

Nature and determinants of socio-moral development: Theories, methods and applications

Edited by

Alessandra Geraci, Paola Rigo, Laura Franchin and
Aner Govrin

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Nature and determinants of socio-moral development: Theories, methods and applications

Topic editors

Alessandra Geraci — Dante Alighieri University for Foreigners, Italy

Paola Rigo — University of Padua, Italy

Laura Franchin — University of Trento, Italy

Aner Govrin — Bar-Ilan University, Israel

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EDITED AND REVIEWED BY
Pamela Bryden,
Wilfrid Laurier University, Canada

*CORRESPONDENCE
Alessandra Geraci
✉ geraci.ale@gmail.com

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Editorial: Nature and determinants of socio-moral development: theories, methods and applications

Alessandra Geraci^{1*}, Laura Franchin², Aner Govrin³ and Paola Rigo⁴

¹Department of Social Science and Education, University for Foreigners, Reggio Calabria, Italy,

²Department of Psychology and Cognitive Science, University of Trento, Rovereto, Italy, ³Department of Hermeneutics and Cultural Studies, Bar-Ilan University, Ramat Gan, Israel, ⁴Department of Developmental Psychology and Socialization, University of Padua, Padua, Italy

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Editorial on the Research Topic

Nature and determinants of socio-moral development: theories, methods and applications

Introduction

In the last two decades, several developmental researchers explored the ontogenesis of morality, revealing an earlier origin of the moral sense (Hamlin et al., 2007; Hamlin, 2013a), and sophisticated abilities starting from 3 months of age (for a recent review see Woo et al., 2022). In particular, preverbal infants and toddlers demonstrated the ability to make social evaluations of different prosocial actions, such as helping behaviors (e.g., Hamlin et al., 2007, 2010; Surian and Franchin, 2017a; Geraci and Franchin, 2021), distributive actions (e.g., Geraci and Surian, 2011, 2023a; Surian and Franchin, 2017b; Franchin et al., 2019), protecting behaviors (e.g., Kanakogi et al., 2013), affiliative behaviors (e.g., Geraci et al., 2022a) and comforting behaviors (Geraci et al., 2021). Other studies provide evidence for infants' ability to evaluate others' actions by considering the agents' intentions in different prosocial interactions (Hamlin, 2013b; Strid and Meristo, 2020; Geraci et al., 2022b; Geraci and Surian, 2023b). Moreover, infants showed a tendency to punish harming agents (Kanakogi et al., 2022), as well as they expect a bystander to punish antisocial agents (e.g., Hamlin et al., 2011; Kanakogi et al., 2017; Geraci and Surian, 2023b).

To account for this evidence, different explanations for moral development coexist, and yet, there is no consensus in the scientific community, as in the case of the debate between nativist (e.g., Wynn et al., 2018; Ting et al., 2019) and constructivists (Dahl, 2018; Smetana et al., 2018). Moreover, there is little evidence of the impact of the determinants on moral development, such as socio-emotional development and early environmental effects (Govrin, 2014). To broaden the knowledge of socio-moral development, this Research Topic of contributions included articles from different theoretical positions that focus on the methods used and on the applicative aspects. This Research Topic provided a collection of recent advances and novel contributions, empirical studies and review, on the emergence and development of moral sense.

Overview of contributions

Studies published in this Research Topic addressed two characteristics: a focus on exploring methods that are used by researcher according to different theoretical approaches, and a novel contribution to the literature on the socio-moral development.

On the emergence of morality in the first years of life, the following empirical study shed light on an early-emerging moral sense that works in different domains, and forms expectations on others' behaviors.

Gill and Sommerville explored whether 14-to 27-month-old toddlers use prior behavior to form expectations about future behavior within the moral domain, focusing on the sub-domains of fairness and help/harm. Their results suggest that infants utilize prior information from one moral sub-domain to form expectations of how an individual will behave in another sub-domain, especially after seeing hindering and unfair distributions. These findings provide evidence for a well-organized work of the moral domain.

On the development of prosociality, the next empirical contributions emphasizes that, in early childhood, helping, comforting and sharing behaviors are influenced by goal pursuit motivations, membership, and the social interaction contexts.

Karasewich et al. to examine the contexts in which shy children may be more or less likely to engage in prosocial behaviors, assessed 3.5- to 4.5-year-olds with prosocial problems, which were different from the type of intervention required (helping vs. comforting) and the source of the problem (social or object). Most of the children acted prosocially in the two helping tasks and in the object-centered comforting task, whereas shyer children were not less likely to intervene in all tasks. These findings provide insights into the methodological challenges of disentangling children's prosocial motivation, providing applicative implications.

Park and Jin investigated whether ingroup belonging reduces ingroup favoritism in 6-year-olds in terms of costly sharing, by applying a minimal-group paradigm. They found that children in the ingroup-exclusion and no-interaction conditions shared more resources with their ingroup members than outgroup members, while children in the ingroup-inclusion condition shared equally with the ingroup and outgroup members. These findings shed light on the role of the membership in sharing behaviors.

Hallers-Haalboom et al. examined the willingness of children to share more food with friends or acquaintances, through a previous published paradigm to replicate and extend knowledge on the topic (Birch and Billman, 1986). 3- to 6-year-olds were coupled with a friend or an acquaintance in a semi-natural context to assess the effect of food preference on sharing food and the interaction between type of relationship and sex. Overall, children were more willing to share non-preferred food. Additionally, boys were more likely to share with friends and girls with acquaintances. Only a partial replication of the results was found. The study highlights a growing need for replications and evaluation of the effects of socio-contextual aspects in more natural contexts.

Moreover, the additional empirical study highlights an interesting association between emotional comprehension, prosociality and conflict resolution strategies in early childhood.

Cao et al. investigated on the relation between emotional comprehension and peer conflict resolution strategies, by assessing 3-to 6-year-olds with the Test of Emotional Comprehension, and their preschool teachers with a Conflict Resolution Strategy Questionnaire. Their findings demonstrated that children with a good emotional comprehension have better prosocial behaviors, which in turn can positively predict the overall conflict resolution strategies.

Finally, the following literature review contributions highlights the role of social and interactive experiences and environmental factors on socio-moral development during the first years of life.

Tarsha and Narvaez investigated the influence of early social experiences on child neurobiological and sociomoral outcomes, specifically, the oxytocinergic system and prosociality, respectively. This review suggests that evolved nest components influence oxytocinergic functioning in parents and children, and contribute to the foundations for prosociality.

Carpendale and Wallbridge adopted a process-relational perspective and drew on developmental systems theory in arguing that infants born with emerging abilities to act and react without knowing about prosociality or morality. In their opinion, prosociality and morality emerge at the level of interaction within a human developmental system. The paper encourages reflection and helps to reconsider different theoretical perspectives that the literature presents today, which are equally interesting and significant contribution to better understand the early prosocial development.

Lu explored the link between goal pursuit motivation and prosociality in a pandemic context. Polish participants were randomly assigned to a simulated cartoon of the parable of the Good Samaritan, in which the normative focus on prevention or promotion was manipulated. The results confirmed a certain favorable trend toward offering help in both regulatory focus conditions, demonstrating a dynamic association between goal pursuit motivation and prosocial behavior.

Chen et al. implementing a bibliometrics approach, examined the dynamics and progress of the research agenda on moral education research. Specifically, they assessed basic quantitative information from studies published from January 2000 to September 2022, such as highly authors, organizations and countries, top-cited articles and journals. Then, applying cluster analyses, the authors organized the results. According to the authors, any research field is a dynamic process and requires effort from researchers to evaluate its evolution.

Limone and Toto investigated the overall contributing factors of the moral sense emergence and development, by a systematic review (PRISMA model). 26 studies were finally selected for the systematic review. Their findings suggested that, on the one hand, the moral sense appears to be an innate ability and that, on the other, social interactions and environmental factors can influence its expression and development.

Perspectives

First studies on moral sense in infancy showed that by the end of the first year, infants possess a range of basic moral skills (e.g.,

Kuhlmeier et al., 2003; Hamlin et al., 2007, 2010, 2011; Geraci and Surian, 2011; Hamlin and Wynn, 2011; Sloane et al., 2012; Hamlin, 2013a,b). Subsequent research demonstrated that infants have the essential cognitive skills to make intuitive moral judgments in different prosocial contexts (for a review Woo et al., 2022). Moreover, other works found that infants can attribute causality, know others' intentions, and identify membership (e.g., Baillargeon et al., 2015). We have assumed that these early-emerging abilities, as well as a rich and multisensory set of experiences, can be the source of the infant's knowledge of what to expect from others in various situations. However, in contrast to other researchers who thought that these social skills are developed in a vacuum and isolation from the infant's early ties (e.g., Hamlin, 2013a), some researchers assume that participation in the dyadic interaction reorganizes intrapsychic and relational processes (Govrin, 2014, 2019). These processes become the foundations of understanding and experiencing regularities of behavioral patterns in other dyadic relations. The role of dyad (i.e., the mother-baby dyad) on socio-moral development remains still unclear and little explored.

Perhaps, the main limitation emerged from this Research Topic is the lack of attention by researchers to the role of the dyad, and family dynamics, in early moral development, therefore the influence of the socioemotional environment on this domain remains substantially unexplored.

As future directions, this Research Topic aims to suggest an alternative way for research on moral development, by proposing a more interactionist methodological approach that takes into account different variables. There is a lack of infant research about the determinants of moral development, to the point that the knowledge of moral development remains contested between different theoretical approaches, excluding the possibility of a dialogue that can shed light on some unknown aspects. We believe that new infant research is needed to address the early relations between social context and moral development (Kelley and Power, 2013; Ziv and Sommerville, 2017; Dahl, 2018).

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Author contributions

AG: Conceptualization, Data curation, Methodology, Resources, Supervision, Writing—original draft, Writing—review and editing. LF: Methodology, Data curation, Supervision, Visualization, Writing—original draft, Writing—review and editing. AG: Methodology, Data curation, Supervision, Writing—original draft, Writing—review and editing. PR: Conceptualization, Data curation, Methodology, Supervision, Writing—original draft, Writing—review and editing.

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The Good Samaritan Parable Revisited: A Survey During the COVID-19 Pandemic

Yong Lu*

Institute of Psychology, Faculty of Christian Philosophy, Cardinal Stefan Wyszyński University in Warsaw, Warsaw, Poland

From an integrative approach of parable interpretation that combines ethical, evolutionary, historical, and psychological perspectives, the current research empirically examined the purely theorized assumption elucidating the behaviors of the priest, Levite, and Samaritan in the good Samaritan parable (Luke 10:25-37) by the regulatory focus theory. In one experiment conducted during the COVID-19 outbreak, 93 Polish participants were randomly assigned to a simulated vignette of the good Samaritan parable where either the prevention or promotion regulatory focus was manipulated. The results confirmed a certain favorable tendency to offer quasi-realistic help in both the regulatory focus conditions. The finding highlights a dynamic association in goal pursuit motivation and prosocial behavior in a pandemic context regarding the good Samaritan parable. The current study is among rare empirical research which reflects a challenge people respond to offer help in simulated scenarios as original as the good Samaritan parable.

Keywords: COVID-19, empathy, helping behavior, prosocial behavior, regulatory focus theory

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Edited by:

Alessandra Geraci,
University of Trento, Italy

Reviewed by:

Pavel Aleksandrovich Kislyakov,
Russian State Social University, Russia
Damian Odo,
University of Nigeria, Nigeria

*Correspondence:

Yong Lu
luyong@student.uksw.edu.pl

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1. INTRODUCTION

The parable of the compassionate Samaritan (Luke 10:30-37) has been among the most famous narrative portrayals that were exemplified by Jesus. In the parable, Jesus is abruptly interrupted by an expert in the law who intends to test the Lord (Luke 10:25). The expert asks, “Who is my neighbor?” (Luke 10:29b, *The Bible*, New International version and so subsequently). As the majority of rabbinic parables functions as exegeses of the scriptural text or narrative (Jeremias, 2003, pp. 112-113), Jesus puts forward the parable in order to elucidate the greatest commandment—“Love your neighbor as yourself” (Leviticus 19:18b; Luke 10:27b)—and a most proclaimed Confucius’ and Hellenistic “golden rule”—“What you do not want [sic] done to yourself, do not do to others” (refer to *Analects* 15.24; Luke 6:31; cf., Lu, 2020). In the parable, Jesus narrates that while a priest and a Levite journey away on the Jericho road from Jerusalem, they sequentially pass by and neglect an injured man. Nonetheless, to somewhat the audience’s surprise, an ignominious Samaritan, who performs as an example of one who loves his neighbor, comes to help the victim by bringing him to a sheltered place (cf., Luke 9:58b) and by instructing the innkeeper to spare no expense in his treatment (cf., Luke 2:7b; refer to Longenecker, 2009 for a characteristic interpretation on the innkeeper). However, it should be noted that the injured man is seemingly beaten unconscious by the robbers who also steal his clothes. As a result, the audience, being Jewish, can not identify, without his dialect and dress, what clan the injured man is belonged to and how much he is involved in his religion (cf., Green, 1997, p. 429). The paradigm of the good Samaritan parable serves to demonstrate that the demand to love God has to be complemented by

what God demands of the love of the neighbor. Further syntheses of the parable can be found in 2 Chronicles 28:15 and Deuteronomy 10:18-19, and further hermeneutic and hypertextual exegeses appear in Adamczewski (2010, pp. 319-322) and Proctor (2019).

In Temple times, priests and Levites were assumed to be different from each other with regard to ritual cleanness and uncleanness (Leviticus 10:10). More precisely, they were urged to maintain the natural state and to keep away from impurity, both of which belong, of any kind, to the disintegration of the body. As one of the central religious concerns and awareness in Judaism, impurity is a specifically nonstandard status to the extent to which a person loses his or her status of ritual purity because of inappropriate bodily processes or sins (Wenham, 1979, p. 23). Importantly, according to the Bible (cf., Leviticus 15 and Deuteronomy 23:11-12), the impurity can be imparted by certain sources of pollution, such as direct or indirect contact with a dead human body, blood (menstruation), sweat, scale diseases (i.e., leprosy), or any discharges from privy parts or sexual organs (e.g., excrement or urine). Particularly, the impurity can be even transmitted through the air from corpse contamination in certain extreme circumstances (cf., Exodus 19:14-22; Douglas, 1966, p. 51; Fröhlich, 2010, pp. 2-3). Nonetheless, human impurity is not regarded as a sin but simply a natural phenomenon that is often related to the natural functioning of the body. However, if priests and Levites defiled themselves (e.g., a contact with a dead body), they could neither enter the Temple's territory (courtyards) nor receive, give, and consume tithes. Specifically, even though priests had a responsibility to bury abandoned corpses, the defilement contaminated by corpses was still seen as the strongest impurity (cf., Salo, 1991, p.110; for ethical perspectives on priests and Levites, refer to Clark, 2014). Qumran records that death pollution makes impure the entire inner space of the house, i.e., whatever and whoever in the house, and they shall maintain unclean for 7 days (e.g., 11Q 19 XLIX.10; for general reviews on the system of ritual purity and impurity in Judaism, refer to Wright, 1992; Woolf, 2015).

According to the Bible, the Samaritans were descendants of Assyrians who settled in the former kingdoms of the land of Northern Israel in the Sargon time (cf., 2 Chronicles 28, Ezra, 2 Kings 17, Nehemiah; refer to also Fensham, 1982, p. 67; Frey et al., 2012). A large number of research regarding the Samaritan Pentateuch, papyri, inscriptions, archaeological discoveries, and others indicate that the Samaritans assembled as a small-sized communal group and resided in certain, locally bounded places near the temple on Mount Gerizim (refer to Fensham, 1982, p. 18). Moreover, the Samaritans preserved their seemingly self-rooted religious kinship systems, as mostly represented by a surrogate form of worshipping venerated YHWH, the God of Israel (cf., Anderson and Giles, 2002, pp. 24-34 and Pummer, 2010 for a brief introduction). According to Tanaitic sources, "The ways of the Cuthites are sometimes like idolaters, sometimes like Jews. Most of them are like Jews" (Tractate Cuthim 1,1), the Cuthites/Samaritans are classified neither as Jews nor as idol worshipers. Besides, the Second Temple Jews syncretized that the Samaritans were antitheses between Israelites and pagans with regard to their collective identities,

politics, and religious interests (Kartveit, 2009; cf., Matthew 10:5; John 4:9, 8:48, 9:51-56; for conjectural employments of the Samaritans and the historicity and socialization of relevance to the Second Temple period, refer to Knowles, 2004). Nevertheless, the Samaritans remained faithful servants of Israel's God. More recently, Chalmers (2020) argued against the conventionally scholarly exclusion of the Samaritans in first-century Palestine from Israelites—they were nevertheless understood by Jews as enmities; rather, the status of the Samaritans was presumably situated as an interactive inclusion of Samaritan Israelites rather than non-Israelite "others." Compared with Jews, due to a lack of knowledge of the ritual precept, the Samaritans were occasionally suspicious of their strictness of abiding by the legal system of impurity and purity (Amit, 2010, p. 263). In spite of the fact that there existed many rebuttals in late antiquity against the Samaritans by the Jewish tradition (refer to Schreiber, 2014, ch. 2), the Gospels show sympathetic perspectives on the ostensibly "alien" Samaritans (e.g., Luke 10:25-37, 17:16; John 4:39-42).

The present article aimed to empirically rephrase Lu's (2017a) theoretical study on the explanation of the good Samaritan parable by the regulatory focus theory. In the next section, we delineate this explanation from an integrative approach that combines ethical, evolutionary, historical, and psychological perspectives. Accordingly, we formulate a hypothesis for this novel argument featuring the parable in a more contemporary context. Then, we examined this hypothesis in a behavioral-judgmental experiment.

2. A SOCIAL, EVOLUTIONARY, AND BEHAVIORAL PERSPECTIVE ON THE GOOD SAMARITAN PARABLE

The narrative of the good Samaritan parable has been rated by the Jesus Seminar with 60% to be authentic and 29% to be probably authentic (Jones, 1999, p. 294). While many hermeneutical exegeses, humanitarian perceptions, socially justified law courts, and other fields have addressed it (for recent discussions, refer to Zimmermann, 2015; Rule, 2017; Zylla, 2017), only very limited social-psychological studies have attempted to duplicate a verisimilar situation in order to authentically examine the original parable's implications in the contemporary context. In fact, there appears to be only one relevant study so far by Darley and Batson (1973), who conducted a simulated good Samaritan field experiment in a between-subject design for male seminary participants who encountered a real "victim." The results showed that the experimental group who was primed to consider religious and ethical thoughts (i.e., a talk on the good Samaritan parable) was not more inclined to call for a helping response than the control group who was primed to other topics (e.g., a talk on the jobs instead).

Nevertheless, the research from contemporary psychological studies may provide insights into our understanding of the narrative of the good Samaritan parable. Recently, Lu (2017a) introduced the regulatory focus theory, which posits that a person intends to pursue a behavior in a way that maintains the person's own orient standpoints and desires (Higgins, 2012), as

a theoretical approach to interpreting the behaviors of the priest, Levite, and Samaritan in the parable. According to the theory, there coexist two distinct self-regulatory focuses: *prevention* and *promotion* (Higgins et al., 1994; Higgins, 2008; Hodiš, 2017). Individuals whose self-regulation has a prevention focus are inclined to perform a defensive strategy, which may lead to a high vulnerability to pessimistic circumstances, such as the prevention of errors and losses and the fulfillment of responsibilities. In contrast, when a promotion focus is dominated, individuals are likely to prefer an enthusiastic strategy, which may lead to a particular sensitivity to positive information, such as the pursuit of gains and aspiration toward ideals and hedonic pleasure (e.g., Crowe and Higgins, 1997; Uskul et al., 2009; Gino and Margolis, 2011). Past research has demonstrated the impact of regulatory focuses (e.g., prevention vs. promotion) on such as (un)ethical behaviors (e.g., Gino and Margolis, 2011) and decision-making strategies (e.g., Lu and Nieznański, 2017).

According to Lu's (2017a) purely theoretical conjecture, the priest and Levite in the good Samaritan parable were largely affected by their ritual restrictions, whereas the Samaritan was much less likely affected by his religious constraints as to which he must strictly abide by the similar laws of injunction against contact with the dead. Accordingly, the priest and Levite considered their defilement, specifically when it can be caused by touching a corpse, as their vital distress of humiliation. In contrast, it is argued that the Samaritan would regard his possible defilement as less serious suffering in consideration of his impertinent involvement relating to any religious services. Furthermore, the priest and Levite pursued a sturdy prevention focus of their self-regulation goals by taking into consideration any potential threats against safety, security, and vigilance. Thus, they neglected the victim in order to avoid a potentially risky menace of defilement. The Samaritan, however, had no goals to sustain the law of ritual cleanness, so his self-regulation goals were much less affected by the prevention focus. This resulted in the matter of fact that his empathy could override the risk of defilement and then could choose to help the victim. Nevertheless, the limitations of this interpretation were also addressed in that, in short, it applies contemporary psychological perspectives to the explication of a particular historical pericope. A similar elucidation was also done by Lu (2017b) who proposed a novel application of the false memory theory on the exegesis of Peter's denials of Jesus, but Howes (2017) criticized such attempts due to the conscious removal of the pre-Easter context when explicating the parables.

From an evolutionary point of view, the self-regulatory focuses of contemporary priests and Levites have changed tremendously, compared with the priest and Levite in the parable who were restricted by the ritual purity law, ethnically remote away from us, in specific areas of the Mediterranean, long ago. Nowadays in most areas, priests and Levites have not been necessary to daily abide by the ritual law, apart from celebrating the Eucharist or reading the Torah in the synagogue. Therefore, their occupational obligations have evolutionarily transformed from obeying the Jewish law into, e.g., showing themselves as good shepherds and practicing the idea of divine mercy toward people who need help. Furthermore, after hundreds of years of preaching the Gospels, both religious belief and helping behavior

are all correlated with Christian ethical virtues such as "having love and compassion for one's fellow man" and "being a good Samaritan" (Cline and Richards, 1965). This assumes a positive association between religiosity and prosocial tendency toward outgroups (e.g., Galen, 2012; Batara et al., 2016). Although contemporary research has shown that religious prosociality has been merely applied in certain circumstances (Norenzayan and Shariff, 2008), the explicit expression of the notion of agape or benevolence in the good Samaritan parable per se becomes a successful moderator to attenuate discrimination in certain instances (e.g., Johnson et al., 2015). Besides, the evidence from social identity theory showed that the application of the good Samaritan parable can directly reduce intergroup conflicts (Esler, 2000).

From a behavioral decision-making perspective, it is convincing to argue that the priest, Levite, and Samaritan in the parable took actions of either neglecting or helping the victim in a "completely" uncertain situation, where they could perceive the set of possible outcomes (e.g., defilement, delay/punctuality, mercy) for each action, but had no information about the probabilities of these outcomes. Consequently, each of the actions was related to an undetermined expected value represented by the set of possible outcomes corresponding to that action. Moreover, the decisions made by the priest, Levite, and Samaritan were unavoidably influenced by their underlying motivations and perceptions. Taken together, to summarize the variables suggested as affecting neglecting or helping behavior by the parable applied in contemporary society, the situational variables include the contents of one's fulfillment of obligations by priming prevention and non-regulatory focuses. The dispositional variables seem to involve types of religiosity. These variables suggest the following hypothesis:

Hypothesis. *When presumably encountering a situation possibly calling for an aiding response, individuals who are primed in a promotion regulatory focus condition by emphasizing on achieving gains are more likely to offer help than individuals who are primed in a prevention regulatory focus condition by emphasizing avoiding losses.*

3. METHODS

3.1. Participants

A total of 93 Polish participants, who were randomly assigned to the two regulatory focus conditions, participated in the experiment. The female percentage was 54.84%, and the mean age was 29.3 years ($SD = 9.3$). They were invited through emails *via* social media. The current research was one of three online experiments in which each participant received 50 PLN (Polish currency Złoty) (1 PLN worth approximately €0.24 at the time of the experiment) in total as compensation for their participation. The payments were made as online shopping cards from a Polish commercial retailer.

3.2. Design and Materials

We presented to the participants a quasi-realistic vignette of the good Samaritan parable, asking about the likelihood of the neglect or help behavior by considering three consequences:

Defilement, delay/punctuality, and mercy. The questionnaires were initially written in English and then were translated into Polish. The scenarios were back-translated to English in order to check that all the translated versions had the same contents. Half of the participants ($n = 45$) read the following scenario which evokes the prevention regulatory focus. Then, the participants responded to the question “You will neglect the victim” by

TABLE 1 | The probabilities resulted from neglecting the half-dead stranger with leprosy^a.

Defilement	Delay	Mercy
– (50%)	+ (0%)	– (100%)

^aOn a scale from 0% to 100%, ranging from – (loss) to + (gain), with probabilities in bracket (50% = chance level).

TABLE 2 | The probabilities resulted from helping the half-dead stranger with leprosy^a.

