



# Multilevel factors affecting early socioemotional development in humans

Joy Cui<sup>1</sup> · Elisabeth J. Mistur<sup>1</sup> · Christine Wei<sup>1</sup> · Jennifer E. Lansford<sup>2</sup> · Diane L. Putnick<sup>1</sup> · Marc H. Bornstein<sup>1,3</sup> 

Received: 20 December 2017 / Revised: 7 September 2018 / Accepted: 12 September 2018 / Published online: 4 October 2018  
© This is a U.S. Government work and not under copyright protection in the US; foreign copyright protection may apply 2018

## Abstract

Socioemotional climate in the family environment is critical to a child's socioemotional development. This focused literature review examines some central dynamics of that relation, viz. how positive and negative parent-child interactions influence genetic, neurodevelopmental, affective, and behavioral adjustment in children across cultures. Our narrative review of the extant empirical research indicates that, first, socioemotional caregiving experienced in infancy contributes to the postnatal genome and development of the brain in that, for example, early parent-child interactions affect genetic expression and the integrity of white matter neural tracts involved in emotion regulation, social cognition, and behavioral adjustment and presumably do so in culturally common ways. Second, positive parenting (warmth and acceptance) favorably affects child socioemotional adjustment, whereas negative parenting (rejection and punishment) adversely affects child socioemotional adjustment, in specific and fairly consistent ways across cultures. Third, very negative parenting, specifically corporal punishment, anticipates poor child socioemotional behavioral adjustment across cultures. These dynamics are situated in broader caregiving contexts reflecting parent and child gender, parent-child relationship quality, and cultural normativeness. Overall, contemporary research emphasizes the importance of parent-child socioemotional dynamics and cultural interpretation for understanding long-term socioemotional development in human children.

**Keywords** Experience-based myelination · Socioemotional development · Corporal punishment · Parental warmth · Parental rejection

## Introduction

Positive socioemotional development is instrumental to individual growth and well-being. Socioemotional development integrates various aspects of social and emotional change across the lifespan, including how emotions are expressed in certain contexts, what factors elicit emotional expressions,

how social constructions form from emotional experiences, and effects of emotion on social behavior (Thompson 1983). These developmental processes are vital in early infancy and childhood for themselves and because they have far-reaching effects for significant child development outcomes, including adjustment and adaptation, such as internalizing (e.g., anxiety) and externalizing behaviors (e.g., aggression; Bornstein et al. 2013; Lansford 2018). Throughout the life course, human beings experience significant intra- and interpersonal growth subject to the influence of their surroundings, but childhood is a sensitive period (Bornstein 1989) for socioemotional development (Maccoby and Martin 1983; Sroufe et al. 2005). From birth, healthy human infants are sensitive to interactive behavior patterns with caregivers (Tronick 2007). Therefore, interactions a human child has with parent or caregiver in the earliest years likely affect later socioemotional development (Bornstein et al. 2014). This idea guides our understanding of just how crucial is the parent-child dyad for wholesome individual adjustment.

Maccoby and Martin (1983) stressed the impact that parents and caregivers have on child socialization, suggesting

---

Communicated by F. Amici

---

This article is a contribution to the Topical Collection An evolutionary perspective on the development of primate sociality—Guest Editors: Federica Amici and Anja Widdig

---

✉ Marc H. Bornstein  
Marc\_H\_Bornstein@nih.gov

<sup>1</sup> Child and Family Research, Eunice Kennedy Shriver National Institute of Child Health and Human Development, Suite 220 6555 Rock Spring Drive, Bethesda, MD 20817, USA

<sup>2</sup> Duke University, Durham, NC, USA

<sup>3</sup> Institute for Fiscal Studies, London, UK

that children learn how to control their behavior and self-regulate their emotions based on interactions with parent or caregiver. Bronfenbrenner (1986) set the role of parents in the child's microsystem in the larger context of ecological systems theory. Although many environments and experiences (e.g., peers, classrooms, religious settings, community, mass media, culture, political systems, nationality) influence development, many do so indirectly through mediation of the parent-child microsystem.

Much research on child socioemotional development has focused on Western industrialized societies, and so it is important to extend this research across cultures for several reasons. International research on parenting and child development can support or refute theories about children's development and the effects of parenting. Bornstein (1995) proposed a  $2 \times 2$  matrix based on the forms and functions of parenting, where the form of parenting can be thought of as what action, gesture, verbal expression, or other is given, and function of parenting can be thought of as the idea or meaning the form conveys. This matrix conceptualizes similarities and differences between cultural forms and functions. If form and function are coincident across cultures, there is an expectation of cross-cultural similarity. If form and function differ, there is cross-cultural specificity. There may also be cases when different forms serve the same function, or the same form serves different functions, indicating cross-cultural differences as well. Differences in socialization across cultures in, say, parenting strategies are expected, but the ultimate goal of many parents is to rear productive, successful, and well-adjusted children for their culture. Thus, cross-cultural research helps broaden our understanding of how children might be reared differently but attain similar outcomes, and conversely, how children might be reared similarly but arrive at dissimilar (if still culturally relevant) outcomes. Parenting poses many challenges, but further insight into how the parent-child dyad functions, and recognition of similarities and differences in parenting processes help in achieving the human universal goal of rearing healthy and well-adjusted children.

This research review identifies relations between specific genetic, neurobiological, and environmental factors and child socioemotional development. First, we briefly introduce four central developmental science theories relating parent socioemotional socialization to child socioemotional development. Next, we address how early social experiences guide change in the child genome and development of the child brain. Because the primary relationship infants establish is with their caregiver(s), we focus on how caregiver-infant interactions influence neural networks associated with socioemotional development. Developmental changes in the offspring brain microstructure are associated with child and adult behaviors. Then, we scrutinize patterns of association of parental warmth or acceptance and of parental rejection with child socioemotional adjustment. Nearly a quarter of the

variance seen in child and adult psychological adjustment has been attributed to the differences in these parenting orientations (Khaleque and Rohner 2002), implying that this spectrum within parenting exerts meaningful effects on offspring socioemotional adjustment. Last, we explore a common, if extreme aspect of parenting, discipline in the form of corporal punishment, which has manifest negative effects on child socioemotional adjustment, particularly in the expression of aggression. There is a global initiative afoot to reduce and eliminate the use of corporal punishment due to the deleterious effects it has on development. Attitudes about and use of corporal punishment vary across cultures (Lansford et al. 2005, 2010). In this section of the review, we focus on cultural normativeness, parent-child context, and parent and child gender, all of which moderate relations between corporal punishment and child socioemotional adjustment.

Although behavioral research is subject to many challenges, including a constant impulse to untangle biological and environmental influences cross-culturally, the kinds of research we review have added to scientific understanding of important influences on human socioemotional development. Just as identifying a problem is the necessary first step in addressing it, pinpointing parent-generated influences on child socioemotional development is the first step toward promoting positive influences and preventing negative influences on child adjustment in the global community.

## Theory linking parent socioemotional socialization to child socioemotional development

Numerous theories have been advanced to explain prominent relations between parenting practices and child adjustment outcomes. Here, we briefly review four contemporary theories in socioemotional socialization. These theories guide much socialization research today.

### Interpersonal acceptance-rejection theory

Interpersonal acceptance-rejection theory (IPARTheory), formerly called parental acceptance-rejection theory (PARTheory), asserts that children universally need warmth, love, and acceptance from caregivers and other attachment figures and that their socioemotional development is affected by the messages of acceptance and rejection they receive from parents and caregivers (Rohner 1975, 1986, 2016; Rohner and Cournoyer 1994; Rohner et al. 2003; Rohner and Smith 2018). Rohner (2014b) updated PARTheory, which only considered the importance of parental love. The new IPARTheory additionally considers the importance of warmth, acceptance, and love in other interpersonal relationships across the lifespan. Considering significant interpersonal relationships

beyond the parent-child dyad, such as intimate friendships and romantic relationships, broadens the theory on how acceptance and rejection affect human socioemotional development.

Under IPARTheory, Rohner defined parental acceptance as warmth, love, and affection, and parental rejection as the absence of those characteristics and the presence of physically or psychologically hurtful behaviors. Messages of acceptance and rejection come from parental behaviors expressed in physical, verbal, or symbolic forms (Rohner and Smith 2018). Affirmation, for example, can be expressed through hugging, verbal encouragement, or a culturally specific ritual such as giving a gift on a birthday. Messages of acceptance or rejection are also interpreted on the basis of child perspectives and beliefs about acceptance or rejection. Every human experiences a combination of acceptance and rejection messages, and these messages can come both from caregivers' behaviors and from children's beliefs; parental acceptance-rejection should be viewed on a continuum (Rohner and Smith 2018).

Rohner's IPARTheory predicts a direct relation between how the child perceives parental acceptance-rejection and the child's socioemotional adjustment (Rohner and Britner 2002; Rohner et al. 2003). A number of methodological approaches have been used in IPARTheory research, but the most accepted approach is to measure individuals' subjective experiences of acceptance or rejection from caregivers using the Parental Acceptance-Rejection Questionnaire (PARQ). This phenomenological approach recognizes that every child's experiences are unique and her/his perceptions of acceptance and rejection are subjective and cannot be measured validly by an observer (Rohner and Smith 2018). The PARQ has been recognized as a valid measure of the warmth dimension of parenting and has shown construct validity cross-culturally; using the PARQ and a mixture of other methodologies, studies overwhelmingly point to a universal need for parental warmth and acceptance and the presence of an "acceptance-rejection syndrome" when these needs are not met (Rohner and Cournoyer 1994; Rohner and Britner 2002; Rohner 2004).

In turn, socioemotional adjustment varies depending on the degree of acceptance or rejection an individual feels in important relationships. Individuals who report relationships with their parents characterized by rejection also report specific psychological maladjustment that includes seven characteristics that construct acceptance-rejection syndrome. The seven measurable characteristics are as follows: "(a) hostility, aggression, passive aggression, or problems with the management of hostility and aggression; (b) dependence or defensive independence depending on the form, frequency, duration, and intensity of perceived rejection; (c) impaired self-esteem; (d) impaired self-adequacy; (e) emotional unresponsiveness; (f) emotional instability; and (g) negative worldview" (Rohner 2004, p. 830).

## Social learning theory

Bandura (1978) proposed a social learning theory of aggression, describing aggression as a "multifaceted phenomenon" with multiple possible determinants (p. 12). It had been assumed that child aggression formed without guidance is a product of frustration, as suggested by frustration-aggression theory (Dollard et al. 1939). But because many forms of sophisticated violence (e.g., using a gun, sword fighting) are learned through direct experience or observation and children observe aggressive behaviors (Hicks 1968; Bandura 1969), it was subsequently hypothesized that aggression may be learned. Bandura (1978) pointed to three modern sources of learned aggression: the child's family members, the subculture in which the child lives, and mass media to which the child is exposed. The role of family members and observed and/or experienced aggression is crucial to the tactics children choose to deal with others and whether and how children favor aggressive responding (Bandura and Walters 1959; Rule and Nesdale 1976). The society in which a child lives also influences how the child views and uses aggression; if aggression is used more frequently in a society and is regarded as a valued attribute, the child may be inclined to aggress. Last, violence portrayed in media (e.g., television, video games, and movies) exposes the child to aggressive styles of conduct, which may desensitize the child to, and influence attitudes the child possesses toward, violence that ultimately affects how the child resolves conflicts (Bushman 2016).

Thus, if a child observes or experiences corporal punishment, the child may learn that such behaviors are both acceptable and useful. Social learning theory (Bandura 1977) also implies that certain cognitive structures form from observed and reinforced behavior. These cognitive structures then provide standards against which one judges actions. Through self-observation, judgmental processes, and self-response, a child gradually develops specific internal standards and valuations of actions, which likely lead to the reproduction of those behaviors. Modeling and reinforcement ultimately operate symbiotically.

## Coercion theory

In accordance with models of reinforcement, Patterson's (1982) coercion theory described a learning process of aggressiveness as equally dependent on reward and reinforcement. It begins with a parent's attempt to change a child's behavior through deliberate action like verbal persuasion. When the child refuses and counterattacks, the parent backs off, negatively reinforcing the child's behavior. Parent and child are both rewarded—the child stops her/his behavior and the parent stops her/his disciplinary action, and thereby, both sets of behaviors are reinforced. Over time, parent and child may employ these tactics repeatedly. However, their expression

risks becoming increasingly aggressive (the parent may yell or physically strike, while the child may scream and hit) to elicit the same response. Due to the progressively aggressive nature of the behaviors of both parent and child, the child may learn that aggressive tactics lead to desired outcomes, increasing the likelihood of aggression in the future.

### Parenting style

Baumrind (1967) developed a tripartite classification of parenting styles from the intersections of parental demandingness and responsiveness, and Maccoby and Martin (1983) built on Baumrind's theory to develop a fourfold scheme of parenting, including authoritarian, authoritative, permissive, and neglectful. Authoritarian parenting involves high parental demand and low acceptance; authoritarian parents try to shape and control their child's behavior using their own standards, and value obedience, respect for authority, tradition, work, and order. Of the four styles, authoritarian parenting is most firmly associated with negative child socioemotional development. There is a positive relation between parental punishment and child aggression, such that authoritarian parents tend to foster aggressiveness in children.

