Journal of Experimental Child Psychology 176 (2018) 39–54

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

# Do infant sociomoral evaluation and action studies predict preschool social and behavioral adjustment?

Enda Tan *, Amori Yee Mikami, J. Kiley Hamlin

*Department of Psychology, University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada*

ARTICLE INFO

*Article history:*
Received 5 February 2018
Revised 7 June 2018

*Keywords:*
Infant
Preschool
Moral evaluation
Social functioning
Longitudinal study
Individual differences

ABSTRACT

Recent studies suggest that infants and toddlers evaluate others based on their prosocial and antisocial behaviors and engage in prosocial behaviors themselves. It is unknown to what extent infants' responses in such studies reveal stable individual differences in social and/or moral competence that persist throughout development. The current study ($N = 63$) demonstrates that infants' performance in sociomoral evaluation and action studies (mean age = 12 months) predicts social and behavioral adjustment at age 4 years. Specifically, a stronger preference for moral actions as an infant was associated with parent reports of fewer callous–unemotional traits, the domain most conceptually related to sociomoral evaluation and action, during preschool. Critically, preschool moral adjustment was uniquely associated with infants' sociomoral responding and not with other more general aspects of infant functioning. When 2 children with an autism spectrum disorder diagnosis were included in the sample, correlations between infant and preschool functioning were more widespread. Taken together, these results provide evidence for developmental continuity in the sociomoral domain and suggest that infants' early behavioral tendencies may be building blocks for subsequent sociomoral development.



* Corresponding author.
*E-mail address:* enda.tan@psych.ubc.ca (E. Tan).

https://doi.org/10.1016/j.jecp.2018.07.003
0022-0965/

## Introduction

Past research has shown that preverbal infants evaluate individuals on the basis of the actions they direct toward third parties, preferring agents who assist others' goals over agents who hinder others' goals. To illustrate, in one study (Hamlin, Wynn, & Bloom, 2007) infants watched puppet shows in which a protagonist repeatedly tried but failed to reach the top of a steep hill. On the protagonist's third attempt, either a "helper" character bumped the protagonist up the hill, facilitating its goal, or a "hinderer" character bumped the protagonist down the hill, blocking its goal. In this and several subsequent studies using a variety of helpful and harmful acts (Buon et al., 2014; Hamlin & Wynn, 2011; Hamlin et al., 2007; Scola, Holvoet, Arciszewski, & Picard, 2015; Tasimi & Wynn, 2016; but see Salvadori et al., 2015), a majority of infants chose helpful characters over harmful characters. This preference has been observed as early as 3 months after birth (Hamlin & Wynn, 2011; Hamlin, Wynn, & Bloom, 2010).

More recent work suggests that later in infancy, infants' preference for helpers over hinderers is affected by both helpers' and hinderers' mental states (Hamlin, Ullman, Tenenbaum, Goodman, & Baker, 2013). Infants also selectively prefer characters who helped prosocial others and characters who hindered antisocial others (Hamlin, 2014; Hamlin, Wynn, Bloom, & Mahajan, 2011), suggesting that infants' evaluations of sociomoral actions take into account the context in which helping and hindering occurs. In addition to evaluating helpful and unhelpful others, infants' evaluations also extend to other types of sociomoral actors, including those who distribute resources fairly versus unfairly (Burns & Sommerville, 2014; Geraci & Surian, 2011) and those who intervene when observing bullying (Kanakogi et al., 2017). Other work finds that infants are responsive to others' distress during the first year (Davidov, Zahn-Waxler, Roth-Hanania, and Knafo, 2013) and during the second year increasingly engage in their own prosocial behaviors, including sharing, helping, and comforting (Brownell, 2016; Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Nichols, Brownwell, & Svetlova, 2013; Warneken & Tomasello, 2006; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Taken together, these results suggest that fundamental aspects of sociomoral evaluation and action emerge early and undergo significant development during the first 2 years after birth.

Do infants' responses in these studies actually reflect developmental precursors to morality? Some researchers have questioned rich interpretations of infant behaviors in general (Haith, 1998). Others have argued that infants' responses may be better explained by various low-level perceptual features of stimuli and/or basic preferences for completed goals (Paulus, 2014; Scarf, Imuta, Colombo, & Hayne, 2012a, 2012b; Tafreshi, Thompson, & Racine, 2014; cf. Hamlin, 2014; Hamlin, Wynn, & Bloom, 2012) and that early prosocial behaviors may be driven by a preference for engaging in social interactions as opposed to altruistic motives per se (Brownell, 2016; Paulus, 2014, 2018; Rheingold, 1982). On these accounts, individual differences in tendencies to interpret, prefer, and perform sociomoral actions during infancy may have more to do with individual differences in perceptual and/or mentalizing abilities, or with general preferences for social interaction, than with features of truly moral responding.

On the other hand, there is evidence for associations between different aspects of sociomoral functioning among very young children, suggesting that these aspects may reflect the early emergence of an underlying moral system. For example, in one study 18- and 25-month-olds who showed more concerned looks when observing one individual harm another were subsequently more likely to help the victim (Vaish, Carpenter, & Tomasello, 2009); in another study 16- to 27-month-olds who looked longer when a character interacted with an antisocial actor versus a prosocial actor, suggesting that they found the antisocial interaction surprising, were more likely to subsequently help the prosocial actor (vs. the antisocial actor) (Dahl, Schuck, & Campos, 2013). Finally, several studies have demonstrated that 15-month-olds who show larger differential looking times to unfair distributions versus fair distributions are also more likely to share appealing toys themselves (Schmidt & Sommerville, 2011); critically, this association cannot be explained by individual differences in other domains such as language and motor skills (Ziv & Sommerville, 2016). Taken together, these studies suggest that infants' performance may have some consistency across domains of sociomoral responding at a single point in development.

Consistency in sociomoral tendencies can also be explored longitudinally by examining whether individual differences in responses during infant studies predict subsequent differences in sociomoral adjustment later in life. Indeed, domain-specific continuities in performance from infancy to preschool have been previously observed in several domains (for a review, see Bornstein, 2014), including attentional control (Papageorgiou et al., 2014), mathematical competence (Starr, Libertus, & Brannon, 2013), and theory of mind (Thoermer, Sodian, Vuori, Perst, & Kristen, 2012; Wellman, Lopez-Duran, LaBounty, & Hamilton, 2008; Yamaguchi, Kuhlmeier, Wynn, & VanMarle, 2009). Continuity within the sociomoral domain has also been suggested. For example, Margoni and Surian (2016) argued that apparent discontinuity between infants' and preschoolers' moral competence stems from task demands and executive limitations rather than from conceptual changes in moral reasoning. Empirically, Knafo, Zahn-Waxler, Van Hulle, Robinson, and Rhee (2008) found longitudinal correlations in empathy from 14 to 36 months, suggesting that empathy is a relatively stable disposition during the first 3 years after birth. Furthermore, individual differences in affective and cognitive empathy at 10 months have been shown to predict prosocial behaviors (helping and comforting distressed others) during the second year (Roth-Hanania, Davidov, & Zahn-Waxler, 2011), and disregard for others at 14–36 months predicts antisocial behavior during middle childhood and adolescence (Rhee et al., 2013). These findings provide evidence that early individual differences in empathy predict subsequent sociomoral behaviors.

In the current study, we examined whether similar continuities exist in sociomoral domains beyond empathy specifically by exploring whether infants' responses in sociomoral evaluation and action studies predict parent-reported social and moral adjustment during preschool. Evidence for continuity between infant and early childhood responding would provide support for the hypothesis that infants' responses in sociomoral evaluation and action tasks reflect early emerging aspects of sociomoral development. To explore the development of these skills, we identified children who had participated in two or more sociomoral evaluation and action studies during their first 2 years and who were currently at least 3 years of age. Here we note that this exploration was based on an opportunity sample; when infants and toddlers came into our laboratory to participate in studies, we had no intention of exploring this longitudinal question, and so features of our design reflect this. When children reached 3 years of age (range = 37.21–72.86 months), we administered a number of parent-report scales over the internet, probing different aspects of functioning during the preschool years. Given that our interest was in probing continuity in sociomoral development in particular, scales that focused on various aspects of moral and social functioning during preschool were chosen.