Defilement	Punctuality	Mercy
+ (50%)	– (0%)	+ (100%)

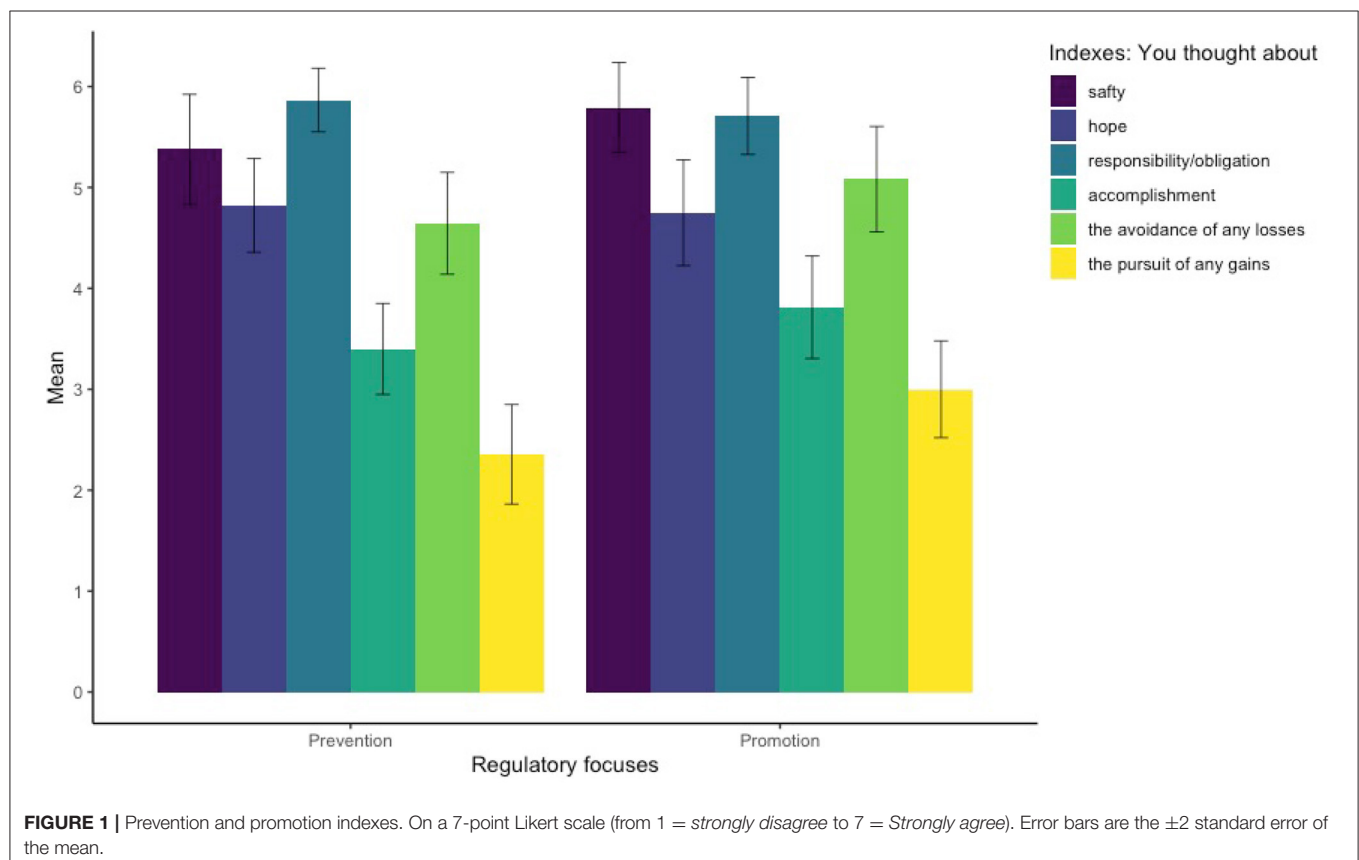
^aOn a scale from 0% to 100%, ranging from – (loss) to + (gain), with probabilities in bracket (50% = chance level).

indicating the extent to which they agreed with this statement (from 1 = *Strongly disagree* to 5 = *Strongly agree*).

Please imagine that while one day you are proceeding to take an exam at your university, you come across a half-dead victim with leprosy, who is left lying down by an alley. If you choose to neglect the victim, there is a 50% probability that you will be contagiously defiled by the skin disease, a 0% probability that you will be late to the exam, and a 100% probability that you will feel a lack of mercy (refer to **Table 1**). Please note that these three cues, i.e., defilement, delay, and mercy, are independent of each other.

The other half of the participants ($n = 48$) read the following scenario which evokes the promotion regulatory focus. Then, the participants responded to the question “You will help the victim” by indicating the extent to which they agreed with this statement (from 1 = *Strongly disagree* to 5 = *Strongly agree*).

Please imagine that while one day you are proceeding to take an exam at your university, you come across a half-dead victim with leprosy, who is left lying down by an alley. If you choose to help the victim, there is a 50% probability that you will be contagiously defiled by the skin disease, a 0% probability that you will be punctual to the exam, and a 100% probability that you will gain a compliment of mercy (refer to **Table 2**). Please note that these three cues, i.e., defilement, punctuality, and mercy, are independent of each other.



The probabilities of the consequences of defilement, delay/punctuality, and mercy that were presumably resulted from the neglect or help behavior were displayed using the format shown in **Tables 1, 2**, respectively. We constructed the average cue validations to be the same; therefore, the manipulations of the two regulatory focuses may be not influenced if the participants used normal criteria such as mean validations. Furthermore, we manipulated the scenario as a binary, weak-dominant three-attribute alternative choice problem, in which the two behaviors contain the quantity-same, albeit direction-opposite, cue validations for the three consequences, respectively (i.e., defilement: -50 vs. $+50\%$; delay: $+0$ vs. -0% ; mercy: -100 vs. $+100\%$); therefore, the manipulations of the two regulatory focuses may also be not influenced if the participants used aggregation heuristics such as the equate-to-differentiate rule (Lu, 2016) or the majority rule (Lu and Nieznański, 2017).

In order to check the effectiveness of the manipulations of the two regulatory focuses, we asked all the participants to answer the following questions: While you were reading about the scenario and question, please describe the extent to which (1) you thought about safety; (2) you thought about hope; (3) you thought about responsibility/obligation; (4) you thought about the accomplishment; (5) you thought about the avoidance of any losses; and (6) you thought about the pursuit of any gains. They responded on a 7-point Likert scale by indicating the extent to which they agreed with each statement (from 1 = *strongly disagree* to 7 = *Strongly agree*). The first, third, and fifth items were summed and averaged to form a prevention index, and the remaining three items were summed and averaged to form a promotion index.

3.3. Procedure

The experiment was conducted online during the COVID-19 outbreak, from December 2020 to February 2021. The participants received *via* email one leaflet containing the questions in PDF format (refer to **Appendix A,B**), and they answered individually at their own self-pace.

4. RESULTS AND DISCUSSION

Cronbach's α coefficients for the prevention and promotion indexes were .58 and .54, respectively, suggesting that the participants' responses reached relatively acceptable internal consistency. During the COVID-19 outbreak, people have arisen considerable concerns about, generally speaking, safety, responsibility/obligation, and the avoidance of losses that are in line with the scope of the prevention regulatory focus. Compared with the non-outbreak period, for instance, the extent degree of anxiety about safety in the Polish population has become significantly higher during the outbreak period (Debowska et al., 2020; Gawrych et al., 2021; Malesza and Kaczmarek, 2021). Our results confirmed this pattern. On the one hand, the participants in the prevention condition thought more about safety, responsibility/obligation, and the avoidance of any losses ($M = 5.30$, $SD = 1.63$) than about hope, accomplishment, and the pursuit of any gains ($M = 3.53$, $SD = 1.86$), $t(44) = 8.31$, $p < .001$, $d = 0.76$. On the other

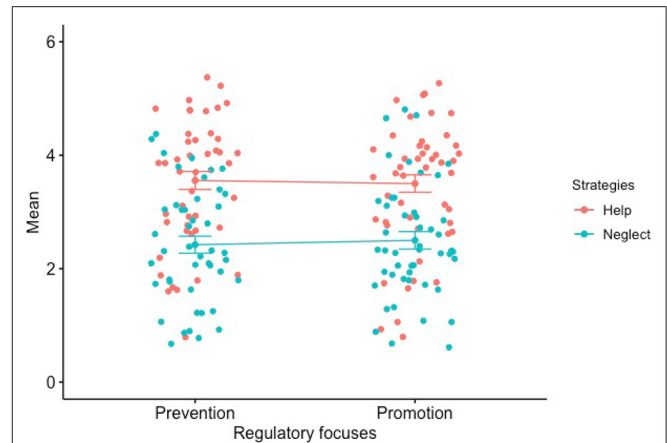


FIGURE 2 | Neglect vs. help strategy. On a 5-point Likert scale (from 1 = *strongly disagree* to 5 = *Strongly agree*). Error bars are the ± 1 standard error of the mean.

hand, however, the participants in the promotion condition also thought more about safety, responsibility/obligation, and the avoidance of any losses ($M = 5.53$, $SD = 1.59$) than about hope, accomplishment, and the pursuit of any gains ($M = 3.85$, $SD = 1.88$), $t(47) = 8.16$, $p < .001$, $d = 0.74$. These results provided evidence that the manipulation primed the prevention regulatory focus effectively but, given the reality of the COVID-19 pandemic, not the promotion regulatory focus (cf., **Figure 1**).

In the prevention condition, the mean rating that the participants were supposed to neglect the victim was 2.42 on the 5-point scale ($SD = 1.01$), i.e., a mean rating of 3.58 that the participants were supposed to help the victim. In the promotion condition, the mean rating that the participants were supposed to help the victim was 3.50 ($SD = 1.07$). The difference of the help strategy between the two conditions indicated a lack of significant level, $t(91) = 0.36$, $p = 0.720$, $d = 0.05$. It is argued that although the good Samaritan parable might serve as a COVID-19-related lesson in teaching helping someone in need (Chamburuka and Gusha, 2020), our results suggest only a certain favorable tendency to offer help, no matter what regulatory focus conditions individuals are situated (refer to **Figure 2**).

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found at the Open Science Framework website, at <https://osf.io/de2gj>. The data include all measures and conditions. No data are excluded from the analysis.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the local Institute Ethical Board of

Cardinal Stefan Wyszyński University in Warsaw for Scientific Research (Evidence #: 15/2021). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YL designed the study, run the experiment, analyzed the results, and wrote the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.776986/full#supplementary-material>

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Origin and Development of Moral Sense: A Systematic Review

Pierpaolo Limone* and Giusi Antonia Toto*

Learning Science Hub, Humanities Department, University of Foggia, Foggia, Italy

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Edited by:

Paola Rigo,
University of Padua, Italy

Reviewed by:

Alessandra Geraci,
University of Trento, Italy
Atiqah Azhari,
Nanyang Technological University,
Singapore

*Correspondence:

Giusi Antonia Toto
giusi.toto@unifg.it
Pierpaolo Limone
pierpaolo.limone@unifg.it

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The literature suggests that the moral sense is based on innate abilities. In fact, it has been shown that children show the capacity for moral discernment, emotions and prosocial motivations from an early age. However, the moral sense is a complex construct of an evolutionary and social nature that evolves under the influence of interpersonal relationships. The emergence and development of moral sense is a challenge that has prompted many research studies with the aim of achieving a clear comprehension of moral development. However, success has been scarce, and studies relevant to this subject are limited. Thus, a systematic review of studies relevant to this topic was conducted to clearly establish how moral sense emerges and develops. An Ovid search was conducted to retrieve relevant items for this systematic review. The databases that were electronically visited are Cross-reference, Google Scholar and PubMed. Strict inclusion and exclusion criteria were imposed on the retrieved items to retain only relevant resources. Twenty-six studies were found valid for inclusion in this systematic review. The results of these studies were presented differently: In order to effectively analyze the selected papers and bring out the results more clearly, a categorization of the approaches adopted in the studies was carried out. The approaches identified were: "Natural Moral Sense," "Social Relationships and Moral Development," and "Environmental Factors and Moral Development." The evidence that emerged from the analysis of the papers was collected to produce a general basic model that explains moral development while also serving as a link between the various studies. First, moral sense is found to be innate in humans; individuals can naturally respond morally to various dilemmas. As seen among children and young infants, moral sense naturally exists. Second, it can be socially nurtured through social interactions and exposure to various environmental factors. Various research studies were reviewed in this systematic review to obtain a consensus on how moral sense emerges and develops. From the systematic review, the moral sense is found to be innate. However, moral development is fostered by social interactions and environmental factors.

Keywords: socio-moral development, prosociality, moral judgment, affective and environmental factors, infancy

THE ORIGIN AND DEVELOPMENT OF MORAL SENSE: A SYSTEMATIC REVIEW

As many researchers have come to realise through their studies, it is difficult to try to comprehend morality clearly. A conclusion on whether morality is natural or socially developmental has still not been obtained, given the wide range of constraints, such as a limited number of related findings and compromised results (Globokar, 2018). Researchers have found this topic rather convoluted, with a number of them failing to categorise moral sense as either a natural either natural, therefore innate, or a socially-progressive process, i.e., emerging in response to interpersonal relationships. It is, therefore, possible to distinguish the two main lines of research that investigate the nature of the moral sense: innatism and socio-constructivism. The first considers the innate moral sense, which is present from birth; the second theorizes that this function is the result of a social construction influenced by the interpretation of the subject of lived experiences. It should be noted that the two positions are completely opposite: considering the moral sense as an innate function does not mean rejecting the idea that morality cannot change and evolve during growth (Singer, 2019). Innatism, therefore, asserts that a natural basis of morality is associated with the subsequent processes of accommodation. On the other hand, socio-constructivism believes that moral sense is the result of learning determined by social relations. However, it is also the result of the evolutionary process of the human species.

Socio-constructivism states that Moral development is a process by which human moral sense progressively identifies and distinguishes between the proper and improper, the right and wrong (Turiel, 2015). The moral sense of individuals is considered to be developmental. It progresses over time, distinguishing simple to complex definitions. Evolutionary studies suggest that human morality derives from group selection: during its evolution, the human species encountered socio-ecological conditions that made group selection the dominant evolutionary force. In fact, natural selection has favoured the development of cognitive abilities, emotions and motivations essential for cooperation within groups. Morality, therefore, arises from the human need to preserve the bond with other people and to take care of them to survive (Fimiani et al., 2018). From an innate and evolutionarily founded design, morality is subsequently shaped by social experiences and interpersonal interactions. The human moral sense advances from defining the finite right and wrong to more intricate ways of differentiating between the two. According to Dorrough (2011), the human moral sense is never static, and continuous advancements characterise it. Cherry (2021) affirms this, stating that moral development is a life-long process. Triggered by social interactions and a wide range of environmental factors, people's moral senses are constantly developing.

In support of innatism it is a fact that when infants are born, they know almost nothing about the social environment. As time goes by, without parents necessarily teaching them, infants develop some forms of judgement on what is viewed to be morally upright. At the age of one, young children are seen to support themselves with chairs and erect materials to stand. During this

period, most young children also start to walk by themselves without interventions (Tomasello, 2018). These behaviours show that even before the age of three, children have a tendency to prosociality which subsequently turns into morality due to the learning of normative standards. They are seen to respond to their needs by crying or smiling socially. Additionally, grown-up children are observed to help their parents and guardians accomplish their daily tasks. Thus, they seem to have internal moral judgements that motivate them to make such social responses to the environment and people surrounding them. This observation establishes the innateness of moral development (Laible et al., 2019). According to Lehalle (2020), explaining morality as either natural or socialised is challenging. Despite this constraint, researchers have identified that morality emerges in a progressive system (Turiel, 2018). The moral senses of children are continually shaped by the relationships built around them. With these relationships, children are able to socially interact with individuals who will ultimately boost their moral progression. For example, they can improve their moral senses by interacting with caregivers, who are considered to be the best builders of children's morality.

The findings of Yusuf et al. (2018) are supported by Lawford et al. (2021), who argues that moral judgement is a very organised subject that clearly distinguishes different ages of children. According to Lawford et al. (2021), older children demonstrate a higher moral understanding of harm than younger ones. This indicates that as people grow, so do their moral judgements. Through interacting with social aspects, people inculcate moral judgement skills and develop them with further social interactions.

For many years, researchers have closely studied this topic to establish a clear understanding of human morality. In fact, it has always been difficult to make the right decisions on what is proper or improper. Moral judgements are part of our daily lives. Every individual is always tasked to judge various social aspects of life correctly. According to Willer and Simpson (2017), moral judgements are sometimes considered to be against the social codes of contact. From these considerations, a new path opens up with respect to antisocial behaviours, which, however, is not the subject of discussion in this review but is noteworthy for the completeness of the analysis: some of the individuals in society at times make judgements that are not in agreement with social norms. Politicians, for example, sometimes make moral judgements that are contrary to the social settings. Thus, it can be said that moral judgements are sometimes antisocial (Kim, 2018; Noveni et al., 2021).

The minds of humans are considered to be biologically prepared as children from an early age show moral evaluations and prosocial behaviours. However, during development, they are influenced by the socio-cultural context. When exposed to different aspects such as social interactions and environmental factors, moral senses develop. Hamlin (2013a) observes that although some aspects of moral sense may have evolved to promote cooperation for survival, an innate moral core exists in preverbal infants and children, which structures sophisticated and flexible moral behaviours and assessments, particularly the ability to identify and evaluate others based on their prosocial

or antisocial acts within the first year of their life (Hamlin, 2014). Morality is also evident in the animal species; for example, in chimpanzee groups, the members celebrate only after the power struggles have been resolved: the group desires peace and prefers harmony rather than cooperation and sustenance. Humans experience the same feeling even before experiencing and learning from their fellow men (Haidt and Joseph, 2007).

Dawkins et al. (2019b) also confirm the innate nature of morality: at least four socio-moral principles prematurely guide children's reasoning and expectations, such as fairness, avoidance of harm, support for the group and respect for authority.

In support of this perspective, CK-12 Foundation (2016) states that young children from the age of one to three learn many things through exposure. For instance, they are able to portray various responses that they learn from their superiors. Additionally, a significant change occurs when young children reach adolescence. Adolescents show much interest in their friends and peers. At this stage, these individuals are still learning how to manage their emotions (Lerner et al., 2015). Their peers' interactions greatly influence them CK-12 Foundation, 2016. Adolescents begin to form intimate relationships during this phase. Thus, through interactions with social peers, people learn and develop their moral judgement. This proves that moral development is socially progressive rather than naturally developmental: Interpersonal relationships and the socio-cultural context are decisive as they influence and modify the moral sense. Therefore, it is not possible to consider the function regulated only by the natural development of the human mind.

From the above emerges the constructivist perspective. According to this, each person gives meaning to their own experience and takes actions in relationships based on a set of personal premises and beliefs, which derive from their specific position in the interactive situation, from their previous experiences with relationships. There is no single, universally applicable set of moral requirements; rather, moral requirements are diverse and apply to different people according to their own experiences, emotions and motivations, and socio-cultural context (Brink, 2003). According to Sommerville and Ziv (2018), an intuitive sense of fairness emerges within the first 2 years of life and encompasses many aspects of mature moral responses. Specifically, the authors demonstrated that in children, an intuitive sense of fairness emerges as a result of experience and is derived from their interactions, which allow them to observe and participate in social exchanges, assuming the role of both agents and recipients of fair and unjust behaviour.

Therefore, this systematic review seeks to answer the question: How does moral sense emerge and develop? It is also necessary to establish a clear consensus on whether moral development is wholly natural or socialised. In this particular review, the study aims to establish all possible contributing factors of the emergence and development of moral sense in humans.

METHODOLOGY

This particular systematic review is aimed at establishing a clear understanding of the topic: emergence and development of moral

sense. It also focuses on ascertaining whether moral development is innate or socially developmental.

PROTOCOL DEVELOPMENT

A proper protocol must be consistently implemented to establish a stable background for responding to the review question articulated in any systematic review. For this review, multiple protocols were shaped to fully answer the questions under consideration. All the required review scopes were considerably added to this protocol. They comprised the search strategy, inclusion criteria, screening methods, data analysis and synthesis. The Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) model was utilised in this systematic review.

ELIGIBILITY: INCLUSION AND EXCLUSION CRITERIA

Reporting Language

A crucial eligibility criterion for this systematic review is the reporting language. All the resources necessary for this review were supposed to have been reported in English. All articles and other resources reported in other languages were excluded from this systematic review irrespective of their usefulness.

Type of Study

The studies to be included in this systematic review had to present information contributing to socio-moral development. Research studies using quantitative methods compatible with theoretical approaches were considered eligible for inclusion in the systematic review. Any other studies contrary to the above information were automatically removed from the inclusion list.

Outcome Measures

All the studies that reported positive moral development as an outcome measure were added to the inclusion list for the systematic review. Studies and resources that were not aimed at reporting on this particular outcome measure were automatically excluded from this systematic review.

SEARCH STRATEGY

The retrieval of valid results from databases is the primary goal of every search strategy. A researcher can obtain accurate results only if an organised structure is utilised in the search process. Numerous strategies are available for use during the search process. These search strategies include Ovid search, the use of Boolean logic, citation search and the subject headings search approach. Despite the wide range of methods, inaccurate results occasionally curtail the efforts of researchers. The Boolean logic allows the appropriate combination of operators (and, or, not, adj, near, then, etc.) for the database query syntax (Catania, 2004). With a basic search on Ovid, it is possible to access full-text open access journals from different databases by adopting

specific operators. The citation analysis is the cornerstone of the research discipline known as bibliometry, which operates through the following indicators: Impact Factor, H-index and its variants, Eigenfactor, Scimago Journal Rank, and SNIP (Cassella and Bozzarelli, 2011). Subject headings are an alternative to text word scanning that can be used for searches within the journal record. Subject headings constitute a thesaurus that involves a more precise search but at a lower sensitivity cost than text words (Jenuwine and Floyd, 2004).

The search strategy utilised for this systematic review is an Ovid search. The search process included visiting a number of databases, as far as the retrieval of accurate search results was concerned. Among the databases, Cross-reference, Google Scholar and PubMed were considered relevant for finding studies that accurately fit the scope of this systematic review. During the process of searching, the hand search technique was used. Only the studies published in the English language were eligible for inclusion. In the search process, prosociality, moral judgement, socio-moral development, affective and environmental factors and infancy were considered keywords crucial for the retrieval of valid search results.

STUDY SELECTION

The selection of studies to be included in the systematic review is very complicated; valuable resources need to be identified for the review to be valid. This is achieved by utilising relevant selection techniques that will ultimately return relevant studies. With a massive number of search outcomes, a screening process needs to be conducted to identify both the valid and invalid articles for the systematic review. In this systematic review, title and abstract screening were conducted on the search outcomes to sieve out the relevant studies – this involved screening the articles' titles and abstracts based on the inclusion criteria. For the purpose of the exclusion, full-text analysis was conducted.

Two reviewers critically and independently reviewed the eligible studies, especially the abstracts and titles. The main aim of the two independent reviews was to come up with a reasonable consensus on whether the studies could be included in the systematic review. The reviewers tabled the different resources to initiate a discussion on which articles were eligible for inclusion. A discussion between two reviewers is a two-way process, which can result in both agreements and disagreements. In case of the latter, a third reviewer should be selected as a backup, who would intervene in the discussion when a consensus could not be reached. In this systematic review, a third party played a significant role in settling disagreements that arose between two independent reviewers. Ultimately, a valid consensus was achieved, thanks to the third reviewer.

DATA EXTRACTION

A suitable data collection process is a necessity of every systematic review – all fields required need to be included

in the data collection. The MS Access database was used to collect data in this systematic review. The fields captured by the data collection database were study design, participants, inclusion and exclusion criteria, methods and results. The independent reviewers were further tasked with collecting and recording the required data based on the fields highlighted above. The third reviewer revised the data to confirm its relevance. In cases of missing information or confusing data, the primary authors of the studies were contacted to harmonise such situations. Qualified articles were forwarded for systematic review.

RISK-OF-BIAS ASSESSMENT

The two independent reviewers participated in assessing the risk of bias of the studies selected. To conduct the process in the most effective and relevant way possible, the Cochrane risk-of-bias tool (CRBT) was used. The CRBT instructions contain systematic strategies to reduce bias as the conclusion can become unreliable if the data are incorrect. Thus, an assessment of the internal validity of the included studies is made to reduce the likelihood of bias. The tool is based on seven bias domains: sequence generation and allocation concealment (both within the domain of selection bias or allocation bias), blinding of participants and personnel (performance bias), blinding of outcome assessors (detection bias), incomplete outcome data (attrition bias), selective reporting (reporting bias) and an auxiliary domain: "other bias." For each bias domain, the tool urges users to assign a "high," "low," or "unclear" risk judgement of bias and to document the basis of their judgements (Jørgensen et al., 2016).