Maccoby and Martin (1983) also stressed the importance of cross-cultural generalizability. The effects of parenting style depend to an extent on (1) the degree of agreement between a family's values and expectations of parents in their society, (2) the degree of social surveillance a child experiences, (3) the degree that a child's future depends on her/his parents' approval, and (4) the degree of importance of all members cooperating within the authority structure of the group. Therefore, socioemotional effects of parenting styles are arguably contingent on social and cultural constraints as well as the history of the relationship between parent and child.

### Gene expression, brain, and socioemotional development

Socioemotional socialization, following mechanisms associated with the theories just discussed, has been found to alter the offspring epigenome and brain.

### Epigenetic change

In March of 2015, astronaut Scott Kelly blasted into orbit to begin a 340-day mission. Notable beyond the duration of his stay in space was the fact that his identical twin brother Mark stayed on Earth. Before Scott left he and Mark were tested extensively, as they were when Scott returned to Earth and for a year after. Multiple kinds of biological samples were collected from the two brothers, including whole blood cells, saliva, and skin, on which before and after genetic analyses were

conducted. Genes change all the time, but living in space activated some genes that maintained their activation state even 6 months after Scott returned to Earth (Edwards and Abadie 2018).

Experience can alter genetic expression. Pertinent to our thesis here, socioemotional experiences can alter genetic expression as well. Childhood adversity associates with chemically stable, epigenetic modifications, such as DNA methylation (Bick et al. 2012). Genome-wide DNA methylation (the DNA methylome) is dynamic across development and altered by early social experience. An example follows.

The Nurse-Family Partnership (NFP) pairs nurses with vulnerable, first-time mothers throughout their pregnancy and until the child's second birthday (Olds et al. 2003, 2010). The NFP targets mothers at risk of abusive parenting to reduce child abuse and neglect and improve neurodevelopmental outcomes. O'Donnell et al. (2018) undertook an epigenetic analysis of a long-term outcome of the program and uncovered the first evidence that a perinatal intervention for mothers influenced children's epigenetic markers. Blood samples were taken from offspring of the control group ( $n = 99$ ) and intervention group ( $n = 89$ ) as adults with a mean age of 27.4 (SD = 0.7) years. With blood samples, O'Donnell and colleagues analyzed DNA methylation—addition of methyl groups that inhibit DNA transcription. An objective measure of child abuse and neglect was extracted from substantiated cases in Child Protective Services records. The NFP program and a history of child abuse and neglect together accounted for a proportion of the interindividual variation in DNA methylation at 27 years of age, independent of gender, ancestry, cellular heterogeneity, and a polygenic risk index for major psychiatric disorders. This study reveals the persisting influence of the early socioemotional environment on variation in DNA methylation across the genome. The association between childhood adversity and the methylation status of genes was apparent in peripheral cells and associated with concurrent psychopathology, and transcription factor-initiated remodeling of the DNA methylome emerged as a possible mechanism. Childhood adversity might also have direct as well as indirect effects on the epigenome by influencing health-risk behaviors, which, in turn, may influence biological factors. In brief, this study documents a significant association between the maternal-focused NFP intervention and variation in genome-wide DNA methylation in adult offspring.

### Central nervous system change

From gestation to early adulthood, neural structures involved in regulating emotions, memories, and homeostasis of the body mature, as the brain constantly reorganizes. Social functioning and behaviors are extensions of central nervous system function. The central nervous system is responsible for registering what is present in one's surroundings, processing

information, and deliberating possible responses. It is thus critical to consider the interplay of neurodevelopment, socioemotional development, and child adjustment. Here, we briefly review a timeline of landmark events in neurodevelopment, examine select neural pathways that are associated with social cognition and behavior, recount effects of deprivation of socioemotional caregiving during infancy, and describe how positive experiences provided through parent interventions cultivate enriching interactions to promote healthy socioemotional development.

### Experience-dependent myelination

Cerebral white matter (WM) is composed of myelin, a fatty white substance that wraps around axons of neurons to provide electrical insulation. Myelin speeds the conduction of neural signals and, as a result, facilitates networks of neurons to communicate quickly and allows the nervous system to regulate itself more efficiently (Toritsuka et al. 2015; Mount and Monje 2017). WM development correlates with motor skill development and supports higher-order cognitive capacities in humans (Klingberg et al. 2000; Schmithorst et al. 2005; Bava et al. 2010). Therefore, tracts, or bundles of myelinated axons, give rise to neural pathways and play an important role in cognitive development. Myelination begins in late fetal development and progresses well into childhood (Fields 2010; Toritsuka et al. 2015). Not all brain regions myelinate at the same time (Bick and Nelson 2016), and WM volume grows linearly from childhood to early adulthood, and continues to increase, but at a slower rate, into the third decade of life, when the brain has fully matured (Sowell et al. 2002). Synaptogenesis and synaptic pruning also contribute to the volume of WM. Synaptogenesis creates new synapses between neurons, begins during gestation, and is controlled by genes (Tierney and Nelson 2009); different areas of the brain achieve peak rates of synaptogenesis at different points in the first year of life (Tau and Peterson 2010). In response to an overproduction of synapses, the brain undergoes synaptic pruning to eliminate redundant or infrequently used synapses. Synaptic pruning also begins and lasts for varied amounts of time in different areas of the brain. Pruning is experience-driven (Tierney and Nelson 2009). Thus, in tailoring its architecture to its needs, brain maturation optimizes efficiency and prepares itself for adaptation to specific environmental demands.

Overall, the brain is a plastic organ and, like genes, is regulated by internal and external environments. There is growing evidence that environmental cues and experiences direct postnatal WM development (Tierney and Nelson 2009; Tau and Peterson 2010; Bick and Nelson 2016; Mount and Monje 2017). For example, adolescence is dominated by social experiences that engage the frontal lobe and affect socioemotional development, as such experiences often

involve practice of executive control and adaptive functioning. To meet environmental demands, various frontal connections mature and long-distance tracts that stem from the prefrontal cortex continue to form and myelinate to increase cognitive control and interhemispheric communication (Asato et al. 2010). Widespread changes in WM during adolescence coincide with ongoing modulation of social behavior, reward processing, and decision making, all of which contribute to socioemotional well-being.

According to Hebb's (1949) theory, synaptic strength increases when a connection between neurons is repeatedly stimulated: "Neurons that fire together, wire together." The theory may relate to experience-dependent myelination. Temporally synchronized neuronal firing in networks engaged in recurring activities and interactions promotes experience-dependent myelination (Fields 2005; Zatorre et al. 2012; Steele et al. 2013). In other words, the trigger for experience-dependent myelination is likely repeated stimulation of the neurons activated by repeated experiences. This idea is supported by research that links learning with microstructural changes in WM: differences in WM organization between early and late trained musicians (Steele et al. 2013) and changes in WM after learning a second language (Schlegel et al. 2012) and new motor skills, such as juggling (Scholz et al. 2009) and navigating through a virtual reality task (Lakhani et al. 2016), have been attributed to experience-based myelination (Fagiolini et al. 2009; Mount and Monje 2017)

### Infancy as a sensitive period in human socioemotional development

A sensitive period marks a time when input from the environment can exert specific effects on development (Bornstein 1989). Bengtsson et al. (2005) proposed that regionally specific plasticity in myelinating tracts reflects experiences (e.g., learning to play an instrument) during such sensitive periods. Without adequate environmental stimulation, the brain does not receive the necessary inputs to process and respond to social situations, thereby jeopardizing positive socioemotional development. Given that infancy and childhood are subject to significant influences from caregivers, early social experiences likely affect the formation of neural pathways and later child socioemotional development (Bornstein et al. 2014). Two lines of evidence document the detrimental long-term socioemotional effects of, first, social isolation during infancy and, second, preterm birth.

### Romanian orphans reared in socially deprived environments

Under the regime of the dictator Nicolae Ceausescu, family planning in Romania was not accessible because of abortion regulations, and contraception was outlawed in efforts to stimulate population growth (Leidig 2005). The Romanian

government reported that in 1989, the last year that Ceausescu was in power prior to his execution, 104,000 children lived in orphanages, where they received an estimated 5–6 min of daily attention and experienced low levels of warmth from caregivers. Due to the poor conditions under which these thousands of children were reared, Doctors Without Borders estimated that 10% of Romanian children would wither and die in psychiatric institutions (Perlez 1996).

Some orphans had severe health or developmental issues at birth, but many others developed childhood-onset psychiatric complications, such as attention-deficit hyperactivity disorder (ADHD), quasi-autistic behavior patterns, and difficulties in emotional regulation and behavioral adjustment (Rutter et al. 2007; Toritsuka et al. 2015). When structural magnetic resonance imaging (MRI) was used to compare the brains of Romanian orphans who were adopted into the United Kingdom (UK) with the brains of UK children reared from birth in healthy environments, Mehta et al. (2009) discovered that the orphan group had 18% less WM and greater volume of right-sided amygdalae (a structure responsible for processing emotions and linked to aggression and fear). These researchers also found a direct positive relation between size of the left amygdala and time spent in institutions, concluding that the amygdala is sensitive to early deprivation of social experience. Past research suggests disproportionately enlarged amygdalae may be associated with autism (Schumann et al. 2009), anxiety (Qin et al. 2014), and behavioral inhibition, a tendency to withdraw from novel social situations (Hill et al. 2010). Both anxiety and behavioral inhibition are internalizing behaviors and so may underpin some psychiatric complications seen in Romanian orphans.

Beyond differences at a neural level, Romanian children adopted into the UK showed behavioral differences compared to children adopted within the UK who never experienced the poor rearing conditions in Romania. Rutter et al. (2007) found that institutional rearing was associated with disinhibited attachment among Romanian orphans adopted before 3.5 years of age. Disinhibited attachment manifests in displays of indiscriminately friendly behavior toward unfamiliar people, such as close following, and can result from past trauma or neglect. In UK-adopted Romanian orphans, disinhibited attachment signified poor adaptation to consistent caregiving in the UK and failure to form a secure attachment with the adoptive caregivers. Moreover, Rutter et al. (2007) found that disinhibited attachment was linked to elevated rates of cognitive impairment, relationship problems with peers, quasi-autism, inattention/overactivity, and conduct and emotional disturbance.

Disinhibited attachment also persisted in more than half of Romanian orphans studied from ages 6 to 11, suggesting that early social isolation has lingering effects on child socioemotional behavior and adjustment, even after introduction to consistent caregiving, peers, and school. The only

strong predictor of persistent disinhibited social behavior was institutional rearing that lasted beyond 6 months of age, reaffirming that infants are sensitive to inconsistent caregiving and that infancy is a sensitive period in the formation of secure attachment relationships. Ultimately, the studies on the Romanian orphans spotlight the idea that early social experiences can produce cascade effects on the brain and behavior (Rutter and Woodhouse 2018).

### Experience-based myelination in preterm infants

Infants who are born preterm are at an increased risk of perinatal brain injury, neurodevelopmental deficits, and psychiatric disorders (Montagna and Nosarti 2016). In comparison to term infants, preterm infants often have reduced brain volume (de Kieviet et al. 2012), and the development of white and gray matter in preterm infants does not follow the common pattern observed in term infants (Giedd et al. 1999). These differences in brain volume and WM organization are hypothesized to underlie socioemotional impairments, such as diminished social competence and self-esteem, inattention, internalizing behaviors, difficulties in creating friendships, and poor emotional and behavioral adjustment, as sometimes seen in preterm children (Montagna and Nosarti 2016; Heinonen et al. 2018; Jaekel et al. 2018).

However, limiting stressors, overstimulation, and isolation can promote experience-dependent myelination in preterm infants. Milgrom et al. (2010) reported that early sensitivity training of mothers may benefit neurodevelopment in their preterm infants. “PremieStart” is a parental sensitivity training program that taught parenting techniques, such as kangaroo care, which promotes skin-to-skin contact between infant and caregiver, with the goal of preparing parents to provide nurturing interactions that support cortical development. Infants enrolled in PremieStart were discharged earlier from hospitals, spent fewer hours on oxygen, and displayed fewer cases of sepsis than control infants. Additionally, intervention infants showed increases in WM over the course of the study, suggesting that sensitivity training for parents can promote parent-infant interactions that support healthy cortical development.

### WM tracts underlying socioemotional development

Studying change in WM sheds light on neurodevelopment. One common technique to do so is diffusion tensor imaging (DTI), which permits visualization of tracts and is used to determine WM integrity. DTI determines the orientation, direction, and anisotropy of WM tracts based on how water diffuses along tracts (Beaulieu 2002; Mori and Zhang 2006; Alexander et al. 2007). Anisotropy reflects the flow of water along tracts, specifically if it is restricted to one or multiple directions. Using DTI, scientists have localized some WM

tracts associated with social behaviors and relationships. They include the uncinate fasciculus, cingulum, inferior fronto-occipital fasciculus, and superior longitudinal fasciculus.

Increasing myelination of uncinate fasciculus is thought to underlie emotion regulation, episodic memory (memory that pertains to autobiographical events), and mature decision making (Von Der Heide et al. 2013). A number of studies have also investigated the relation of the uncinate fasciculus to sociability. Using DTI, Eluvathingal et al. (2006) and Govindan et al. (2010) reported reduced integrity of the uncinate fasciculus in children reared in socially deprived environments. Socially deprived children, compared to control children, presented deficits in verbal memory as well as more behavioral attention difficulties and conduct problems and atypicality in the borderline range. Eluvathingal et al. (2006) proposed that these impairments result from experiences of maltreatment and neglect, which are also associated with parental rejection and low parental warmth.