First and foremost, we probed empathy and other aspects of moral development by administering the Inventory of Callous–Unemotional Traits—Preschool (ICU; Frick, 2003). This scale was designed to assess a constellation of cognitive features (lack of remorse, inability to tell right from wrong), affective features (poverty in emotional expressions), behavioral features (deceitful and manipulative behaviors), and interpersonal features (callous use of others to achieve one's goals) that are consistent with adult conceptualizations of psychopathy and includes items such as "[My child] does not care who he/she hurts to get what he/she wants" and "[My child] does not seem to know right from wrong." In older children, this questionnaire has been shown to characterize a relatively small subgroup of children exhibiting antisocial behavior who show both aggressive behaviors and lack of remorse for those behaviors. Together, these symptoms are theorized to relate to psychopathy during adulthood (Frick & White, 2008). The preschool version of the scale was developed to explore even earlier precursors of risk factors for psychopathy, and higher scores on this scale are associated with higher rates of antisocial and aggressive behaviors, poorer emotional recognition, and reduced attentional orienting to others' distress during preschool (Ezpeleta, de la Osa, Granero, Penelo, & Domènech, 2013; Frick et al., 2003; Kimonis et al., 2016). High levels of callous and unemotional traits are also associated with deficits in moral emotions (Dadds et al., 2009; Feilhauer, Cima, Benjamins, & Muris, 2013; Jones, Happé, Gilbert, Burnett, & Viding, 2010). Of all the scales we chose, the ICU is the scale most clearly related to moral development and, therefore, was of primary interest.

Second, we examined theory of mind as well as other social reasoning and communication skills by administering the Social Responsiveness Scale (SRS; Constantino & Gruber, 2005), a measure of social impairments associated with autism spectrum disorder (ASD), although we note recent research suggesting that SRS scores may be more appropriately interpreted as a marker of general social and

behavioral impairment (Hus, Bishop, Gotham, Huerta, & Lord, 2013). The SRS includes items such as "[My child] is able to understand the meaning of other people's tone of voice and facial expressions" (reverse coded), "[My child] is aware of what others are thinking or feeling" (reverse coded), and "[My child] gets frustrated trying to get ideas across in conversations." These items were created to describe children who have difficulty in understanding others' mental states and communicating their own thoughts and allowed us to explore whether performance on sociomoral tasks is related to general social skills and understanding.

Third, we administered the Child Behavior Checklist–Preschool (CBCL; Achenbach & Rescorla, 2000), a well-established measure of children's maladaptive functioning, including being emotionally reactive, anxious/depressed, withdrawn, and aggressive. This scale also includes a measure of attentional functioning that allowed us to probe whether this domain-general skill relates to infant performance on sociomoral tasks. The CBCL includes items such as "[My child] looks unhappy without good reason," "[My child] refuses to play active games," and "[My child] can't concentrate, can't pay attention for long."

Finally, we administered two subscales of the Vineland Adaptive Behavior Scales II (Vineland; Sparrow, Cicchetti, & Balla, 2005), a positive measure of children's general adaptive functioning, to further assess children's communication and socialization skills. The scales include items such as "[My child] pronounces words clearly without sound substitutions" (e.g., does not say "wabbit" for "rabbit", does not say "Thally" for "Sally"), "[My child] plays simple interaction games with others" (e.g., peekaboo, patty cake), and "[My child] makes or tries to make social contact" (e.g., smiles, makes noises). Further details of all scales are provided below.

Our primary hypothesis was that any observed relationships between infant responding and preschool social and moral adjustment would be specific to the sociomoral domain. This hypothesis generates two predictions. First, we predicted that infants' performance on sociomoral evaluation and action studies would be more strongly correlated with the preschool measure that is most morally relevant (i.e., ICU) than with measures that assess a broader range of behaviors (e.g., SRS, CBCL, Vineland). Second, we predicted that preschool social and moral adjustment would be uniquely associated with sociomoral responding during infancy and would not extend to other more general aspects of healthy infant development such as cognitive ability and general emotionality. Because past research documents gender differences in the developmental trajectories of social and behavioral functioning (Keenan & Shaw, 1997), we also explored whether associations interacted with children's gender.

Unfortunately, our laboratory does not explicitly assess temperament or cognitive abilities during infancy, so it was not possible to directly assess this hypothesis with our opportunity sample. However, various aspects of our studies can be used to explore these domains. For instance, the rate at which infants habituate to a repeated stimulus has been used extensively by previous research as a measure of infants' cognitive abilities (McCall & Carriger, 1993), with faster habituation predicting higher IQ and language skills (McCall & Carriger, 1993; Slater, Cooper, Rose, & Morison, 1989; Tamis-LeMonda & Bornstein, 1989). Because the majority of studies in our laboratory include habituation procedures, we calculated each infant's "average general habituation rate," or the average number of trials it took the infant to habituate during all studies in which the infant participated at our laboratory (including studies with both sociomoral content [used in the primary measures of interest] and non-sociomoral content [not used]), and included this variable in our analyses. In addition, each study run in our laboratory inevitably results in a number of infants who are not eligible for the final sample because they have "fussed out" of the procedure, or become too emotional to continue. Infants' tendencies to fuss out of infant studies has been shown to relate to levels of anxiety and fear during the preschool years (Ohr, Feingold, & Fagen, 2006); therefore, our analyses included each child's rate of fussing out of studies as a measure of emotionality.

## Method

### *Participants*

Participants were 63 children (40 girls), predominantly Caucasian and East Asian, from middle-class families in a large city in the Pacific Northwest. This sample included all children who met the

requirements of the study and agreed to participate. Power analyses revealed that this sample size provided a power $(1 - \beta)$ of .92 to detect the hypothesized moderate correlations ($\rho s \geq .40$) between infant performance on sociomoral evaluation and action studies and preschool adjustment across genders; these effect sizes were estimated based on past research linking infant and preschool social functioning measures (Wellman et al., 2008).

All infant participants were healthy and full-term; at the preschool assessment point, although we did not formally or systematically request information about diagnosed developmental disabilities, two families spontaneously reported that their children (both male) had received a diagnosis of ASD. To best illustrate the nature of the observed effects, we chose to analyze developmental continuity both with and without these children; analyzing the data without these 2 children would reveal relationships in children without severe social impairments, whereas using the full sample allowed us to explore the relationships across the full range of social and moral functioning.

Children were between 37.21 and 72.86 months of age ($M$ = 48.16 months) and had successfully completed two or more studies ($M$ = 3.25 studies) tapping sociomoral understanding and behavior as infants (age range = 7.45–19.85 months, mean age over all included studies = 11.90 months). We required participants to have taken part in at least two studies as infants in order to obtain a more reliable measure of infants' performance than what could be gleaned from a single data point. In addition, the studies in which infants took part needed to meet all the following preset criteria. First, the study involved moral (rather than merely social or physical) content. Second, the study tested infants under 2 years of age. Third, there was a clear directional prediction that participants would prefer/perform more moral or prosocial actions (e.g., control conditions were ineligible). Fourth, no major confounds were uncovered during data collection that rendered the data uninformative. Finally, there were no procedural errors during the visit. Aside from these restrictions, all studies ever conducted in the laboratory were included whether or not a significant effect was observed or a complete sample was acquired. A total of 72 children were eligible after these exclusions; of these, 65 agreed to participate (90.3% consent rate). Parents of 2 of these 65 children noted that their children had received an ASD diagnosis, yielding $N$ = 63 in the delimited sample.