The use of this criteria list is highly recommended to reviewers during the risk-of-bias assessment process; therefore, this review utilised it. The CRBT comprises items that are useful when assessing the validity of the selected articles. The search resources in agreement with the CRBT demands were awarded positive scores, whereas studies contrary to the CRBT were given negative scores. All the records were discussed by the independent reviewers during the consensus meeting. Studies meeting the recommended items were regarded to have a low risk of bias, while articles not meeting the recommended items were observed to have a high risk of bias. A study was considered to be eligible to be included in the systematic review only if it had a low risk of bias. On the other hand, studies with a high risk of bias were considered ineligible and were excluded from the systematic review. To reach an agreement, the disagreements of the reviewers were resolved by a third reviewer.

DATA ANALYSIS AND RESULTS SYNTHESIS

A systematic review was performed based on the Cochrane requirements. Search outcomes were compared for the systematic review; articles were pooled and analysed through a 95% confidence interval (CI). The search articles were analysed based

on the three inclusion criteria: type of study, outcome measures and reporting language. This only concerned homogeneous studies. To check for the heterogeneity of articles, a Q test was performed.

PUBLICATION BIAS

A systematic review, by all means possible, always has to be valid. However, the validity of a review is sabotaged by the presence of publication bias. Therefore, publication bias needs to be fully explored in a systematic review for it to be justifiable. In this case, the construction of funnel plots aided in determining the possible publication bias of the included studies.

RESULTS

Search Outcomes

A total of 602 studies were retrieved electronically from the search databases, Cross-reference, Google Scholar and PubMed. In the preliminary screening, all 602 articles were used, and then, 433 articles were removed as duplicates. Furthermore, 131 studies were eliminated based on invalid abstracts and titles. Till this stage, 48 studies survived the elimination process. All 48 articles were tested on the eligibility criteria, and 22 articles were eliminated after a complete text analysis was done. The remaining 26 studies were consistent with the inclusion demands and were, therefore, considered for the systematic review. **Figure 1** presents the PRISMA model utilised for the search strategy in this systematic review. **Table 1** below shows the main information of the papers.

ANALYSIS OF RISK OF BIAS

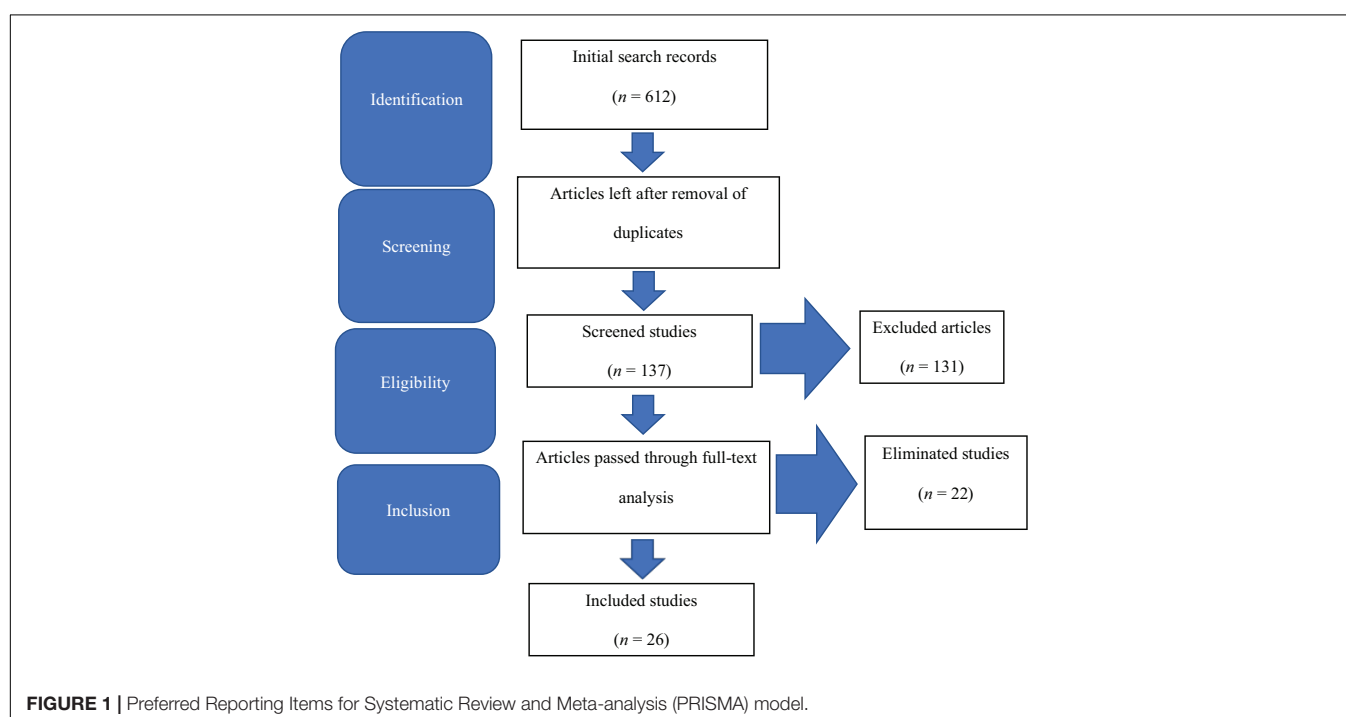
Risk-of-bias analysis was conducted in this systematic review to discover the methodological quality of the articles included. All the included resources were found to be of adequate methodological quality; they were all regarded as qualified for systematic review. The sufficient methodological quality of the articles was accepted by the two independent reviewers as accurate and was then confirmed by the third reviewer.

CHARACTERISTICS OF THE STUDIES

All the studies included in this systematic review provided sufficient information contributing to socio-moral development. Additionally, studies exploring methods that are in accordance with the different theoretical approaches are selectively included in this systematic review. All studies included are reported in the English language.

INDIVIDUAL RESULTS OF THE STUDIES

The studies included in this systematic review explored the emergence and development of moral sense in humans. The theoretical approaches of reference of the studies differ from each other as well as the type of paper: the theory of innatism or socio-constructivism guide researches and interpretations of the data in a different way. Moreover, it should be noted that the studies have the nature of review, experimental study, clinical trial, and chapter book. They use different methods respective to



different approaches to contribute to moral development. Their conclusions are presented as follows.

Natural Moral Sense

The research problem of whether moral sense is wholly socialised or natural has, to date, not been settled despite the numerous studies conducted on this problem. However, quite a few studies have shown that infants and young children exhibit different moral skills at a young age. One-year-old children are seen to explore their social environment by employing inherent skills. According to Carpendale and Hammond (2016), children always help their parents in their daily activities. They are seen to actively take part in fulfilling daily obligations without necessarily being instructed to do so. This shows that young children possess natural moral abilities to decide what is good and what is not. They distinguish between the virtue of helping parents and the wickedness of staying idle. Other researchers have also interpreted that morality emerges naturally in humans (Carpendale and Hammond, 2016). Moral sense is naturally present in a human being, irrespective of their age. Infants and young children possess natural morality that allows them to distinguish between the simple definitions of proper and improper.

A study to assess the moral judgements of young children was also conducted to establish how children view moral transgressions (Smetana and Ball, 2018). In this study, young children aged between 4 and 9 years were tested to determine their response to physical harm, resource transgressions and psychological harm to their enemies and friends. Among the children, transgressions against their enemies were more accepted than those against their close friends. Moreover, the transgressions were least intended when targeted at close friends compared to enemies. Smetana and Ball (2018) confirmed that children considered moral transgressions as improper and wrong. This establishes that the children, across all relationships, distinguish between right and wrong or good and bad. Thus, moral sense is considered to be natural.

Smetana and Ball (2019) conducted another study to ascertain whether age is a determining factor in children developing their moral judgements concerning different types of harm. This study concentrated on children aged 4–9 years and sought to determine their moral judgements from age profiles based on different types of harm. Ultimately, the authors found that children of different ages portrayed significant differences in moral understandings regarding other forms of harm (Smetana and Ball, 2019).

Young children, aged four, depicted little moral understanding of different types of harm. On the other hand, grown-up children, aged nine, had a greater moral understanding of these. In general terms, Smetana and Ball (2019) confirm that children's moral judgement is organising according to their ages. Young children made weak moral judgements, whereas older children made strong moral judgements. This shows that children's moral judgements develop naturally with respect to their ages. 160 children aged 4–9 were observed to evaluate the emotions, judgements, intentions and justifications they manifested with respect to physical and psychological damage and transgressions aimed at acquaintances, friends, disliked peers and bullies.

Transgressions against bullies were found to be more acceptable among the children than those against friends and disliked peers and were deemed to be less deserving of punishment. In addition, the children viewed moral transgressions as wrong based on the principles of well-being and fairness.

Geraci and Simion (2021) investigated whether the perception of the social-causal relationship triggers both children's evaluation processes and expectations relating to the social preferences of third parties. To this end, three experiments were implemented that reproduced a social causality, a physical causality and a choice task to assess children's preferences.

Research results (Geraci and Simion, 2021) have demonstrated that children's evaluations are triggered by their perception of social causality: Only in a social condition did children expect a spectator to help an intermediary agent. Explain the children's actions and their relationships with each other and with adults, and then, evaluate these actions. Korotaeva and Chugaeva (2019) focus on the study of the moral representations of preschool children. This experiment was conducted among preschool children in one of the groups of the Ekaterinburg kindergarten. The theoretical basis of reference was that social behaviour is characterized by duality: on the one hand, a person's actions are determined by social standards and norms; on the other hand, the actions are controlled by the person and his/her ability to choose and take responsibility for that choice. During childhood, a child experiences social relationships, learns to solve problems and assimilates moral standards through personal perception. The experimental study demonstrates the importance of developing methodical recommendations for interactions between teachers and children, or between parents and children, to mediate effective social and moral education that takes into account the children's perspectives on moral standards and rules of conduct. Thus, the authors highlight the importance of adults in the development of moral sensibility by respecting the personal ideas of the children. Franchin et al. (2019) suggest that children within 30 months begin to associate goodness with socio-moral characteristics such as a helping disposition but do not do so regarding equity in distributive actions. The ability to distinguish between intentions and outcomes in morally relevant events is present at the age of 8 months (Hamlin, 2013a). The "moral mind" of the young child is fundamentally different from that of older children and adults. However, as early as 8 months, children incorporate, and even prioritize, intentions in their social assessments. Instead, 5-month-olds appear to be able to distinguish only the characters who intend the outcomes they cause.

Hamlin (2013b) also argues that human morality is a fundamental and innate aspect of human nature, as it supports cooperation. This mental function has developed with the evolution of the human being who needed to aggregate to survive. Hamlin demonstrates that infants naturally engage in surprisingly sophisticated and flexible behaviour and moral assessments.

A section of these studies concerns how individuals can naturally respond morally to various dilemmas: Geraci and Franchin (2021) investigated whether 21-month-olds expect non-needy agents to help agents in need (type of puppet)

TABLE 1 | Overview of reviewed studies.

N.	Author and year of publication	Type of article	Theme	Results
1	hboxcitealpBR24	Experimental study	The relationship between preference and social causality	The results demonstrated that children's assessments are triggered by their perception of social causality: only in the social condition did children expect a spectator to help an intermediary agent
2	Korotaeva and Chugaeva, 2019	Review	Social and moral education and development of preschool children	The social and moral representations of children are tools for understanding their actions and their relationships with adults
3	Franchin et al., 2019	Experimental study	Beginning of the activation of the moral domain	The results suggest that within 30 months, children began to associate good with some socio-moral characteristics, such as a helping disposition, but not with equity in distributive actions
4	Hamlin, 2013a,b	Review	Moral evaluations in infants	The ability to distinguish between intentions and outcomes in morally relevant events is present at the age of 8 months
5	Hamlin, 2013a,b	Review	Behaviour and moral evaluations	Human morality is a fundamental and innate aspect of human nature, as it allows for cooperation
6	Geraci and Franchin, 2021	Experimental study	Children's reaction to agents in need and not in need of help	When agents in need are morphologically similar to agents in need, children watched the event longer, which showed that agents in need help agents in need
7	Surian et al., 2018	Experimental study	Children's reaction to a character who harms another agent	Children who saw the helper perform an unequal distribution looked longer than those who saw the helper perform an equal distribution, while children who saw the hinderer perform an unequal distribution looked the same way as those who saw the hinderer perform an equal distribution
9	Lavoie et al., 2021	Review	Methods for measuring moral development	The review revealed the presence of an innate moral sense in children under 2 years of age
10	Holvoet et al., 2016	Review	Preference for prosocial behaviour	Innate preference for prosocial behaviours
11	Ting and Baillargeon, 2021	Experimental study	How young children value other characters on a moral level	Children from an early age develop moral assessments that regulate their behaviour
12	Denton and Krebs, 2017	Review	Moral decision-making process	The ways in which brain mechanisms have evolved and developed throughout life provide a basis for explaining why people possess the ability to engage in moral decision-making
13	Dahl and Baxley, 2016	Chapter in a book	Morality development in early childhood	The main stages in the development of morality are retraced in this work
14	Hilton and Kuhlmeier, 2019	Review	Moral evaluation	At the beginning of development, humans evaluate others by considering the outcome of an action in relation to the intention behind it
15	Chiasson et al., 2017	Experimental study	Change in socio-moral reasoning during evolutionary development	The study found a linear increase in moral reasoning (MR) from infancy to late adolescence, with significant group differences between childhood (6–8 years) and pre-adolescence (9–11 years)

(Continued)

TABLE 1 | (Continued)

N.	Author and year of publication	Type of article	Theme	Results
16	Baker et al., 2022	Article	Differences in the morality of individuals with conduct disorder and healthy individuals	The factors of “intelligence” and “maternal support” exert a decisive influence on the level of socio-moral development
17	Hammond et al., 2021	Clinical trial	Educational programme for abused teenagers	After the application of the educational intervention programme on self-control and moral development, the experimental group showed fewer learning difficulties and less tendency to aggression
18	Goffin et al., 2020	Article	Mind-mindedness of the mother and children	It demonstrates the positive association between the mind-mindedness of the mother and that of her children and the theory of mind of the children
19	Dahl, 2019	Review	Development of the tendency to help and harm	Children’s orientations towards helping and harming others gradually develop through daily social interactions in the early years
20	Emler, 2021	Chapter in a book	Moral development in children	It outlines children’s socio-moral development from the point of view of social representations
21	Bian et al., 2018	Experimental study	Fairness in cases of limited resources	Infants expect ingroup support to override fairness when resources are limited
22	Dawkins et al., 2019a,b	Experimental study	Fairness in children	Sensitivity to fairness is part of the basic cognitive structures of a human being
23	Tan et al., 2021	Article	Moral functioning and preschool children	Empathic worry and inhibitory control have emerged as important predictors of the moral functioning of preschool children
24	Hamlin and Van De Vondervoort, 2018	Article	Infants and children’s preferences for prosociality	Preverbal children evaluate third parties based on their morally relevant acts, considering other prosocials positively and negatively evaluating other antisocials
25	Govrin, 2014	Review	Moral function in infants and young children	Moral function is innate, but in the first years of life, it develops in response to interactions with the caregiver
26	Geraci et al., 2021	Experimental study	Moral evaluations of preschool children	Children prefer the agent who consoles the victim over the one who presents indifference

of food or shelter. The results show that when agents in need are morphologically similar to agents in need, children watched the event longer, which showed that agents in need help agents in need. Fourteen-month-old babies were familiarised with a character who helped or hindered another agent’s attempts to reach the top of a hill. The hinderer condition started with the same familiarization phase used in the helper condition, but in the test phase, the distributor of the strawberries was the hinderer instead. The preliminary analysis assessed the effects of the order of familiarization events (Help, Hinder, Hinder, Help vs Hinder, Help, Help, Hinder) and the identity of the helper and the hinderer (Square vs Triangle). It found that they had no main effect on looking times at the test trials, nor was there a significant interaction between such factors and the type of test event (equal vs unequal distribution). Children who saw the helper perform an unequal distribution looked longer than those who saw the helper perform an equal distribution, while the children who saw the hinderer perform an unequal distribution looked the same way as those who had seen the hinderer perform an equal distribution (Surian et al., 2018). Lavoie et al. (2021)

confirm the findings of previous studies through a review centred on the methods used to measure the moral development of children under the age of two. They show that moral sense is innate, that is present from birth.

Social Relationships and Moral Development

As mentioned earlier in this paper, people’s moral sense develops over time due to social interactions. In this context, children are considered to encounter moral development when they interact with their parents or even peers. According to various studies, the issue of the emergence of the moral sense has continued to be unclear, and whether moral development is wholly socialised or naturally acquired is a topic of debate still yet. Nonetheless, studies have found that the uniqueness of interactions significantly contributes to moral development. In a social context, moral knowledge is enhanced when a person is exposed to others’ views and ideas. An individual can grow and develop morally only if the social interactions

experienced are educative. In general terms, the active discussions and negotiations a person participates in are the pillars of moral development.

Govrin (2014) produced a general model of the process that contributes to the development of moral judgement in the first year of life, whereby a universal and innate structure of the moral faculty is hypothesised, which is therefore pre-reflexive. However, the latter develops through early interactions with the caregiver. The internal representations that the child constructs in the dynamic system with the caregiver determine their judgements about what is wrong and what is right. This work suggests explaining the mind in the first year of life by integrating Bowlby's attachment theory, ethics of care and moral psychology that were previously regarded as separate domains.

Another literature review was conducted by Carpendale and Hammond (2016) to pinpoint the source of moral norms among children and infants. The authors sought to examine previous claims that proposed that infants have a natural moral understanding. While examining this information, the study aimed to establish the source of the children's moral knowledge—whether it occurred naturally or was socially nurtured. In the review, Carpendale and Hammond (2016) categorically presented the views of the previous researchers. According to them, previous studies stated that children help their parents – young children are always seen to take part in daily activities. Moreover, they put forward that children are interested in pleasing people but are scared away by bad people. This has been interpreted as human beings possessing natural morality.

However, the aforementioned explanation from Carpendale's review has given rise to more questions than solutions. As in the above case, the source of morality is still unclear – whether it is wholly socialised or natural.

Geraci et al. (2021) evaluated the reactions of preschool children in different situations of social interaction. They show that children preferred the character who consoled the victim over the one who did not. Thus, it emerges that social assessments are based exclusively on social interactions between prosocial/antisocial agents and recipients. Furthermore, the authors' findings reveal an evolutionary tendency in children to reward the puppet who comforts and punish the puppet who ignores the victim.

Carpendale and Hammonds' study Carpendale and Hammonds' (2016) also concentrated on examining the source of this moral sense. The daily interaction between children and caregivers is seen to significantly foster children's ability to coordinate morally with others (Cingel and Krcmar, 2020). Through social interactions between them and their superiors, children are able to equip themselves with sufficient moral skills and ultimately nurture their inbuilt moral senses. The authors conclude that children's moral development is significantly boosted by the continuous daily interactions they have with parents and guardians. Thus, according to Carpendale and Hammond (2016), moral development is socialised, that is social interactions contribute to morality enhancement.

Mammen et al. (2019), in their research study, focused on how children develop their moral judgements through socially interacting with their parents and peers. This study sought to

investigate the differences in talking about moral problems when children interact with their parents and their peers. With their parents, the interaction is seen to contribute little as far as the moral development of the children is concerned (Mammen et al., 2019). Children are depicted in Mammen's study as lacking enough freedom to talk about their parents' problems. Mothers and other adults do not always negotiate or discuss moral challenges with their children. This, therefore, denies children the opportunity to develop moral skills for tackling different moral issues.

Conversely, children are seen to negotiate and discuss their dilemmas with their peers freely. They believe that with their peers, who are of an equal level, moral problems can be actively discussed. This, therefore, enhances their experience and, in turn, develops their moral senses. Based on these perspectives, social interactions, especially with peers of an equal level, give individuals the best opportunity to negotiate their moral challenges. This develops them morally, hence contributing to their moral sense. Studies (Chiasson et al., 2017) have focused on changing socio-moral reasoning from infancy to adolescence, and results show that boys with conduct disorders tend to differ from their healthy counterparts in terms of their level of socio-moral maturity of judgement. The factors of "intelligence" and "maternal support" are known to exert a decisive influence on the level of socio-moral development (Baker et al., 2022). The main goal of Hammond et al. (2021) was to show the results of an educational programme on self-control and moral development taught to a sample of abused and abandoned adolescents. Another aim of this subject concerns socio-moral development from the point of view of social representations (Emler, 2021). Significant interpersonal relationships make it possible to construct representations of oneself, of the Other and of the World by mediating cognitive schemes that filter the interpretations and evaluations of one's own and others' actions. This process structures the moral sense in the child who develops and matures in the first years of life.

Goffin et al. (2020) experimentally demonstrated the positive association between the mind-mindedness of the mother and that of her children and the theory of mind of the children. Finally, Dahl (2019) examined research on how children's orientations towards helping and harming others gradually develop through daily social interactions in their early years.

Concerns for the welfare of others, rights, equity, and justice serve as the foundation for structuring the moral sense for the judgement of what is right and wrong. The authors affirm that this passage from a primary to a complex moral is allowed by daily interactions. Therefore, morality is neither innate nor solely the result of caregiver relationships.

Environmental Factors and Moral Development

The environment plays a significant role in shaping the moral sense of human beings. Behavioural expectations are made clear to children when the physical environment is set appropriately. The physical environment provides young children with expectations of behaviour. When educators are

aware of the aesthetics, organization, and function of each area of the space, defiant behaviour is likely to decrease while constructive and cooperative behaviour increases. A well-designed curriculum provides the best opportunity for children to access a wide range of items and ideas that reflect their interests. This great accessibility allows young children to freely discuss their interests with each other. The environment's design is crucial as far as moral development is concerned (Paris et al., 2021). For young children, a space of tremendous and well-designed learning is constructive and interactive. Such an environment has learning materials placed at a location readily accessible to individuals, and children can freely utilise the materials based on their interests. They can negotiate with each other over the materials they have. Additionally, ample space enables child–adult interactions. This creates an opportunity to expand interactions and discussions. The expansion of discussion and negotiation boosts the moral abilities of the people involved in the conversation.

A well-designed physical environment is always observed to be socially attractive. According to Paris et al. (2021), a learning environment designed with quality in mind sets the best background for boosting socio-emotional development. The preparation of a high-quality environment with sufficient learning items is attractive to children and adults. This attraction allows the concerned individuals to participate in activities of their interests and abilities fully. This, in turn, further develops their moral senses. An environment that enables moral development comprises ample and diversified learning space, enough supply of material, supportive engagements and displays of individuals' work.

A socially attractive environment must possess a number of user-friendly factors, such as ample interaction space, and it should be well equipped with the necessary resources. An individual exposed to this space is free to make moral judgements based on the available resources. Notably, a person plays with the environmental resources based on their interest and ability. This contributes to moral development through enabling constructive interactions and engagements. As stated, it allows individuals to freely explore their interests and abilities by utilising the ample resources available to them. Therefore, young children are allowed to manage their relationships and themselves fully. Through this, they are able to develop morally. Environmental factors, consequently, enable moral development.

The social environment is a precursor to morality and moral development (Cowell and Decety, 2015). A study conducted by Cowell and Decety (2015) found that socio-environmental factors support the sensitivity of moral sense among toddlers and young infants. As confirmed by Cowell and Decety (2015), the minds of young children are biologically prepared. They are already in possession of moral sense. Human beings are biologically predisposed to the construction of moral judgements and evaluations, which, therefore, structure behaviours aimed at cooperation and associations between antisocial actions and punishments. The interaction between the environmental factors and these infants' minds impacts their behaviour and social evaluation (Cowell and Decety, 2015).

This is the result of their study that looked at the neural basis and precursors of moral sensitivity in 73 subjects aged 12–24 months. The analyzes performed were of electrophysiological, eye-tracking, behavioural and socio-environmental nature. The study established the interaction of prepared minds with supportive environmental factors to be a great contributor to socio-moral development. The social and moral behaviours of the involved individuals develop when exposed to various environmental foundations. In other words, a person exposed to various supportive factors is well-positioned to behave differently from their previous behaviour; this is moral development. Considering the above perspectives, environmental factors contribute significantly to moral development. Two specific areas are evaluated in the study by Holvoet et al. (2016): (1) studies that have previously explored social assessment skills beyond a basic preference for prosocial behaviour and (2) current theories attempting to explain how and why such preferences could exist so early in childhood. Ting and Baillargeon (2021) explore how young children value other characters on a moral level and reveal how these ratings, in turn, allow children to form sophisticated expectations about the behaviour of others in new contexts. Denton and Krebs (2017) examine the psychological and neurological evidence supporting dual moral decision-making models and discuss research that has attempted to identify triggers for rational-reflexive and emotional-intuitive processes. Dahl and Baxley (2016), on the other hand, present the main theoretical perspectives on the early development of morality and its basic elements during the first 4 years of life. Finally, research on infants and young children suggests that even during early development, humans evaluate others by considering the outcome of an action in relation to the intention behind it. On this note, Hilton and Kuhlmeier (2019) review existing research on moral evaluation and propose that differences in how intentions and outcomes of behaviours are viewed may (1) support or preclude attribution of intentions to young children and (2) alter the relative relevance or predominance of any type of information.

In conclusion, the studies that can be categorized in the socio-environmental approach consider the environmental and social factors determining moral development, but they also agree on the existence of a predisposition to prosociality present from birth.