The uncinate fasciculus and cingulum are two of the last WM tracts in the brain to mature, rendering them sensitive to experience-dependent myelination for a longer period than other tracts (Howell et al. 2016). Third, the inferior fronto-occipital fasciculus connects the frontal and occipital lobes, and, although its function is still disputed, research suggests that the tract is implicated in semantic processing of language (Bookheimer 2002; Wu et al. 2016). Last, the superior longitudinal fasciculus has connections with all four lobes of the brain, including Wernicke's and Broca's language areas (Mori et al. 2008).

Serra et al. (2015) reported that the uncinate fasciculus, cingulum, inferior fronto-occipital fasciculus, and superior longitudinal fasciculus are tied to the development of attachment between child and caregiver. A healthy, secure attachment relationship is one product of enriching social interactions. Attachment style is important in socioemotional development because it affects child adjustment. For example, secure attachment in infancy predicts social competence in childhood, and children with more social competence exhibit fewer internalizing behaviors from childhood to adolescence (Bornstein et al. 2010). Furthermore, parental warmth contributes to child-parent attachment style and is predictive of child social competence and self-regulation (Zhou et al. 2002; Eiden et al. 2009). Using DTI, Serra et al. (2015) found positive associations between reported security in the maternal relationship experienced during childhood and adult WM integrity of the uncinate fasciculus, cingulum, inferior fronto-occipital fasciculus, and superior longitudinal fasciculus. Essentially, caregivers, especially mothers, appear to influence their child's development on a neural level through their attachment relationship and discipline techniques, which, in the long run, impact child social competence and adjustment.

Because the uncinate fasciculus, cingulum, inferior fronto-occipital fasciculus, and superior longitudinal fasciculus are

all involved in higher-level socioemotional functioning, WM tract integrity is likely also associated with interpersonal competence. Interpersonal competence refers to an individual's ability to connect, empathize, and work with others. Strong interpersonal competence anticipates control over one's emotions and the ability to read others' socioemotional cues. In addition, strong interpersonal competence promotes adaptive functioning, which is crucial in child positive adjustment. When navigating social situations or confronting a dilemma, a child can develop coping mechanisms and positive strategies or unhealthy externalizing and internalizing behaviors. De Pisapia et al. (2014) confirmed that self-reported interpersonal competence is correlated with WM integrity of the uncinate fasciculus, cingulum, inferior fronto-occipital fasciculus, and superior longitudinal fasciculus in the right hemisphere of the brain. This group also found that greater integrity of the forceps minor, which comprises a portion of the anterior region of the corpus callosum, connects various orbitofrontal regions (Mori et al. 2008) and, as a part of emotion regulation circuitry, is correlated with interpersonal competence.

The uncinate fasciculus, cingulum, and forceps minor may constitute neural mechanisms underlying emotional dysregulation to a greater degree than behavioral dysregulation. Versace et al. (2015) studied the WM integrity of these three tracts in youth with externalizing behaviors manifested by behavioral dysregulation disorders (ADHD, disruptive behavior disorders, and ADHD plus disruptive behavior disorders) and youth with internalizing behaviors manifested by emotional dysregulation disorders (bipolar spectrum disorder, depressive disorder, anxiety disorder, and their combinations). Children with emotional dysregulation disorders had reduced WM integrity in the uncinate fasciculus, cingulum, and forceps minor and fewer and smaller (in diameter) axons compared to children with behavioral dysregulation disorders or without any dysregulation disorders. The same did not hold true for children with behavioral dysregulation disorders, suggesting that the neural mechanisms involving the three tracts may be unique to emotional dysregulation disorders and its associated internalizing behaviors. Further research is required to determine how pathways that underlie emotional and behavioral dysregulation vary, and what aspects other than WM integrity may be involved.

### Limitations of WM research

Research on human socioemotional development, the studies reviewed here included, is not without limitations. As advantageous as DTI is in unveiling the microstructure and direction of neural tracts that putatively underlie socioemotional function and development, there is debate concerning the accuracy of DTI-derived measures in reflecting WM integrity. Vos et al. (2012) reported that the presence of two crossing tracts may decrease the DTI-derived measure of fractional anisotropy

(FA), which can be inaccurately interpreted as a decrease in WM integrity. However, variability in FA can be reduced if researchers focus on a homogenous population of neurons in a specific region with fewer crossings (Alexander et al. 2007). Leow et al. (2009) recommended that differential diffusivity and average anisotropy in all major directions should be used with other DTI-derived measures. We note, however, that none of the DTI studies mentioned in our review relied solely on FA. Nonetheless, more work is needed to improve the accuracy of DTI and how it is applied to study WM integrity.

Furthermore, most DTI studies are cross-sectional, meaning that data are collected at one specific point in time and so constrain specifying causality. Considering that myelination is dynamic, cross-sectional studies do not inform us about any improvements or deteriorations as children are further exposed to life-changing experiences, social relationships, settings, and circumstances. As such, cross-sectional studies do not reveal confounding factors that appear later in life and could influence tract integrity. The course of socioemotional development for each child varies, and natural increases in WM during the first few decades of life may vary from child to child. Tract maturation is another limitation to consider—tracts myelinate and mature at different times as demonstrated by the uncinate fasciculus, which reaches its peak development between 28 and 35 years of age (Olson et al. 2015). Consequently, a child with less WM in comparison to her/his peers will not necessarily have reduced levels as an adult, and associations between childhood behaviors and WM tract integrity may not persist in adulthood. Finally, a neural tract can be involved in multiple functions. For example, the uncinate fasciculus plays a role in social cognition and episodic memory, and its integrity can be undermined by stress and trauma. However, the uncinate fasciculus is also required in language, specifically for the retrieval of people's proper names (Papagno et al. 2010), and is sensitive to reward and punishment (Olson et al. 2015), meaning parenting style and techniques could influence its development as well.

From a developmental view, early social interactions and experiences influence a child's neurobiology and behaviors. The child's attachment with caregivers and early interpersonal competencies may alter WM integrity in brain tracts involved in later emotional regulation and social cognition. In consequence, caregivers need to be mindful of how social interactions with their children alter genetic development, neurodevelopment, and socioemotional development. It is likely that such experience-dependent effects on WM development in the brain are universal, but to date, virtually, all such research has been conducted in Western Europe and North America, so we can only speculate on the broader applicability and validity of these processes. Parenting styles and behaviors differ within and across cultures, which likely affect the outcomes of child socioemotional development and adjustment.

## Parenting acceptance-rejection and child socioemotional development

Acceptance/rejection, the presence or absence of warmth and control in parenting, has been recognized as a universal influence on child socioemotional development; across cultures, no child is found without the needs for love and acceptance from a caregiver (Bornstein and Putnick 2018). Parental acceptance, of which warmth is a key ingredient, is crucial to meeting these needs and likely evolved as an aspect of human parenting to protect and nurture offspring (MacDonald 1992). Baumrind (1967) and Maccoby and Martin (1983) recognized warmth as a central aspect of parenting, which exerts major effects on child development. The presence or absence of acceptance (warmth and sensitive responsiveness) differentiates authoritative parenting from authoritarian parenting. Authoritarian parenting, as described earlier, is characterized by low acceptance/warmth but high demandingness/control. Authoritative parenting, characterized by high acceptance (warmth/responsiveness) and demandingness/control, is widely recognized as the most favorable parenting style and encourages healthy child socioemotional development (Bornstein and Putnick 2018). Authoritative parenting promotes successful social, affective, and academic adjustment in children and adolescents in many ethnic groups (Reitz et al. 2006; Vazsonyi and Belliston 2006).

Parental acceptance-rejection varies within as well as across Western and non-Western countries (Perris et al. 1985; Chung et al. 2008; Dwairy 2010; Putnick et al. 2012). Across cultures, children with more accepting and less rejecting parents have higher social competence (Kim et al. 2007) and higher self-esteem (Litovsky and Dusek 1985; Haque 1988) and fewer problems with mental health, externalizing, and substance abuse (Rohner and Britner 2002; Rohner et al. 2003). Parental acceptance in childhood even promotes more adult acceptance in romantic relationships (Parmar et al. 2008; Varan et al. 2008).

Rohner (2010) studied child adjustment across Bangladesh, Estonia, India, Kuwait, Turkey, and the USA, uncovering some culturally common and some culturally specific relations among perceived parental acceptance, perceived teacher acceptance, and youth adjustment and school achievement. Children's perceived maternal, paternal, and teacher acceptance was positively correlated with their socioemotional adjustment regardless of their gender or socio-cultural background. However, teacher acceptance had a larger mediating effect on youth psychological adjustment in Bangladesh and India, whereas parental acceptance had a larger mediating effect on youth psychological adjustment in Kuwait and Estonia. Variability in the effects of perceived parent and teacher acceptance on academic achievement and school conduct depended on child gender and sociocultural background. Attachment relationships beyond the caregiver-



child are therefore important, and some may be more important sources of acceptance than others depending on the culture.

Miranda et al. (2012) compared mother and child perspectives of maternal acceptance-rejection and childhood socioemotional adjustment in Italy. When mothers rated child adjustment (anxiety, depressive symptoms, and aggression), child adjustment was positively predicted by socioeconomic status (SES) and negatively predicted by maternal hostility-aggression. Mothers' ratings aligned with previous studies that have shown that low SES puts parents at risk of maladaptive parenting practices (Agathonos-Georgopoulou and Browne 1997), and maternal hostility-aggression gives children an aggressive behavioral model to copy (Bandura 1986) and causes emotional distress in children, which can, in turn, generate symptoms of anxiety and depression. Child-reported adjustment, however, was predicted by maternal neglect-indifference. These findings suggest that children's perceptions of mothers' hostility-aggression or neglect-indifference put them more at risk of becoming aggressive and/or anxious-depressed.

Putnick et al. (2015) studied the effects of perceived parental acceptance-rejection on child adjustment in nine countries. Children from 1247 families from China, Colombia, Italy, Jordan, Kenya, the Philippines, Sweden, Thailand, and the USA were assessed for their perceptions of mother and father acceptance-rejection as predictors of child social competence, prosocial behavior, school performance, and internalizing and externalizing behavior problems. Across 3 years, higher perceived parental rejection predicted decreases in prosocial behavior and school performance and increases in internalizing and externalizing behavior problems. Patterns were similar across mothers and fathers and almost all nine countries. Again, children's perceptions of parental acceptance-rejection relate to their adjustment and development, but some specific effects vary from culture to culture.

### Sociocultural sources of parental acceptance/rejection

Findings of cultural differences lead to questions about how parenting is shaped by societal systems and institutions as well as to the realization that certain systems either support or discourage parent-child attachment relationships. Rohner's sociocultural systems subtheory appeals to these systems for explanations of why some parents are warm and loving whereas others are aggressive, neglecting, or rejecting (Rohner et al. 2003).

Societal gender norms affect parental warmth and so child outcomes. Girls report experiencing more anxious-depressive symptoms than do boys across cultures, but more cultures need to be studied to determine if this gender difference is universal (Rohner and Smith 2018). The difference could be due to greater cultural acceptance of women than of men

expressing and admitting to negative feelings or affect. Past studies have been mixed regarding whether parents are more accepting and less rejecting of girls or boys, if mothers or fathers are more or less accepting, or if there is no difference. Putnick et al. (2012) studied the effects of culture and parent gender on parent-reported acceptance-rejection, warmth, and hostility/rejection/neglect of their preadolescent children. Parents reported high acceptance and warmth across cultures, but fathers reported higher warmth toward children than mothers in Kenya, and mothers reported higher acceptance than fathers in the USA, Sweden, Italy, and China. Culturally specific differences in parental treatment of girls and boys suggest that culture moderates parenting, but there was no universal difference in parental acceptance-rejection of boys and girls. Regardless of mean-level differences in mother and father acceptance-rejection, it is possible that acceptance-rejection from one parent is more important to child socioemotional development than the other. Although mothers are generally children's primary caregivers around the world (Bornstein and Putnick 2016), there is mounting evidence that father acceptance-rejection is as influential as mother on child socioemotional adjustment (e.g., Rohner and Veneziano 2001; de Minzi 2006, 2010; Michiels et al. 2010; Khaleque and Rohner 2011; Putnick et al. 2015; Li and Meier 2017). Fathers' acceptance-rejection may be even more influential than mothers' in cultures where men are perceived to have greater interpersonal power and prestige than women. Power/prestige differentials have been shown to moderate the effects of perceived parental acceptance-rejection on children's socioemotional adjustment in several cultures (Rohner 2014a).

Parent and child gender could also interact such that each acceptance/rejection relation (mother-son, mother-daughter, father-son, father-daughter) is unique. Some studies suggest that paternal acceptance-rejection may be more predictive of individual socioemotional adjustment in childhood and adulthood than maternal acceptance-rejection. For example, remembered childhood paternal acceptance-rejection has stronger effects on adults' psychological adjustment than remembered maternal acceptance-rejection (Rohner 1998; Veneziano 2000; Rohner and Veneziano 2001; Veneziano 2003). Some studies report that acceptance-rejection had a larger effect on rejection sensitivity of the child from the same-sex parent than from the opposite sex parent (Ibrahim et al. 2015), and other studies suggest that fathers' acceptance-rejection sometimes has a greater impact on daughters' adjustment and mothers' acceptance-rejection sometimes has a greater impact on sons' adjustment (Ali et al. 2015; Li and Meier 2017). Further research is needed to understand the effects of parent and child gender in the context of families and cultures.