### *Performance in infant sociomoral evaluation and action studies*

All studies eligible for inclusion in the current analyses examined infants' sociomoral abilities. In the majority of these studies, infants watched videos or puppet shows in which characters behaved prosocially or antisocially and infants' evaluations were examined, but other studies examined infants' own prosocial interactions. Infants' sociomoral evaluations and actions were measured through various response types, the majority of which involved reaching choice (picking one character over another; 94% of studies). However, other studies measured infant performance through preferential looking (looking longer at one character over another), distribution preference (giving more resources to one character over another, giving preferred or dispreferred objects to a single character), help seeking (asking one character for help), selective imitation (imitating one character's behaviors more than another's), and emotional responses (showing more positive emotions when engaging in certain types of prosocial interactions). In total, 81 study conditions were included in the current study (see Table S1 in the online supplementary material for a description of each included study). The proportion of study conditions experienced did not differ by participant gender, $t(63) = -0.001$, $p$ = .999.

#### *Weighted with hypothesis rate*

Each infant's average response to sociomoral evaluation and action studies was calculated via an index we called the *weighted with hypothesis rate* (WWHR). WWHR reflects whether the infant performed in the direction of a study's hypothesis (i.e., showing a preference for moral actions), weighted by the effect size of that study (i.e., the percentage of infants who performed in the direction of the hypothesis in that particular study), averaged across all studies in which the infant participated.

WWHR was calculated in three steps. First, a score was assigned to the infant's performance in each study. An infant who performed in the direction of the hypothesis (e.g., choosing a prosocial character, giving treats to a prosocial character) received a score of 1, and an infant who performed against the direction of the hypothesis (e.g., choosing an antisocial character, refusing to give treats to a prosocial

character) received a score of −1. Second, the infant's score in each study was multiplied by that study's overall effect size (i.e., the percentage of infants who performed in the direction of the hypothesis). This step allowed us to assign different weights to studies reflecting the average performance of infants at the same age on the same procedure, whereby an infant received a lesser "penalty" for performing against the direction of the hypothesis if that was how most other infants performed. Finally, these products were summed across all studies of an infant and divided by his or her total number of studies, providing a value between − 1 and 1. To illustrate, if an infant had three eligible studies, performing with the hypothesis in Study 1 (effect size = .90), against the hypothesis in Study 2 (effect size = .82), and against the hypothesis in Study 3 (effect size = .75), then WWHR would be $\frac{1\times(.90)+(-1)\times(.82)+(-1)\times(.75)}{3} = -0.22$. Average WWHR did not differ by gender ($M_{male}$ = .18, 95% confidence interval (CI) [.01, .35]; $M_{female}$ = .19, 95% CI [.07, .31]), independent-samples $t$ test, $t(63) = -0.10$, $p = .92$, $d = 0.03$).

*Other infant measures*

We considered two additional factors in infants' performance that we hypothesized would not relate to infants' early moral evaluation capabilities or subsequent social and moral adjustment. First, as a measure of general cognitive functioning, we computed each infant's *average general habituation rate* from the average number of trials it took the infant to habituate during all studies in which the infant participated in our laboratory—studies involving both moral and nonmoral content. The rate at which infants habituate to a repeated stimulus has been used extensively in previous research as a measure of cognitive ability. Quick habituation is predictive of future intelligence scores (McCall & Carriger, 1993; Slater et al., 1989; Tamis-LeMonda & Bornstein, 1989) and is considered to indicate superior perceptual, memory and processing capacities (Bornstein, 1985; Bornstein & Tamis-LeMonda, 1994; Sirois & Mareschal, 2004). Second, as a measure of infant general emotionality we calculated the proportion of studies in which each infant fussed out. Infant crying during studies has been shown to predict preschool anxiety and fear (Ohr et al., 2006).

*Rate of habituation*

In studies using habituation procedures, infants watched alternating events until they met a preset habituation criterion or until they saw 14 total events. Trials ended when infants looked away from the display for a consecutive 2 s or when 30 s had elapsed. The habituation criterion was met if the sum of the looking times on a consecutive 3 trials was less than half the sum of the looking times on the first 3 trials that themselves had a sum equal to or above 12 s. These criteria are preset and apply to all habitation studies in our laboratory. Habituation rate was defined as the number of trials it took infants to meet the habituation criterion in a given study. If the habituation criterion was not met by Trial 14, the habituation rate for that study was entered as 15. Average habituation rate was calculated by averaging an infants' habituation rates across all studies that used habituation procedures, including studies involving nonmoral content that were not eligible for inclusion in the WWHR calculations. In the current sample, the average habituation rate was 9.43 with a standard deviation of 2.88.

*Fuss-out rate*

A study was deemed a fuss out if an infant displayed signs of significant distress (e.g., crying), resulting in early termination of the study. The fuss-out rate was calculated by dividing the number of studies in which an infant fussed out by the total number of studies in which the infant participated, including studies involving nonmoral content that were not eligible for inclusion in the WWHR calculations. Note that because infants needed to complete a minimum of two studies without fussing out in order to be eligible for the current sample, the fuss-out rate for infants in this sample was quite low ($M$ = .06, $SD$ = .10).

*Preschool adjustment*

Preschool adjustment was assessed via a battery of parent-report scales tapping major areas relevant to social and behavioral functioning that we considered most likely to relate to moral and

prosocial preferences during infancy. The questionnaires were collected using REDCap (Harris et al., 2009), a web-based application widely used in scientific research. Links to these online questionnaires were sent to parents after their children reached 3 years of age.

*Callous–unemotional traits*

The ICU (Frick, 2003) is a parent-report measure of young children's lack of remorse and poor empathy (Kimonis et al., 2008). It consists of 24 items (12 positively worded and 12 negatively worded) rated on a 4-point Likert scale from 0 (*not at all true*) to 3 (*definitely true*). Past research has provided psychometric support for the use of this scale during preschool (Kimonis et al., 2016). The ICU generates raw scores for three domains (Callousness, Uncaring, and Unemotional) and a total score ranging from 0 to 72. Total ICU scores in the current sample ranged from 5.00 to 46.00, with a mean of 18.54. No gender differences were found ($M_{male}$ = 19.88, 95% CI [15.94, 23.82]; $M_{female}$ = 17.70, 95% CI [15.65, 19.75]), independent-samples $t$ test, $t(63) = -1.06$, $p = .29$, $d = 0.26$.

*Autism spectrum-related social behaviors*

The SRS (Constantino & Gruber, 2005) is designed to measure social behaviors associated with ASD. The SRS is widely used in psychological and clinical research and has good psychometric properties (Bölte, Poustka, & Constantino, 2008). Parents completed 65 items about their children scored from 1 (*not true*) to 4 (*almost always true*). The SRS generates severity raw scores and T scores (normed by age and gender) for each of the five domains of social impairments: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted and Repetitive Behaviors. The scale also yields a single "Social Communication and Interaction" score, which incorporates the Social Awareness, Social Cognition, Social Communication, and Social Motivation domains, as well as a single total score across all five domains. T scores equal to or below 59 are in the normal range. T scores between 60 and 75 are in the mild–moderate range and suggest deficiencies that are clinically significant. T scores equal to or above 76 are in the severe range, suggesting severe social malfunctioning.

The total SRS T scores of the current sample ranged from 50.00 to 90.00, with a mean of 62.33 and with 4 individuals in the severe range (3 boys) and 30 individuals in the mild–moderate range (5 boys). Consistent with gender norming, no gender differences were observed ($M_{male}$ = 61.13, 95% CI [56.56, 65.70]; $M_{female}$ = 63.05, 95% CI [60.89, 65.21]), independent-samples $t$ test, $t(59) = 0.84$, $p = .41$, $d = 0.21$.

*Preschool emotional and behavioral problems*

Parents completed the CBCL (Achenbach & Rescorla, 2000), a comprehensive questionnaire assessing young children's behavioral and emotional problems. The CBCL is widely used and demonstrates high validity and reliability (Achenbach, 1992). For the purpose of the current study, we administered the narrow-band scales that we thought reflected children's social behaviors: Emotionally Reactive (9 items), Anxious/Depressed (8 items), Withdrawn (8 items), Attention Problems (5 items), and Aggressive Behavior (19 items). The CBCL uses a 3-point Likert scale ranging from 0 (*not true*) to 2 (*very true*), generating a raw score and a T score (normed by age) on each narrow-band scale. T scores below 65 are in the normal range. T scores equal to or above 70 are in the clinical range.