DISCUSSION, LIMITATIONS AND CONCLUSION

Discussion

This systematic review included 26 studies. Although these studies used different methodological approaches, all of them contributed to the topic under study. Nevertheless, the emergence and development of moral sense is a theme that still requires further study, as studies focusing on this area are few and far between. The facts and research available claim that moral sense is naturally occurring (Garrigan et al., 2018). Infact, many researchers have found it difficult to determine the source of

morality in humans – whether moral sense is wholly socialised or natural. This stand is also consistent with Kotlova (2020) findings that children view moral transgressions as being wrong. These interpretations thus converge, indicating that morality and moral judgements are innate across all social relationships.

Morality may be taught and developed even though it is innate (Cowell and Decety, 2015). Social relationships create a suitable environment for individuals to share, discuss and negotiate their dilemmas with ease. Thus, social interactions equip individuals with ample space to shape their moral skills (Lapsley et al., 2022). People exposed to a wide range of constructive social interactions can better negotiate their problems than individuals exposed to less constructive interactions. According to Mammen et al. (2019), the interaction between a child and a coequal peer is more productive than an interaction between a child and a parent. A child discusses their moral problems more with a peer than with a parent. Based on this, moral development is enabled by child–peer interactions more than child–parent interactions.

Moral development is not fostered by social interactions only; it can also be encouraged by exposing minds to various constructive and interactive environmental factors (Malle, 2021). Children's learning environments are seen to promote moral development the best. Quality learning environments set the stage for exploration and socio-emotional growth. When children are presented with a warm, welcoming, culturally motivating and familiar environment, they feel comfortable and safe. The attractive spaces that adults prepare for children communicate expectations of responsibility and cooperative union (Hamlin, 2013a).

A well-designed environmental space with ample resources is considered fit for moral development. In such spaces, children can freely utilise the resources available to make judgements based on their interests (Paris et al., 2021). These environments have various characteristics: challenging and developmentally appropriate materials, ample supply of materials, appropriately sized small-group activities, a variety of small-group activities within a range of adult supervision, aesthetically appealing spaces to be with others and spaces to be alone, furnishings and materials accessible to children, displays of children's work and support for children's active engagement.

Additionally, the ample space provided by such an environment allows the concerned individuals to interact freely. The interaction between a child and an adult also gives rise to good opportunities for resolving moral dilemmas; this is done by posing questions and discussing them.

The three areas in which the selected studies have been categorized are: “Natural Moral Sense,” “Social Relationships and Moral Development,” and “Environmental Factors and Moral Development.” Although each approach proposes a different aetiology of the moral sense, the review brings out an agreement among the authors regarding the presence of a predisposition to morally acceptable behaviours (Cowell and Decety, 2015; Dahl, 2019; Korotaeva and Chugaeva, 2019) that mature and are influenced by life experiences determined by interpersonal relationships and environmental factors.

In general, this systematic review summarises the findings from various research studies and articles and provides a definite conclusion. First, moral sense is innate. Second, moral development is considerably strengthened through social interactions and exposure to constructive and interactive environmental factors.

Limitations

The number of studies included in this systematic review was small. This can be mainly attributed to the strict criteria used during the inclusion and exclusion process. To establish a consensus on a specific area of study, numerous articles need to be included. Therefore, the small number of the studies analysed in this systematic review limits the accuracy of the conclusion reached. Limited data available for a systematic review is considered to limit the consensus achieved.

Furthermore, only items reported in English and those meeting the required study characteristics were considered relevant for this systematic review. Items that were reported in languages other than English, irrespective of their usefulness, were declared irrelevant for this systematic review. The use of articles published in a single language is a source of bias. Research studies reported in other languages are never promoted.

CONCLUSION

The emergence and development of moral sense is a complex theme that has attracted the attention of multiple researchers. Several of these have focused their efforts on obtaining explicit knowledge of moral sense, moral development and the source of morality. Indeed, research studies vary in terms of the conclusions drawn. Therefore, this systematic review collated the various conclusions to reach a reasonable consensus, that the moral sense is a natural ability that every human is born with, and this natural ability can be nurtured through social interactions and by environmental factors.

The findings of the present review are confirmed by Wynn et al. (2018) who affirm that, although there is evidence of an early emerging moral sense, altruistic behaviours are selective from the first moments after birth. Children recognise and prefer cases of fairness and kindness and prefer people who have been kind to them and family members over strangers. They also tend to make errors of judgement based on the belonging of the other to their own group or to an external group. Morality, therefore, matures during growth and is refined: adult morality is the result of an arduous process of development that involves exposure to culture and the exercise of rationality.

An individual's interaction with others, especially coequal people, allows moral problems to be shared, discussed and negotiated. This interactive behaviour allows the people in a conversation to explore new skills and knowledge that can significantly boost their moral judgements. Through social interactions, moral development is guaranteed. Moreover, environmental factors contribute to the development of moral capabilities too. As stated earlier, humans possess innate moral abilities.

Thus, exposure of the prepared minds to the environmental aspects further shapes human morality. This systematic review mainly focused on children, and it was found that exposing children to environmental factors such as ample access to educational items, enables them to fully experience their interests and abilities. Therefore, moral sense is found to be naturally occurring; it can further be developed through exposure to constructive and interactive environments and social relationships. In conclusion, the questions of this systematic review have been answered.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

PL wrote introduction and conclusion. Both authors contributed to the article and approved the submitted version.

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Gene–Environment Interactions in Face Categorization: Oxytocin Receptor Genotype x Childcare Experience Shortens Reaction Time

Michelle Jin Yee Neoh^{1†}, Peipei Setoh^{1*†}, Andrea Bizzego², Moses Tandiono^{3,4}, Jia Nee Foo^{3,4}, Albert Lee¹, Marc H. Bornstein^{5,6,7} and Gianluca Esposito^{2*}

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*Correspondence:

Peipei Setoh
psetoh@ntu.edu.sg
Gianluca Esposito
gianluca.esposito@unitn.it

[†]These authors have contributed
equally to this work and share first
authorship

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¹Psychology Program, School of Social Sciences, Nanyang Technological University, Singapore, Singapore, ²Department of Psychology and Cognitive Science, University of Trento, Rovereto, Italy, ³Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore, Singapore, ⁴Human Genetics, Genome Institute of Singapore, Singapore, Singapore, ⁵Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, MD, United States, ⁶Institute for Fiscal Studies, London, United Kingdom, ⁷UNICEF, New York, NY, United States

Human faces capture attention, provide information about group belonging, and elicit automatic prepared responses. Early experiences with other-race faces play a critical role in acquiring face expertise, but the exact mechanism through which early experience exerts its influence is still to be elucidated. Genetic factors and a multi-ethnic context are likely involved, but their specific influences have not been explored. This study investigated how oxytocin receptor gene (OXTR) genotypes and childcare experience interacted to regulate face categorization in adults. Information about single nucleotide polymorphisms of OXTR (rs53576) and experiences with own- and other-race child caregivers was collected from 89 Singaporean adults, who completed a visual categorization task with own- versus other-race faces. Participants were grouped into A/A homozygotes and G carriers and assigned a score to account for their type of child caregiver experience. A multivariate linear regression model was used to estimate the effect of genetic group, child caregiver experience, and their interaction on categorization reaction time. A significant interaction of genetic group and child caregiver experience ($t = 2.48, p = 0.015$), as well as main effects of both genetic group ($t = -2.17, p = 0.033$) and child caregiver experience ($t = -4.29, p < 0.001$) emerged. Post-hoc analysis revealed that the correlation between categorization reaction time and child caregiver experience was significantly different between the two genetic groups. A significant gene x environment interaction on face categorization appears to represent an indirect pathway through which genes and experiences interact to shape mature social sensitivity to faces in human adults.

Keywords: face categorization, perceptual expertise, multiracial, oxytocin receptor gene, gene–environment interaction

INTRODUCTION

Facial characteristics are employed in the perception and categorization of individuals into groups (Macrae and Quadflieg, 2010). People can accurately identify the social categories to which individuals belong, such as age, race, and sex (Zhao and Bentin, 2008), by using specific physiognomic cues (see Rule and Sutherland, 2017). For example, face categorization decisions regarding race are influenced by skin color (see Maddox, 2004 for review), face shape (Hill et al., 1995), and other facial features, such as nose shape, lip fullness, hair texture, and quality and jaw width (e.g., Blair and Judd, 2011; Stepanova and Strube, 2012; Strom et al., 2012; Dunham et al., 2015). Hence, learning indicative perceptual features of group membership constitutes an effective component of categorization accuracy (Rule and Sutherland, 2017). Individuals with more interactional experiences with members of a particular social category categorize faces more accurately, possibly due to their more frequent opportunities to learn relevant facial features that distinguish social groups (Rule et al., 2010; Brambilla et al., 2013).

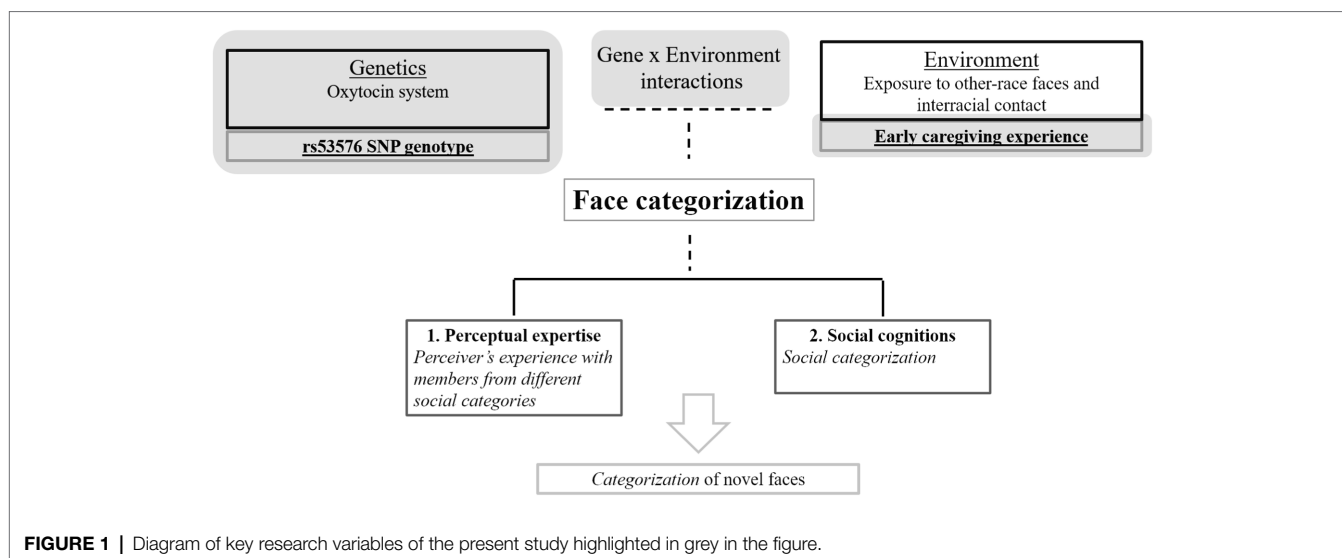
Real-life experiences have been proposed to play a critical role in acquiring face expertise (Lee et al., 2011) where an individual's ability to categorize faces based on social concepts, such as race, stems from early repeated experiences and develops through socialization (Rutland et al., 2005; Dunham et al., 2013; Xiao et al., 2015). For example, 3- and 4-month-old infants show better recognition for faces of the same race (and gender) of their primary caregiver, and 8- and 9-month-old infants with female other-race child caregivers show better recognition for other-race faces compared to infants without such experience, suggesting roles of caregiver experience and other-race contact for face processing (Tham et al., 2018). Moreover, 9-month-old White infants categorize and individuate White faces but not Chinese faces, pointing to the role of experience in categorizing face race (Anzures et al., 2010). Thus, current evidence indicates that experience with a group and early caregiver experience with other-race caregivers can influence infants' distinctions between members of different social categories.

Besides the effects of experience with faces on face processing, genetic factors are associated with social cognition and social sensitivities (see Skuse and Gallagher, 2011). We propose that such genetic factors could influence race-based face categorization. A potential gene of interest in this connection is the oxytocin receptor gene (OXTR). The oxytocin system has been implicated in human socially related personality traits and behaviors (Donaldson and Young, 2008; Meyer-Lindenberg et al., 2011). Specifically, the OXTR has been identified as a candidate gene regulating attachment-related behaviors and social cognition in humans where the link between single nucleotide polymorphisms (SNPs) in this gene and sociality has been examined (Gillath et al., 2008; Ebstein et al., 2010). One such SNP is rs53576 (G/A). Compared to A allele carriers, G allele homozygosity (GG) is associated with higher (i) self-reported empathy (Rodrigues et al., 2009), (ii) prosocial features (Tost et al., 2010), and (iii) general sociality as rated by peers

(Kogan et al., 2011). By contrast, A allele carriers appear to have social information processing deficits in, for example, emotion recognition (Rodrigues et al., 2009). Previous studies have also examined gene–environment interactions between OXTR genotypes and environmental factors on responses to social stimuli (Cataldo et al., 2020), sociability (Carollo et al., 2021), and psychopathology (Cataldo et al., 2018; Zhang et al., 2021), suggesting that OXTR genotypes may also interact with environmental factors in influencing face categorization, which involves the processing of social information relating to faces. For example, rs53576 A/A carriers with high levels of paternal care showed less adaptive responses to social stressors (Cataldo et al., 2020) and followed more Instagram profiles (Carollo et al., 2021), indicating differences between OXTR genotypes in their response to social stressors and social media activity. The review by Cataldo et al. (2018) found that both rs53576 and rs2254298 were significantly involved in gene–environment interactions with early parental care in modulating psychopathology risk. In a similar vein, Zhang et al. (2021) found that higher childhood adversity was associated with depressive symptoms only in rs2254298 G/G carriers in a sample of incarcerated males although such a gene–environment interaction was not observed for rs53576.

Oxytocin appears to improve face processing, such as facial emotion recognition (Guastella et al., 2008; Bartz et al., 2011; Lopatina et al., 2018), and administration of oxytocin facilitates face recognition (Bate et al., 2015) and face memory (Rimmele et al., 2009). rs53576 genotypes have previously been found to be associated with implicit responses to infant and adult faces, where G/G carriers exhibited a more positive implicit association to ingroup infant faces (Senese et al., 2017). The rs53576 genotype has also been associated with neural responses toward ingroup and outgroup faces where A/A carriers showed significant empathic neural responses for faces with both shared racial and group identity compared to G/G carriers who showed such empathic responses for faces with either shared racial or group identity (Luo et al., 2019), suggesting that OXTR rs53576 may interact with intergroup relationships on prosocial behavior. However, evidence about associations between SNPs and face processing is inconsistent. For example, one study reported a significant association between face recognition and the OXTR SNP rs237887 (Skuse et al., 2014), whereas another study failed to find significant associations between 17 OXTR SNPs, including rs237887, and face processing (Verhallen et al., 2017). In a third study, face recognition parameters were associated with OXTR SNPs, where rs53576 and rs2254298 were proposed to lead to poorer performance across social cognition measures, including face recognition (Slane et al., 2014).

The present study aims to explore how genetic factors, childhood experience with other-race child caregivers, and gene \times experience interactions influence mechanisms involved in race-based face categorization in a multiracial context. Specifically, we investigated the effects of OXTR rs53576 genotype and early caregiver experiences with either own- or other-race child caregivers in Singaporean adults' categorizing faces by race (**Figure 1**). The rs53576 SNP genotype was examined as the G allele appears to be associated with prosocial traits including



sociality and social cognition (Tost et al., 2010; Kogan et al., 2011; Li et al., 2015), and has been previously implicated in responses to ingroup/outgroup faces (Senese et al., 2017; Luo et al., 2019) which is related to the present study on own vs. other-race face categorization. Finally, the effect of rs53576 genotype on face categorization has not been studied previously.

The times taken for visual categorizing of face stimuli by race were measured. In line with previous findings (Tham et al., 2018; Woo et al., 2020), we expect individuals with other-race early child caregiver experience to show faster categorization times than individuals with own-race early child caregiver experience or no experience. However, G carriers may be more likely to have greater social interactions and contact with others than A/A carriers, possibly resulting in exposure to child caregivers during early childhood to constitute a more significant source of interracial contact for A/A carriers compared to G carriers. Hence, starting from the idea that early caregiver experience would interact with OXTR genotype in influencing face categorization (operationalized as response times to face stimuli of own and other-race in our study), the following hypotheses were investigated:

Hypothesis 1: It is hypothesized an interaction effect between OXTR genotype and early child caregiver experience. Specifically, we expect to observe faster categorization times in individuals with a OXTR genotype A/A and history of other-race child caregivers when responding to own and other-race faces compared to individuals with a history of an own-race child caregiver and G carriers or no experience (both OXTR genotype A/A or G carriers).

Hypothesis 2: We expect a main effect of early child caregiver experience. Specifically, individuals with a history of other-race child caregivers will have faster categorization times compared to those with a history of an own-race child caregiver or those with no experience when responding to own and other-race faces.

MATERIALS AND METHODS

Participants

Participants [$N=89$, Age (years) $M=21.85$, $SD=1.70$, females=65] were undergraduates compensated with course credit. All participants were ethnic Chinese. The study was approved by the Nanyang Technological University IRB (IRB Number: IRB-2015-08-020-01) and the research conducted in this study was performed in accordance with Helsinki Declaration. Written informed consent was obtained from participants prior to commencement of the study.

Procedure

Participants were assessed individually when they were asked to complete a demographics questionnaire at the beginning of the study to obtain information regarding their early experiences with own- or other-race child caregivers. Participants were asked for the following details: (i) age at the time of the child caregiver experience, (ii) duration of the child caregiver experience, and (iii) nationality of their child caregiver. 53 participants experienced non-parental child caregiving. 14 participants had own-race child caregivers, of which 6 were a relative; the rest had other-race child caregivers who were either Indonesian ($n=14$) or Filipino ($n=10$). 15 participants had more than one child caregiver who were either Indonesian and Filipino ($n=8$) or other nationalities ($n=7$).

After the questionnaire, participants completed a visual categorization task to measure their performance in categorizing faces by race. The task was conducted using a Microsoft Surface Pro tablet with a touch screen, using E-prime 2.0 Professional (Psychology Software Tools, Sharpsburg, PA). Participants were instructed to place their hands at the side of the tablet to standardize the time needed to move their thumb to the response keys. Participants were also reminded to read the instructions carefully and perform the task as fast and as accurately as possible.

Experimental Task

Face Stimuli

To assess participants' categorizing ability in identifying the race of faces, 4 unique Chinese faces and 4 unique Javanese faces were used. The faces were selected from an existing face database (Yap, Chan, and Christopoulos, 2016). Indonesian Javanese faces were used to represent other-race child caregivers in Singapore as Indonesians made up the majority of foreign domestic workers in Singapore—about 50.4% of foreign domestic workers (Devaraj, 2020). All faces displayed neutral expressions in color and frontal views presented on a white background. The face images were standardized at 480 pixels (17 cm) wide and 600 pixels (21 cm) high with a resolution of 72 pixels per inch and were processed to be the same elliptical shape and size, with eyes and nose centrally aligned.

Trials

The visual categorization task consisted of eight test trials where either an own- (Chinese) or other (Javanese)-race face stimulus was presented in the middle of the display screen with two race labels, similar to the experimental paradigm employed in Setoh et al. (2019) (Figure 2). These race labels were programmed at the bottom-left or bottom-right corners of the screen as response keys. Participants were instructed to identify the race of the face stimulus by tapping on the response keys. Each face was displayed until the participant made their response by tapping on either response key and a new face was presented following the participant's response. The face races were presented in a randomized order. To control for and minimize the effect of side preference, the position of race labels was counterbalanced such that the race labels alternated between left and right positions for each race. For instance, half of the own-race face stimuli were programmed with other-race label on the left and own-race label on the right, and vice versa for the other half. The same was programmed for

Javanese face stimuli. Participants were not provided with feedback indicating whether their response was correct during the test trials.

For each stimulus, the Reaction Time (RT), the time interval between onset of the face and the tapping on the selected label, was measured.

OXTR Genotyping

Buccal mucosa samples were collected from each participant and genotyped by a laboratory. DNA extraction was performed for each participant using the Oragene DNA purifying reagent and concentrations were assessed using spectroscopy (NanoDrop Technologies, United States). Polymerase Chain Reaction (PCR) was conducted to amplify the target OXTR gene region rs53576 using 1.5 l of genomic DNA from the test sample, PCR buffer, 1 mM each of the forward and reverse primers, 10 mM deoxyribonucleotides, KapaTaq polymerase, and 50 mM MgCl₂. The forward and reverse primers used were 5-GCC CAC CAT GCT CTC CAC ATC-3 and 5-GCT GGA CTC AGG AGG AAT AGG GAC-3. The PCR process involved (i) 15 min of denaturation at 95 degrees Celsius, (ii) 35 cycles at 94 C (30 s), 60 C (60 s), 72 C (60 s), and (iii) 10 min of protraction at 72 C.

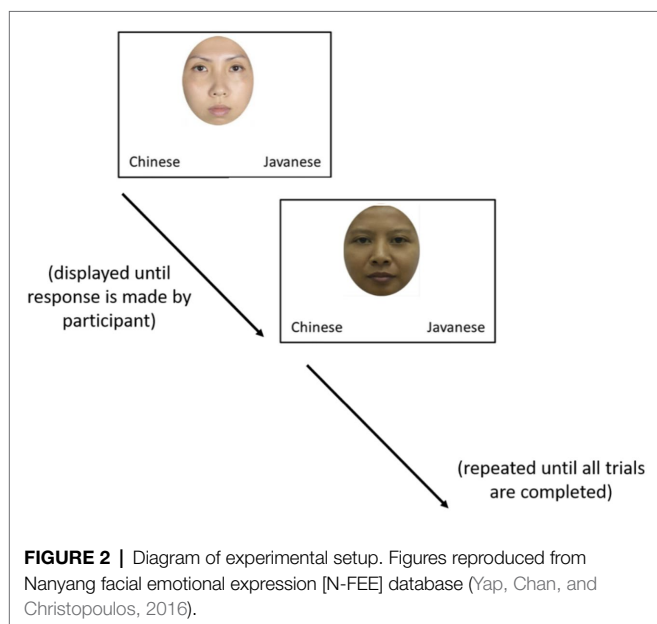
Previous studies investigating rs53576 genotypes showed a higher prevalence of G/G homozygotes particularly in European American samples where there tends to be a skewed distribution of A/A, A/G, and G/G genotypes corresponding to 12, 38, and 50%, respectively (Kim et al., 2010). Due to this skewed distribution, previous publications have largely clustered the genotype variants into G/G vs. A/ carriers. However, allele frequencies and linkage disequilibrium patterns differ between Asians and Caucasians (Tost et al., 2011) and multiple studies have found that A allele frequency of rs53576 is higher in Asian populations (Luo and Han, 2014; Butovskaya et al., 2016). The averaged distribution of the different genotypes in the Asiatic population is 45–65% for A/A homozygotes and 35–55% for G carriers (1,000 Genomes project, BioSamples: SAMN07486027-SAMN07486024, dbSNP, 2017).

Participants were therefore classified into “G”: G carriers—those with at least one G allele (G/G homozygotes or A/G) or “AA”: A/A homozygotes. The division of participants into the rs53576 genotypes was: 46 (51.7%) A/A carriers, 30 (33.7%) A/G carriers, and 13 (14.6%) G/G carriers.

Experience With Child Caregiver

Participants were assigned to three groups, based on the reported experience with child caregivers: (i) No-experience group ($N=36$): participants who did not receive non-parental caregiving experience; (ii) Own-race group ($N=14$): participants who received own-race child caregiving; (iii) Other-race group ($N=39$): participants who received other-race child caregiving.

As experience and interactions with others is posited to provide more opportunity for learning relevant facial features which are distinct between members of different social categories (in this case, race), an individual with an other-race child caregiver can be considered to have more experience with members of that particular social category compared to an individual without an other-race child caregiver. Because all participants in the study were Chinese, individuals with an other-race child caregiver would have more experience with distinguishing relevant facial features



of members from a different social category compared to individuals with a same-race child caregiver.

Hence, a new variable (Experience), was created based on the early child caregiving received by participants, in order to account for the different extent of exposure that individuals had with faces of different social categories based on their early caregiver experience: No-experience was assigned an Experience value of 0, Own-race was assigned a value of 1, and Other-race was assigned a value of 2.

Analytic Plan

Preliminary analysis was conducted to ensure that the independent variable used in this study was appropriate to measure subjects' face categorization performance and normally distributed. A chi-square test was used to ensure the observed frequencies in the rs53576 genotypes were comparable with those of the reference East-Asian population. Similarly, another chi-square test was used to ensure the observed frequencies in the Experience groups were comparable between the two Genetic Groups (A/A and G carriers). Descriptive and inferential analysis were used to investigate the role played by Genetic Group and Experience on the categorization performance. Specifically, a multivariate linear regression model was fit using an Ordinary Least Square estimator. Then, the main effects for Genetic Group and Experience were investigated using post-hoc analysis: Welch's *t*-test was used to assess if there are significant differences between the two genetic groups; Spearman correlation test was used to test if Experience is associated with the categorization performance. Finally, Spearman correlation between Experience and categorization performance was separately computed on the two genetic groups, and a *z* test was used to test if the two correlations were significantly different. The dataset used in this study can found at Esposito and Setoh (2020).