Attributional styles also moderate parenting efforts and effects. Culturally normative parental attributions of children's successes and failures, and attitudes about parenting, moderate

parenting practices and parental acceptance-rejection. Parents from different countries across the globe show differences in attributions and attitudes about parenting, although generally, mothers tend to report more progressive parenting styles and fathers more authoritarian attitudes (Bornstein et al. 2011). Direct attributions of children's successes and failures to one's own parenting have been associated with more accepting and supportive parenting practices and fewer behavioral problems in children's later development. Bornstein et al. (2017) found that mothers who were more knowledgeable and satisfied, and who attributed successes in parenting to themselves when their child was a toddler, showed more supportive parenting during a joint activity with their children years later. The same children at preadolescence were rated by their teachers as displaying fewer classroom externalizing behavior problems.

Family composition and marital status are two other contextual factors that moderate parenting practices and acceptance-rejection. Single parents in social and emotional isolation, and single parents who are young and poor, are at higher risk of using more rejecting parenting (Rohner and Smith 2018). Single parents most likely experience above-average levels of societal stresses and pressures. These factors about single parents may affect child adjustment.

### Child socioemotional consequences

Child socioemotional development is partially determined by acceptance-rejection behaviors of caregivers and other attachment figures, but children also develop ways to shield themselves from, and cope with, negative parenting practices to protect their development. As Rohner's coping subtheory of IPARTheory explains, a spectrum of abilities helps individuals emotionally cope with the experience of rejection, and some individuals cope better than others (Rohner et al. 2003). So-called "affective copers" exhibit positive psychological adjustment amidst parental rejection, and "instrumental copers" do well in task-oriented activities, like work, but exhibit impaired emotional and mental health (Rohner and Smith 2018). Affective copers may also look to outside mentors or attachment figures to fill their needs for love and acceptance. Thus, a single warm attachment figure outside the parent-child relationship could buffer the effects of parental rejection (Rohner and Smith 2018).

Parental acceptance/warmth has many other direct effects on child development. Gurdal et al. (2016) studied its longitudinal effects on child agency, adjustment, and school achievement in Swedish children. Higher parental warmth at age 8 predicted greater child agency at age 9, which, in turn, predicted fewer child externalizing and internalizing problems and greater academic achievement at age 10. Child agency is an important aspect of socioemotional development and is enhanced by parental warmth and subsequently benefits child

adjustment by protecting against externalizing and internalizing problems.

Lansford et al. (2018) studied the cross-cultural generalizability of bidirectional relations between parental warmth and externalizing and internalizing behaviors in children from ages 8 to 13 in 12 cultural groups in 9 countries. They found that parental warmth and control predicted child externalizing and internalizing behaviors in mid- to late childhood (i.e., ages 7–9). Child externalizing and internalizing behaviors in late childhood (i.e., ages 8–9) to early adolescence (i.e., ages 10–13) were negatively associated with subsequent parental warmth and positively associated with parental control. Specifically, externalizing behaviors in children at ages 8, 9, and 10 were negatively associated with subsequent parental warmth at ages 9, 10, 12, respectively. Internalizing behaviors in children ages 8 and 10 were negatively associated with subsequent parental warmth at ages 9 and 12, respectively. Overall, Lansford and colleagues (2018) found fewer parent-driven effects (i.e., effects of warmth and control) than child-driven effects (i.e., effects of child externalizing and internalizing behavior). Moreover, as the results indicate, parent-driven effects are developmentally specific for mid to late childhood. Lansford et al. (2018) proposed that parenting during the transition from late childhood to early adolescence influences subsequent child adjustment, but as the child ages, other factors like peers and identity formation become larger influencers. These findings suggest that, as children age into and beyond adolescence, child behavior may increasingly affect parenting, and parenting may diminish in its influence on child behavior. The importance of child age in determining the strength and direction of parent-child influences again highlights the roles of timing and sensitive periods in child development. There were more similarities than differences between cultures in relations between parental warmth and child internalizing and externalizing behaviors, which also points to the cross-cultural relevance of theories about parental warmth.

One way that parental warmth promotes healthy child development is by moderating negative effects that other parenting practices and environmental influences may have on child socioemotional adjustment. As will be discussed, corporal punishment (an extreme form of rejection) is generally associated with negative child adjustment and puts children at risk of heightened levels of anxiety and aggression. Lansford et al. (2014) studied associations between corporal punishment and child anxiety and aggression and examined their moderation by maternal warmth. A longitudinal approach across eight different countries revealed that maternal warmth was related to decreases in child anxiety and aggression, but corporal punishment was related to increases in child anxiety and aggression. In addition, maternal warmth moderated the association between corporal punishment and child anxiety such that child anxiety increased over time for children whose mothers used

corporal punishment in the context of an otherwise warm mother-child relationship. Furthermore, in 13 cultural groups in nine countries, corporal punishment and parental neglect were predicted by individual child externalizing behaviors and the cultural normativeness of corporal punishment (Lansford et al. 2015). Child externalizing behaviors and cultural normativeness of corporal punishment could, then, provoke parental neglect and harsh punishment, further depriving children of parental warmth, which may exacerbate their externalizing.

The notion that authoritative parenting and parental warmth are universally optimal, however, has been challenged. Studies with different ethnic, sociodemographic, and cultural contexts have revealed differences in outcome patterns according to the interaction of parenting style and ethnicity or culture. Authoritarian parenting can promote successful social adaptation and can be favorable in some contexts, such as some dangerous inner-city neighborhoods (Bornstein 1995). Some studies suggest that parental warmth might be a risk factor for externalizing in some ethnicities, even as it is a protective factor in others (Lorber et al. 2011), echoing the multiple interpretations of ethnic differences in other parenting behaviors. Individual children, therefore, may have needs for higher or lower degrees of parental warmth depending on their environment or culture. Cultural context may also lead individuals to perceive parental warmth in different ways. Deater-Deckard et al. (2011) found that associations between warmth and control vary across cultural groups; for example, parental control is positively correlated with perceived parental warmth in Kenya but negatively correlated among European Americans in the USA. Associations were also different between U.S. ethnic majority and minority individuals. In brief, a single display of parental control could be perceived as an expression of warmth and protection by one child, but as a cold authoritarian act by another child (Bornstein 1995).

The quality of the parent-child relationship plays a determining part in child emotional and psychological security and adjustment. Parental acceptance and rejection shape child socioemotional development. Children have been found to universally respond to their perceptions of acceptance or rejection by their parents in specific ways. Children who feel rejected experience anxiety and insecurity are likely to develop personality issues, ranging from aggression to low self-esteem to an overall negative worldview, defined as acceptance-rejection syndrome (Rohner 2004). Moreover, childhood acceptance and rejection effects appear to last into adulthood and old age. Khaleque and Rohner's (2002) meta-analysis showed that 26% of variance in children's adjustment and 21% of variance in adult psychological adjustment could be explained by parental acceptance-rejection in childhood. If nearly a quarter of adult human socioemotional adjustment can be attributed to parental acceptance-rejection, we should

pay careful attention to this aspect of parenting on individual, familial, and societal levels.

### Limitations of research on parenting

Qualifications in research on the effects of parenting practices on child socioemotional development are important to note. The subjectivity of perception and experience of individual parents and children poses a special challenge. Jager et al. (2016) studied the overlap between early adolescents' individual perspectives of parental rejection as well as mothers' and fathers' perspectives of their rejection of their adolescents. Adolescents' unique perspectives (their distinct view of parental rejection) correlated with their internalizing and externalizing behavior problems, but parents' unique perspectives did not. Hence, if children perceive or believe that they are being rejected, they will be at higher risk of internalizing and externalizing adjustment problems.

Similarly, relationships outside the parent-child dyad play a part in child socioemotional development and often go unaccounted for in this domain of research. Rohner (2016) emphasized in IPARTheory that parents and caregivers affect child development and that significant figures with whom a child has a strong relationship also often affect development. The multiplicity of child-other relationships makes it difficult to isolate the influences of parenting from these other influences. Further common limitations are sample size and sample representativeness in cross-cultural studies (Lansford et al. 2010). Moreover, within-country differences add to variability (Lansford et al. 2005), and overall, there is less extensive research available from non-Western countries, leaving them underrepresented in the literature. Nonetheless, diversity is often requisite to test crucial hypotheses.

### Parenting, corporal punishment, and child socioemotional development

The parent-child relationship is important to child socioemotional development. Beyond rejection, one specific domain that considerable research has become occupied with is the link between parental use of corporal punishment and deleterious child socioemotional adjustment. Corporal punishment is a form of parental discipline meant to correct and/or control behavior and is defined as physical action taken by a parent or caregiver with intention to cause a child physical pain, but not injury (Lansford et al. 2010; UNICEF 2017). Corporal punishment includes shaking, slapping, and hitting on the limbs or bottom or, in more serious cases, the face or head.

The use of corporal punishment as a form of parental discipline has received increased attention and criticism (see UNICEF 2014; World Health Organization 2015), and there is growing concern about its untoward effects on child

socioemotional development and adjustment, including externalizing (aggression) and internalizing (anxiety) behaviors. According to UNICEF (2017), as many as 300 million children from ages 2 to 4 years old worldwide experience some sort of violent discipline by their caregivers *on a regular basis*. Furthermore, in low- and middle-income countries, 6 in 10 children from 1 to 2 years are subjected to violent (physical and psychological) disciplinary methods, and among children this age nearly half have experienced physical punishment. Redressing corporal punishment and finding ways to decrease and eventually eliminate corporal punishment have become a global goal. Proper rearing is believed to be the child's human right, and various measures have been taken by national and international organizations to prohibit corporal punishment, including the United Nations Convention on the Rights of the Child (UNICEF 2014) and the Global Initiative to End All Corporal Punishment of Children (2016). However, only 53 countries have adopted legislation that completely prohibits the use of corporal punishment in the home (<http://www.endcorporalpunishment.org/>). Thus, more than 600 million children under age 5 are without full legal protection. These statistics reveal that corporal punishment of children remains a controversial issue, leaving us in need of greater understanding of its broad effects on child development. Echoing an earlier section of this chapter, such child maltreatment disrupts the normal development of the hippocampus, amygdala, and corpus callosum (De Bellis et al. 2001; Woon and Hedges 2008; Whittle et al. 2013; Teicher and Samson 2016).

Corporal punishment has been criticized for its negative effects, but the belief that physical forms of discipline are normal, and even necessary, is widespread (Deater-Deckard and Dodge 1997; Deater-Deckard et al. 2003; Lansford and Deater-Deckard 2012). Globally, just under 1.1 billion caregivers, which amounts to roughly 1 in 4 caregivers worldwide, say that physical punishment is necessary to rear or educate children.

Disagreements among social learning theorists (Deater-Deckard and Dodge 1997) about the appropriateness of such parenting practices make it even more difficult to redress the issue internationally. To broaden understanding about corporal punishment, researchers have examined child gender, age, and temperament, and parent gender, ethnicity, and culture as determinants of parental discipline and as potential moderators of relations between parental discipline and child adjustment (Lansford 2018). In this last section of the article, we look at studies that may be instrumental to understanding the implications of corporal punishment for child socioemotional development.

In the tradition of coercion theory, Dodge et al. (1990) documented that parental physical harm predicts future aggressive child behavior, above and beyond family ecology and child characteristics. Physical harm in a child's early years

encourages the child's aggressive behavioral development by altering her/his processing of social information, supporting Bandura's social learning theory. Deater-Deckard and Dodge (1997) reviewed and integrated research on parenting and child externalizing behaviors and offered four general hypotheses about the nature of experiential effects, particularly corporal punishment, on child adjustment: the relation (1) is non-linear, (2) is culture specific, (3) reflects parent-child context, and (4) depends on parent and child genders. The importance of these experiential factors supports the notion that poor-quality parenting is a major determinant for child externalizing behavior problems.

Previous research assumed that the association between physical punishment and child aggression was linear. However, Deater-Deckard and Dodge (1997) postulated that the association between parenting and child aggressiveness depends on the intensity, frequency, and/or severity of the physical punishment, resulting in both linear and nonlinear relations between parental discipline and child aggression. Past research also assumed that corporal punishment has the same effect on all groups of children. However, associations between parenting behaviors and child externalizing behaviors depend on a variety of factors, including both age and gender (Rothbaum and Weisz 1994), such that effects are stronger for older children, boys, and mothers. In their 1997 study, Deater-Deckard and Dodge found that gender and the gender match of parent and child moderate the strength of relations between parent punishment and child adjustment. When computed separately for father-son, father-daughter, mother-son, and mother-daughter dyads, mothers engaged in harsher discipline with girls than boys (there was a similar trend with fathers and boys).

Following Bandura's social learning theory, Deater-Deckard and Dodge (1997) posited that individuals mentally piece together relevant information through social interactions and behavioral responses linked to situation-specific events to form representations that help in evaluating behavioral responses and their appropriateness. Such a learning process would mean that a child's mental representations that form after being disciplined or punished would influence the child's subsequent behavior and how the child processes future social cues. Parents are arguably crucial transmitters of cultural information (Bornstein and Lansford 2010); a child may witness the parental use of corporal punishment as either appropriate and normal or inappropriate and abnormal, based on the child's experience and relationship with the parent, rendering the tenor of parent-child relationships central (Bornstein 1995).