Total scores on the CBCL were incalculable in the current study because only selected narrow-band scales were administered. To represent participants' average behavioral or emotional problems, we computed "Average CBCL" scores by averaging T scores on available narrow-band scales (Emotionally Reactive, Anxious/Depressed, Withdrawn, Attention Problems, and Aggressive Behavior). The Average CBCL scores of the current sample ranged from 50.00 to 73.80, with a mean of 54.25 and with 2 individuals in the clinical range (above 70). No gender differences were found ($M_{male}$ = 54.74, 95% CI [52.38, 57.09]; $M_{female}$ = 54.11, 95% CI [52.83, 55.38]), independent-samples $t$ test, $t(62) = -0.50$, $p = .62$, $d = 0.12$.

*Communication and socialization adaptive functioning*

The Vineland (Sparrow et al., 2005) assesses children's adaptive functioning in domains including Communication, Socialization, Daily Living Skills, and Motor Skills. The scales show good psychometric properties (Sparrow, 2011). Because the focus of the current study was on sociomoral

development, we administered only the Communication domain (Subdomains: Receptive, Expressive, and Written) and the Socialization domain (subdomains: Interpersonal Relationships, Play and Leisure Time, and Coping Skills). Each domain has 99 items rated from 0 (*never*) to 2 (*usually*) (scoring discontinues when the examinee receives 0 on 4 consecutive items). The scales generate total raw scores, standard scores (normed by age, $M = 100$ and $SD = 15$), and percentile ranks for each domain as well as raw scores and *V* scores (normed by age, $M = 15$ and $SD = 3$) for subdomains. Unlike the other scales assessing preschool adjustment in the current study, higher scores on the Vineland reflect better social functioning.

Because only selected domains were administered, total Vineland scores were incalculable. To represent participants' general adaptive skills, we computed overall scores for the Vineland by averaging standard scores on the Communication and Socialization domains. Average Vineland scores ranged from 65.00 to 131.00 ($M = 103.78$). Although the Vineland is not gender normed, no gender differences were found ($M_{male} = 103.42$, 95% CI [98.01, 108.82]; $M_{female} = 104.00$, 95% CI [100.73, 107.27]), independent-samples *t* test, $t(62) = 0.19$, $p = .85$, $d = 0.05$.

### *Statistical analyses*

Statistical analyses were performed using (a) raw scores on the ICU, which does not yield standard scores; (b) standardized T scores ($M = 50$, $SD = 10$) on SRS total, SRS subscales, and CBCL subscales; (c) standard scores ($M = 100$, $SD = 15$) on Vineland main domains; and (d) *V* scores ($M = 15$, $SD = 3$) on Vineland subdomains. Results are presented below, first with the delimited sample, excluding the 2 children whose parents reported them to have an ASD diagnosis, and subsequently on the full sample.

## Results

Table 1 displays correlational analyses between WWHR and preschool adjustment. For the delimited sample (excluding the children reported by parents to have ASD; above the diagonal), no significant correlations were found between WWHR and parent-reported preschool adjustment. For the full sample (below the diagonal), a stronger observed preference for moral actions in infant sociomoral and action studies was associated, during preschool, with parent reports of fewer callous–unemotional traits (ICU), $r(63) = -.25$, 95% CI [−.47, −.01], $p = .049$, and fewer ASD-related problematic social behaviors (SRS), $r(59) = -.28$, 95% CI [−.50, −.03], $p = .030$. Correlational analyses between WWHR and subscales of the CBCL and Vineland revealed that a stronger preference for moral actions in infant sociomoral and action studies was associated with parent reports of lower attention problems (CBCL), $r(61) = -.39$, 95% CI [−.58, −.16], $p = .002$, and higher receptive communication skills (Vineland), $r(61) = .32$, 95% CI [.08, .52], $p = .011$.

**Table 1**
Bivariate correlations between measures of infant functioning and preschool adjustment.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. WWHR | – | −.15 | −.11 | −.09 | −.07 | .07 | −.09 |
| 2. Average habituation rate | −.19 | – | −.06 | .09 | −.17 | −.05 | .01 |
| 3. Fuss-out rate | −.18 | −.02 | – | −.10 | .05 | −.01 | .03 |
| 4. ICU total | −.25* | .13 | .00 | – | .41** | .45** | −.18 |
| 5. SRS total | −.28* | −.06 | .21 | .56** | – | .66** | −.30* |
| 6. Average CBCL | −.18 | .04 | .21 | .57** | .78** | – | −.22 |
| 7. Average Vineland | .15 | −.07 | −.11 | −.40** | −.54** | −.48** | – |

*Note.* Correlations above the diagonal are for the sample with the children reported by parents to have autism ($n = 2$) removed, and correlations below the diagonal are for the full sample. For the Inventory of Callous–Unemotional Traits (ICU), Social Responsiveness Scale (SRS), and Child Behavior Checklist (CBCL), lower scores represent better functioning; for the Vineland Adaptive Behavior Scales II (Vineland), higher scores indicate better functioning. Note that *p* values were not adjusted for multiple tests. WWHR, weighted with hypothesis rate.

* $p < .05$.

** $p < .01$.

Notably, for the full sample, the bivariate correlations with preschool social and behavioral adjustment were unique to WWHR. The average habituation rate was not associated with any adjustment indicator during preschool (Table 1). In addition, there were no significant correlations between the fuss-out rate and the preschool adjustment indicators that had been related to WWHR. Further analyses with subscale scores revealed that, suggestive of the validity of the fuss-out rate as a measure of infant emotionality, a higher fuss-out rate was correlated with higher parent-reported withdrawal during preschool, $r(61) = .39$, 95% CI [.16, .58], $p = .002$. These results suggest that the correlations observed between WWHR and parent-report preschool adjustment cannot be explained by the domain-general factors measured by average habituation and fuss-out rates.

We next tested our core study hypothesis, that infant WWHR would prospectively predict preschool social and behavioral adjustment, using hierarchical multiple regression analyses. To limit the total number of regressions conducted to four; the overall scores on the ICU, SRS, CBCL, and Vineland were criterion variables in each regression. The number of studies in which the infant took part, average age of infant study participation, average habituation rate, average fuss-out rate, and age at preschool survey were entered as statistical controls in Step 1. Gender was entered in Step 2. Crucially, Step 3 contained WWHR and Step 4 contained the two-way interaction term between gender and WWHR. Significant interaction effects were probed in the manner recommended by Holmbeck (2002).

**Table 2**
Multiple regressions of overall scores on the ICU, SRS, CBCL, and Vineland with the children reported by parents to have autism ($n = 2$) removed.