RESULTS

Preliminary Analyses

Prior to data analysis, we first verified that there were no significant differences in the accuracy of categorization responses for Chinese and Javanese faces. The accuracy of the categorization responses was high across participants and no significant differences in the accuracy for Chinese and Javanese faces were found (Wilcoxon test, $W=255$, $p=0.279$). We then verified that no differences existed between the RTs of the two races. Since the RT were not normally distributed for both Chinese ($M=1081.0$ ms, $SD=260.9$ ms, Shapiro–Wilk test: $W=0.95$, $p=0.001$) and Javanese ($M=1048.3$ ms, $SD=229.1$ ms, Shapiro–Wilk test: $W=0.90$, $p<0.001$) faces, we tested the difference using a Wilcoxon signed-rank test. No significant difference was found: ($W=1,671$, $z=-1.35$, $p=0.174$, Common Language Effect Size: 0.54). Since no difference between the two races was found, the overall categorization RT was computed for each participant by averaging the RT across all trials. The resulting overall categorization RT was not normally distributed (Shapiro–Wilk test: $W=0.95$, $p=0.001$). We then computed the log-transformed overall categorization RT (ORT), which was normally distributed (Shapiro–Wilk test: $W=0.98$, $p=0.126$). No significant difference, $X^2(N=89, 2)=4.52$, $p=0.104$, Cramer's $V=0.09$, was observed between the distribution of participants of this study (A/A: 51.7%,

A/G: 33.7%, G/G: 14.6%) and the reference East-Asian population (A/A: 42.1%, A/G: 45.8%, G/G: 12.1%; Yates et al., 2020). The distributions of the participants with different child caregiver experiences were similar between the two genetic groups: $X^2(N=89, 2)=0.527$, $p=0.768$, Cramer's $V=0.08$. No differences in age and gender emerged between the groups.

Descriptive and Inferential Analysis

Descriptive statistics of the ORT for the two Genetic Groups and the three Experience groups are reported in Table 1. A multiple linear regression was calculated to predict ORT based on Genetic Group (A/A, G carriers) and Experience (No-experience=0, Own-race=1, Other-race=2) and their interaction. A significant regression equation was found [$F(3, 85)=6.323$ $p<0.001$], with an R^2 of 0.18 (see Table 2). A significant interaction of Genetic Group and Experience ($t=2.48$, $p=0.015$), as well as main effects of both Genetic Group ($t=-2.17$, $p=0.033$) and Experience ($t=-4.29$, $p<0.001$) emerged. Post-hoc analysis revealed no significant difference in the ORT between A/A carriers and G carriers [$t(85.13)=0.41$, $p=0.685$, Cohen's $d=0.09$], and a significant correlation between ORT and Experience [$\rho(87)=-0.33$, $p=0.002$]. A significant correlation between Experience and ORT was found for the AA group [$\rho(44)=-0.52$, $p<0.001$], but not for the G carriers [$\rho(41)=-0.10$, $p=0.533$]. The difference in correlations was significant ($z=-2.17$, $p=0.015$, see Figure 3).

DISCUSSION

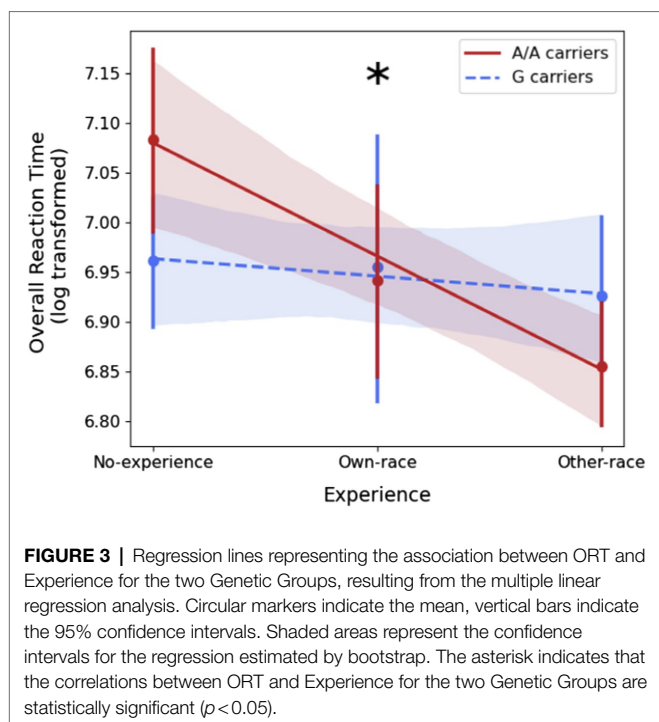
The present study aimed to investigate the role of both genetic and environmental factors on other-race face recognition where we examined the rs53576 OXTR genotype and early caregiver

TABLE 1 | Distribution of the samples in the two genetic groups and types of early child caregiver experience.

	Child caregiver Experience	N (% of genetic group)	Overall reaction time [ms] M (SD)
AA (N=46)	No-experience	19 (41.3)	1217.33 (254.76)
	Own-race	6 (13.0)	1043.21 (145.96)
	Other-race	21 (45.7)	958.72 (138.07)
G (N=43)	No-experience	17 (39.5)	1065.05 (150.23)
	Own-race	8 (18.6)	1067.42 (217.94)
	Other-race	18 (41.9)	1032.52 (177.96)

TABLE 2 | Results of the multiple linear regression to investigate the effects of Experience, Genetic Group, and their interaction on ORT.

Variable	β	95% Confidence interval [0.025, 0.975]	SE	<i>t</i>	Value of <i>p</i>
Intercept	7.08	[7.01, 7.15]	0.04	190.70	<0.001
Genetic Group [G carriers]	-0.12	[-0.22, -0.01]	0.05	-2.17	0.033
Experience	-0.11	[-0.17, -0.06]	0.03	-4.29	<0.001
Experience × Genetic Group [G carriers]	0.10	[0.02, 0.17]	0.04	2.48	0.015



experience in Singaporean adults. Here, we proposed the inclusion of a genetics perspective to be considered in investigating face categorization.

First, a significant interaction effect of Genetic Group with Experience was found in the present study, supporting Hypothesis 1. A possible explanation for this finding is the difference in prosociality between A/A homozygotes and G carriers. As discussed earlier, the G allele has previously been associated with adaptive prosocial traits. Hence, it is possible on average, G carriers have greater interracial contact with others and derive perceptual expertise from their social interactions as opposed to early caregiver experience compared to A/A homozygotes. As such, early caregiver experience constitutes a more significant source of interracial contact and exposure to other-race faces for A/A homozygotes and forms a significant avenue through which A/A homozygotes derive perceptual expertise in face categorization by race. These findings suggest that the environment—early caregiver experience—may be able to compensate for a profile of less adaptive social traits and characteristics that have previously been associated with A/A carriers of rs53576. Overall, these findings also strongly suggest the importance of applying a genetics perspective to examining face categorization by race given the significant gene–environment interaction discovered in the present study which align with previous studies indicating gene–environment interactions between OXTR genotype and environmental factors (see for example Esposito et al., 2017a,b).

Second, a significant correlation between Experience and categorization reaction time was found in the present study where individuals with other-race child caregiver experience had the fastest categorization reaction times in the A/A homozygotes. This finding is in line with previous findings in Rennels et al. (2017) and Tham et al. (2018) that the face processing system

can be flexible to changes in caregiver experiences in an infant's natural environment. Notably, Tham et al. (2018) found some evidence indicating that Chinese infants with additional other-race (Malay; a high frequency race in Malaysia) caregivers showed better recognition for other-race faces than infants without additional other-race caregivers in Malaysia. In terms of the frequency of Javanese as an other-race in Singapore, Singapore has a relatively high non-resident population (1.47 million as of June 2021; Singapore Department of Statistics, 2021) with 252,600 foreign domestic workers, making up 18.7% of the non-resident population (Ministry of Manpower, 2020) where it has been reported that one in five Singaporean households hires a foreign domestic worker (Awang and Wong, 2019) and about half of these foreign domestic workers are Indonesian (Devaraj, 2020). Hence, Javanese can be considered a relatively high frequency other-race in Singapore. In addition, Malays constitute the second largest racial group in Singapore where the Javanese are one of the Indonesian ethnic groups which migrated to Singapore and people with Javanese ancestry in Singapore have largely assimilated and are regarded as part of the Malay racial group (Tham, 1993). As such, in the context of the relatively large population of Javanese foreign domestic workers and Malay individuals in Singapore, an individual needs to be able to individuate and recognize their own other-race child caregiver apart from other Javanese faces, possibly leading to greater perceptual expertise derived from early experience with individuation and categorization of Javanese faces. This aligns with previous findings that early experience contributes to the ability to categorize faces by social categories, such as race. Hence, early experience with individuating an other-race face could result in more efficient cognitive processes involved in face categorization and consequently, faster reaction times for race-based categorization.

Majority of the studies on face processing have been conducted in predominantly monoracial populations living in racially homogeneous environments who generally lack experience with other-race faces (Valentine and Endo, 1992; Levin, 1996; Zhao and Bentin, 2008; Feng et al., 2011) and there are fewer studies looking at participants from multiracial societies, indicating that face processing in populations with greater experience with faces of different categories—specifically, race—is not well understood. Given the multiracial societal context that the study was conducted in—Singapore's resident population consists of 74.2% Chinese; 13.7% Malay; 8.9% Indian; and 3.2% other races (Singapore Department of Statistics, 2021), the findings of the present study suggest that early childhood experience involving interracial contact appear to influence face categorization and future studies leveraging on the nature of multiracial societies can help to provide greater insight in investigating this phenomenon. Findings in the present study align with previous findings indicating better face recognition abilities in infants with other-race caregivers (Tham et al., 2018). Extending from this role of early childhood experience with other-race faces, another implication of these findings could be an important consideration during child development, especially in light of findings that racial categorization of faces has been associated with implicit racial bias in children (Setoh et al., 2019) and that training children can reduce implicit racial bias (Xiao et al., 2015).

Limitations and Future Directions

However, there are a number of limitations to the study. Firstly, early caregiver experience with a child caregiver was simply measured in terms of absence of child caregiver or presence of other- or own-race child caregiver. A number of other factors, such as time spent with the child caregiver and quality of the relationship, could possibly influence the experience that individuals would have. Hence, future studies can investigate these factors to better understand how these factors may moderate the effect of early caregiving experience on race-based face categorization. The present study did not assess prosociality directly and further studies specifically comparing prosociality traits between rs53576 genotypes would allow for greater clarity of the underlying mechanisms of the gene–environment interaction on face categorization found in the present study. For example, future studies can make use of measures of prosociality, such as behavioral coding (e.g., Kogan et al., 2011) or self-reports, such as the Tridimensional Personality Questionnaire (e.g., Tost et al., 2010), and look into possible associations with the interaction experiences of adults with members of other races in their daily lives. By investigating the relationships between these factors between genetic groups, these studies can further strengthen the possible explanation that greater prosociality in G allele carriers facilitates greater experience interacting with members of different social categories in daily life compared to A/A homozygotes, resulting in early caregiving experience with other-race child caregivers constituting a less significant source of interracial contact for the G allele carriers relative to A/A homozygotes.

Secondly, early experiences with a child caregiver were measured retrospectively by asking adult participants to recall their childhood experiences. While it may be difficult to meaningfully quantify the extent of one's own vs. other-race exposure in a multicultural society like Singapore, in terms of the other-race caregiver experience in the present study, the other-race child caregivers in the study are foreign domestic workers who live in with the household that they work for, which implies a significant majority of time, possibly close to 24-h exposure a day, since they are living in the same household. Future studies can seek to further strengthen current findings by employing a longitudinal design examining race-based face categorization in children as they develop, where the possible explanations that we proposed for our findings can be tested in terms of the relationship between the ability to individuate one's other-race child caregiver and the categorization response. Both the experiences an individual has with own and other-race individuals as well as the specific timeframe in life during which the early caregiving experience and other experiences with own and other-race individuals occurred may also contribute to differences in face categorization abilities and future studies can also look into whether the age at which the child caregiver experience occurred influences face categorization. These studies will also contribute to a more accurate depiction of the duration and timing of exposure to other-race child caregivers that must elapse for significant differences in categorization responses with individuals without caregiving experience to arise.

Thirdly, the sample in the present study did not have an equal distribution of participants for each OXTR genotype group as specific early life experiences and OXTR genotypes

are not easily determined during participant recruitment. The sample was also made up of more females than males. Future studies can look to expand on and validate present findings by recruiting a larger sample.

CONCLUSION

The present study found that early child caregiver experience affects the speed of categorization response times, suggesting that perceptual expertise could play a role in face categorization abilities in adults of a multiracial society. There was also preliminary evidence pointing toward gene–environment interactions influencing speed of face categorization, specifically the rs53576 OXTR genotype. Such gene–environment interactions suggest that environmental factors could help to compensate for genetic predispositions relating to face categorization. Findings from the present study suggest that studies on face categorization need to take into account the demographic of the population individuals are exposed to as well as the contributing role of genetics, especially given the vast differences in both these factors in societies around the world.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: (DR-NTU) <https://doi.org/10.21979/N9/IWGQ1M>.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Nanyang Technological University Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

PS and GE conceptualized the study. PS collected the data. MT and JF analyzed the genetic data. AB, MB, and GE analyzed the data. MN, AB, MB, and GE wrote the first draft. All the authors reviewed and edited the submitted version of the article.

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EDITED BY

Alessandra Geraci,
University of Trento,
Italy

REVIEWED BY

Peipei Setoh,
Nanyang Technological University,
Singapore
Silvia Moscatelli,
University of Bologna,
Italy

*CORRESPONDENCE

Kyong-sun Jin
kj@sungshin.ac.kr

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The sense of belonging reduces ingroup favoritism in children

Joo Hyang Park and Kyong-sun Jin*

Department of Psychology, Sungshin Women's University, Seoul, Republic of Korea

Belonging is an important motive for intergroup behavior. Adults display pronounced ingroup favoritism when the sense of inclusion by an ingroup is decreased or threatened. The present study investigated whether ingroup belonging reduces ingroup favoritism in 6-year-old children in terms of costly sharing. Children were allocated to a novel group in a minimal-group paradigm. In two conditions, children played a brief ball-tossing game and were either included (ingroup-inclusion condition) or excluded (ingroup-exclusion condition) by their ingroup members. Children in a no-interaction condition did not have any interactions with the members of the ingroup. After this manipulation, we tested the extent to which children shared resources with ingroup and outgroup members. We found that children in the ingroup-exclusion and no-interaction conditions shared more resources with their ingroup member than their outgroup member, while children in the ingroup-inclusion condition shared equally with the ingroup and outgroup members. These results could inform interventions aimed at fostering positive intergroup relations.

KEYWORDS

children, belonging, ingroup favoritism, intergroup intervention, minimal group, prosocial behavior, sharing

Introduction

Ingroup favoritism refers to the tendency to favor ingroups over outgroups in evaluations and actions. Individuals tend to evaluate ingroup members more positively than outgroup members, prefer ingroup members, allocate more resources to ingroup members, and selectively help ingroup members (e.g., [Tajfel et al., 1971](#); [Brewer, 1979](#); [Killen and Turiel, 1998](#); [Turiel, 1998](#); [Hewstone et al., 2002](#); [Tajfel and Turner, 2004](#); [Levine et al., 2005](#); [Fehr et al., 2008](#); [Balliet et al., 2014](#)). Ingroup favoritism is deeply rooted in evolutionary history, as group living has been critical to human survival. Our dependence on groups has at least two psychological consequences: we have a pervasive and fundamental motivation to belong to a group ([Brewer, 1991](#); [Baumeister and Leary, 1995](#); [Fiske, 2010](#); [Over, 2016](#)) and we act in ways that support the group by caring for ingroup members and showing them loyalty ([Tajfel et al., 1971](#); [Shweder, 1997](#); [Brewer, 1999](#); [Tooby et al., 2006](#); [Rai and Fiske, 2011](#); [Graham et al., 2013](#); [Baillargeon et al., 2015](#)). Thus, one might expect the sense of belonging to a group to be associated with the tendency to be selectively prosocial with respect to the group

(e.g., Brewer, 1991; Leary et al., 1995; Leary, 2005; Leonardelli et al., 2010). In the present study, we investigated the way in which the sense of belonging impacted ingroup favoritism in children. We proposed that children would show less ingroup favoritism when they had a strong sense of belonging to the ingroup.

The relationship between group belonging and ingroup favoritism has been demonstrated in adults. This line of research has mainly focused on the reactions of adults whose sense of inclusion by a group is lowered or threatened (e.g., people who are on the margins of a group or are excluded by the group). Adults in such situations often respond with relatively pronounced ingroup favoritism (Noel et al., 1995; Jetten et al., 2002; Williams et al., 2003; Vignoles and Moncaster, 2007), ingroup loyalty (Gómez et al., 2011), nonconscious mimicry of ingroup members (Lakin et al., 2008), ethnocentrism (Greitemeyer, 2012), and fundamentalist beliefs that are endorsed by the ingroup (Schaafsma and Williams, 2012). For example, in one study, peripheral group members (who presumably felt a need to assimilate) showed greater distinction in their attitudes toward their ingroup versus outgroup members than core group members (Noel et al., 1995), suggesting that threats to group inclusion motivate ingroup favoritism as a means of re-establishing belonging. These findings are consistent with the idea that individuals who are motivated to enhance their inclusionary status with respect to the group will attempt to display their value and worth as a group member, and that this may be achieved by favoring the ingroup over the outgroup (Leary et al., 1995; Leary, 2005).

The premise that threat to group belonging is an important motive for ingroup favoritism (Noel et al., 1995; Jetten et al., 2002) could inform interventions aiming to reduce intergroup bias in children. Recent findings indicate that ingroup favoritism emerges early in young children (Kinzler et al., 2007; Fehr et al., 2008; Olson and Spelke, 2008; Gummerum et al., 2009; Moore, 2009; Dunham et al., 2011; Paulus and Moore, 2014; Renno and Shutts, 2015; Yu et al., 2016; Sparks et al., 2017; Yazdi et al., 2020) and even in infants (e.g., Kinzler et al., 2007; Powell and Spelke, 2013; Jin and Baillargeon, 2017; Bian et al., 2018; Ting et al., 2019; Pun et al., 2021). These findings led developmental researchers to orient their efforts in a new direction and to develop targeted interventions to prevent the negative consequences of ingroup favoritism, including discrimination and prejudice. Strategies for reducing intergroup bias in children focus on moderating intergroup cognitions and emotions, for example, promoting interethnic friendships (Aboud et al., 2012), increasing empathy toward outgroup members (Sierksma et al., 2014, 2015; Abrams et al., 2015), empathizing with outgroup members (McLoughlin and Over, 2019), reading stories describing positive intergroup interactions (Cameron et al., 2006; Cameron and Rutland, 2006), and imagining interpersonal contact with outgroup members (Vezzali et al., 2012, 2015). However, harnessing this knowledge to achieve sustained positive outgroup cognitions and emotions can be challenging (Dixon et al., 2007; Dovidio et al., 2009;

Vorauer and Sasaki, 2009; Brown et al., 2016; Walton and Yeager, 2020).

The present study investigated whether children's sense of belonging to a group reduced ingroup favoritism. If threats to group inclusion motivate the expression of ingroup favoritism as a means of establishing belonging (Leonardelli et al., 2010), children who are completely accepted by their ingroup might be less likely to treat its members preferentially compared to children who experience rejection. To the best of our knowledge, only a few published experimental reports have investigated how group belonging influences children's behaviors in intergroup contexts (Nesdale et al., 2007, 2010; Watson-Jones et al., 2016). In one experiment (Nesdale et al., 2010), 7- and 9-year-old children were asked to imagine that they were going to participate in an intergroup drawing competition that would involve children from other schools in the area. Next, the children in the inclusion condition were informed that their team members liked the participant's drawing and had explicitly asked the participant to join the team. In contrast, the children in the exclusion condition were informed that their team members did not like the participant's drawing and that they did not want the participant on the team. More relevant to the present study, children who received feedback signaling ingroup inclusion displayed more positive attitudes toward the members of their outgroup (e.g., how much they like, trust, and would want to play with the members) than children who received feedback signaling ingroup exclusion.

The present study focused on prosocial behaviors in children, primarily sharing, and investigated the impact of ingroup inclusion and exclusion on ingroup favoritism in 6-year-old children. Developmental research has indicated that children show ingroup favoritism in sharing behaviors (Zinser et al., 1981; Kinzler et al., 2007; Fehr et al., 2008; Gummerum et al., 2009; Moore, 2009; Paulus and Moore, 2014; Yu et al., 2016; Sparks et al., 2017; Yazdi et al., 2020). These results were mainly obtained *via* three different types of tasks. First, in resource-allocation tasks, children are typically asked to distribute scarce resources to ingroup and outgroup individuals but are not allowed to reserve any resources for themselves. In these mixed-recipient resource allocation tasks, preschool children allocate more resources to ingroup versus outgroup members (Olson and Spelke, 2008; Dunham et al., 2011; Renno and Shutts, 2015). For example, Olson and Spelke (2008) reported that 3-year-old children directed a protagonist puppet to give more resources to the protagonist's friends or siblings than to strangers.

Second, in forced-choice sharing tasks (i.e., mini-dictator games), children are asked to choose a desirable outcome between two resource allocation options involving themselves and a partner. In these scenarios, children are more likely to share their own resources when their partner is a member of their ingroup versus a member of their outgroup (Fehr et al., 2008; Moore, 2009; Paulus and Moore, 2014; Yu et al., 2016; Sparks et al., 2017). For example, Fehr et al. (2008) asked children to choose how sweets should be shared between themselves and an ingroup partner (an anonymous child from the same school) or an outgroup partner

(an anonymous child from a different school). Specifically, the children were asked to choose between an allocation of one sweet for themselves and one sweet for their partner (1,1) and an allocation of (2,0). The researchers found that children aged 7–8 were more likely to choose the equal (1,1) allocation when their partner was an ingroup member compared to when they were an outgroup member. Using a similar paradigm, Yu et al. (2016) found that 5- to 6-year-old children showed ingroup favoritism in that they were more likely to choose an equal sharing option when their partner was an ingroup member versus an outgroup member.

Finally, in the third type of sharing task, known as the dictator game, children freely chose how many (if any) of a set number of items to allocate between themselves and their partner. Compared with the others tasks, the dictator game is less frequently used to examine costly sharing in children in relation to group membership. This is likely due in part to difficulties in curbing self-interest during dictator games. However, children have been found to share more resources with individuals in their ingroup versus outgroup in the dictator game, and this pattern becomes clearer with age (Gummerum et al., 2009; Benozio and Diesendruck, 2015; McLoughlin and Over, 2019; Yazdi et al., 2020). For example, Gummerum et al. (2009) asked 7- and 11-year-old children to play a dictator game using money, and found that older but not younger children allocated significantly more resources to members of their own group. Related to this finding, Yazdi et al. (2020) asked 5- to 9-year-old children to allocate 10 stickers between themselves and an ingroup member or an outgroup member either in the presence of an adult observer or alone, and found that children shared more resources with the ingroup member regardless of the existence of the observer. Studies with younger children revealed more individual variance, for instance, in children 3 to 5 years of age, only boys showed ingroup favoritism in a dictator game where they were allowed to allocate 10 stickers between themselves and an ingroup or outgroup partner (Benozio and Diesendruck, 2015).

Taken together, the above results suggest that, at least in certain situations, children selectively share more with their ingroup members than with outgroup members. In the present study, we explored how children's ingroup favoritism in terms of sharing behaviors are influenced by their previous interactions with ingroup members. Specifically, we investigated the impact of the experience of being included or excluded by an ingroup on children's costly sharing with ingroup versus outgroup members in dictator games. In the present study, children were first assigned to one of two minimal groups marked by different colors (e.g., Dunham et al., 2011). Next, children in two conditions, *ingroup-inclusion* and *ingroup-exclusion*, played a brief Cyberball game (Williams and Jarvis, 2006). Cyberball is a virtual ball-tossing game that has previously been used to manipulate the experience of inclusion or exclusion by group members (Watson-Jones et al., 2016). Following this manipulation, we measured the way that the children shared with ingroup and outgroup members (i.e., how many stickers they chose to share). We used the dictator

game because we hoped to provide stronger evidence regarding prosocial tendencies in children, as well as to contribute to the sparse literature on young children's ingroup favoritism in dictator games. We predicted that 6-year-old children would exhibit less ingroup favoritism, as indicated by their selective sharing, with ingroup versus outgroup members when they were included by the ingroup compared to when they were excluded. We also included one more condition, a *no-interaction* condition in which the children did not play Cyberball. The inclusion of this condition helped address directionality of the effect, i.e., does ingroup inclusion reduce ingroup favoritism or does ingroup exclusion promote it, or both?