As social learning theory suggests, cognitive acceptance and judgment of aggression can be learned through observation and reciprocation. Deater-Deckard et al. (2003) extended the idea that parental acceptance of aggression may foster externalizing behaviors in children. They focused on whether

differences in development of and attitudes about spanking are associated with ecological factors, including experience with physical punishment, low socioeconomic status, and being African American, and whether these variables moderate acceptance. By examining the parental use of corporal punishment and intergenerational transmission of corporal punishment over an 8-year longitudinal study, the researchers also built on previous research that proposed that the association between child adjustment and parenting is not linear. Their work showed that most children harbor a slightly negative attitude toward physical punishment. Children from lower-SES African American households were more likely to have experienced some type of corporal punishment. This study also replicated Bronfenbrenner's (1979) findings, showing that African American and lower-income youth were more approving of parental use of spanking as a discipline method. Generally, the study supported a positive association between experience with spanking and approval of spanking. Because of this positive association, we gather that cognitive interpretations of aggression depend, to an extent, on both experience and ecological factors. Thus, the children who had experience with physical punishment from a parent may have formed a mental representation with which they judge corporal punishment as acceptable. As Deater-Deckard et al. (2003) suggested, if there is causality, and not just correlation, between experiencing corporal punishment and aggressing later, social changes that lead to the reduction of such parenting strategies could change children's attitudes about corporal punishment downstream.

Cultural specificity and context, as well as acceptance, condition the association between child adjustment and parenting behaviors (Deater-Deckard and Dodge 1997). Grusec and Goodnow (1994) postulated that whether and how a child perceives parental disciplinary messages and consequently accepts or rejects them affects the impact of discipline. Children who find punishment or discipline unfair or unreasonable may be less likely to internalize messages associated with it. Rohner (1986) also asserted that parental behavior a child interprets as rejecting and hostile may have deleterious effects on the child's future socioemotional adjustment. Lansford et al. (2005) expanded on these ideas by postulating that "cultural normativeness" moderates the effects of parental discipline and helps to explain why parenting behaviors lead to negative child adjustment in some cultures but not in others. Lansford et al. (2005) conceptualized cultural normativeness as (1) perceptions of normativeness—forms of discipline parents and children believe other parents within their cultural group use—and (2) actual normativeness—forms of discipline parents within their cultural group use. The perception of normativeness is important in understanding cultural differences because, if parents believe physical punishment is normative, they may be more likely to use such forms of discipline. Actual normativeness is important as

well because perceptions develop, to some extent, on the basis of actual behavior.

Lansford et al. (2005) proceeded to investigate parenting in six countries—China, India, Italy, Kenya, the Philippines, and Thailand—based on several criteria that differentiate them, including individualism versus collectivism, dominant religious affiliations, notable legal action involving parental discipline (seen particularly in Italy where cases of parental corporal punishment have been brought to court; Bitensky 1998; corporal punishment was outlawed in Kenya after the publication of Lansford et al. 2005), and historical, ideological, and other distinctions. It is important to note that Lansford and colleagues specified several forms of corporal punishment: spanking/slapping, grabbing/shaking, and beating. Beating would be considered abuse and maltreatment in the USA and was included to test limits of the theory that the association between corporal punishment and child socioemotional adjustment depended on cultural normativeness. Lansford et al. (2005) focused on four measures of child socioemotional adjustment—aggression and anxiety as reported by the mother and by the child. The six countries differed in reported normativeness and use of corporal punishment as well as in how corporal punishment associated with child socioemotional adjustment. For example, corporal punishment is perceived as more normative and is used more frequently in Kenya, whereas corporal punishment is perceived as non-normative and is used rarely in Thailand (reflective perhaps of Buddhist teachings). Mothers and children in Italy and India perceived corporal punishment as being more normative and frequent, whereas those in China and the Philippines perceived corporal punishment as being non-normative and less frequent.

Perceived normativeness of corporal punishment, particularly by the child, moderated the association between the experience of physical punishment and children's socioemotional adjustment (aggression and anxiety). The use of corporal punishment was related *less* strongly to child aggression and anxiety when the child perceived discipline as normative than when the child did not perceive discipline as normative. These findings suggest that, if cultural normativeness and acceptance of a parenting behavior lead to children's perceptions of the behavior as being more acceptable, the effects of physical punishment may be less severe. If the child does not perceive the type of physical punishment as being acceptable, the child may associate this behavior with rejection from the parent, which leads to more negative child adjustment. However, corporal punishment had negative effects overall in all six countries. Despite this link between normativeness and adjustment outcomes, mother-reported use of corporal punishment and frequency of physical discipline were associated with child adjustment problems, even when the child perceived the discipline as normative. As Bornstein's (1995) form-by-function model predicts, in some cultural

contexts, parenting behaviors may have deleterious effects on a child, whereas in other cultural contexts, the same parenting behaviors may not. At the same time, however, still other parenting behaviors may overall be harmful. Just because a practice is accepted and sanctioned by a culture does not mean it should be accepted, and extreme acceptance of cultural relativism in this case should be questioned.

That being said, extant research has reported inconsistent findings regarding gender and corporal punishment. Some studies report no differences between daughters and sons in experiencing corporal punishment, whereas others report that boys more frequently experience corporal punishment than girls, and research is equally inconsistent with whether mothers and fathers differ in the frequency and type of corporal punishment they dole out (Eagly et al. 2000; Kochanska et al. 2009; Endendijk et al. 2017; Brown and Tam 2018). In consequence, Lansford et al. (2010) looked further at the function of child and parent gender and their associations with corporal punishment. They compared mothers' and fathers' use of discipline strategies and severity vis-à-vis daughters and sons, as well as how strategies compared across nine countries—China, Colombia, Italy, Jordan, Kenya, the Philippines, Sweden, Thailand, and the USA. Their findings were extensive: 54% of girls and 58% of boys had experienced mild punishment, and 13% of girls and 14% of boys had experienced severe punishment, by parents or caregivers in the preceding month. Overall, corporal punishment was used generally once a month or less. Mothers tended to use corporal punishment more than fathers. Only parents in China believed corporal punishment was more necessary for boys than girls. Only Kenya and Colombia had significant interactions in parent-child gender compositions: Kenyan mothers reported using corporal punishment equally frequently with daughters and sons, whereas Kenyan fathers used corporal punishment less frequently with daughters than sons. Colombian mothers reported using corporal punishment less frequently with sons than with daughters, whereas Colombian fathers reported using corporal punishment less frequently with daughters than sons. Among child reports, boys in Colombia and the Philippines averred that their fathers used corporal punishment more than their mothers, and girls in the same countries that their mothers used corporal punishment more than their fathers. These findings suggest that gender roles with respect to child discipline are clearly demarcated in many countries and attended to by children. For the sake of redressing corporal punishment, it should be noted that in all nine countries studied, more parents used corporal punishment than deemed it necessary for childrearing.

The literature on corporal punishment as an extreme form of child control suggests that associations between the use of corporal punishment and child adjustment are not linear. Many variables contribute to rendering relations nonlinear, including the parent-child relationship context, the

sociocultural context, and parent and child gender. The parent-child relationship affects how accepting a child is of aggression, which then affects the development of the mental representation of the relationship. If the child learns that the use of corporal punishment is acceptable, à la Coercion theory, the child may be more likely to use it. The sociocultural context of corporal punishment also affects the relation between the use of corporal punishment and child adjustment. The perception of physical punishment as culturally normative moderates the effects of punishment on the child. Moreover, children who experience physical punishment are more likely to endorse it. Finally, the use of corporal punishment across countries differs by gender of parent, gender of child, and the parent-child dyad gender match. Nonetheless, the effects of many of these differences are still open to exploration and reformation.

It seems that one possible step to redress the widespread use of corporal punishment is to change parents' attitudes about corporal punishment. However, changing attitudes alone may not be sufficient due to cultural variation in the use and acceptance of corporal punishment. In many cases, parents use corporal punishment, even though they do not believe it is necessary (Lansford and Deater-Deckard 2012). The use of corporal punishment has negative outcomes on child socioemotional adjustment, regardless of moderators. This reality makes it especially important to enforce global standards to eliminate physical punishment for the betterment of child mental health. As the Global Initiative to End All Corporal Punishment of Children (2017) asserts, corporal punishment violates a child's right to respect for her/his human dignity and physical integrity as well as child rights to health, development, and education. Moreover, corporal punishment is associated with a wide range of negative health, developmental, and behavioral outcomes that can follow children into adulthood. It is imperative therefore to rectify policies and ideas about parenting that are accepting of corporal punishment.

### Limitations of behavioral research

The way in which data are collected poses one common limitation in behavioral research. In direct observation, resources limit how many participants can be studied, and the presence of a third-party observer can heighten parental and child awareness of being studied and may alter parent-child interactions through reactivity. Self-reports entrust participants with the opportunity to share their experiences and perspectives truthfully and fully. As we have seen, the phenomenology of the individual is sometimes illuminating and determinative. When children are young, however, reports about them are often actually based only on parent perspective. Even when children are old enough to self-report, the subjectivity of individual perspectives and experiences poses limitations.

Individuals have important and meaningful unique perspectives on their health and function, families, and relationships, which may or may not overlap with those of other family members (Jager et al. 2012). Child adjustment is sometimes linked more closely to the perspectives of the child than to the perspectives of the parents. Jager et al. (2016) found that the better adolescents see their family functioning and health, the better their adjustment, regardless of the perspective of their family. Subjective perspective may, then, be the strongest predictor of child adjustment, but whether self-reports fully and accurately follow and capture subjective perspectives and experiences is questionable. Lansford et al. (2010) found that parents and children can overestimate or underestimate answers in self-reports, such as frequency, type, and feelings toward corporal punishment.

Another important limitation of cross-sectional studies is failure to account for bidirectionality. Parenting affects child outcomes, but children also affect parenting. Antisocial behavior in adolescents, for example, results in a decrease in warmth and acceptance and an increase in hostility and rejection in parents (Ge and Conger 1999; Lansford et al. 2018). Transactions and genetics limit conclusions about direction of effects that can be drawn.

## Future directions

Future biobehavioral cultural research in the socioemotional development and adjustment of children can be expanded in various ways. With regard to research on neurodevelopment, additional improvements in technology and accuracy could pave the way for DTI to become a diagnostic tool useful to detect WM abnormalities that underlie socioemotional disorders. Additionally, longitudinal studies can be mounted to track changes in neural tracts across multiple stages of life. Longitudinal DTI studies can also be used to contrast WM patterns in childhood with WM patterns in adulthood in order to provide a more comprehensive perspective on how WM microstructure changes across the lifespan. Future technologies may even make it possible to move beyond the laboratory and bring neuroimaging into field research.

Similarly, longitudinal designs will benefit research on parenting and child socioemotional behavior and adjustment. As attitudes toward corporal punishment shift, so will its normativeness and frequency as well as its effects. Levels of parental warmth, rejection, and acceptance are not necessarily constant across the life course, and longitudinal studies can capture changes in parental demeanor that may influence a child's outlook on her/himself and their temperament. Only longitudinal work is designed to uncover whether and how parental practices are transmitted across generations.

The parent-child dyad is formative in child socioemotional development, but more research is needed to examine the

effects of interpersonal relationships outside the parent-child dyad on child socioemotional development. Rohner's (2014b, 2016) IPARTheory acknowledges the importance of all significant interpersonal relationships and individuals' needs for acceptance and warmth from significant others. What exactly determines the strength of the impact of acceptance-rejection messages from significant others? Degree of intimacy, the nature of the relationship, the gender or age of the significant other, or any number of other variables? More in-depth studies should be conducted where participants are evaluated based on multiple interpersonal relationships to further refine IPARTheory. It will be important in the future to expand socioemotional research to encompass a greater diversity of cultures as well. Broadening research in this way will enhance the generalizability of theories and ideas surrounding parenting and child socioemotional adjustment.

Gender of both parent and child has been studied, but this research has been less conclusive to date. In IPARTheory research, questions remain about whether parents are more accepting of girls or boys (Putnick et al. 2012). Further studies also are needed to identify patterns of gender-specific parent-child relationships (i.e., mother-son, father-daughter) and to test whether the gender specificity of parent-child relationships has specific effects on child socioemotional development. The gender gap in emotionality could be influenced by parenting or by cultural normativeness of experiencing emotion. Evidently, there are parent gender differences in how a child is socialized in emotion that may transcend just parental discipline and warmth. Future exploration of specificity of parent behaviors of fathers with daughters or sons, and mothers with daughters or sons, will deepen our understanding of how parenting practices shape child socioemotional development.

## Conclusions

In summary, empirical research shows that social and cultural factors in a child's environment shape the child's socioemotional development, as evidenced by their effects on genetic expression, neurodevelopment, and socioemotional adjustment. Parenting behaviors, as part of children's socioemotional environment, alter the expression of a child's epigenome, brain architecture, and socioemotional self in development. The studies reviewed here have underscored how the interactions children have with their parents or caregivers influence how they perceive the world, parents, and themselves and how they act in certain situations. As such, not all findings about parenting and child socioemotional outcomes can be conclusively generalized across cultures. In accordance with a matrix that conceptualizes similarities and differences in the forms and functions (Bornstein 1995), many cross-cultural studies indicate that

social context is essential to what parenting cognitions and practices mean to a child, and, therefore, how thoroughgoingly parenting cognitions and practices affect a child's socioemotional adjustment. Overall, however, there is waxing consensus that positive parent-child relationships, in which parents provide warmth, care, love, and understanding, lead to positive biological development and behavioral adjustment in the child.