| Dependent variable | Predictor | $\beta$ (Step 1) | $\beta$ (Step 2) | $\beta$ (Step 3) | $\beta$ (Step 4) |
|---|---|---|---|---|---|
| ICU total | Infant study age | .12 | .12 | .20 | .15 |
| | Child survey age | −.17 | −.17 | −.19 | −.15 |
| | Number of infant studies | .27 | .27 | .24 | .22 |
| | Habituation rate | .03 | .02 | .01 | −.02 |
| | Fuss-out rate | −.09 | −.10 | −.12 | −.11 |
| | Gender | | .03 | .04 | .05 |
| | WWHR | | | −.21 | −.48* |
| | Gender × WWHR | | | | −.35 |
| SRS total | Infant study age | −.14 | −.09 | −.06 | −.07 |
| | Child survey age | −.03 | −.03 | −.03 | −.02 |
| | Number of infant studies | .26 | .31* | .30 | .30 |
| | Habituation rate | −.26 | −.16 | −.16 | −.17 |
| | Fuss-out rate | .00 | .04 | .03 | .03 |
| | Gender | | −.28 | −.28 | −.28 |
| | WWHR | | | −.06 | −.14 |
| | Gender × WWHR | | | | −.09 |
| CBCL average | Infant study age | −.05 | −.05 | −.09 | −.12 |
| | Child survey age | .00 | .00 | .00 | .02 |
| | Number of infant studies | −.01 | −.01 | .01 | .00 |
| | Habituation rate | −.06 | −.06 | −.05 | −.07 |
| | Fuss-out rate | −.06 | −.06 | −.04 | −.03 |
| | Gender | | .00 | −.01 | .00 |
| | WWHR | | | .12 | −.05 |
| | Gender × WWHR | | | | −.22 |
| Vineland average | Infant study age | −.06 | −.07 | −.05 | −.08 |
| | Child survey age | −.36* | −.36* | −.37* | −.35* |
| | Number of infant studies | .05 | .03 | .03 | .02 |
| | Habituation rate | −.06 | −.09 | −.09 | −.11 |
| | Fuss-out rate | .08 | .06 | .06 | .06 |
| | Gender | | .11 | .12 | .12 |
| | WWHR | | | −.05 | −.19 |
| | Gender × WWHR | | | | −.19 |

*Note.* $\beta$, standardized regression coefficient; ICU, Inventory of Callous–Unemotional Traits; SRS, Social Responsiveness Scale; CBCL, Child Behavior Checklist; Vineland, Vineland Adaptive Behavior Scales II; WWHR, weighted with hypothesis rate.
* $p < .05$.

Results are displayed in Table 2 for the delimited sample and Table 3 for the full sample. For both samples, there were no gender differences in the average scores of WWHR or the ICU, SRS, CBCL, or Vineland (note that the SRS and Vineland are gender normed). In addition, Cook's distances found no highly influential outliers ($D$s < .50). For the delimited sample, after statistical control of all covariates, higher infant WWHR predicted scores on the ICU: $\beta = -0.48$, 95% CI [−0.96, −0.01], $t(45) = -2.04$, $p = .047$, but failed to reliably predict performance on the SRS, CBCL, or Vineland ($p$s > .429). These results indicate that when children with diagnosed social impairments are not included in the sample, infants' performance on sociomoral evaluation and action studies best predicted preschool callous–unemotional traits, a finding that holds after statistical control of covariates assessing general functioning. Notably, the ICU is the questionnaire most directly related to moral functioning.

For the full sample, after statistical control of all covariates, higher infant WWHR continued to predict parent reports of fewer problems on the ICU during preschool: $\beta = -0.38$, 95% CI [−0.66, −0.09], $t(48) = -2.64$, $p = .011$. In addition, there were significant interaction effects between WWHR and gender for the ICU, SRS, and CBCL. Post hoc probing revealed that the associations between a higher WWHR and better preschool adjustment were significant for boys on the ICU, $\beta = -0.76$, 95% CI [−1.14, −0.38], $t(47) = -4.01$, $p < .001$, the SRS, $\beta = -0.65$, 95% CI [−1.07, −0.22], $t(43) = -3.04$,

**Table 3**
Multiple regressions of overall scores on the ICU, SRS, CBCL, and Vineland with the full sample.

| Dependent variable | Predictor | $\beta$ (Step 1) | $\beta$ (Step 2) | $\beta$ (Step 3) | $\beta$ (Step 4) |
|---|---|---|---|---|---|
| ICU total | Infant study age | .11 | .10 | .24 | .14 |
| | Child survey age | −.25 | −.25 | −.25 | −.16 |
| | Number of infant studies | .13 | .11 | .10 | .11 |
| | Habituation rate | .10 | .05 | .03 | −.03 |
| | Fuss-out rate | .00 | −.03 | −.09 | −.10 |
| | Gender | | .15 | .14 | .14 |
| | WWHR | | | −.38* | −.76** |
| | Gender × WWHR | | | | −.53** |
| SRS total | Infant study age | −.11 | −.10 | .01 | −.07 |
| | Child survey age | −.13 | −.14 | −.14 | −.06 |
| | Number of infant studies | .10 | .10 | .10 | .12 |
| | Habituation rate | −.12 | −.11 | −.12 | −.15 |
| | Fuss-out rate | .16 | .17 | .12 | .11 |
| | Gender | | −.04 | −.08 | −.09 |
| | WWHR | | | −.29 | −.65** |
| | Gender × WWHR | | | | −.49* |
| CBCL average | Infant study age | −.03 | −.04 | .00 | −.11 |
| | Child survey age | −.12 | −.12 | −.12 | −.03 |
| | Number of infant studies | −.10 | −.12 | −.12 | −.11 |
| | Habituation rate | .05 | .00 | −.01 | −.07 |
| | Fuss-out rate | .18 | .15 | .13 | .13 |
| | Gender | | .13 | .13 | .13 |
| | WWHR | | | −.11 | −.52* |
| | Gender × WWHR | | | | −.56** |
| Vineland average | Infant study age | −.05 | −.05 | −.12 | −.06 |
| | Child survey age | −.18 | −.18 | −.18 | −.23 |
| | Number of infant studies | .16 | .16 | .17 | .16 |
| | Habituation rate | −.14 | −.12 | −.11 | −.07 |
| | Fuss-out rate | −.08 | −.07 | −.04 | −.03 |
| | Gender | | −.06 | −.05 | −.05 |
| | WWHR | | | .20 | .43* |
| | Gender × WWHR | | | | .32 |

*Note.* Gender (coded 0 = male, 1 = female) moderated all associations between WWHR and preschool adjustment except for the Vineland. *B,* standardized regression coefficient; ICU, Inventory of Callous–Unemotional Traits; SRS, Social Responsiveness Scale; CBCL, Child Behavior Checklist; Vineland, Vineland Adaptive Behavior Scales II; WWHR, weighted with hypothesis rate.

* $p < .05$.

** $p < .01$.

$p = .004$, and the CBCL, $\beta = -0.52$, 95% CI [−0.94, −0.10], $t(46) = -2.48$, $p = .017$. In contrast, no associations were significant for girls, $ps > .238$ (Fig. 1). These results indicate that in the full sample including 2 boys with an ASD diagnosis as reported by their parents, male preschoolers' better social and behavioral adjustment was predicted by their preference for moral actions during infancy.