Experiment

Method

Participants

Ninety 6-year-old Korean children (72.0–84.3 months, $M=77.34$, $SD=3.75$, 44 girls) participated in the experiment. An additional five children participated but were excluded because they were too active or fussy (3), or because of parental interference (2). Thirty children were randomly assigned to one of three conditions (ingroup-inclusion, ingroup-exclusion, no-interaction condition). We conducted an *a priori* power analysis (G*Power 3.1; Faul et al., 2007) for a 3 (condition) \times 2 (group) analysis of variance (ANOVA). Based on the effect size of the previous research on the similar topic (McLoughlin and Over, 2019), for a power of 0.80 and with an α of 0.05, a minimum of 78 participants were required. Nevertheless, we included 30 participants in each condition (total of 90 participants). The children were given a book to thank them for their participation. Each child's parent provided written informed consent, and the study protocol was approved by the Institutional Review Board of Sungshin Women's University.

Apparatus

This experiment was conducted during the COVID-19 pandemic, and so the children participated using an online system. The visual stimuli were created using Microsoft PowerPoint (Microsoft Corp., Redmond, WA, United States). During the experiment, an experimenter interacted with each child online. Visual stimuli were presented to the children using the "screen sharing" function in Zoom (Zoom Video Communications, Inc., San Jose, CA, United States). Prior to the study, parents were given instructions as to how to set up their screen (a single monitor of a specific size, Zoom video settings, etc.), a recording tool (centered webcam, etc.), sound (the computer volume), and the environment (faces clearly visible, minimizing distractions, etc.). We recorded the shared screen during the session. To prevent any interference during the experiment, the parents were instructed to leave the room.

Materials and procedure

Ingroup conditions (Ingroup-inclusion, Ingroup-exclusion)

The experiment consisted of three phases: group-allocation, Cyberball, and sharing. The children were tested individually by an experimenter using Zoom. The entire experiment took approximately 15 min to complete.

Group allocation

In the group allocation phase, the children were assigned to one of two groups (a yellow or a green group) in a minimal-group paradigm (Tajfel et al., 1971). The children were first presented with three slides that each showed a pair of objects belonging to the same category, such as pet animals (cat vs. dog), fruit (apple vs. pear), and playground equipment (swings vs. slide), and were asked which one they liked better. On the next slide, each pair of objects appeared in a row, and the child's preferred choices were marked with a red circle. The experimenter reminded the children of their choices by saying, "So you said you like cats, apples, and swings better," while pointing at the child's preferred choices using a mouse cursor. The experimenter then introduced two groups, the yellow and the green group, one on each side of the screen, and showed two illustrated characters wearing yellow T-shirts and two characters wearing green T-shirts. The gender of the characters matched the child's gender. Then, the children were told that, depending on their preferred choices, they would be assigned to the yellow or green group, e.g., "Children in the yellow (or green) group like cats, apples, and swings, just like you. So now you are in the yellow group." The experimenter then asked the child to which color group they belonged. All of the children who participated in the present experiment correctly identified their group membership.

Cyberball

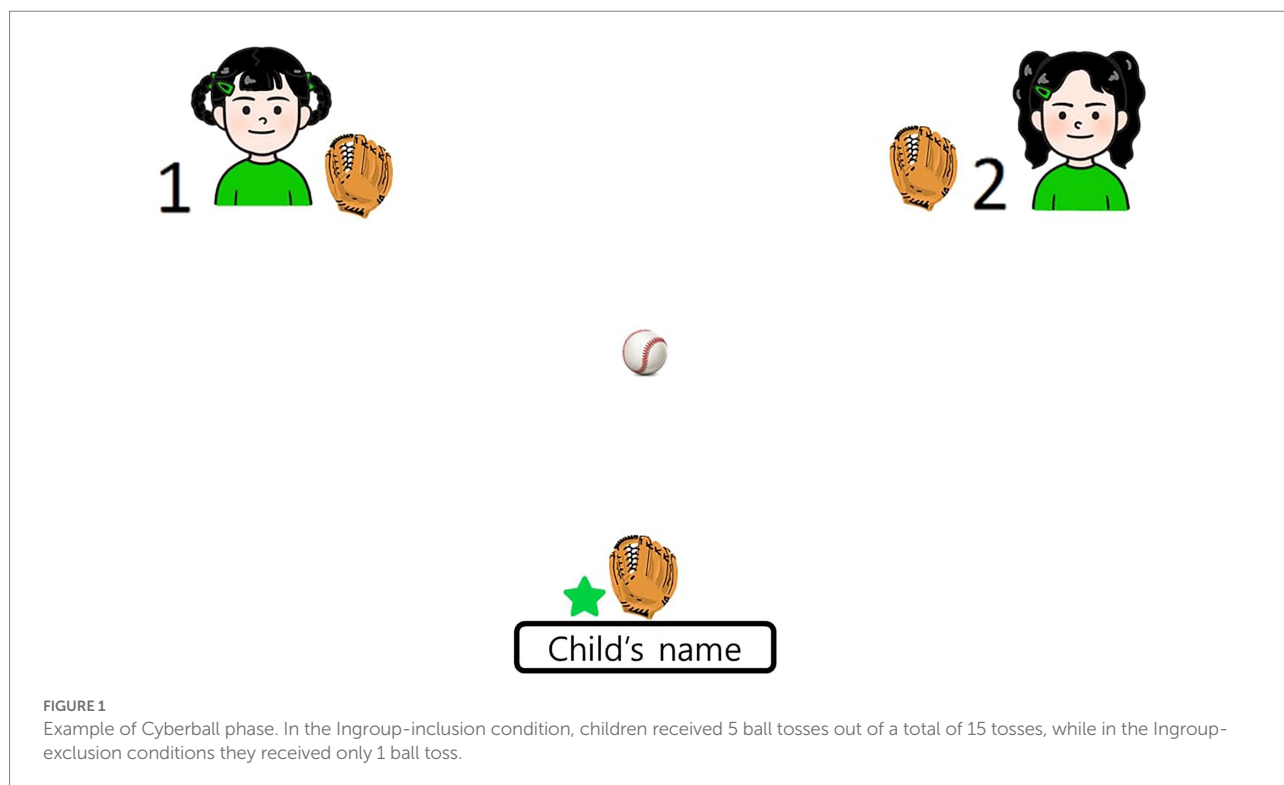
Next, in the Cyberball phase, children in the ingroup-inclusion and ingroup-exclusion conditions were told that the computer would connect them with their group members so that they could play a ball-tossing game together. We adapted the age appropriate Cyberball paradigm for children (Abrams et al., 2011; Watson-Jones et al., 2016; Hwang and Markson, 2020). Children saw two members of their ingroup, i.e., the illustrated characters, one on the left side and the other on the right side of the upper screen, each with a baseball glove (Figure 1). At the lower center area of the screen, an illustrated baseball glove with the name of the participant was shown with a colored star. To increase the saliency of group membership, the color of the star on the baseball glove matched the color of the child's group. At the beginning of the game, a ball appeared in the glove of one of the other players. The participants could only toss the ball to the other players when the ball was in their glove. Since the present study was conducted online, the two ingroup members were number-coded (1 and 2). To toss the ball, the children had to read the number that corresponded to the player to which they wanted to toss the ball.

The experimenter explained how to play the game by saying, "This is a ball tossing game. When you have the ball, it's your turn to throw the ball. If you want to throw the ball to this child (while pointing at the character on the left, which was numbered as (1), you say "One!" and the ball will be thrown to that child. When you want to throw the ball to this child (while pointing at the character on the right, numbered as (2), you say "Two!" and the ball will be thrown to that child. You can choose to pass the ball to any player you want and the other players will choose to whom they are going to pass the ball. While you are playing the game, I want you to imagine that you are in the playground, actually passing a ball back and forth with the other players in the game. Okay?" After completing a practice game, the children played the Cyberball game. The two ingroup conditions differed in terms of how many ball tosses the children received from the ingroup members. The children in the ingroup-inclusion condition received 5 ball tosses out of a total of 15 tosses; whereas the children in the ingroup-exclusion condition received only 1 ball toss and they were left out of the game for the remaining ~2 min of game play.

Following the Cyberball game, we performed a *manipulation check* to ensure that the children recognized the situation of inclusion versus exclusion. The experimenter asked the children, "How much did they throw you the ball? A lot or a little?" while presenting thumbs-up and thumbs-down signs side-by-side on the screen. Next, we asked the children a *moral-evaluation question* to explore how they evaluated the ingroup individuals who either included or excluded them. The experimenter asked the children, "What do you think about the children who played the ball-tossing game with you? Were they very bad, bad, not bad nor nice, nice, or very nice?" while showing a 5-point scale with stars representing positive ratings (from two stars representing very nice to one star representing nice), X representing negative ratings (from XX representing very bad to X representing bad), and a blank circle representing not nice nor bad. The ratings were coded from 1 (very bad) to 5 (very nice). To check for differences in emotional experience following the inclusion and exclusion games, we also asked children how they felt after they played the ball-tossing game. For *emotion ratings*, the experimenter asked, "How did you feel during the ball tossing game?" while showing a 5-point scale with representative drawings of a face depicting the relevant emotion. The ratings were then coded from 1 (very bad) to 5 (very good).

Sharing

Next, in the sharing phase, the children played two rounds of the dictator game in the role of the proposer, in which they were asked to divide their stickers between themselves and either an ingroup or an outgroup member (order was counterbalanced across the children). In each trial, the children were presented with two boxes: one on the top and one on the bottom center area of the screen. The children were told that the bottom box belonged to them and that the top box belonged to another child who was either an ingroup or outgroup member. To help the children



understand the task, their name was written next to their box, and the face of the illustrated character (the ingroup or outgroup member) was presented next to his or her box. The ingroup member was one of the other players in the Cyberball game, and the outgroup member was one of the two outgroup members who were previously introduced in the group-allocation phase. Next, the experimenter presented five identical red heart-shaped 'stickers' on the screen and told the participant that they could give some of their stickers to their partner if they wanted, or they could keep the stickers: "Look, here are your stickers. Do you want to count them with me?" After pausing to let the child count the stickers, the experimenter said, "Right, you have five stickers! Look, this is your box," and pointed to the bottom box. The experimenter then said, "I put your name on this box so you know that this is yours. And look, this box is for this yellow (or green) group child," while pointing to the top box. Then, the experimenter told the children that they could share their stickers: "If you want to, you can keep your stickers. Or, if you want to, you can give your stickers to this child from the yellow (or green) group, as many as you want." To make the online experiment more realistic, the experimenter informed the children that she would mail the actual stickers to the participant's home right after the experiment. The children were asked to indicate verbally whether they wanted to share the stickers and, if they wanted to share, how many stickers they wanted to give away. The experimenter moved the stickers next to the recipient's box following the children's responses. The number of stickers that the participant shared with the other child served as the main dependent variable of the present experiment. After the

experiment was complete, the children were informed that the players in the Cyberball game were not real people, and the children in the ingroup-exclusion condition were allowed to play the inclusion game to alleviate any negative emotions caused by the exclusion game.

No-interaction condition

The materials and procedure in the no-interaction condition were similar to those in the ingroup-exclusion and ingroup-inclusion conditions except for a key difference: the children in the no-interaction condition did not complete the Cyberball phase. Therefore, the no-interaction condition consisted of two phases, the group-allocation and the sharing phase. Following the group-allocation phase, the children completed an emotion rating task in which we asked them about their current emotions, and then completed the sharing task. The full experiment took approximately 10 min to complete.

Results

Manipulation check

In the ingroup-inclusion condition, 27/30 (90.0%) children responded that they received many ball tosses during the ball-tossing game, $p < 0.001$ (cumulative binomial probability). Meanwhile, in the ingroup-exclusion condition, 27/30 (90.0%) children responded that they received few ball tosses during the ball-tossing game, $p < 0.001$. The distributions of the binary

choices (many vs. few) in the two conditions were significantly different according to a 2×2 Fisher's exact test, $p < 0.001$.

Moral evaluation

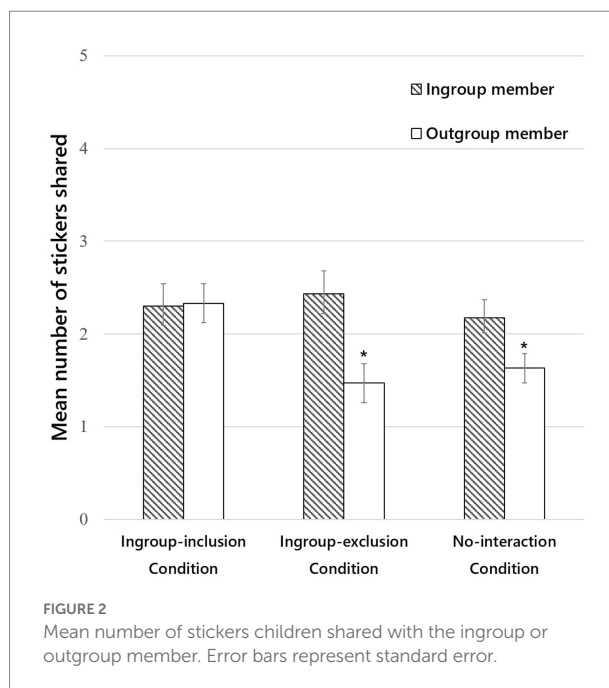
We conducted an independent samples t -test with condition (ingroup-inclusion or ingroup-exclusion) as a between-subjects factor to determine whether the children in the two conditions gave different evaluations for their ingroup members with whom they played Cyberball. Children in the ingroup-inclusion condition ($M = 4.23$, $SD = 1.04$) evaluated their ingroup members more positively than those in the ingroup-exclusion condition ($M = 3.07$, $SD = 1.34$), $t(58) = 3.772$, $p < 0.001$. In addition, we performed one sample t -tests to compare the moral evaluations of ingroup members against the midpoint (3, not bad nor nice). Children in the ingroup-inclusion condition evaluated their ingroup members as nice, $t(29) = 6.495$, $p < 0.001$, whereas the average evaluation for ingroup members in the ingroup-exclusion condition was not reliably different from the midpoint, $t(29) = 0.273$, $p = 0.787$.

Emotion ratings

An independent samples t -test with condition (ingroup-inclusion or ingroup-exclusion) as a between-subjects factor revealed that the children in the ingroup-inclusion condition ($M = 4.33$, $SD = 0.76$) felt more positive emotions than the children in the ingroup-exclusion condition ($M = 3.67$, $SD = 1.12$), $t(58) = 2.693$, $p = 0.009$. One sample t -tests revealed that in both conditions, the emotional ratings were significantly above the midpoint (3, not bad nor good; ingroup-inclusion condition: $t(29) = 9.633$, $p < 0.001$, ingroup-exclusion condition: $t(29) = 3.247$, $p = 0.003$). This indicates that the Cyberball paradigm is safe to use with young children because the children in the exclusion condition reported their emotions as slightly positive, i.e., better than neutral. The emotional ratings in the no-interaction condition ($M = 4.00$, $SD = 0.95$) were not significantly different to those of the ingroup-inclusion condition, $t(58) = -1.505$, $p = 0.138$, and those of the ingroup-exclusion condition, $t(58) = 1.242$, $p = 0.219$.

Sharing

Preliminary analyses of the test data revealed no interaction of condition and recipient group with children's sex or test order, all $F(2, 84) < 0.687$, $ps > 0.506$. Therefore, the data were collapsed across the latter two factors. Sharing behavior (Figure 2) was subjected to an ANOVA with condition (ingroup-inclusion, ingroup-exclusion, no-interaction) as a between-subjects factor and recipient's group (ingroup, outgroup) as a within-subject factor. The analysis yielded no significant main effect of condition,



$F(2, 87) = 1.810$, $p = 0.170$, $\eta_p^2 = 0.04$, a significant main effect of recipient's group, $F(1, 87) = 10.670$, $p = 0.002$, $\eta_p^2 = 0.11$, and, crucially, a significant condition \times group interaction, $F(2, 87) = 3.742$, $p = 0.028$, $\eta_p^2 = 0.08$. Children in the ingroup-inclusion condition shared equally with the ingroup ($M = 2.30$, $SD = 1.29$) and outgroup members ($M = 2.33$, $SD = 1.16$), $t(29) = -0.114$, $p = 0.910$. However, children in the ingroup-exclusion condition shared more stickers with the ingroup ($M = 2.43$, $SD = 1.36$) versus the outgroup member ($M = 1.47$, $SD = 1.17$), $t(29) = 3.846$, $p = 0.001$. Similarly, children in the no-interaction condition shared more stickers with the ingroup ($M = 2.17$, $SD = 1.09$) versus the outgroup member ($M = 1.63$, $SD = 0.89$), $t(29) = 2.333$, $p = 0.027$.

Discussion

The present study investigated whether a sense of ingroup belonging decreases children's ingroup favoritism in costly sharing behavior. Six-year-old children shared more resources with a member of their minimal ingroup versus an outgroup member, both when they were previously excluded by the ingroup or when they had no particular interaction with the ingroup. In contrast, they shared equally with the ingroup and outgroup members when they were clearly included by the ingroup. These results suggest that ingroup inclusion may reduce children's ingroup favoritism.

The present results indicate that belonging to the group is one of the important motives underlying children's selective prosociality toward the ingroup. It is well documented that young children preferentially allocate resources toward ingroup members compared with outgroup members (e.g., Fehr et al., 2008;

Olson and Spelke, 2008; Dunham et al., 2011; Kinzler et al., 2012; Benozio and Diesendruck, 2015; Renno and Shutts, 2015; Yu et al., 2016). Moreover, by the end of the second year of life, even young infants hold expectations about ingroup care: infants expect individuals to help in-group members in need (Jin and Baillargeon, 2017) and to reserve scarce resources for ingroup members as opposed to outgroup members (Bian et al., 2018). While very informative, this prior work leaves questions regarding the social circumstances under which young children show ingroup favoritism and the motivation for these behaviors. Our experimental approach using the Cyberball paradigm allowed us to address these questions. We found that being excluded by the ingroup, even in a brief interaction, or having no clear indication regarding ingroup membership led children to be more willing to share in favor of the ingroup. By contrast, children included by the ingroup were more willing to share equally with the ingroup and outgroup. Thus, this study represents the first evidence that belonging to a group reduces children's tendency to favor their minimal ingroup over the outgroup.

Notably, the present results suggest that inclusion status within a group can modulate intergroup bias. The vast majority of intergroup bias interventions focused on changing children's representations of, and emotional responses to, outgroup members (Cameron et al., 2006; Cameron and Rutland, 2006; Aboud et al., 2012; Vezzali et al., 2012, 2015; Sierksma et al., 2014, 2015; Abrams et al., 2015; McLoughlin and Over, 2019). However, implementing these interventions in reality can be challenging and may actually intensify intergroup bias in adults (Dixon et al., 2007; Dovidio et al., 2009; Vorauer and Sasaki, 2009). The experimental manipulation in the present study was designed to enhance children's ingroup belonging while overcoming these challenges. In children, clear acceptance by a group through positive interactions with its members may decrease preferential treatment of ingroup over outgroup members. Understanding the link between ingroup belonging and ingroup favoritism is important for effective and affordable interventions (Walton and Wilson, 2018) and educational programs to reduce the negative consequences of ingroup favoritism, including outgroup derogation and prejudice.

Our findings are consistent with theoretical insights derived from adult social psychology (e.g., Brewer, 1991; Baumeister and Leary, 1995; Branscombe et al., 1999; Fiske, 2004; Leary, 2005). Baumeister and Leary (1995) viewed the need to belong as a fundamental motivation for the formation of long-lasting interpersonal relationships. Other researchers have elaborated further on this need to belong to groups (Brewer, 1991; Fiske, 2004). For example, from the perspective of optimal distinctiveness theory (Brewer, 1991), Leonardelli et al. (2010) argued that individuals might exhibit ingroup favoritism to meet their need for inclusion in an effort to gain acceptance or inclusion by the group. The optimal distinctiveness theory posits that humans have two fundamental needs, the need for group inclusion and the need for a sense of uniqueness, and the conflict between the two needs is resolved through achieving an optimal level of distinctiveness.

In this regard, our tendency to treat ingroup members more positively than outgroup members might be a way to maintain intergroup differences such that they are greater than intragroup differences. A sense of ingroup inclusion could reduce such ingroup bias because it would encourage group members to focus on ingroup similarities as opposed to intergroup differences.

It is interesting to note that the children in the ingroup-exclusion and no-interaction conditions showed similar behaviors in that they shared more resources with the ingroup versus outgroup members, whereas children in the ingroup-inclusion condition shared equally with the ingroup and outgroup members. We speculate that children show relatively pronounced ingroup favoritism unless they have a clear indication that they are included by their ingroup (e.g., Leonardelli et al., 2010). For instance, in the no-interaction condition, children were assigned to a new minimal group, and the only information they knew about the group members was that they had the same preferences for some objects. That is, children in the no-interaction condition were not given a firm guarantee that they would be welcomed and included by their ingroup members in future interactions. For this reason, children in the no-interaction condition might have shown the same level of ingroup favoritism as those in the ingroup-exclusion condition.

This was the first study to document ingroup favoritism among children, in the context of costly sharing, using the minimal-group paradigm (MGP) in the setting of a collective culture. Prior research on children's ingroup favoritism using the MGP was conducted almost exclusively within Western cultures (Patterson and Bigler, 2006; Dunham et al., 2011; Rhodes, 2012; Plötner et al., 2015; Misch et al., 2016; Richter et al., 2016; Sparks et al., 2017; Dunham, 2018; Over et al., 2018; Yazdi et al., 2020; see for exceptions, Lee et al., 2018; Yang et al., 2021; Yang and Park, 2022), and their findings may not be applicable to other cultures. Although ingroup favoritism has been suggested as an innate human tendency (Tajfel et al., 1971; Brewer, 1979), the level of ingroup favoritism may differ across cultures (Fischer and Derham, 2016). Interestingly, an association between individualism–collectivism and ingroup bias in the MGP has been observed in adults in both directions. On one hand, collectivism may be associated with higher in-group bias in the MGP because individuals in collectivistic cultures tend to value harmony among group members and cooperation to achieve mutual goals (Triandis, 1990, 1994). Moreover, the social enjoinments are characterized by close-knit groups (Yamagishi et al., 1998). On the other hand, collectivism may also be associated with lower in-group bias in the MGP because individuals in collectivistic cultures already have strong, stable, and immutable individual-group associations, and are not concerned about their identities or inclusion in novel minimal groups (Hogg, 2000, 2007; Falk et al., 2014). Given the multiple possibilities, cross-cultural research on the development of ingroup favoritism in MGPs across age groups may be particularly informative. We found that 6-year-old Korean children displayed minimal group effects in the context of resource allocation, similar to results from Western studies (Dunham et al., 2011; Sparks et al., 2017). This cross-culture consistency indicates that ingroup favoritism in the MGP is culturally consensual, at least around the

age of 6 years. However, further large-scale studies are required to examine the minimal group effects in on-Western cultures in different age groups.

The present results contribute to literature on the impact of social exclusion on social behavior in children. Previous research has shown that young children can correctly identify social exclusion and that they prefer inclusive agents to exclusive agents (Hwang and Markson, 2020). As they get older, children are increasingly able to make moral decisions about social exclusion (Killen and Rutland, 2011; Will et al., 2013). Furthermore, a brief experience of social exclusion was found to increase imitation behaviors in children (Over, 2016), including imitative fidelity (Over and Carpenter, 2009; Watson-Jones et al., 2014, 2016), nonconscious facial mimicry (de Klerk et al., 2020), and imitation in referential and syntactic choices (Hopkins and Branigan, 2020). The present findings provide evidence that ingroup exclusion and inclusion affect a different type of social behavior, i.e., the tendency of children to favor ingroup members during sharing. These results suggest that the need to belong is an important driver of sociomoral development in children.

One interesting topic for future research is the way in which reputation concerns amongst children might impact ingroup favoritism after they experience ingroup inclusion or exclusion. Adults whose sense of belonging to their ingroup was threatened made greater distinctions between the ingroup and outgroup, especially when they were in public as opposed to a private setting (Noel et al., 1995). These results suggest that adults are able to exploit ingroup favoritism as a means by which to display their willingness to ingratiate themselves to a group. Relatedly, previous research has suggested that young children are also motivated by a desire to make a positive impression on others (Piazza et al., 2011; Engelmann et al., 2012, 2013; Fu et al., 2012, 2016; Leimgruber et al., 2012; Zhao et al., 2017; Rapp et al., 2019; Yazdi et al., 2020). For example, 5-year-old children are more likely to share when they are in the presence of a peer than when they are alone (Engelmann et al., 2012). If children use ingroup favoritism as a means by which to affiliate with ingroup members, children who seek to belong to ingroups would be expected to become more preferential toward ingroups when they are in public versus private contexts. In addition, it will be interesting to investigate whether the effects of inclusion and exclusion arise only from ingroup interactions, or also from other types of social interactions (e.g., with individuals whose group membership is unknown or outgroup individuals). Future studies that test these possibilities are needed to further our understanding of the motivations underlying human ingroup favoritism.