**Acknowledgments** We are grateful to Fedserica Amici and Anja Widdig for their invitation to the topical collection "An evolutionary perspective on the development of primate sociality."

**Funding information** This article was supported by the Intramural Research Program of the NIH/NICHHD, USA, and an International Research Fellowship in collaboration with the Centre for the Evaluation of Development Policies (EDePO) at the Institute for Fiscal Studies (IFS), London, UK, funded by the European Research Council (ERC) under the Horizon 2020 research and innovation program (grant agreement no. 695300-HKADeC-ERC-2015-AdG).

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

## References

- Agathonos-Georgopoulou H, Browne KD (1997) The prediction of child maltreatment in Greek families. *Child Abuse Negl* 21:721–735. [https://doi.org/10.1016/S0145-2134\(97\)00034-3](https://doi.org/10.1016/S0145-2134(97)00034-3)
- Alexander AL, Lee JE, Lazar M, Field AS (2007) Diffusion tensor imaging of the brain. *Neurotherapeutics* 4:316–329. <https://doi.org/10.1016/j.nurt.2007.05.011>
- Ali S, Khaleque A, Rohner RP (2015) Pancultural gender differences in perceived parental acceptance and psychological adjustment of children and adult offspring: a meta-analytic review of worldwide research. *J Cross-Cult Psychol* 46:1059–1080. <https://doi.org/10.1177/0022022115597754>
- Asato MR, Terwilliger R, Woo J, Luna BS (2010) White matter development in adolescence: a DTI study. *Cereb Cortex* 20:2122–2131. <https://doi.org/10.1093/cercor/bhp282>
- Bandura A (1969) Principles of behavior modification. Holt, Rinehart, and Winston, Oxford
- Bandura A (1977) Social learning theory. Prentice Hall, Englewood Cliffs
- Bandura A (1978) Social learning theory of aggression. *J Commun* 28: 12–29. <https://doi.org/10.1111/j.1460-2466.1978.tb01621.x>
- Bandura A (1986) The social learning perspective: mechanisms of aggression. In: Toch H (ed) *Psychology of crime and criminal justice*. Waveland, Prospect Heights, pp 198–236
- Bandura A, Walters RH (1959) Adolescent aggression. Ronald, New York
- Baumrind D (1967) Child care practices anteceding three patterns of preschool behavior. *Genet Psychol Monogr* 75:43–88
- Bava S, Thayer R, Jacobus J, Ward M, Jernigan TL, Tapert SF (2010) Longitudinal characterization of white matter maturation during adolescence. *Brain Res* 1327:38–46. <https://doi.org/10.1016/j.brainres.2010.02.066>
- Beaulieu C (2002) The basis of anisotropic water diffusion in the nervous system: a technical review. *NMR Biomed* 15:435–455. <https://doi.org/10.1002/nbm.782>
- Bengtsson SL, Nagy Z, Skare S, Forsman L, Forsberg H, Ullén F (2005) Extensive piano practicing has regionally specific effects on white matter development. *Nat Neurosci* 8:1148–1150. <https://doi.org/10.1038/nm1516>
- Bick J, Nelson CA (2016) Early adverse experiences and the developing brain. *Neuropsychopharmacology* 41:177–196. <https://doi.org/10.1038/npp.2015.252>
- Bick J, Naumova O, Hunter S, Barbot B, Lee M, Luthar SS, Faefski A, Grigorenko EL (2012) Childhood adversity and DNA methylation of genes involved in the hypothalamus–pituitary–adrenal axis and immune system: whole-genome and candidate-gene associations. *Dev Psychopathol* 24:1417–1425. <https://doi.org/10.1017/S0954579412000806>
- Bitensky SH (1998) Spare the rod, embrace our humanity: toward a new legal regime prohibiting corporal punishment of children. *Univ Mich J Law Reform* 31:353–474
- Bookheimer S (2002) Functional MRI of language: new approaches to understanding the cortical organization of semantic processing. *Annu Rev Neurosci* 25:151–188. <https://doi.org/10.1146/annurev.neuro.25.112701.142946>
- Bornstein MH (1989) Sensitive periods in development: structural characteristics and causal interpretations. *Psychol Bull* 105:179–197. <https://doi.org/10.1037/0033-2909.105.2.179>
- Bornstein MH (1995) Form and function: implications for studies of culture and human development. *Cult Psychol* 1:123–137. <https://doi.org/10.1177/1354067X9511009>
- Bornstein MH, Lansford JE (2010) Parenting. In: Bornstein MH (ed) *Handbook of cross-cultural developmental science*. Taylor and Francis, Inc, New York, pp 259–277
- Bornstein MH, Putnick DL (2018) Parent-adolescent relationships in global perspective. In: Lansford JE, Banati P (eds) *Handbook of adolescent development research and its impact on global policy*. Oxford University Press, Oxford, pp 107–129
- Bornstein MH, Hahn CS, Haynes OM (2010) Social competence, externalizing, and internalizing behavioral adjustment from early childhood through early adolescence: developmental cascades. *Dev Psychopathol* 22:717–735. <https://doi.org/10.1017/S0954579410000416>
- Bornstein MH, Putnick DL (2016) IV. Mothers' and fathers' parenting practices with their daughters and sons in low- and middle-income countries. *Monographs of the Society for Research in Child Development* 81: 60–77. <https://doi.org/10.1111/mono.12226>
- Bornstein MH, Putnick DL, Lansford JE (2011) Parenting attributions and attitudes in cross-cultural perspective. *Parent Sci Pract* 11: 214–237. <https://doi.org/10.1080/15295192.2011.585568>
- Bornstein MH, Hahn CS, Suwalsky JTD (2013) Developmental pathways among adaptive functioning and externalizing and internalizing behavioral problems: cascades from childhood into adolescence. *Appl Dev Sci* 17:76–87. <https://doi.org/10.1080/10888691.2013.774875>
- Bornstein MH, Arterberry ME, Lamb ME (2014) Development in infancy: a contemporary introduction. Psychology, New York
- Bornstein MH, Putnick DL, Suwalsky JTD (2017) Parenting cognitions → parenting practices → child adjustment? The standard model. *Dev Psychopathol* 30:399–416. <https://doi.org/10.1017/S0954579417000931>
- Bronfenbrenner U (1979) *The ecology of human development: experiments by nature and design*. Harvard University Press, Cambridge
- Bronfenbrenner U (1986) Ecology of the family as a context for human development: research perspectives. *Dev Psychol* 22:723–742. <https://doi.org/10.1037/0012-1649.22.6.723>



- Brown CS, Tam M (2018) Parenting girls and boys. In: Bornstein MH (ed) Handbook of parenting, 3rd edn. Routledge, New York. (in press)
- Bushman BJ (2016) Violent media exposure and hostile appraisals: a meta-analytic review. *Aggress Behav* 42:605–613. <https://doi.org/10.1002/ab.21655>
- Chung J, Zappulla C, Kaspar V (2008) Parental warmth and socio-emotional adjustment in Brazilian, Canadian, Chinese and Italian children: a cross-cultural perspective. In: Ramirez RN (ed) Family relations, issues, and challenges. Nova Science, New York, pp 21–41
- De Bellis MD, Hall J, Boring AM, Frustaci K, Moritz G (2001) A pilot longitudinal study of hippocampal volumes in pediatric maltreatment-related posttraumatic stress disorder. *Biol Psychiatry* 50:305–309. [https://doi.org/10.1016/S0006-3223\(01\)01105-2](https://doi.org/10.1016/S0006-3223(01)01105-2)
- de Kieviet JF, Zoetebier L, van Elburg RM, Vermeulen RJ, Oosterlaan J (2012) Brain development of very preterm and very low-birthweight children in childhood and adolescence: a meta-analysis. *Dev Med Child Neurol* 54:313–323. <https://doi.org/10.1111/j.1469-8749.2011.04216.x>
- de Minzi MCR (2006) Loneliness and depression in middle and late childhood: the relationship to attachment and parental styles. *J Genet Psychol* 167:189–210
- de Minzi MCR (2010) Gender and cultural patterns of mothers' and fathers' attachment and links with children's self-competence, depression and loneliness in middle and late childhood. *Early Child Dev Care* 180:189–210. <https://doi.org/10.1080/03004430903415056>
- de Pisapia N, Serra M, Rigo P, Jager J, Papinutto N, Esposito G, Venuti P, Bornstein MH (2014) Interpersonal competence in young adulthood and right laterality in white matter. *J Cogn Neurosci* 26:1257–1265. [https://doi.org/10.1162/jocn\\_a\\_00534](https://doi.org/10.1162/jocn_a_00534)
- Deater-Deckard K, Dodge KA (1997) Externalizing behavior problems and discipline revisited: nonlinear effects and variation by culture, context, and gender. *Psychol Inq* 8:161–175. [https://doi.org/10.1207/s15327965pli0803\\_1](https://doi.org/10.1207/s15327965pli0803_1)
- Deater-Deckard K, Lansford JE, Dodge K, Pettit GS, Bates JE (2003) The development of attitudes about physical punishment: an 8-year longitudinal study. *J Fam Psychol* 17:351–360. <https://doi.org/10.1037/0893-3200.17.3.351>
- Deater-Deckard K, Lansford JE, Malone PS, Alampay LP, Sorbring E, Bacchini D, Bombi AS, Bornstein MH, Chang L, di Giunta L, Dodge KA, Oburu P, Pastorelli C, Skinner AT, Tapanya S, Tirado LMU, Zelli A, al-Hassan SM (2011) The association between parental warmth and control in thirteen cultural groups. *J Fam Psychol* 25:790–794. <https://doi.org/10.1037/a0025120>
- Dodge KA, Bates JE, Pettit GS (1990) Mechanisms in the cycle of violence. *Science* 250:1678–1683. <https://doi.org/10.1126/science.2270481>
- Dollard J, Miller NE, Doob LW, Mowrer OH, Sears RR (1939) Frustration and aggression. Yale University Press, New Haven
- Dwairy M (2010) Parental acceptance-rejection: a fourth cross-cultural research on parenting and psychological adjustment of children. *J Child Fam Stud* 19:30–35. <https://doi.org/10.1007/s10826-009-9338-y>
- Eagly AH, Wood W, Diekmann AB (2000) Social role theory of sex differences and similarities: a current appraisal. In: Eckes T, Trautner HM (eds) The developmental social psychology of gender. Lawrence Erlbaum Associates, Mahwah, pp 123–174
- Edwards M, Abadie L (2018) NASA twin study confirms preliminary findings. National Aeronautics and Space Administration. <https://www.nasa.gov/feature/nasa-twins-study-confirms-preliminary-findings>
- Eiden RD, Colder C, Edwards EP, Leonard KE (2009) A longitudinal study of social competence among children of alcoholic and non-alcoholic parents: role of parental psychopathology, parental warmth, and self-regulation. *Psychol Addict Behav* 23:36–46. <https://doi.org/10.1037/a0014839>
- Eluvathingal TJ, Chugani HT, Behen ME, Juhász C, Muzik O, Maqbool M, Chugani DC, Makki M (2006) Abnormal brain connectivity in children after early severe socioemotional deprivation: a diffusion tensor imaging study. *Pediatrics* 117:2093–2100. <https://doi.org/10.1542/peds.2005-1727>
- Endendijk JJ, Groeneveld MG, van der Pol LD, van Berckel SR, Hallers-Haalboom ET, Bakermans-Kranenburg MJ, Mesman J (2017) Gender differences in child aggression: relations with gender-differentiated parenting and parents' gender-role stereotypes. *Child Dev* 88:299–316. <https://doi.org/10.1111/cdev.12589>
- Fagioli M, Jensen CL, Champagne FA (2009) Epigenetic influences on brain development and plasticity. *Curr Opin Neurobiol* 19:207–212. <https://doi.org/10.1016/j.conb.2009.05.009>
- Fields RD (2005) Myelination: an overlooked mechanism of synaptic plasticity? *Neuroscientist* 11:528–531. <https://doi.org/10.1177/1073858405282304>
- Fields RD (2010) Change in the brain's white matter. *Science* 330:768–769. <https://doi.org/10.1126/science.1199139>
- Ge X, Conger RD (1999) Adjustment problems and emerging personality characteristics from early to late adolescence. *Am J Community Psychol* 27:429–459. <https://doi.org/10.1023/A:1022238227937>
- Giedd JN, Blumenthal J, Jeffries NO, Castellanos FX, Liu H, Zijdenbos A, Paus T, Evans AC, Rapoport JL (1999) Brain development during childhood and adolescence: a longitudinal MRI study. *Nat Neurosci* 2:861–863. <https://doi.org/10.1038/13158>
- Global Initiative to End All Corporal Punishment of Children (2016) <http://www.endcorporalpunishment.org/assets/pdfs/reports-global/Global-report-2016.pdf>
- Global Initiative to End All Corporal Punishment of Children (2017) Prohibiting corporal punishment. <http://www.endcorporalpunishment.org/>
- Govindan RM, Behen ME, Helder E, Makki MI, Chugani HT (2010) Altered water diffusivity in cortical association tracts in children with early deprivation identified with tract-based spatial statistics (TBSS). *Cereb Cortex* 20:561–569. <https://doi.org/10.1093/cercor/bhp122>
- Grusec JE, Goodnow JJ (1994) Impact of parental discipline methods on the child's internalization of values: a reconceptualization of current points of view. *Dev Psychol* 30:4–19. <https://doi.org/10.1037/0012-1649.30.1.4>
- Gurdal S, Lansford JE, Sorbring E (2016) Parental perceptions of children's agency: parental warmth, school achievement and adjustment. *Early Child Dev Care* 18:1203–1211. <https://doi.org/10.1080/03004430.2015.1083559>
- Haque A (1988) Relationship between perceived maternal acceptance-rejection and self-esteem among young adults in Nigeria. *J Afr Psychol* 1:15–24
- Hebb DO (1949) The organization of behavior. Wiley, New York
- Heinonen K, Lahti J, Sammallahhti S, Wolke D, Lano A, Andersson S, Pesonen A-K, Eriksson JG, Kajantie E, Raikkonen K (2018) Neurocognitive outcome in young adults born late-preterm. *Dev Med Child Neurol* 60:267–274. <https://doi.org/10.1111/dmcn.13616>
- Hicks DJ (1968) Short- and long-term retention of affectively varied model behavior. *Psychon Sci* 11:369–370. <https://doi.org/10.3758/BF03328246>
- Hill SY, Tessner K, Wang S, Carter H, McDermott M (2010) Temperament at 5 years of age predicts amygdala and orbitofrontal volume in the right hemisphere in adolescence. *Psychiatry Res* 182:14–21. <https://doi.org/10.1016/j.psychres.2009.11.006>
- Howell BR, Neigh GN, Sanchez MM (2016) Animal models of developmental psychopathology. In: Cicchetti D (ed) Developmental psychopathology: developmental neuroscience, vol 2, 3rd edn. Wiley & Sons, Hoboken, pp 166–201

- Ibrahim DM, Rohner RP, Smith RL, Flannery KM (2015) Adults' remembrances of parental acceptance-rejection in childhood predict current rejection sensitivity in adulthood. *Fam Consum Sci Res J* 44: 51–62. <https://doi.org/10.1111/fcsr.12119>
- Jaekel J, Baumann N, Bartmann P, Wolke D (2018) Mood and anxiety disorders in very preterm/very low-birth weight individuals from 6 to 26 years. *J Child Psychol Psychiatry* 59:88–95. <https://doi.org/10.1111/jcpp.12787>
- Jager J, Bornstein MH, Putnick DL, Hendricks C (2012) Family members' unique perspectives of the family: examining their scope, size, and relations to individual adjustment. *J Fam Psychol* 26:400–410. <https://doi.org/10.1037/a0028330>
- Jager J, Mahler A, An D, Putnick DL, Bornstein MH, Lansford JE, Dodge KA, Skinner AT, Deater-Deckard K (2016) Early adolescents' unique perspectives of maternal and paternal rejection: examining their across-dyad generalizability and relations with adjustment one year later. *J Youth Adolesc* 45:2108–2124. <https://doi.org/10.1007/s10964-016-0509-z>
- Khaleque A, Rohner RP (2002) Perceived parental acceptance-rejection and psychological adjustment: a meta-analysis of cross-cultural and intracultural studies. *J Marriage Fam* 64:54–64. <https://doi.org/10.1111/j.1741-3737.2002.00054.x>
- Khaleque A, Rohner RP (2011) Transnational relations between perceived parental acceptance and personality dispositions of children and adults: a meta-analytic review. *Personal Soc Psychol Rev* 16: 103–115. <https://doi.org/10.1177/1088868311418986>
- Kim E, Han G, McCubbin MA (2007) Korean American maternal acceptance-rejection, acculturation, and children's social competence. *Fam Community Health* 30:S33–S45. <https://doi.org/10.1097/01.FCH.0000264879.88687.32>
- Klingberg T, Hedeus M, Temple E, Salz T, Gabrieli JD, Moseley ME, Poldrack RA (2000) Microstructure of temporo-parietal white matter as a basis for reading ability: evidence from diffusion tensor magnetic resonance imaging. *Neuron* 25:493–500. [https://doi.org/10.1016/S0896-6273\(00\)80911-3](https://doi.org/10.1016/S0896-6273(00)80911-3)
- Kochanska G, Barry RA, Stellern SA, O'Bleness JJ (2009) Early attachment organization moderates the parent-child mutually coercive pathway to children's antisocial conduct. *Child Dev* 80:1288–1300. <https://doi.org/10.1111/j.1467-8624.2009.01332.x>
- Lakhani B, Borich MR, Jackson JN, Wadden KP, Peters S, Villamayor A, MacKay AL, Vavasour IM, Rauscher A, Boyd LA (2016) Motor skill acquisition promotes human brain myelin plasticity. *Neural Plast* 2016:7526135. <https://doi.org/10.1155/2016/7526135>
- Lansford JE (2018) Parenting and child discipline. In: Bornstein MH (ed) *Handbook of parenting*, 3rd edn. Routledge, New York. (in press)
- Lansford JE, Deater-Deckard K (2012) Childrearing discipline and violence in developing countries. *Child Dev* 83:62–75. <https://doi.org/10.1111/j.1467-8624.2011.01676.x>
- Lansford JE, Chang L, Dodge KA, Malone PS, Oburu P, Palmérus K, Bacchini D, Pastorelli C, Bombi AS, Zelli A, Tapanya S, Chaudhary N, Deater-Deckard K, Manke B, Quinn N (2005) Physical discipline and children's adjustment: cultural normativeness as a moderator. *Child Dev* 76:1234–1246. <https://doi.org/10.1111/j.1467-8624.2005.00847.x>
- Lansford JE, Alampay LP, Bacchini D et al (2010) Corporal punishment of children in nine countries as a function of child gender and parent child gender. *Int J Pediatr* 2010:1–12. <https://doi.org/10.1155/2010/672780>
- Lansford JE, Sharma C, Malone PS, Woodlief D, Dodge KA, Oburu P, Pastorelli C, Skinner AT, Sorbring E, Tapanya S, Tirado LMU, Zelli A, al-Hassan SM, Alampay LP, Bacchini D, Bombi AS, Bornstein MH, Chang L, Deater-Deckard K, di Giunta L (2014) Corporal punishment, maternal warmth, and child adjustment: a longitudinal study in eight countries. *J Clin Child Adolesc Psychol* 43:670–685. <https://doi.org/10.1080/15374416.2014.893518>
- Lansford JE, Godwin J, Uribe Tirado LM, Zelli A, al-Hassan SM, Bacchini D, Bombi AS, Bornstein MH, Chang L, Deater-Deckard K, di Giunta L, Dodge KA, Malone PS, Oburu P, Pastorelli C, Skinner AT, Sorbring E, Tapanya S, Alampay LP (2015) Individual, family, and culture level contributions to child physical abuse and neglect: a longitudinal study in nine countries. *Dev Psychopathol* 27:1417–1428. <https://doi.org/10.1017/S095457941500084X>
- Lansford JE, Godwin J, Bornstein MH et al (2018) Parenting, culture, and the development of externalizing behaviors from age seven to 14 in nine countries. *Dev Psychopathol*. <https://doi.org/10.1017/S0954579418000925>
- Leidig M (2005) Romania still faces high abortion rate 16 years after fall of Ceausescu. *Br Med J* 331:1043. <https://doi.org/10.1136/bmj.331.7524.1043-a>
- Leow AD, Zhan L, Zhu S et al (2009) White matter integrity measured by fractional anisotropy correlates poorly with actual individual fiber anisotropy. In: *biomed imaging: from nano to macro, 2009*. ISBI'09. Proceedings IEEE international symposium, pp 622–625. <https://doi.org/10.1109/ISBI.2009.5193124>
- Li X, Meier J (2017) Father love and mother love: contributions of parental acceptance to children's psychological adjustment. *J Fam Theory Rev* 9:459–490. <https://doi.org/10.1111/jftr.12227>
- Litovsky VG, Dusek JB (1985) Perceptions of child rearing and self-concept development during the early adolescent years. *J Youth Adolesc* 14:373–387. <https://doi.org/10.1007/BF02138833>
- Lorber MF, O'Leary SG, Slep AM (2011) An initial evaluation of the role of emotion and impulsivity in explaining racial/ethnic differences in the use of corporal punishment. *Dev Psychol* 47:1744–1749. <https://doi.org/10.1037/a0025344>
- Maccoby EE, Martin JA (1983) Socialization in the context of the family: parent-child interaction. In: Hetherington EM (ed) *Handbook of child psychology: Vol. 4 Socialization, personality, and social development*, 4th edn. Wiley, New York, pp 1006–1017
- MacDonald K (1992) Warmth as a developmental construct: an evolutionary analysis. *Child Dev* 63:753–773. <https://doi.org/10.1111/j.1467-8624.1992.tb01659.x>
- Mehta MA, Golembo NI, Nosarti C, Colvert E, Mota A, Williams SCR, Rutter M, Sonuga-Barke EJS (2009) Amygdala, hippocampal and corpus callosum size following severe early institutional deprivation: the English and Romanian adoptees study pilot. *J Child Psychol Psychiatry* 50:943–951. <https://doi.org/10.1111/j.1469-7610.2009.02084.x>
- Michiels D, Grietens H, Onghena P, Kuppens S (2010) Perceptions of maternal and paternal attachment security in middle childhood: links with positive parental affection and psychosocial adjustment. *Early Child Dev Care* 180:211–225. <https://doi.org/10.1080/03004430903415064>
- Milgrom J, Newnham C, Anderson PJ, Doyle LW, Gemmill AW, Lee K, Hunt RW, Bear M, Inder T (2010) Early sensitivity training for parents of preterm infants: impact on the developing brain. *Pediatr Res* 67:330–335. <https://doi.org/10.1203/PDR.0b013e3181cb8e2f>
- Miranda MC, Bacchini D, Bombi AS, Di Giunta L, Pastorelli C, Lansford JE (2012) Maternal acceptance-rejection and psychological adjustment in childhood: comparison between mother and child perspective. In: Ripoll Núñez KJ, Comunian AL, Brown CM (eds) *Expanding horizons: current research on interpersonal acceptance*. Brown Walker, Boca Raton, pp 61–76
- Montagna A, Nosarti C (2016) Socio-emotional development following very preterm birth: pathways to psychopathology. *Front Psychol* 7: 80. <https://doi.org/10.3389/fpsyg.2016.00080>
- Mori S, Zhang J (2006) Principles of diffusion tensor imaging and its applications to basic neuroscience research. *Neuron* 51:527–539. <https://doi.org/10.1016/j.neuron.2006.08.012>
- Mori S, Oishi K, Jiang H, Jiang L, Li X, Akhter K, Hua K, Faria AV, Mahmood A, Woods R, Toga AW, Pike GB, Neto PR, Evans A,