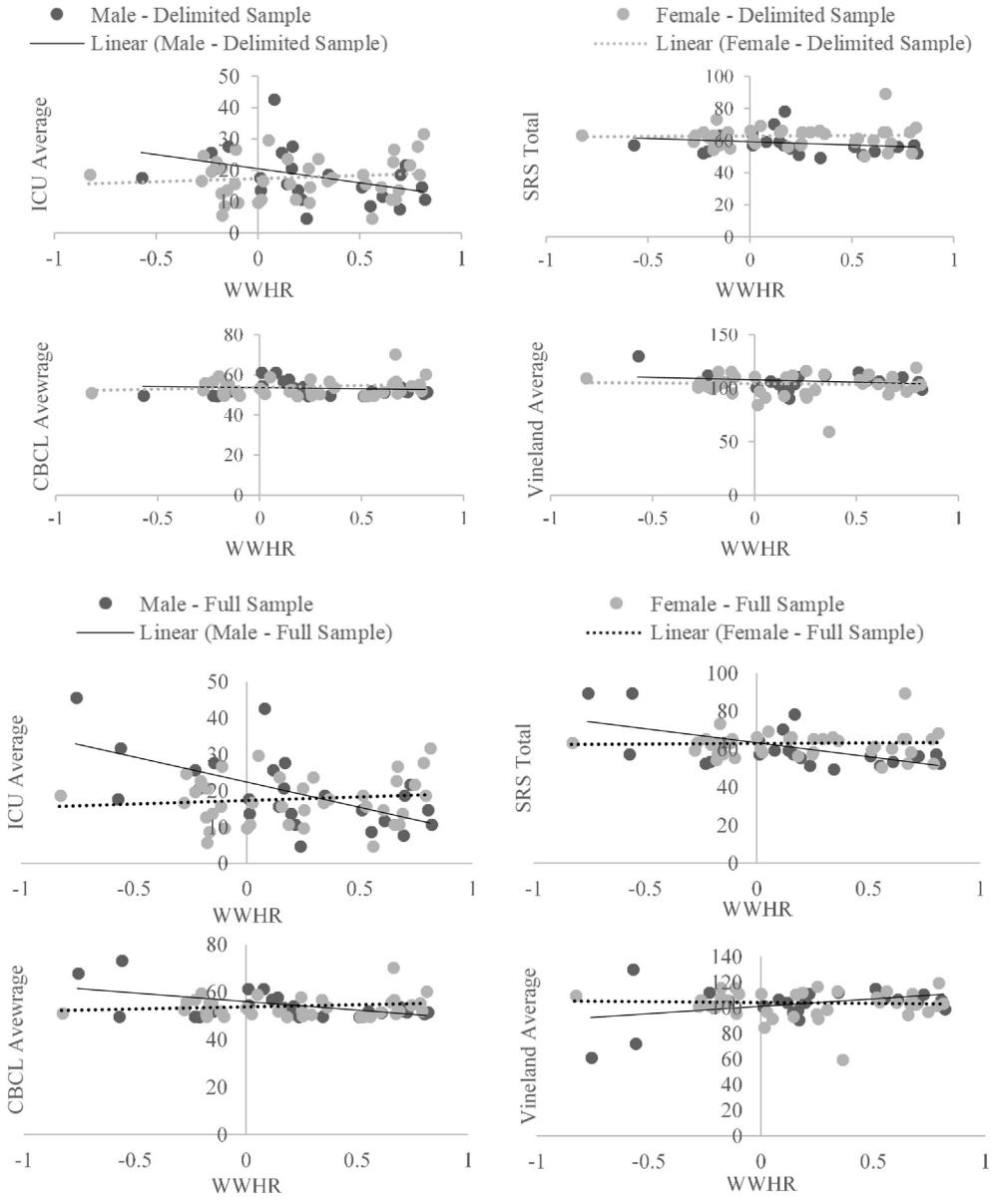


**Fig. 1.** Linear regressions for the delimited sample and the full sample. For the Inventory of Callous–Unemotional Traits (ICU), Social Responsiveness Scale (SRS), and Child Behavior Checklist (CBCL), lower scores represent better functioning; for the Vineland Adaptive Behavior Scales II (Vineland), higher scores indicate better functioning. WWHR, weighted with hypothesis rate.

## Discussion

Our results demonstrate that individual differences in observed sociomoral competence during infancy are associated with future parent-reported social and behavioral adjustment, particularly within the moral domain. These findings provide evidence for developmental continuity between early sociomoral evaluations and behaviors and later sociomoral traits. What accounts for the observed continuity? One class of explanations relies on factors internal to the child. For example, WWHR may reflect domain-specific capacities for sociomoral evaluation or action that incorporate empathy, social understanding, and moral reasoning. These capacities continue to shape social and moral functioning throughout the life span. On the other hand, WWHR might represent a composite measure of lower-level social and cognitive abilities (e.g., attention, memory), each of which is stable over time and independently contributes to the development of good social and behavioral adjustment during preschool (see also Shenhav & Greene, 2010; Young & Dungan, 2012). The fact that the largest effects for WWHR were found in predicting preschool callous–unemotional traits on the ICU supports the first account. However, because these data were based on a relatively small opportunity sample, significant additional scrutiny is needed to further tease apart these two possibilities. Future studies must use a larger sample and incorporate other infant tasks (including both sociomoral and non-sociomoral tasks) and child measures (e.g., general IQ) in order to test whether the relationships observed in this sample hold.

Continuity in the sociomoral domain likely also results from stability in factors external to the child as well as from the interaction between internal and external factors. For example, early individual differences in social and moral functioning may elicit differential responses from parents. These responses in turn affect children's sociomoral development, perpetuating early individual differences (Kochanska, 1993). To examine the impact of familial environment and the interaction between children's internal characteristics and parental behaviors, future studies should include parental behaviors in the model as potential contributors to preschoolers' sociomoral development—both as main effects and in interaction with children's characteristics (see, e.g., Cowell & Decety, 2015).

The findings of the current study suggest that infant measures of sociomoral evaluation are meaningful inasmuch as there is developmental continuity in sociomoral functioning from infancy to preschool. Consistent with our hypothesis, without 2 children with parent-reported ASD, the effect of WWHR on preschool callous–unemotional traits as measured by the ICU was the only significant effect observed, and in the full sample the effect was largest for the ICU. We speculate that this association may be particularly strong because, of all our measures of preschool adjustment, the ICU is most closely linked to moral development. Indeed, callous–unemotional traits assessed by the ICU are used to classify a particular subgroup of aggressive children (Frick & White, 2008) in which aggressive behavior is accompanied by lack of remorse for wrongdoing and poor empathy. This combination is hypothesized to relate to psychopathy during adulthood (Barry et al., 2000; Frick, O'Brien, Wootton, & McBurnett, 1994). Our findings suggest that precursors to this developmental trajectory may begin during infancy.

Although no gender differences were observed in WWHR, indicating that male and female infants responded similarly to our infant tasks, the associations between WWHR and preschool adjustment were unique to boys in the full sample. We note that when 2 boys with an ASD diagnosis were removed from the sample, the interaction between gender and WWHR failed to reach significance. Therefore, it is possible that the gender differences observed in the full sample were driven purely by these 2 extreme cases. Alternatively, if gender differences in continuity in the sociomoral domain do exist in the population, there are multiple potential explanations for this result. One possibility, supported by past research, is that there are gender differences in the tendency to be influenced by one's environment over development. That is, it may be that both boys' and girls' performance in sociomoral evaluation tasks during infancy did indeed reflect some sort of individual difference in sociomoral functioning but that the girls in our sample were subsequently more influenced by their environments than were the boys, and these environmental influences were more predictive of girls' sociomoral functioning as preschoolers. Indeed, this possibility is consistent with several other studies in the literature; Conger et al. (1993) found that girls are more sensitive to parents' negative mood

caused by economic stress than are boys; Griffin, Botvin, Scheier, Diaz, and Miller (2000) found that girls are more responsive to parenting practices that reduce problem behaviors than are boys; and Bedford, Pickles, Sharp, Wright, and Hill (2015) found that higher maternal sensitivity during infancy is related to lower callous–unemotional traits during preschool in girls but not in boys. Based on these results, it seems plausible that girls' lack of continuity is the result of being particularly susceptible to input from the environment.

Our results should be interpreted in light of the characteristics of our study design. On the plus side, the fact that the associations were found between observed behaviors (during infancy) and parent-reported behaviors (during preschool) suggests that these associations were not driven by consistent experimenter or parental biases in assessing children's behaviors. On the downside, due to low availability of infant participants and the stringent inclusion criteria of the study, our results are based on a relatively small sample size (but see Lauer & Lourenco, 2016, for a similar longitudinal sample size). We note that of all infants who were eligible for inclusion, we successfully recruited more than 90% of them, and that our power to observe significant effects was .92. Second, to attain sufficient data points for each participant and increase sample size, we included studies that used very different procedures (e.g., reaching choices, prosocial behaviors), studies that had relatively low effect sizes (provided that the studies had clear directional predictions), and studies that involved both moral and nonmoral (as opposed to purely moral) content. This practice presumably added noise to our data. Future work should attempt to tease apart the relative contribution of each type of procedure to the correlations observed here and increase sample size so that more stringent study inclusion criteria (e.g., strong effect size, pure moral content) can be adopted. Finally, and critically, the current study used a correlational design, which prevents causal conclusions.

In sum, the current study provides evidence that infants' performance on sociomoral evaluation studies is predictive of preschool social and moral adjustment. These findings shed light on the nature of developmental continuity in the sociomoral domain and suggest that infants' early behavioral tendencies may be building blocks for subsequent sociomoral development. Future research should seek to replicate these initial results and further explore the specific roles of biological, emotional, cognitive, and social factors in this developmental continuity.