Conclusion

The present study is the first to demonstrate that ingroup belonging may reduce children's ingroup favoritism in terms of cost sharing. In a minimal-group paradigm, 6-year-old children shared more of their resources with their ingroup members than outgroup members. This was the case both when they were

excluded by their ingroup members and when they had no particular history of interaction with them. In contrast, children did not show such ingroup favoritism when they were included by their ingroup members. This new finding suggests that children are sensitive to information about ingroup belonging and will respond accordingly.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Internal Review Board of Sungshin Women's University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

JP and KJ developed the study concept and design. Data were collected and analyzed by JP and KJ. JP wrote the first draft. KJ made critical revisions. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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

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EDITED BY
Paola Rigo,
University of Padua, Italy

REVIEWED BY
Belinda Davis,
Macquarie University, Australia
Dulce M. Redin,
University of Navarra, Spain

*CORRESPONDENCE
Yidan Liu
✉ 973597294@qq.com
Chengliang Wang
✉ 249493144@qq.com

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Development and status of moral education research: Visual analysis based on knowledge graph

Jingying Chen¹, Yidan Liu^{2*}, Jian Dai^{2,3} and Chengliang Wang^{4*}

¹School of Marxism, Zhejiang University of Technology, Hangzhou, China, ²College of Educational Science and Technology, Zhejiang University of Technology, Hangzhou, China, ³School of Management, Zhejiang University of Technology, Hangzhou, China, ⁴Department of Education Information Technology, Faculty of Education, East China Normal University, Shanghai, China

Introduction: Moral education is an educational process of the continuation, construction, and transformation of moral and social norms, and is an important guarantee for the sustainable vitality of human morality.

Methods: With bibliometrics applied and VOSviewer and CiteSpace as tools, this paper systematically analyzes 497 articles published in the Social Sciences Citation Index of Web of Science core collection from 2000 to 2022 in the field of moral education research.

Results: By quantifying specific performance information in the field of moral education in terms of authors, journals, organizations and countries, this paper identifies the highly productive authors and organizations, as well as core journals (i.e., the *Journal of Moral Education*). A cluster analysis is used to show the knowledge structure, and an evolutionary analysis to present the macro-development trend of moral education.

Discussion: In this paper, the comprehensive description of the research topics on moral education clarifies the development model and disciplinary prospect of the moral education research, and provides theoretical and practical support for the continuous development and application practice of the moral education research.

KEYWORDS

moral education, moral instruction, bibliometrics, knowledge graph, visual analysis

1. Introduction

Discussions of morality can be traced back to the ancient Greek period, when Aristotle noted in *Nicomachean Ethics* that virtue could be divided into intellectual virtue and virtue of character, and that the latter came about as a result of habit, which was people's pursuit of beauty and kindness (Ameriks and Clarke, 2000). During the more than two thousand years since then, countless scholars and philosophers have been inspired by Aristotle's *Nicomachean Ethics* and have made in-depth interpretations and explanations of morality and moral phenomena (Kristjánsson, 2006). Under the theoretical framework of Aristotelian virtue ethics, this paper attempts to classify and review the development of moral education in K–12 and higher educational systems.

Moral education is a grand concept that involves many disciplines (MacIntyre and Dunne, 2002; Kristjánsson, 2021). Generally, the essence of moral education is the process by which educators transform certain social thoughts and *virtue ethics* concepts into the individual thoughts and morals of educatees with certain educational means in social activities and exchanges (Solomon et al., 2001). Thus, moral education is mainly the process of moral social inheritance or transmission.

Different from disciplinary education, the value of moral education in practice has been controversial (Peters, 2015). Some scholars have questioned the necessity for schools to provide moral education (Stanley, 2003, 2004; Motos, 2010); however, more scholars have agreed that schools should supply systematic moral education and have provided corresponding bases for doing so (Hoekema, 2010; Wong, 2020; Sison and Redín, 2022). These scholars have considered that schools have the responsibility and obligation to help students contribute to society in ways that are not limited to the value of social production but that also consider the prosocial value of promoting social goodness from the moral perspective (Hoekema, 2010). Meanwhile Sison and Redín (2022), based on MacIntyre's moral education principle, emphasized the importance of moral education in educational institutions, as an "intrinsic value of an educational institution that instills virtues ... [schools should] provide ethical training on par with scientific-objective and technical training" (Sison and Redín, 2022; p. 13). Undoubtedly, these disputes have deepened the value and connotation of moral education and have established a close connection between moral education and other disciplines (e.g., business education), which efforts have increased the value placed upon moral education by scholars (Lee, 2022). At the same time, the in-depth thinking and scholarly refutation has vigorously promoted moral education studies, transforming the discussion from the necessity of moral education to its contents and purpose.

The battle has been long and arduous for moral education to play an important role in public schools. However, thanks to the efforts of scholars, moral education has become an indispensable part of school education (Leihy and Salazar, 2016). Nevertheless, disputes remain on how to implement moral education as well as on its connotation and value (Wong, 2020; Lee, 2022). The differences remain unclear in the moral educational issues in terms of cultural environments and social backgrounds, and systematic and comprehensive quantitative reviews and analyses are lacking in the moral education literature. Therefore, this paper aims to apply the method of a literature review to systematically organize and further analyze the research on moral education in K–12 and higher educational systems after a comparison and an identification, mainly focusing on the following points:

1. We conduct a systematic performance analysis of the research topics on moral education; know the authors, organizations,

and countries with high productivity in the field of moral education; and thoroughly uncover the main journals and highly cited studies in this field.

2. We reveal the core issues and research status in the field of moral education through a cluster analysis and summarize the research results.
3. We provide theoretical and practical support for the subsequent academic research and practice of moral education using evolutionary and keyword-burst analyses to delineate the evolutionary trend of the field.

2. Literature review

Morality can be traced to the origin of human language. In exploring the origin of morality, Tappan (1997) proposed that morality, as a high-level psychological function, was mediated/regulated by the forms of words, language, and discourse. Per Tappan, as language is a remarkable social medium, the process of social communication and social relations inevitably produce moral function. Tappan also argues that because words, language, and discourse forms are essentially social and cultural phenomena, moral development has always been affected by the specific social, cultural, and historical background in which it occurs.

Morality, as a uniquely human higher mental function, has long been noticed by scholars. In ancient Greece, Socrates incorporated the study of moral ethics into the philosophical system and created his own "philosophy of ethics." Aristotle further wrote *Nicomachean Ethics*, which describes the qualities of an ideal or perfect human being: courage, temperance, generosity and magnificence, and possessing a great soul (Ameriks and Clarke, 2000). Aristotle provided the most basic definition of virtue ethics, which is considered the systematic origin of virtue ethics (Ferrero and Sison, 2014). The morality research has been continuous as human civilized has evolved. For example, Aquinas in the Middle Ages and Machiavelli in the Renaissance built ethical discourse systems (McInerney, 1997; Bielskis, 2011). However, due to social and historical limitations, the past research on morality has mostly relied on experience, and scholars have mostly discussed morality from the theoretical or philosophical level. Not until the psychologist Wundt established the first psychology laboratory (in 1879) did scholars begin to use modern scientific research methods to discuss morality. Soon thereafter, the research on moral education reached a development peak.

Piaget (1932) put forward Piaget's Theory of Moral Development based on his observation on children's play, initiating the scientific and systematic research on moral education (Peters, 2015). Based on Piaget's research, as well as that of Dewey (1959) and others, Kohlberg (1969, 1973) proposed a more valuable moral theory, namely, that of moral cognitive development, which was later revised and improved.

The theory of moral cognitive development states that moral education is intended to help young people learn to justify moral claims correctly and rationally and to develop logical strategies to draw correct inferences from such claims when dealing with moral dilemmas (Kohlberg, 1981). Kohlberg's theory attracted great attention in sociology and psychology, and it aroused intense discussion (Mischel, 1971; Lickona, 1976). Kohlberg's theory was partially overturned in subsequent empirical studies (Kuhn, 1976). Nevertheless, as the first systematic and complete theory of moral cognitive development, Kohlberg's theory of moral cognitive development has made an indelible contribution in promoting people's cognition of morality and has successfully caused many scholars to focus on moral education.

The value of Kohlberg's theory of moral cognitive development rested not only in the theory but also in his research method, which provided a perspective for an in-depth understanding of the development of moral thinking. However, because the research design was not entirely rigorous, for example, the subjects used were all male (Aron, 1977), the theory also received some criticism and spawned further studies (Gilligan and Attanucci, 1988; Rest et al., 1997), causing the research on moral development to present a diversified development trend.

The criticism of Kohlberg's moral theory and its development were accompanied by the beginning of the theories of constructivism and humanism. Humanistic theory, in particular, positively affirmed humanity and considered that human nature is kind, rational, positive, and trustworthy. The theory proposes that moral education is required because human environment after birth has many bad factors that hinder the development of human nature's innate potential. However, the basis of moral education is rational, positive, and active humanity, a theory upon which many Chinese and Western scholars have reached an agreement (Slote, 2016).

Societal development and changing times have endowed the moral education research with new elements. In the 1980s, a systematic moral education curriculum system emerged in many region's schools (Cheung and Lee, 2010). However, the initial practice of moral education was a process of exploration, and the development process was accompanied by many frustrations. For example, in the late 20th century, many scholars criticized the excessive emphasis placed on moral skills in the process of traditional moral education (Doyle, 1997; Lickona, 1999). These scholars put forward a new concept of character education to emphasize the specific content (a set of specific values) behind morality: trustworthiness, respect, responsibility, honesty, justice, and fairness (Berreth and Berman, 1997; Fenstermacher, 2001).

Since the 21st century, the frequent contact among different cultural groups has added a multicultural perspective to moral education. Some scholars have noted that the main goal of moral education is to achieve equality between different groups

and allow them to maintain contact with the overall culture of society (Ranson, 2000). Therefore, moral education practitioners should teach students communication skills. Some scholars have also noted and emphasized that moral education should create channels for learners to understand society's diversity (Banks et al., 2001). That is, moral education should cultivate learners with a broad cultural vision and cultural inclusiveness (Santas, 2000). This suggestion means that the historical and cultural perspectives of different social groups should be included in the moral education curriculum (Kumashiro, 2000).

Meanwhile, as the concept of a postmodern society spreads, moral education development has transformed from a discipline that emphasizes the standardization and objectivity of rationality and science to one that pays attention to educational value, diversity, and context (Sarid, 2012). In this process, the moral education research method, contents, and objects have undergone profound changes. For example, the speculative reasoning research has gradually been replaced by the empirical situation research, and moral education has begun to emphasize the emotional commitment and developmental reflection made by individuals in the growth process (Wardekker, 2004). Civic and value education have been gradually incorporated into the category of moral education and have become an indispensable part of it (Schuitema et al., 2008). Finally, the research objects have gradually expanded from learners to practitioners of moral education and school administrators (Reiman and Dotger, 2008). Meanwhile, diversified education has put forward some new standards for moral education. For example, moral education should pay more attention to learners' personality factors than to disciplinary education, including social identity factors consisting of race, gender, and class and personality factors such as character and temperament (Schuitema et al., 2008). Therefore, the mission of moral education has gradually come to include social identity construction.

The discipline systematization of moral education is also an overall trend of the development of moral education (Zhang et al., 2022). Increasingly, scholars have begun to discuss subject-specialization for moral education and standardizing the curriculum design (Bleazby, 2020). In addition, the school ages and stages related to moral education have also been expanded. Some scholars have proposed that the cognition of moral education should not be limited to the moral training received at school, and moral education should become a part of the lifelong learning process (Higgins-D'Alessandro, 2011; Wong, 2020).

The rapid development of postmodern technology has expanded the new dimension of moral education, such as defining the moral norm in the environment of mass media and networking (Internet) and how to implement the corresponding moral education (Wanxue and Hanwei, 2004; Li et al., 2017; Chang et al., 2018). Technology is a double-edged sword. On the one hand, the openness, anonymity, and interactivity of the Internet are challenging the traditional moral concept, especially

the college students who are widely exposed to online we-media are faced with largescale moral anomia (Li et al., 2017; Shao and Wang, 2017). On the other hand, based on the application of human-computer interactions and virtual reality scenes, artificial intelligence can achieve a more realistic situational experience of moral education. Regarding the hidden concern that artificial intelligence might replace teachers in moral education, current scholars have a relatively consistent view that human teachers in moral education will be irreplaceable for a long time (Tan, 2020).

Summarizing the current research on moral education, its purpose in schools is to prepare students to participate in society (Schuitema et al., 2008), but this purpose is not isolated. Instead, it can be divided into two supportive aspects: firstly, its aim is to serve students' individual development to guide students to adulthood where they can produce their own social identity; secondly, moral education hopes to promote the rational, orderly development of society by cultivating students' prosocial behaviors, as viewed from the social development perspective. These two aspects of moral education reflect two perspectives on it (personal and social). In fact, these two perspectives complement each other and together constitute the profound connotation of moral education. These underlying connotations do not change dramatically over time, showing that morality is uniquely stable in the tide of diversification and modernization. However, the multiple dimensions of culture and the rapid development of technology continually call into question the implementation and practice of moral education. In response, we must deeply examine this era and learn the development course and the current discipline structure of moral education.

3. Methods and materials

3.1. Research method

To understand the research agenda of moral education systematically, objectively, and comprehensively from a global perspective, this paper adopted a bibliometrics approach for the analysis. Bibliometrics is a measurement method used to describe and analyze the dynamics and progress of a discipline or research field. Since 1969, when British scholar Pritchard put forward "bibliometrics," as an independent discipline, it has become prominent in scientific quantitative research. Meanwhile, benefiting from the recent developments in computer science and technology, econometric analyses combined with visual analyses have become a new trend in this research field. Econometric analytical results can be displayed in simple and clear knowledge graphs, thus achieving the goal of "one picture is worth ten thousand words" (Merigó et al., 2015).

In this paper, CiteSpace 6.1.R3 (developed by Chen C. at Drexel University), VOSviewer 1.6.17 (developed by Van Eck and Waltman at the Center for Science and Technology

TABLE 1 Summary of data source and selection.

Category	Specific standard requirements
Research database	Web of science core collection
Citation indexes	Social science citation index (SSCI)
Searching period	January 2000 to September 2022
Language	"English"
Searching keywords	TS = ("moral education" OR "moral instruction")
Document types	Articles and Reviews
Sample size	842 (Before Screening)

Studies) and SCImago Graphica 1.0.24 (developed by Scimago Lab in Spain) were used to draw knowledge graphs. Each software package has its own advantages, and together they can play complementary roles. CiteSpace adopts the data standardization method based on set theory to measure the similarity of knowledge units. By drawing a Timezone view, CiteSpace can clearly outline the evolutionary process of research hot spots in the temporal dimension, thus presenting the development process and trend of this field (Wang et al., 2022). VOSviewer adopts the data-standardization method based on probability theory and provides a variety of visual presentations of keywords, co-organizations, co-authors, etc. With simple drawings and elaborate images, at present, it has increasingly attracted scholars' attention in the visualization field of bibliometrics (Pan et al., 2018). SCImago Graphica, on the other hand, can use table data in various formats exported from CiteSpace and VOSviewer for redrawing to supplement the mapping.

3.2. Initial literature search

In the initial literature search of this paper, the Web of Science core collection was mainly used. This was because many review studies have posited that the literature quality of the data source is crucial to the reliability and persuasiveness of the review study (Hwang and Tsai, 2011; Hsu et al., 2012). As a high-quality digital literature resource database, the Web of Science core collection has been accepted by many researchers (Ding and Yang, 2022). Within this collection, the Social Science Citation Index (SSCI) is the most well-known journal index in the field of social sciences (Yadegaridehkordi et al., 2019). Taken together, these methods guarantee the quality of the literature used in this paper.

Literature retrieval is also an important link to ensure research quality. Since some scholars (Ferrero and Sison, 2014) have tried to review virtue ethics in business by means of quantitative reviews, this paper follows the model of Ferrero and Sison (2014) in the literature retrieval.

When setting the retrieval strategy, only the advanced retrieval function of Web of Science core collection is used in this paper. The input was the searchable TS = (“moral education” OR “moral instruction”), and Topics (TS) was used as the Field Tag to implement searchable matching in the title, abstract, and other informational elements of the literature. Such a search strategy can retrieve the literature related to moral education as comprehensively as possible. At the same time, to ensure sufficient data to analyze the development trend of the research topics on moral education, the selected literature search period was January 2000 to September 2022, and the literature types Article and Review were selected. The retrieval-based search resulted in 842 articles, the specific information for which is shown in Table 1.

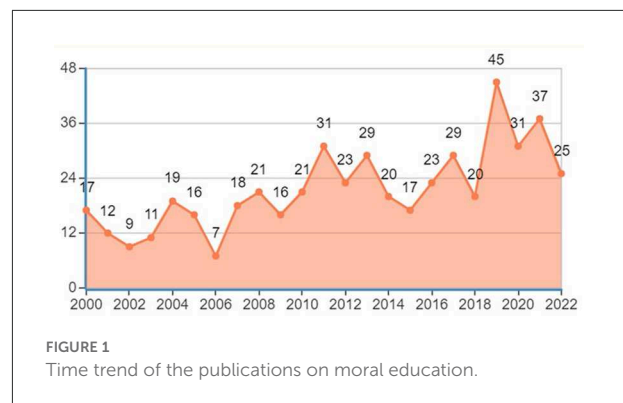
3.3. Literature screening

The literature obtained was often mixed with some irrelevant results (e.g., literature taking moral education as a research background but analyzing other research contents). Therefore, to ensure that the literature included in the analysis was closely related to the relevant topics, software was required to remove and manually screen the literature included in the analysis after the initial literature search. Doing so prevents the analytical results from suffering due to data quality problems (Chen et al., 2022).

The “remove duplicate” function of CiteSpace software was used to discard two duplicates and proceed to the manual screening. To ensure a scientific and reliable screening process, this paper refers to the literature screening criteria proposed by Su et al. (2019). Before screening, the three team members consulted with moral education scholars to determine the inclusion and exclusion criteria. This standard was mainly to review the core research contents and themes, to identify the primary focuses in the research related to moral education in K–12 and higher education (such as the implementation path of moral education, the influence factors of the moral education effect, etc.), and to exclude some articles whose research subject was not moral education or whose research field was not within the scope of K–12 and higher education.

After determining the inclusion and exclusion criteria, the three team members independently reviewed each article according to the criteria. In the case of controversial articles, discussions and votes were held to decide whether to exclude them.

After this systematic screening process, 342 articles were deleted as they did not meet the requirements of this study, and 497 articles were ultimately retained for further analyses. VOSviewer was used to collect basic statistical information on the selected literature. These 497 articles originated from 426 organizations in 49 countries, had 759 authors, were published in 132 journals, and cited 16,815 references from 10,648 journals.



4. Performance analysis: Productivity and impact

4.1. Publication time trend

To understand a research field, it is necessary to first understand the most basic quantitative information, among which, the change in the annual publication number can best reflect the development trend of a research field. Figure 1 shows the temporal distribution of papers published in the moral education research. Overall, the publication number in this field is still increasing although fluctuating and not obvious. In 2000, the number of published articles reached 17, indicating that the moral education research has been active for a long time, rather than being a new topic. Additionally, in the past 5 years, the number of published articles was 20+, indicating that this topic has not declined gradually over time but has evolved continually as the classical scholars' thoughts and views are constantly reflected upon, reshaped and extended (Lewis, 2018; Hand, 2019), and the topic remains vital as an independent discipline.

4.2. Authors

By analyzing the number of articles authors publish, we can learn the representative scholars and core research topics in the moral education research. This paper used Price's law to calculate the boundary between ordinary and core authors in this field:

$$m = 0.749 \times \sqrt{n_{\max}}$$

where n_{\max} is the number of papers by the most productive authors in this field ($n_{\max} = 11$ according to VOSviewer's statistical analysis), and m is the minimum number of papers by the core authors, which can be calculated as $m \approx 2.5$. Therefore, authors with ≥ 3 papers were identified as the core authors in this field (Price, 1963), and there were 20 core authors. Table 2 presents the relevant information on the core authors in this

TABLE 2 Core authors in the moral education research field.

Rank	Author	Counts	Citations per paper	Rank	Author	Counts	Citations per paper
1	Han, H.	11	17.09	11	Swartz, S.	4	4.75
2	Kristjánsson, K.	9	14.89	12	Thoma, S. J.	3	9
3	Huo, Y.	4	1.25	13	Sanger, M. N.	3	45
4	Thornberg, R.	4	38.25	14	Dawson, K. J.	3	5.33
5	Xie, J.	4	1.25	15	Meindl, P.	3	10.33
6	Osguthorpe, R. D.	4	30	16	Akar, H.	3	7.67
7	Kuusisto, E.	4	6.25	17	Carr, D.	3	28.33
8	Tirri, K.	4	6.25	18	Sen, D.	3	7.67
9	Nucci, L.	4	32	19	Temli, Y.	3	7.67
10	de Ruyter, D. J.	4	10.25	20	Veugelers, W.	3	6.33

field, including their names, the number of published articles, and the citation number per article.

Table 2 shows that Han is the most productive author in this field. He has published 11 papers in the past 20 years. Han and his research team have mainly focused on moral exemplars in moral education (Han et al., 2022). The moral exemplars in teaching materials and voluntary service have been deeply studied (Han et al., 2017, 2018b). Moreover, Han is a pioneer in advocating technology-enabled moral education. Several of his studies have used Bayesian models to predict the relationship between moral foundations and the development of moral judgments (Han et al., 2018a; Han and Dawson, 2022). Kristjánsson's scientific productivity in the field of moral education is second only to Han's. Kristjánsson is a classical scholar who paid great attention to Aristotle's thought. Many of Kristjánsson's studies have focused on the value of Aristotle's thought in contemporary moral education (Kristjánsson, 2014, 2020), proposing that the wisdom of classical philosophers should not be ignored in contemporary moral education, and implementing a practical and critical inheritance of Aristotle's philosophical thought (Kristjánsson, 2013). Kristjánsson is also the editor-in-chief of the core journal, *Journal of Moral Education*, in this field (Kristjánsson, 2021).

4.3. Journals

Journals are the main carriers of literature. This paper performs statistical analyses of the journals that publish moral education research (Table 3 shows the top-10 core journals in terms of published article volume). The results show that most of the research results in this field were published in the *Journal of Moral Education* (198, accounting for 39.76% of the total), while the second-ranked journal published only 34 research papers on moral education (approximately 6.83% of the total). Regarding the distribution of the published article volume, the Matthew

effect was significant because moral education is highly focused and independent. In addition to the *Journal of Moral Education*, a journal closely related to moral education, other journals that focus on moral education are mostly related to educational philosophy (such as the *Journal of Philosophy of Education*, *Educational Philosophy and Theory*, and *Studies in Philosophy and Education*). This finding shows the close relations among moral education, educational philosophy, and virtue ethics. In addition, from the perspective of the average citation frequency, *Teaching and Teacher Education* had a high citation frequency (31.67 times on average), indicating that teacher education is highly relevant to the moral education research (Xiaoman and Cilin, 2004).