- Zhang J, Huang H, Miller MI, van Zijl P, Mazziotta J (2008) Stereotaxic white matter atlas based on diffusion tensor imaging in an ICBM template. *NeuroImage* 40:570–582. <https://doi.org/10.1016/j.neuroimage.2007.12.035>
- Mount CW, Monje M (2017) Wrapped to adapt: experience-dependent myelination. *Neuron* 95:743–756. <https://doi.org/10.1016/j.neuron.2017.07.009>
- O'Donnell KJ, Chen L, MacLassac JL et al (2018) DNA methylome variation in a perinatal nurse-visitation program that reduces child maltreatment: a 27-year follow-up. *Transl Psychiatry* 8:15–24. <https://doi.org/10.1038/s41398-017-0063-9>
- Olds DL, Hill PL, O'Brien R, Racine D, Moritz P (2003) Taking preventive intervention to scale: the nurse-family partnership. *Cogn Behav Pract* 10:278–290. [https://doi.org/10.1016/S1077-7229\(03\)80046-9](https://doi.org/10.1016/S1077-7229(03)80046-9)
- Olds DL, Kitzman HJ, Cole RE, Hanks CA, Arcoleo KJ, Anson EA, Luckey DW, Knudtson MD, Henderson CR, Bondy J, Stevenson AJ (2010) Enduring effects of prenatal and infancy home visiting by nurses on maternal life course and government spending: follow-up of a randomized trial among children at age 12 years. *Arch Pediatr Adolesc Med* 164:419–424. <https://doi.org/10.1001/archpediatrics.2010.49>
- Olson IR, Von Der Heide RJ, Alm KH, Vyas G (2015) Development of the uncinate fasciculus: implications for theory and developmental disorders. *Dev Cogn Neurosci* 14:50–61. <https://doi.org/10.1016/j.dcn.2015.06.003>
- Papagno C, Miracapillo C, Casarotti A, Romero Lauro LJ, Castellano A, Falini A, Casaceli G, Fava E, Bello L (2010) What is the role of the uncinate fasciculus? Surgical removal and proper name retrieval. *Brain* 134:405–414. <https://doi.org/10.1093/brain/awq283>
- Parmar P, Ibrahim M, Rohner RP (2008) Relations among perceived spouse acceptance, remembered parental acceptance in childhood, and psychological adjustment among married adults in Kuwait. *Cross-Cult Res* 42:67–76. <https://doi.org/10.1177/1069397107309767>
- Patterson GR (1982) Coercive family process. Catalia, Eugene
- Perlez J (1996) Romanian 'orphans': prisoners of their cribs. *New York Times*. <http://www.nytimes.com/1996/03/25/world/romanian-orphans-prisoners-of-their-cribs.html>
- Perris C, Arrindell WA, Perris H, Ende J, Maj M, Benjaminsen S, Ross M, Eisemann M, del Vecchio M (1985) Cross-national study of perceived parental rearing behaviour in healthy subjects from Australia, Denmark, Italy, the Netherlands and Sweden: pattern and level comparisons. *Acta Psychiatr Scand* 72:278–282. <https://doi.org/10.1111/j.1600-0447.1985.tb02607.x>
- Putnick DL, Bornstein MH, Lansford JE, Chang L, Deater-Deckard K, di Giunta L, Gurdal S, Dodge KA, Malone PS, Oburu PO, Pastorelli C, Skinner AT, Sorbring E, Tapanya S, Tirado LMU, Zelli A, Alampay LP, al-Hassan SM, Bacchini D, Bombi AS (2012) Agreement in mother and father acceptance-rejection, warmth, and hostility/rejection/neglect of children across nine countries. *Cross-Cult Res* 46:191–223. <https://doi.org/10.1177/1069397112440931>
- Putnick DL, Bornstein MH, Lansford JE, Malone PS, Pastorelli C, Skinner AT, Sorbring E, Tapanya S, Uribe Tirado LM, Zelli A, Alampay LP, al-Hassan SM, Bacchini D, Bombi AS, Chang L, Deater-Deckard K, di Giunta L, Dodge KA, Oburu P (2015) Perceived mother and father acceptance-rejection predict four unique aspects of child adjustment across nine countries. *J Child Psychol Psych* 56:923–932. <https://doi.org/10.1111/jcpp.12366>
- Qin S, Young C, Duan X, Chen T, Supekar K, Menon V (2014) Amygdala subregional structure and intrinsic functional connectivity predicts individual differences in anxiety during early childhood. *Biol Psychiatry* 75:892–900. <https://doi.org/10.1016/j.biopsych.2013.10.006>
- Reitz E, Deković M, Meijer AM, Engels RCME (2006) A longitudinal examination of parenting and best friends' effects on problem behavior during early adolescence. *J Early Adolesc* 26:272–295. <https://doi.org/10.1177/0272431606288591>
- Rohner RP (1975) Parental acceptance-rejection and personality development: a universalist approach to behavioral science. In: Brislin RW, Bohner S, Lonner WJ (eds) *Cross-cultural perspectives on learning*. Wiley, New York, pp 251–269
- Rohner RP (1986) *New perspectives on family. The warmth dimension: foundations of parental acceptance-rejection theory*. SAGE, Thousand Oaks
- Rohner RP (1998) Father love and child development: history and current evidence. *Curr Dir Psychol Sci* 7:157–161. <https://doi.org/10.1111/1467-8721.ep10836851>
- Rohner RP (2004) The parental "acceptance-rejection syndrome": universal correlates of perceived rejection. *Am Psychol* 59:830–840. <https://doi.org/10.1037/0003-066X.59.8.830>
- Rohner RP (2010) Perceived teacher acceptance, parental acceptance, and the adjustment, achievement, and behavior of school-going youths internationally. *Cross-Cult Res* 44:211–221. <https://doi.org/10.1177/1069397110366849>
- Rohner RP (2014a) Parental power and prestige moderate the relationship between perceived parental acceptance and offspring's psychological adjustment: introduction to the international father acceptance-rejection project. *Cross-Cult Res* 48:197–213. <https://doi.org/10.1177/1069397114528295>
- Rohner RP (2014b) PARTheory gets a new name: interpersonal acceptance-rejection theory (IPARTheory). *Interpers Accept* 8:6
- Rohner RP (2016) Introduction to interpersonal acceptance-rejection theory (IPARTheory) and evidence. *Online Read Psychol Cult* 6. <https://doi.org/10.9707/2307-0919.1055>
- Rohner RP, Britner PA (2002) Worldwide mental health correlates of parental acceptance-rejection: review of cross-cultural and intracultural evidence. *Cross-Cult Res* 36:16–47. <https://doi.org/10.1177/106939710203600102>
- Rohner RP, Coumoyer DE (1994) Universals in youths' perceptions of parental acceptance and rejection: evidence from factor analyses within eight sociocultural groups worldwide. *Cross-Cult Res* 28:371–383. <https://doi.org/10.1177/106939719402800408>
- Rohner RP, Smith RL (2018) Parental acceptance-rejection. In: Bornstein MH (ed) *Handbook of parenting*, 3rd edn. Routledge, New York. (in press)
- Rohner RP, Veneziano RA (2001) The importance of father love: history and contemporary evidence. *Rev Gen Psychol* 5:382–405. <https://doi.org/10.1037/1089-2680.5.4.382>
- Rohner RP, Khaleque A, Coumoyer DE (2003) Cross-national perspectives on parental acceptance-rejection theory. In: Peterson GW, Steinmetz SK, Wilson SM (eds) *Parent-youth relations: cultural and cross-cultural perspectives*. Haworth, New York, pp 79–98
- Rothbaum G, Weisz JR (1994) Parental caregiving and child externalizing behavior in nonclinical samples: a meta-analysis. *Psychol Bull* 116:55–74. <https://doi.org/10.1037/0033-2909.116.1.55>
- Rule BG, Nesdale AR (1976) Moral judgments of aggressive behavior. In: Geen RG, O'Neal E (eds) *Prospectives on aggression*. Academic, New York, pp 37–60
- Rutter M, Woodhouse S (2018) Maternal deprivation. In: Bornstein MH (ed) *Handbook of parenting*, 3rd edn. Routledge, New York. (in press)
- Rutter M, Colvert E, Kreppner J, Beckett C, Castle J, Groothues C, Hawkins A, O'Connor TG, Stevens SE, Sonuga-Barke E (2007) Early adolescent outcomes for institutionally-deprived and non-deprived adoptees. *J Child Psychol Psychiatry* 48:17–30. <https://doi.org/10.1111/j.1469-7610.2006.01688.x>
- Schlegel AA, Rudelson JJ, Peter UT (2012) White matter structure changes as adults learn a second language. *J Cogn Neurosci* 24:1664–1670. [https://doi.org/10.1162/jocn\\_a\\_00240](https://doi.org/10.1162/jocn_a_00240)
- Schmithorst VJ, Wilke M, Dardzinski BJ, Holland SK (2005) Cognitive functions correlate with white matter architecture in a normal

- pediatric population: a diffusion tensor MRI study. *Hum Brain Mapp* 26:139–147. <https://doi.org/10.1002/hbm.20149>
- Scholz J, Klein MC, Behrens TE, Johansen-Berg H (2009) Training induces changes in white-matter architecture. *Nat Neurosci* 12:1370–1371. <https://doi.org/10.1038/nn.2412>
- Schumann CM, Barnes CC, Lord C, Courchesne E (2009) Amygdala enlargement in toddlers with autism related to severity of social and communication impairments. *Biol Psychiatry* 66:942–949. <https://doi.org/10.1016/j.biopsych.2009.07.007>
- Serra M, De Pisapia N, Rigo P, Papinutto N, Jager J, Bornstein MH, Venuit P (2015) Secure attachment status is associated with white matter integrity in healthy young adults. *Neuroreport* 26:1106–1111. <https://doi.org/10.1097/WNR.0000000000000479>
- Sowell ER, Trauner DA, Gamst A, Jernigan TL (2002) Development of cortical and subcortical brain structures in childhood and adolescence: a structural MRI study. *Dev Med Child Neurol* 44:4–16. <https://doi.org/10.1111/j.1469-8749.2002.tb00253.x>
- Sroufe LA, Egeland B, Carlson EA, Collins WA (2005) *The development of the person: the Minnesota study of risk and adaptation from birth to adulthood*. Guilford, New York
- Steele CJ, Bailey JA, Zatorre RJ, Penhune VB (2013) Early musical training and white-matter plasticity in the corpus callosum: evidence for a sensitive period. *J Neurosci* 33:1282–1290. <https://doi.org/10.1523/JNEUROSCI.3578-12.2013>
- Tau GZ, Peterson BS (2010) Normal development of brain circuits. *Neuropsychopharmacology* 35:147–168. <https://doi.org/10.1038/npp.2009.115>
- Teicher MH, Samson JA (2016) Annual research review: enduring neurobiological effects of childhood abuse and neglect. *J Child Psychol Psychiatry* 57:241–266. <https://doi.org/10.1111/jcpp.12507>
- Thompson RA (1983) *Socioemotional development in Nebraska symposium on motivation*. University of Nebraska, Lincoln
- Tierney AL, Nelson CA III (2009) Brain development and the role of experience in the early years. *Zero Three* 30:9–13
- Toritsuka M, Makinodan M, Kishimoto T (2015) Social experience-dependent myelination: an implication for psychiatric disorders. *Neural Plast* 2015:465345. <https://doi.org/10.1155/2015/465345>
- Tronick E (2007) *The neurobehavioral and social-emotional development in infants and children*. Norton, New York
- UNICEF (2014) *Convention on the rights of the child*. UNICEF. [https://www.unicef.org/crc/index\\_30160.html](https://www.unicef.org/crc/index_30160.html)
- UNICEF (2017) *Current status and progress*. UNICEF. <https://data.unicef.org/topic/child-protection/violence/violent-discipline/>
- Varan A, Rohner RP, Eryuksel G (2008) Intimate partner acceptance, parental acceptance in childhood, and psychological adjustment among Turkish adults in ongoing attachment relationships. *Cross-Cult Res* 42:46–56. <https://doi.org/10.1177/1069397107309758>
- Vazsonyi AT, Belliston LM (2006) The cultural and developmental significance of parenting processes in adolescent anxiety and depression symptoms. *J Youth Adolesc* 35:491–505. <https://doi.org/10.1007/s10964-006-9064-3>
- Veneziano RA (2000) Perceived paternal and maternal acceptance and rural African American and European American youths' psychological adjustment. *J Marriage Fam* 62:123–132. <https://doi.org/10.1111/j.1741-3737.2000.00123.x>
- Veneziano RA (2003) The importance of paternal warmth. *Cross-Cult Res* 37:265–281. <https://doi.org/10.1177/1069397103253710>
- Versace A, Acuff H, Bertocci MA, Beblo G, Almeida JRC, Perlman SB, Leemans A, Schirda C, Aslam H, Dwojak A, Bonar L, Travis M, Gill MK, Demeter C, Diwadkar VA, Sunshine JL, Holland SK, Kowatch RA, Birmaher B, Axelson D, Horwitz SM, Frazier TW, Arnold LE, Fristad MA, Youngstrom EA, Findling RL, Phillips ML (2015) White matter structure in youth with behavioral and emotional dysregulation disorders: a probabilistic tractographic study. *JAMA Psychiatr* 72:367–376. <https://doi.org/10.1001/jamapsychiatry.2014.2170>
- Von Der Heide RJ, Skipper LM, Klobusicky E, Olson IR (2013) Dissecting the uncinate fasciculus: disorders, controversies and a hypothesis. *Brain* 136:1692–1707
- Vos SB, Jones DK, Jeurissen B, Viergever MA, Leemans A (2012) The influence of complex white matter architecture on the mean diffusivity in diffusion tensor MRI of the human brain. *Neuroimage* 59:2208–2216. <https://doi.org/10.1093/brain/awt094>
- Whittle S, Dennison M, Vijayakumar N, Simmons JG, Yucel M, Lubman DI, Pantelis C, Allen NB (2013) Childhood maltreatment and psychopathology affect brain development during adolescence. *J Am Acad Child Adolesc Psychiatry* 52:940–952. <https://doi.org/10.1016/j.jaac.2013.06.007>
- Woon FL, Hedges DW (2008) Hippocampal and amygdala volumes in children and adults with childhood maltreatment-related posttraumatic stress disorder: a meta-analysis. *Hippocampus* 18:729–736. <https://doi.org/10.1002/hipo.20437>
- World Health Organization (2015) *Prohibiting and eliminating corporal punishment: a key health issue in addressing violence against children*. World Health Organization, <http://www.who.int/topics/violence/Global-Initiative-End-All-Corporal-Punishment-children.pdf>
- Wu Y, Sun D, Wang Y, Wang Y (2016) Subcomponents and connectivity of the inferior fronto-occipital fasciculus revealed by diffusion spectrum imaging fiber tracking. *Front Neuroanat* 10:88. <https://doi.org/10.3389/fnana.2016.00088>
- Zatorre RJ, Fields RD, Johansen-Berg H (2012) Plasticity in gray and white: neuroimaging changes in brain structure during learning. *Nat Neurosci* 15:528–536. <https://doi.org/10.1038/nn.3045>
- Zhou Q, Eisenberg N, Losoya SH, Fabes RA, Reiser M, Guthrie I, Murphy B, Cumberland A, Shepard S (2002) The relations of parental warmth and positive expressiveness to children's empathy-related responding and social functioning: a longitudinal study. *Child Dev* 73:893–915. <https://doi.org/10.1111/1467-8624.00446>