## Acknowledgments

This work was supported in part by a University of British Columbia (UBC) Hampton Fund Research Grant to K. Hamlin. We thank Susan Birch for comments and thank Shannon Bridson, Hannah de Vries, Vivian Wong, Rachelle Graham, Paniz Pasha, Adrienne Young, Brianna Vissers, Stacy Luzhanska, Thaddeus Grams, and Adam Shillington for their assistance. The data reported in the article are deposited in the Department of Psychology at UBC. The authors have no conflicts of interest to declare.

## Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jecp.2018.07.003.

## References

Achenbach, T. (1992). *Manual for the child behavior checklist/2-3 and 1992 profile*. Burlington: University of Vermont, Department of Psychiatry.

Achenbach, T., & Rescorla, L. (2000). *Manual for the ASEBA preschool forms & profiles*. Burlington: University of Vermont, Research Center for Children, Youth, & Families.

Barry, C. T., Frick, P. J., DeShazo, T. M., McCoy, M., Ellis, M., & Loney, B. R. (2000). The importance of callous–unemotional traits for extending the concept of psychopathy to children. *Journal of Abnormal Psychology, 109*, 335–340.

Bedford, R., Pickles, A., Sharp, H., Wright, N., & Hill, J. (2015). Reduced face preference in infancy: A developmental precursor to callous–unemotional traits? *Biological Psychiatry, 78*, 144–150.

Bölte, S., Poustka, F., & Constantino, J. (2008). Assessing autistic traits: Cross-cultural validation of the Social Responsiveness Scale (SRS). *Autism Research, 1*, 354–363.

Bornstein, M. H. (1985). Habituation of attention as a measure of visual information processing in human infants: Summary, systematization, and synthesis. In G. Gottlieb & N. A. Krasnegor (Eds.), *Measurement of audition and vision in the first year of postnatal life: A methodological overview* (pp. 253–300). Westport, CT: Ablex.
Bornstein, M. H. (2014). Human infancy and the rest of the lifespan. *Annual Review of Psychology, 65*, 121–158.
Bornstein, M. H., & Tamis-LeMonda, C. S. (1994). Antecedents of information-processing skills in infants: Habituation, novelty responsiveness, and cross-modal transfer. *Infant Behavior and Development, 17*, 371–380.
Brownell, C. A. (2016). Prosocial behavior in infancy: The role of socialization. *Child Development Perspectives, 10*, 222–227.
Buon, M., Jacob, P., Margules, S., Brunet, I., Dutat, M., Cabrol, D., et al (2014). Friend or foe? Early social evaluation of human interactions. *PLoS One, 9*(2), e88612.
Burns, M. P., & Sommerville, J. (2014). "I pick you": The impact of fairness and race on infants' selection of social partners. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.00093.
Conger, R. D., Conger, K. J., Elder, G. H., Lorenz, F. O., Simons, R. L., & Whitbeck, L. B. (1993). Family economic stress and adjustment of early adolescent girls. *Developmental Psychology, 29*, 206–219.
Constantino, J., & Gruber, C. (2005). *Social Responsiveness Scale (SRS)*. Los Angeles: Western Psychological Services.
Cowell, J. M., & Decety, J. (2015). Precursors to morality in development as a complex interplay between neural, socioenvironmental, and behavioral facets. *Proceedings of the National Academy of Sciences of the United States of America, 112*, 12657–12662.
Dadds, M. R., Hawes, D. J., Frost, A. D. J., Vassallo, S., Bunn, P., Hunter, K., et al (2009). Learning to "talk the talk": The relationship of psychopathic traits to deficits in empathy across childhood. *Journal of Child Psychology and Psychiatry, 50*, 599–606.
Dahl, A., Schuck, R. K., & Campos, J. J. (2013). Do young toddlers act on their social preferences? *Developmental Psychology, 49*, 1964–1970.
Davidov, M., Zahn-Waxler, C., Roth-Hanania, R., & Knafo, A. (2013). Concern for others in the first year of life: Theory, evidence, and avenues for research. *Child Development Perspectives, 7*, 126–131.
Dunfield, K. A., Kuhlmeier, V. A., O'Connell, L., & Kelley, E. (2011). Examining the diversity of prosocial behavior: Helping, sharing, and comforting in infancy. *Infancy, 16*, 227–247.
Ezpeleta, L., de la Osa, N., Granero, R., Penelo, E., & Domènech, J. M. (2013). Inventory of callous–unemotional traits in a community sample of preschoolers. *Journal of Clinical Child & Adolescent Psychology, 42*, 91–105.
Feilhauer, J., Cima, M., Benjamins, C., & Muris, P. (2013). Knowing right from wrong, but just not always feeling it: Relations among callous–unemotional traits, psychopathological symptoms, and cognitive and affective morality judgments in 8- to 12-year-old boys. *Child Psychiatry & Human Development, 44*, 709–716.
Frick, P. J. (2003). *The inventory of callous-unemotional traits*. New Orleans, LA: University of New Orleans.
Frick, P. J., Cornell, A. H., Bodin, S. D., Dane, H. E., Barry, C. T., & Loney, B. R. (2003). Callous–unemotional traits and developmental pathways to severe conduct problems. *Developmental Psychology, 39*, 246–260.
Frick, P. J., O'Brien, B. S., Wootton, J. M., & McBurnett, K. (1994). Psychopathy and conduct problems in children. *Journal of Abnormal Psychology, 103*, 700–707.
Frick, P. J., & White, S. F. (2008). Research review: The importance of callous–unemotional traits for developmental models of aggressive and antisocial behavior. *Journal of Child Psychology and Psychiatry, 49*, 359–375.
Geraci, A., & Surian, L. (2011). The developmental roots of fairness: Infants' reactions to equal and unequal distributions of resources. *Developmental Science, 14*, 1012–1020.
Griffin, K. W., Botvin, G. J., Scheier, L. M., Diaz, T., & Miller, N. L. (2000). Parenting practices as predictors of substance use, delinquency, and aggression among urban minority youth: Moderating effects of family structure and gender. *Psychology of Addictive Behaviors, 14*, 174–184.
Haith, M. M. (1998). Who put the cog in infant cognition? Is rich interpretation too costly? *Infant Behavior and Development, 21*, 167–179.
Hamlin, J. K. (2014). Context-dependent social evaluation in 4.5-month-old human infants: The role of domain-general versus domain-specific processes in the development of social evaluation. *Frontiers in Psychology, 5*. https://doi.org/10.3389/fpsyg.2014.00614.
Hamlin, J. K., Ullman, T., Tenenbaum, J., Goodman, N., & Baker, C. (2013). The mentalistic basis of core social cognition: Experiments in preverbal infants and a computational model. *Developmental Science, 16*, 209–226.
Hamlin, J. K., & Wynn, K. (2011). Young infants prefer prosocial to antisocial others. *Cognitive Development, 26*, 30–39.
Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*, 557–559.
Hamlin, J. K., Wynn, K., & Bloom, P. (2010). Three-month-olds show a negativity bias in their social evaluations. *Developmental Science, 13*, 923–929.
Hamlin, J. K., Wynn, K., & Bloom, P. (2012). Reply to Scarf et al.: Nuanced social evaluation: Association doesn't compute. *Proceedings of the National Academy of Sciences, 109*, E1427.
Hamlin, J. K., Wynn, K., Bloom, P., & Mahajan, N. (2011). How infants and toddlers react to antisocial others. *Proceedings of the National Academy of Sciences of the United States of America, 108*, 19931–19936.
Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics, 42*, 377–381.
Holmbeck, G. N. (2002). Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *Journal of Pediatric Psychology, 27*, 87–96.
Hus, V., Bishop, S., Gotham, K., Huerta, M., & Lord, C. (2013). Factors influencing scores on the Social Responsiveness Scale. *Journal of Child Psychology and Psychiatry, 54*, 216–224.
Jones, A. P., Happé, F. G. E., Gilbert, F., Burnett, S., & Viding, E. (2010). Feeling, caring, knowing: Different types of empathy deficit in boys with psychopathic tendencies and autism spectrum disorder. *Journal of Child Psychology and Psychiatry, 51*, 1188–1197.
Kanakogi, Y., Inoue, Y., Matsuda, G., Butler, D., Hiraki, K., & Myowa-Yamakoshi, M. (2017). Preverbal infants affirm third-party interventions that protect victims from aggressors. *Nature Human Behaviour, 1*. https://doi.org/10.1038/s41562-016-0037.

Keenan, K., & Shaw, D. (1997). Developmental and social influences on young girls' early problem behavior. *Psychological Bulletin, 121*, 95–113.
Kimonis, E. R., Fanti, K. A., Anastassiou-Hadjicharalambous, X., Mertan, B., Goulter, N., & Katsimicha, E. (2016). Can callous–unemotional traits be reliably measured in preschoolers? *Journal of Abnormal Child Psychology, 44*, 625–638.
Kimonis, E. R., Frick, P. J., Skeem, J. L., Marsee, M. A., Cruise, K., Munoz, L. C., et al (2008). Assessing callous–unemotional traits in adolescent offenders: Validation of the Inventory of Callous-Unemotional Traits. *International Journal of Law and Psychiatry, 31*, 241–252.
Knafo, A., Zahn-Waxler, C., Van Hulle, C., Robinson, J. L., & Rhee, S. H. (2008). The developmental origins of a disposition toward empathy: Genetic and environmental contributions. *Emotion, 8*, 737–752.
Kochanska, G. (1993). Toward a synthesis of parental socialization and child temperament in early development of conscience. *Child Development, 64*, 325–347.
Lauer, J. E., & Lourenco, S. F. (2016). Spatial processing in infancy predicts both spatial and mathematical aptitude in childhood. *Psychological Science, 27*, 1291–1298.
Margoni, F., & Surian, L. (2016). Explaining the U-shaped development of intent-based moral judgments. *Frontiers in Psychology, 7*. https://doi.org/10.3389/fpsyg.2016.00219.
McCall, R. B., & Carriger, M. S. (1993). A meta-analysis of infant habituation and recognition memory performance as predictors of later IQ. *Child Development, 64*, 57–79.
Nichols, S. R., Brownwell, C. A., & Svetlova, M. (2013). Converging developments in prosocial behavior and self–other understanding in the second year of life: The second social-cognitive revolution. In M. R. Banaji & S. A. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 385–390). Oxford, UK: Oxford University Press.
Ohr, P. S., Feingold, J., & Fagen, J. W. (2006). Predicting adolescent anxiety ratings from infant behavioral style in response to expectancy violation. *Applied Developmental Science, 10*, 147–156.
Papageorgiou, K. A., Smith, T. J., Wu, R., Johnson, M. H., Kirkham, N. Z., & Ronald, A. (2014). Individual differences in infant fixation duration relate to attention and behavioral control in childhood. *Psychological Science, 25*, 1371–1379.
Paulus, M. (2014). The emergence of prosocial behavior: Why do infants and toddlers help, comfort, and share? *Child Development Perspectives, 8*, 77–81.
Paulus, M. (2018). The multidimensional nature of early prosocial behavior: A motivational perspective. *Current Opinion in Psychology, 20*, 111–116.
Rhee, S. H., Friedman, N. P., Boeldt, D. L., Corley, R. P., Hewitt, J., Knafo, A., et al (2013). Early concern and disregard for others as predictors of antisocial behavior. *Journal of Child Psychology and Psychiatry, 54*, 157–166.
Rheingold, H. L. (1982). Little children's participation in the work of adults, a nascent prosocial behavior. *Child Development, 53*, 114–125.
Roth-Hanania, R., Davidov, M., & Zahn-Waxler, C. (2011). Empathy development from 8 to 16 months: Early signs of concern for others. *Infant Behavior and Development, 34*, 447–458.
Salvadori, E., Blazsekova, T., Volein, A., Karap, Z., Tatone, D., Mascaro, O., et al (2015). Probing the strength of infants' preference for helpers over hinderers: Two replication attempts of Hamlin and Wynn (2011). *PLoS One, 10*(11), e0140570.
Scarf, D., Imuta, K., Colombo, M., & Hayne, H. (2012a). Golden rule or valence matching? Methodological problems in Hamlin et al. *Proceedings of the National Academy of Sciences of the United States of America, 109*, E1426.
Scarf, D., Imuta, K., Colombo, M., & Hayne, H. (2012b). Social evaluation or simple association? Simple associations may explain moral reasoning in infants. *PLoS One, 7*(8), e42698.
Schmidt, M., & Sommerville, J. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS One, 6* (10), e23223.
Scola, C., Holvoet, C., Arciszewski, T., & Picard, D. (2015). Further evidence for infants' preference for prosocial over antisocial behaviors. *Infancy, 20*, 684–692.
Shenhav, A., & Greene, J. D. (2010). Moral judgments recruit domain-general valuation mechanisms to integrate representations of probability and magnitude. *Neuron, 67*, 667–677.
Sirois, S., & Mareschal, D. (2004). An interacting systems model of infant habituation. *Journal of Cognitive Neuroscience, 16*, 1352–1362.
Slater, A., Cooper, R., Rose, D., & Morison, V. (1989). Prediction of cognitive performance from infancy to early childhood. *Human Development, 32*, 137–147.
Sparrow, S. (2011). Vineland Adaptive Behavior Scales. In J. Kreutzer, J. DeLuca, & B. Caplan (Eds.), *Encyclopedia of clinical neuropsychology* (pp. 2618–2621). New York: Springer.
Sparrow, S., Cicchetti, D., & Balla, D. (2005). *Vineland Adaptive Behavior Scales-Second Edition (Vineland II): Survey interview form/caregiver rating form*. Livonia, MN: Pearson Assessments.
Starr, A., Libertus, M. E., & Brannon, E. M. (2013). Number sense in infancy predicts mathematical abilities in childhood. *Proceedings of the National Academy of Sciences of the United States of America, 110*, 18116–18120.
Tafreshi, D., Thompson, J. J., & Racine, T. P. (2014). An analysis of the conceptual foundations of the infant preferential looking paradigm. *Human Development, 57*, 222–240.
Tamis-LeMonda, C. S., & Bornstein, M. H. (1989). Habituation and maternal encouragement of attention in infancy as predictors of toddler language, play, and representational competence. *Child Development, 60*, 738–751.
Tasimi, A., & Wynn, K. (2016). Costly rejection of wrongdoers by infants and children. *Cognition, 151*, 76–79.
Thoermer, C., Sodian, B., Vuori, M., Perst, H., & Kristen, S. (2012). Continuity from an implicit to an explicit understanding of false belief from infancy to preschool age. *British Journal of Developmental Psychology, 30*, 172–187.
Vaish, A., Carpenter, M., & Tomasello, M. (2009). Sympathy through affective perspective taking and its relation to prosocial behavior in toddlers. *Developmental Psychology, 45*, 534–543.
Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311*, 1301–1303.
Wellman, H. M., Lopez-Duran, S., LaBounty, J., & Hamilton, B. (2008). Infant attention to intentional action predicts preschool theory of mind. *Developmental Psychology, 44*, 618–623.

Yamaguchi, M., Kuhlmeier, V. A., Wynn, K., & VanMarle, K. (2009). Continuity in social cognition from infancy to childhood. *Developmental Science, 12*, 746–752.
Young, L., & Dungan, J. (2012). Where in the brain is morality? Everywhere and maybe nowhere. *Social Neuroscience, 7*, 1–10.
Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology, 28*, 126–136.
Ziv, T., & Sommerville, J. A. (2016). Developmental differences in infants' fairness expectations from 6 to 15 months of age. *Child Development*. https://doi.org/10.1111/cdev.12674. Advance online publication.