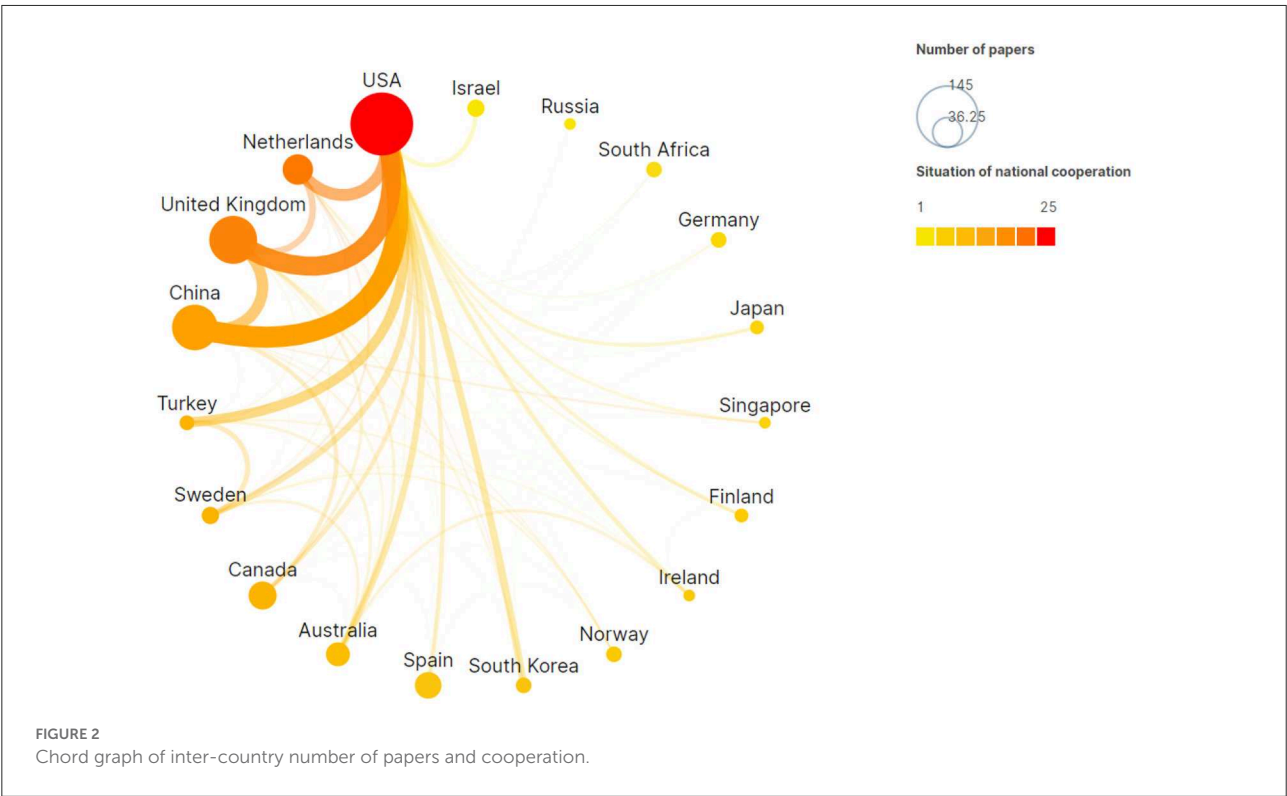
4.4. Countries and organizations

An analysis of the countries in which the research was published can reveal the countries and research organizations with high productivity in this field. To have a clear understanding of the number of publications and cooperation situation between different countries, this paper used a chordal graph for elaboration. Chordal graphs are mainly composed of nodes and chords. Nodes represent the number of certain country's published articles and are arranged along the circumference and in a radial series. The node colors represents the cooperation intensity with other countries, and colors closer to red indicate greater more cooperation with other countries. An arc with a weight (and a width) connecting any two nodes is called a chord, which represents the between-country cooperation. The resulting chord graph of the intercountry number of publications and the cooperation network is shown in Figure 2.

Figure 2 shows that the main countries with large publication numbers and intercountry cooperation in this field are the USA, the United Kingdom, China and the

TABLE 3 Top 10 journals in the moral education research field.

Rank	Journal title	Counts	Citations	Citations per paper	Impact factor (2021)
1	Journal of Moral Education	198	2,232	11.27	1.398
2	Journal of Philosophy of Education	34	214	6.29	0.949
3	Educational Philosophy and Theory	27	174	6.37	2.054
4	Teaching and Teacher Education	15	475	31.67	3.782
5	Journal of Beliefs and Values-Studies in Religion and Education	11	56	5.09	1.724
6	Studies in Philosophy and Education	7	42	6	1.629
7	British Journal of Religious Education	6	112	18.67	1.131
8	Journal of Curriculum Studies	6	89	14.83	2.175
9	Educational Review	6	73	12.17	3.829
10	Asia Pacific Journal of Education	6	41	6.83	1.478



Netherlands. These four countries not only publish a large number of articles but also cooperate closely. They have close international academic exchanges and a high degree of internationalization in the moral education academic research. Table 4 gives more specific quantitative information for the top-10 countries in terms of publication number. Except for China, the remaining 9 countries are all developed countries, indicating that moral education is an issue that many scholars pay attention to only after a society develops to a certain degree and has a certain economic foundation.

A further analysis was made of the issuing organizations. Table 5 shows the top-10 organizations in terms of publication number and their related quantitative information. Among these organizations, most (up to 5) are from the United Kingdom, among which the University of Birmingham is the most productive organization, with 17 published articles, making it the primary academic force in the moral education research. Most of this organization's articles were published between 2014 and 2020 and focused on philosophical discussions of moral education, many of which tried to relate the thoughts of ancient

Greek philosophers and use them as guidance to carry out moral practice (Carr, 2014; Jordan and Kristjánsson, 2017). Stanford University, located in the USA, has both a high publication and a high citation number (35 times on average), mainly due to Noddings (2010), Han et al. (2017, 2018a,b, 2022), and Han and Dawson (2022).

4.5. Articles

Highly cited articles can often reveal the key issues and core points of differentiation and analysis in a research field. The highly cited articles in the moral education are shown in Table 6. The most frequently cited study from 2000 to 2022 was Villenas (2001), a qualitative study on family moral education that analyzed the key role of mothers in family moral education from the perspective of feminism and antiracism through interviews with many Latino mothers. The second

most frequently cited was a speculative study by Halstead (2004), which systematically analyzed moral education in Islam from its basic philosophical issues. A review of the highly cited articles further reveals that moral education is a very broad topic. These highly cited articles cover many aspects of moral education, such as teacher (Sanger and Osguthorpe, 2011), ethics (Woods, 2005), and value education (Thornberg, 2008). Other scholars have systematically discussed how moral education balances the threats and sense of alienation created by technological development (Persson and Savulescu, 2013). Moral education is thus not only related to the words and deeds of each individual but also closely related to social groups. Meanwhile, to present the articles in the moral education research more comprehensively and three-dimensionally, this paper identified the remaining 90 among the 100 articles with the highest citation frequency from 2000–2022 (see Appendix 1 for details).

5. Keywords analysis: Cluster, evolution, and burst

5.1. Keyword co-occurrence analysis

Keywords condense an article's core and essence. Research hot spots in a certain field can be found through keyword co-occurrence analyses, so keywords have been widely used to reveal the knowledge structure of the research field (Chen and Xiao, 2016). In this paper, VOSviewer was used to visualize high-frequency keywords and display those with frequencies > 5. The results are shown in Figure 3. In the keyword co-occurrence knowledge graph, the node sizes reflect the keyword frequency: larger nodes indicate that the keywords appeared more frequently. The node colors represent different clusters, namely, the research topics. The lines between the nodes represent the strength of association: thicker lines indicate that

TABLE 4 Top 10 countries in the moral education research field.

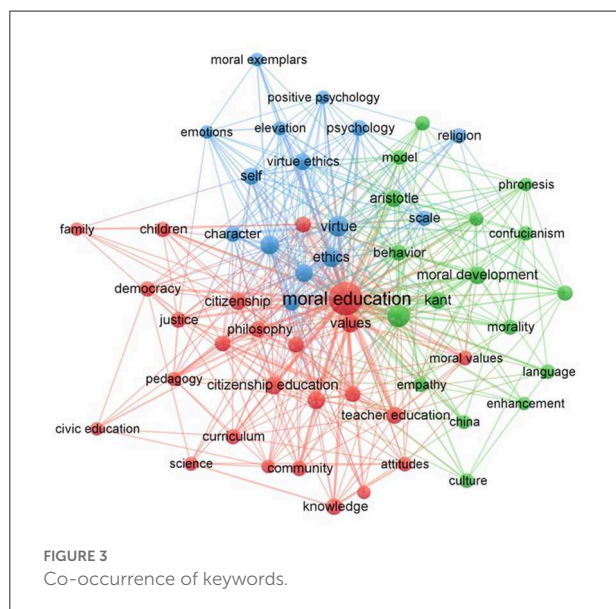
Rank	Country	Counts	Citations	Citations per paper
1	USA	145	2,035	14.03
2	United Kingdom	84	981	11.67
3	China	76	535	7.04
4	Netherlands	34	383	11.26
5	Canada	29	267	9.21
6	Spain	26	161	6.19
7	Australia	21	223	10.62
8	Sweden	11	289	26.27
9	Israel	11	45	4.09
10	Norway	10	92	9.2

TABLE 5 Top 10 organizations in the moral education research field.

Rank	Organization	Country	Counts	Citations	Citations per papers
1	University of Birmingham	United Kingdom	17	194	11.41
2	University of Alabama	USA	10	109	10.9
3	Vrije University Amsterdam	Netherlands	10	147	14.7
4	University of Edinburgh	United Kingdom	8	132	16.5
5	University of Nottingham	United Kingdom	8	25	3.13
6	Stanford University	USA	7	245	35
7	University of Cambridge	United Kingdom	7	37	5.29
8	University of Oxford	United Kingdom	7	156	22.29
9	National Taiwan Normal University	China	7	53	7.57
10	Hong Kong University of Education	China	7	14	2

TABLE 6 Most cited articles between 2000 and 2022.

Rank	References	Title	Year	Citations
1	Villenas (2001)	Latina mothers and small-town racism: creating narratives of dignity and moral education in North Carolina	2001	124
2	Halstead (2004)	An Islamic concept of education	2004	110
3	Hardy and Carlo (2005)	Identity as a source of moral motivation	2005	94
4	Thornberg (2008)	The lack of professional knowledge in values education	2008	84
5	Persson and Savulescu (2013)	Getting moral enhancement right: the desirability of moral bioenhancement	2013	84
6	Nucci and Turiel (2009)	Capturing the complexity of moral development and education	2009	83
7	Sanger and Osguthorpe (2011)	Teacher education, preservice teacher beliefs, and the moral work of teaching	2011	78
8	Chouliraki (2008)	The media as moral education: mediation and action	2008	76
9	Noddings (2010)	Moral education in an age of globalization	2010	70
10	Kristjánsson (2006)	Emulation and the use of role models in moral education	2006	64



the keywords appear more frequently together in the same article.

As can be seen from Figure 3, the moral education research has three main clusters. To learn the research details of the focus within each cluster, the following 3 clusters are analyzed individually.

In the blue cluster, the research studies moral education from the psychological perspective. Many studies have focused on the effect of moral exemplars (Han et al., 2017, 2018b). Studies have also examined how the psychological levels are associated with moral development, including self-preservation (Dahlbeck, 2017), self-doubt (Verducci, 2014), and self-cultivation or self-shaping. Such studies explain the value of morality and moral education from the perspective of psychology. Other

psychological studies have measured the motivational strength of moral behavior by the scientific measurement method (Bock et al., 2021). Some studies have also analyzed the kind of moral education that should be given from the perspectives of belief and religion (Lin and Lu, 2020). In addition, virtue ethics is a focal point covered by this cluster and has attracted much attention in the field of moral education. Virtue ethics has been deeply discussed by many scholars; for example, advocates of virtue ethics have launched a heated debate on whether a shared public moral education system is possible (Katayama, 2003).

Research in the green cluster focuses on the more specific critical thinking and practical research on moral education. As a discipline derived from educational philosophy, many studies on moral education still follow the discourses and speculative research methods used in the philosophical research (Nakazawa, 2018), for example, by comparing the thinking and practical models of scholars such as Kant, Aristotle and Mill and by discussing their contributions to moral education (Surprenant, 2010). Cross-cultural comparative analyses and speculative studies are also an important component of this cluster and have become an important model for the creation of new thoughts on moral education. Some scholars, after learning the shortcomings of Western educational philosophers' thoughts, began to promote the Oriental Confucian view of moral education (Sin, 2022). Some scholars have tried to explain whether the effect of moral education was internally or externally driven by comparing the thoughts of famous thinkers in the field of moral education between China and the West (Slote, 2016). In addition to the speculative research, which is more profound, many comparative empirical studies in this cluster have focused on moral practice (Chi-Hou, 2004; Cheung and Lee, 2010; Ronkainen et al., 2021). For example, Asif et al. (2020) compared the differences in the training objectives of moral education between Chinese and Pakistani teachers by

combining qualitative and quantitative research methods. The teachers in Pakistan considered the sovereignty of sacred laws, loyalty to the country's constitution, and a sense of service to society as the ultimate goals of a moral education. Meanwhile, the Chinese teachers promoted a political ideology that stressed collectivism in a socialist approach, with family and social values being the most relevant. As moral education is a research topic involving social culture, historical background, and temporal characteristics, discussions on its object and implementation method are quite complicated. The research in the green cluster tries to reveal the complex relationships from more abstract ideological discussions and a more concrete empirical analysis to delineate the big picture of the moral education research.

The research in the red cluster mainly studies civic education, which is a very important subtopic in moral education. Although some scholars have proposed that moral education should be distinguished from civic education (Cantero, 2008), many scholars have reached a consensus on this issue at present. Civic education is believed to be a research topic under the general concept of moral education (Schuitema et al., 2008). This status is because the essence of moral education on the social level is to promote the orderly and rational development of society by cultivating students' prosocial behaviors. Therefore, all democratic societies should pay attention to citizen socialization, that is, for everyone in a democratic society to know their citizenship status. Moral education plays an important role in this process (Althof and Berkowitz, 2006). Obviously, the social meaning of moral education is highly consistent with civic education. However, the use of civic education to replace moral education is not comprehensive, and some scholars have noted problems in talking about moral education only from the social level. In a democratic society, it is necessary to constantly weigh the balance between the advantages and disadvantages of public rights and private rights, requiring teachers engaged in the work of moral education teach social expectations for qualified citizens on the one hand, and citizens develop the self-awareness and moral awareness, on the other hand (Bernal Guerrero et al., 2019).

The cluster analysis of moral education shows that the main research schools at present are moral psychology, moral education philosophy, and civic education. However, a careful examination of the moral bases followed by these schools shows that they cannot be separated from Aristotle's framework of moral virtues. The moral psychology schools are mostly based on the virtue theory of positive psychology (Seroczynski, 2015). The moral education philosophy schools are also based on the derivation of Aristotelian concepts such as morality and virtue (Surprenant, 2010). Civic education regards the establishment of certain sociopolitical mechanisms as a prerequisite for maintaining moral education (Carr, 2006; Kristjánsson, 2014), which also coincides with some ideas discussed by Aristotle. Therefore, a consistent tradition and inspiration in the moral-related and moral education research

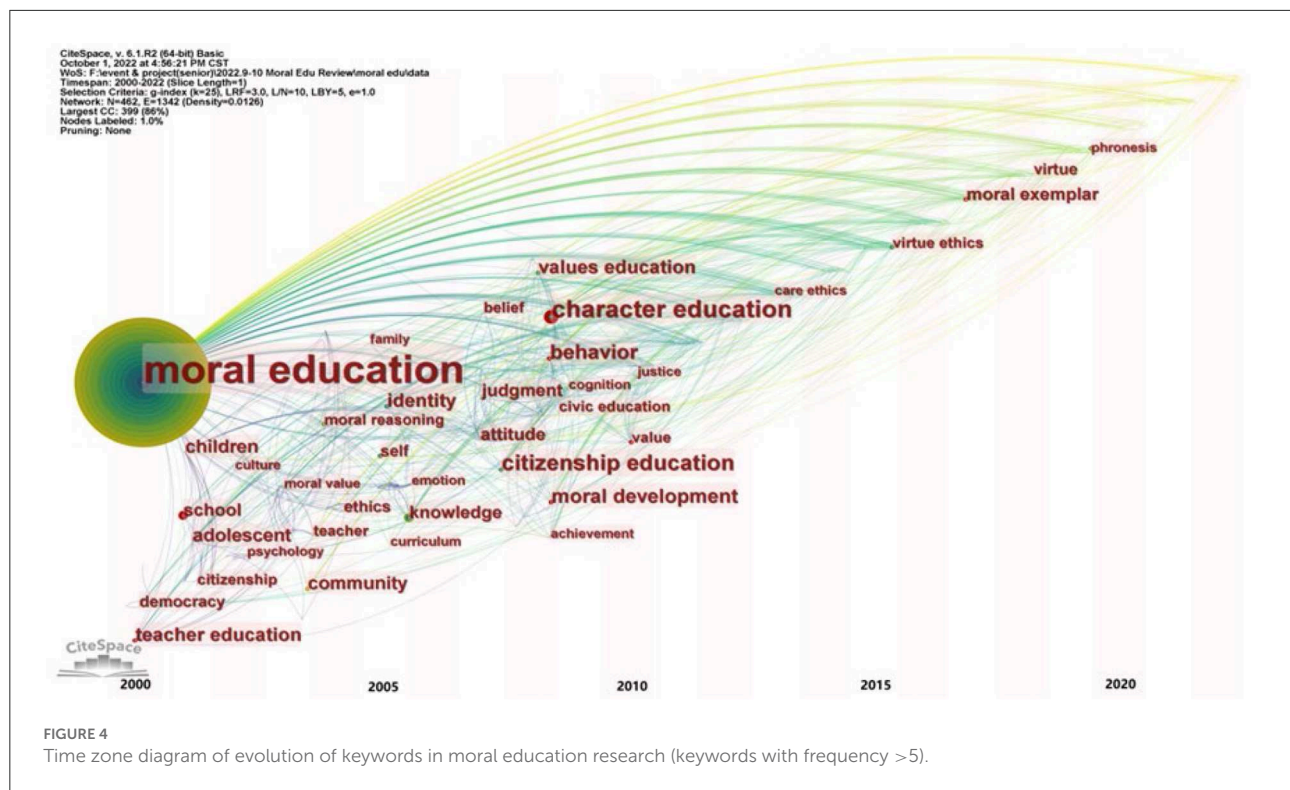
for many years has been the inspiration taken from the ancient philosopher Aristotle's thought. It acts much like a towering tree: many research schools have undergone steady development and growth but remain firmly rooted in the thought foundation of ancient philosophers.

This cluster analysis of moral education also shows that it is a complex multidimensional and interdisciplinary topic, involving pedagogy, psychology, sociology, philosophy, and other fields (Chi-Kin Lee et al., 2021). People from different disciplines have different opinions on moral education (Alvey, 2001). Each disciplinary perspective provides an indispensable piece of the jigsaw puzzle that is the overall picture of moral education. In addition, the cluster research demonstrates a typical characteristic of the moral education research—the emphasis placed on theoretical research and analysis—which is due to the subject's particularity. Until the present, mainly educational philosophers have made profound analyses of moral education, and educational philosophers have often chosen to develop the field of moral education by argumentation (Lewis, 2018). Regarding the discipline's development, the emergence and initial development of any discipline depends on high-quality argumentation to realize the conceptualization and categorization of the discipline's terms, and the same is true of moral education. These wonderful arguments are difficult to reflect in this paper in terms of a simple and concise conclusion, but they are the objects worthy of appreciation. Therefore, the cluster analysis presents only the overall style of moral education, and the brilliant internal testimony and argumentation among scholars requires readers to examine the classical literature carefully. Moreover, the cluster research also finds that under the influence of positivism, all kinds of empirical studies in moral education have increased in recent years, and the use of qualitative and quantitative analytical technology has enriched the research model of this issue. Undoubtedly, the introduction of the empirical paradigm endows this topic with scientific nature, extends the scope of the moral education research, and expands the value of moral education as a separate discipline.

5.2. Keyword evolutionary analysis

Keyword co-occurrence analyses can reveal the hot spots and focal points of research fields, thus showing the structural characteristics of moral education issues and the development process of the research field. In this paper, CiteSpace was used to conduct an evolutionary analysis and delineate the view of keyword time zones (see Figure 4). In Figure 4, each background bar in the time zone diagram represents a year, the keyword size represents the keyword frequency, and the line represents the keyword co-occurrence relationship.

Figure 4 shows that the high-frequency keywords essentially appeared before 2010, and only 4 keywords with frequencies > 5 appeared after 2015. This result indicates that the concept



development of moral education has entered a relatively stable stage in recent years, and the discipline structure tends to be perfect. Therefore, the evolutionary analysis should focus on the development of and change in keywords from 2000 to 2010.

At the beginning of the 21st century, the subdomain of moral education, including topics such as its teachers and mission (Fallona, 2000; Wardekker, 2001; Husu and Tirri, 2003), was widely studied. In addition, some research topics, such as democracy and citizenship, were more specific and reflected scholars' expectations about moral education's goals, including understanding and recognizing obligations and responsibilities in a democratic society, seeking equality in human rights, and understanding the connotation of citizenship (Brabeck and Rogers, 2000). The keywords "children" and "adolescent" reveal the main groups with which moral education was concerned at that time (Kuther and Higgins-D'Alessandro, 2000). This focus is different from the view that "moral education is an integral part of lifelong education," held by some scholars in recent years (Wong, 2020). This difference shows that the generalization in moral education's object has been a major trend in the past 20 years. At the same time, moral education in the early 21st century was more about the value and benefit of the individual educatee (Wardekker, 2001). Some studies paid attention to the value of moral education in improving adolescent self-esteem (Covell and Howe, 2001). However, the research at that time paid less attention to the larger social

benefit of moral education. To some extent, this absence affected the construction of moral education's goal, making it slightly one-sided and narrow.

Meanwhile, the wide opportunities for moral education in schools at all levels has triggered scholars' systematic research on moral education at the instructional design level (Jie and Desheng, 2004). During this period, the curriculum and teaching theory system have been constructed belonging exclusively to moral education (Tai Wei and Lee Chin, 2004). At this time, the curriculum orientation of moral education was based on the pursuit of personal wellbeing and citizens' moral qualities (Lee and Ho, 2005). Many studies have attempted to guide the development of the moral education curriculum based on previous theoretical studies (Jie and Desheng, 2004; Richmond and Cummings, 2004). The reform of the moral education curriculum has become a new hot spot, as reflected in "curriculum" and other keywords in Figure 4. At this time, under the guidance of Chinese government policies, Chinese scholars' research has become the forefront of curriculum theory in moral education, and has put forward much practical guidance for the curriculum system design of moral education (Chi-Hou, 2004; Wansheng and Wujie, 2004; Lee and Ho, 2005; Cheung, 2007).

Between 2008 and 2012, moral, value, character, and civic/citizenship education have significantly and increasingly diverged, becoming emerging hot spots for scholars (Gilead, 2011). Civic education particularly compensates for the

drawbacks of the past moral education that focused too much on individual values, and it emphasizes the social benefits of individual identification with citizenship (Schuitema et al., 2008). In contrast, value education, in its emphasis on the construction of learners' values, together with moral education, involves the specific connotation of moral education at the individual level (Marshall et al., 2011; Pantić and Wubbels, 2012). As moral education continues to differentiate, concrete research has begun to increase, since the detailed issues require the support of the micro-empirical research. Although the abstract and philosophical speculation and argument remained the mainstream research trend, they were no longer in a monopolistic position.

The empirical paradigm and hybrid research methods widely used in discipline education and higher education have also been used by the moral education researchers (Dahlin, 2010). This fact has become a turning point that cannot be ignored in the process of promoting moral education's development.

Overall, moral education since 2012 has essentially continued its past development trend, with few typical signs of discipline development and evolution. Although the outbreak of COVID-19 has reshaped the model of contemporary education, it seems to have had little impact on moral education at the academic research level. Until now, no scholars have systematically discussed the impact of COVID-19 on moral education. This is a blank area that the current research on moral education needs to pay attention to, because there is no doubt that the great changes in society will bring multidimensional challenge to moral education and promote its deeper reflection and development.

Moreover, the current development and evolutionary situation of moral education have also attracted scholarly attention. Krettenauer (2021) noted that in the social sciences and related fields, the morality research increased exponentially in the past 15 to 20 years, but the moral education research had not seen a corresponding upsurge. However, unfortunately, Krettenauer (2021) also failed to reveal the mechanism behind the phenomenon, and therefore failed to make constructive suggestions to resolve it. Perhaps this is also a specific research direction under the larger topic of moral education that still has present research value and requires further scholarly exploration.

5.3. Keyword-burst analysis

Keyword emergence and transformation can partially reflect the hot spot changes in the research field. Although the moral education development in the past decade has not produced many emerging elements, the change and transition of research hot spots still occurred in a specific period. Therefore, this paper utilizes the CiteSpace function of Burst detection to detect the

top-10 keyword bursts (as shown in Figure 5) to systematically show the changes in this research topic.

Figure 5 shows that, at the beginning of the 21st century, few research hot spots had high intensity, and the research focus was mainly on teacher education. This subtopic is explained in detail in the Keyword Evolutionary Analysis (see Subsection 5.2). Beginning in 2016, the field's research hot spots in the field of moral education frequently changed, and Figure 5 shows that many keyword bursts with profound connotations emerged from 2016 to 2019. For example, from 2017 to 2019, many scholars began to pay attention to the role of moral exemplars in moral education (Hamilton and LaVoi, 2017; Han et al., 2017, 2018b; Engelen et al., 2018; Nielsen, 2019; Tachibana, 2019). Character education and virtue also became the research hot spots of moral education between 2018 and 2022 (Bernal Guerrero et al., 2019; Chi-Kin Lee et al., 2021). These keywords formed a new trend that promoted the development of moral education in a deeper and more detailed direction. Research on moral education and virtue is often closely related to virtue ethics and character development, inspired by Aristotle. Therefore, the emergence of these hot spots reflects scholarly interest in the origin of morality study. Hence, Darnell et al. (2019) suggested the necessity to take seriously the increasing interest in Aristotle-inspired virtue ethics and character development within the social sciences.

In addition, *phronesis* is an ancient concept developed by Aristotle, and much of its discussion takes place in the sixth volume of his work, *Nicomachean Ethics*. Its intuitive meaning is practical wisdom, but understanding its meaning first requires a deep understanding of Aristotle's philosophy. Aristotle believed that human beings had both rational and irrational sides, and to have *phronesis* required adjusting or tailoring the irrational side of human beings to make them more rational (Darnell et al., 2019; