby, 1969/1984), jealousy protest aims to retain *exclusive* proximal contact with the caregiver. The difference between exclusive *versus* nonexclusive contact with mother was not lost on ancestral toddlers. As we have shown, proximal contact with mother could still have life-threatening consequences for toddlers – if it was shared with a newborn sibling.

15.4 The 9-Month Revolution

The infant's capacity to form expectations of exclusivity arises among a number of skills in social cognition that account for a transformation by the end of the first year (Moore & Dunham, 1995; Saarni et al., 2006) that is considered to be of such magnitude that it is known as the 9-month social-cognitive revolution (Tomasello, 1999, 2019). A key development involves the capacity for *joint attention*. This requires that an infant is able to look where an adult is looking by focusing on the adult's eyes, to attend to movement of the adult's gaze, and to follow it toward the object of the adult's visual attention. At this point, shared attention has been achieved, which facilitates the infant's capacity to process triadic exchanges. It also enables *social referencing*, which requires not only the ability to be directed to the object of an adult's gaze but also the ability to be informed by the cues that the adult directs toward that object. For example, Boccia and Campos (1989) found that 8.5-month-olds' reactions to a stranger depended on their mothers' facial affect expressions when the stranger entered the room, suggesting congruence between maternal and

infant behavior as a consequence of the infant's ability to learn from the adult simply by observing social signals, such as smiling or frowning.

Reciprocally, infants of this age have the ability to draw an adult's attention to objects that are of their own interest. Toward this end, they establish eye contact with the adult and then lead the adult's gaze toward the object they find of interest. They also exhibit communicative gestures, such as pointing to an object, and pantomime, such as reaching toward an adult with outstretched arms, raised as if to say, "pick me up" (Boccia & Campos, 1989; Moore & Dunham, 1995; Tomasello, 1999).

These skills in social cognition enable the infant's presentation of jealousy protest, which begins by tapping the capacity for joint attention so that an infant's attention can be directed correctly to a third party, and can recognize that the third party is a baby. Infants must then be able to process the cues that the adult directs toward the baby. In order to arrive at jealousy protest, infants do not simply mirror adult affect, as in affect sharing, nor present congruent behavior as in social referencing. Rather, they must process the adult's affect cues in light of their own expectations. This requires that they take into account the fact that the cues are being expressed by someone who is a primary caregiver and are being directed toward a baby, at which point the cues are interpreted as representing a violation of infants' expectations of exclusivity. This, in turn, enables *inversed affect sharing*, which is illustrated in Fig. 15.4, where a mother's expression of delight coincides with her infant's expression of displeasure.

Jealousy protest also requires that an infant's experience of displeasure can be communicated to an adult. Drawing on his skill in the use of gaze, the infant in Fig. 15.4 looked directly toward his mother's eyes in an attempt to establish distal contact. At the same time, he communicated through gesture by reaching toward his

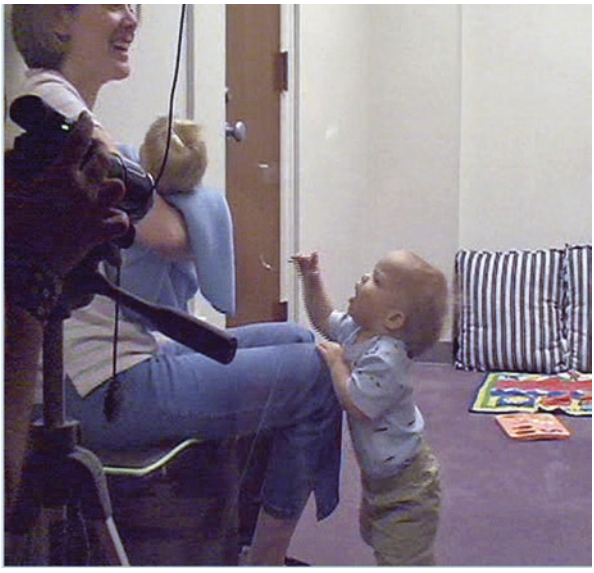

Fig. 15.4 A 10-month-old male exhibits inversed affect matching whereby he expresses displeasure as his mother expresses delight over a lifelike baby doll. (Photo courtesy of Sybil L. Hart, Texas Tech University)

mother with one outstretched arm, waving it as if to say, "hey, look at *me*!" while placing the other hand on her knee, using touch to establish proximal contact as if to say, "we're still connected." Compared with unregulated presentations of jealousy protest, including melt downs colorfully depicted in clinical accounts (and also documented in laboratory research), jealousy protest's normative form is sophisticated and by incorporating skills in emotion regulation, as illustrated in Fig. 15.3, it is also measured.

The skills involved in the social-cognitive revolution are associated with another monumental transition, one that involves independent locomotion (Anderson et al., 2013; Campos et al., 2000). By the age of 9 months, most infants are able to crawl. With new ways to explore and engage the world, infants are exposed to an expanded range of experiences that precipitate developmental cascades. In addition to facilitating advances in spatial cognition and memory, independent locomotion leads to experiences that stimulate social and emotional development (Anderson, 2018; Campos et al., 2000; Clearfield, 2011). Indeed, they enable both exclusive and non-exclusive forms of proximal contact with mother, behaviors that are central to jealousy protest and separation protest and to formulation of the attachment system (Bowlby, 1969/1984; Hart, 2018).

Paradoxically, experience that is enabled by independent locomotion has also been implicated in a reconfiguration of the infant-maternal relationship, a transformation that has been described as "a major transition toward independence from caregivers" (Anderson et al., 2013, p. 14). Inquiries into upright locomotion found that the onset of the ability to walk is associated with increases in infant-initiated encounters, including increases in interaction time with mother (Biringen et al., 1995; Clearfield, 2011; Karasik et al., 2011) that are characterized by a rise in behavior described as "testing of wills" (Biringen et al., 1995, p. 511). These findings call to mind early clinical reports (Gesell & Ilg, 1943; Levy, 1953) of toddlers' noncompliant and oppositional behavior that Gesell and Ilg (1943) famously characterized as the "terrible twos." Their reports were later substantiated by Kopp (1992), who observed that maternal requests for cooperation were met by 15- to 48-month-olds demonstrating temper tantrums and resistant behaviors in the form of refusals and off-task negotiations, as well as crying that peaked in the second year.

Reports of this nature spawned decades of investigative attention. In addition to treatment in clinical literatures, where problematic aspects of toddler behavior are seen as maladaptive, a growing body of research has been conducted by developmental psychologists who find that some aspects of toddlers' troublesome behaviors are not maladaptive (Calkins & Williford, 2009; Hughes et al., 2020; Kochanska et al., 2015; Nucci et al., 1996; Roberts et al., 2018). Following theorists, such as Erikson (1963) and Mahler (1979), and with increasing insight into bidirectional influences in the infant-maternal relationship (Kochanska & Aksan, 2004; Lewis & Rosenblum, 1974), troublesome behaviors that reflect agency and autonomy vis-à-vis the infant-maternal relationship reflect the idea that as they enter the second year, infants are not merely passive recipients of adult directives. As Baillargeon and associates point out, "one of the most important developmental issues facing the toddler in the second year of life is to maintain 'connectedness' with the caregiver

while carrying his or her own inner aims and goals. Hence, toddlers' deliberate noncompliance to parental requests, directives, and prohibitions is not, in and of itself, necessarily maladaptive, and many authors have stressed its adaptive nature" (Baillargeon et al., 2011, p. 429).

In line with this formulation, the stance shown by the infants in Figs. 15.2 and 15.4 illustrates jealousy protest as behavior that requires that infants have acquired the ability to operate as autonomous agents who are able to act assertively as sources of influence during bidirectional exchanges with their mothers, including those that are confrontational. Emboldened by being equipped with these capacities, infants as young as these 10-month-olds are able to "stand up" for themselves, both literally and figuratively.

The origin of the 9-month revolution in social cognition has been attributed to an adaptation that was compelled by children's ongoing need for care once weaning came to conclusion (Tomasello, 2020), at which point these skills would come into play toward enabling sociability that would be applied toward soliciting care from caregivers other than mother (Hrdy & Burkart, Chap. 8, this volume). Indeed, the increases in social interactions that emerge with infants' growing mobility and autonomy also include exchanges that are positive in tone (Biringen et al., 1995; Brownell & Kopp, 2007; Clearfield, 2011; Karasik et al., 2011). Yet, ancestral 9-month-olds would not be fully weaned before the age of approximately 36 months, which was several years in the future, and so the abrupt onset and earliness of the 9-month revolution in social cognition is perplexing. A possible explanation can be approached by noting that the timing of its onset coincides not only with a milestone in socioemotional development that involves the unfolding of infant-caregiver attachment (Bowlby, 1969/1984) but also with a milestone in motor development marked by the onset of independent locomotion (Campos et al., 2000). A parsimonious explanation for convergence in timing during the final quarter of the first year would highlight a selection pressure that unifies these milestones in socioemotional, sociocognitive, and motor development.

As we have shown, advances in each of these areas are requisite to the 9-month-old's ability to address usurpation. Socioemotional development is responsible for the formation of a valued relationship, namely infant-maternal attachment, at which point indiscriminate sociability gives way to specific preferences for attachment figures (Bowlby, 1969/1984), much as jealousy protest is found greater when mother, rather than a stranger, directs preferential attention toward a lifelike baby doll (Hart et al., 1998a). Jealousy protest also requires skills in social cognition. These underlie the infant's ability to form expectations with respect to the nature and direction of maternal caregiving and insight into violations of such expectations, as well as joint attention, communicative gesture, and the ability to grapple with a triadic social context so as to arrive at inversed affect sharing. Finally, it calls on skills in self-produced locomotion. These enable efforts to regain exclusive proximal contact with mother, which is essential to infants' efforts to defend against usurpation, and toward enhanced sense of agency and assertiveness by which such efforts are invigorated.

The fact that each of these milestones in socio-emotional, socio-cognitive, and motor development enables jealousy protest may not be coincidental. Nor is it likely to be coincidental that each does so by an infant's 9th month, just as the 9-month period of human gestation concludes along with guarantee of exclusive access to mother. We propose that these milestones in development came about in tandem as *ontogenetic adaptations* (Bjorklund, 1997, 2015; Chap. 2, this volume) to threat posed by the birth of a sibling. Each of the skills involved would have served adaptively by enabling jealousy protest's functionality as a mechanism for defending against the life-threatening consequences of usurpation, and did so following IBIs as brief as 9 months so as to prepare infants for managing a source of threat that would became increasingly imminent as the second year of life approached. Presumably, infants in whom these skills failed to unfold in time were among the one half of children who did not survive (McDowell & Volk, Chap. 5, this volume; Volk & Atkinson, 2008, 2013).

15.5 Future Research: Beyond the Terrible Twos

By the age of 36 months, ancestral infants would have encountered monumental changes in psychosocial functioning that were precipitated by physical maturation. These involved a manner of development that was observable – the eruption of molar teeth – and growth that was *not* observable – maturation of infants' digestive and immune systems, which lessened their reliance on breast milk for nutrition and passive immunity to disease (Hart, Chap. 7, this volume). The appearance of full dentition would have been interpreted by ancestral mothers as a sign that their infants' metabolic requirements could be satisfied without breastfeeding, which prompted them to bring weaning to conclusion. The nonobservable developments would have allowed mothers to do so without causing serious harm to their children's chances of survival (Dettwyler, 1995; Humphrey, 2010; Kennedy, 2005; Locke & Bogin, Chap. 6, this volume; Stuart-Macadam, 1995; Tsutaya & Yoneda, 2015). At this juncture, vulnerability to malnutrition and morbidity would have been diminished – along with weanlings' dependence on maternal caregiving – and so exclusive access to mother was less likely to be a matter of life or death (Hart, Chap. 7, this volume). Thus, it is unclear whether jealousy protest continued to play a role in 36-month-olds as it had since they reached the age of 9 months, when guaranteed access to mothers' milk expired.

Some insight into nascent jealousy's continuing role has come to light through longitudinal research on continuity in children's responses to differential treatment. Studies that explored presentations of jealousy protest in toddlers and preschoolers following a sibling's birth found that their responses did not differ from those that they had exhibited prior to the sibling's arrival in a laboratory procedure which took place during their mothers' final trimester of pregnancy (Chapman & Hart, 2017; Chapman et al., 2018; Szabo et al., 2014). Such evidence of stability seems to suggest that nascent jealousy continues to exert influence beyond infancy.

It is also notable that evidence of jealousy protest has been documented in laboratory studies where it was induced in infants, toddlers, and preschoolers by mothers directing attention preferentially toward siblings (Teti & Ablard, 1989; Volling et al., 2002); twins (Gewirtz & Pelaez-Nogueras, 1999); younger, older, and same-aged peers (Bauminger, 2010; Bauminger et al., 2008; Draghi-Lorenz et al., 2001; Masciuch & Kienapple, 1993); and spouses (Cummings et al., 1981). It has also been observed in settings where differential treatment was exhibited by fathers (Miller et al., 2000; Szabo et al., 2014; Volling et al., 2002). These studies were conducted in the United States, the Netherlands, the United Kingdom, and Israel, by different teams of researchers, using samples from different social classes. The unequivocal results uphold the idea that jealousy is an omnipresent phenomenon among siblings (Cicirelli, 1995), and that exclusivity is a feature of valued relationships that extend beyond the infant-maternal relationship and reaches across cultures and social classes, which suggests that it is a robust phenomenon. Such robustness lends weight to thought that children's sensitivity to differential treatment by a parent is to some degree innately based. We believe that future research on children's responses to differential treatment that incorporate longitudinal approaches stands to yield insight into nascent jealousy as a mechanism that continues to function across age and valued relationships among children past the age of 36 months.

Of course, such approaches will find that presentations of jealousy protest differ with child age. Evidence suggests that it also differs with marker variables, such as gender and birth order (Hart & Behrens, 2013a; Hart et al., 2004), and depends on whether it is elicited by mother *versus* father (Miller et al., 2000; Szabo et al., 2014; Volling et al., 2002), and with experiences related to qualities of maternal caregiving (Hart et al., 1998b, 2003). These findings point to the contributions of child characteristics involving maturation of socioemotional, cognitive, and motor functioning, as well as contextual influences, such as parenting practices. Continued investigative attention to the exceptionally wide range of individual differences that result stands to help isolate endogenous influences from those which are organized by exogenous influences.

Efforts to address individual differences also stand to establish an empirical basis for defining a form of jealousy in children which can be upheld as normative. In addition to illuminating a feature of infants and children that is ubiquitous, yet poorly understood, doing so opens possibilities for addressing innately based aspects of jealousy that help account for its enduringness beyond its roots in ancestral settings. We believe that work along these lines will shed light on nascent jealousy's origin within the context of exclusive infant-maternal relationships, as well as the pathways along which it unfolded in an adaptive fashion in children in ancestral settings, where they navigated complex social environments, marked by multiple supradyadic relationships that called upon skills in both cooperation (Hrdy, 2005; Hrdy & Burkart, Chap. 8, this volume; Tomasello, 2020) and competition (Bjorklund & Pellegrini, 2002; Myers & Bjorklund, 2018; Trivers, 1974).

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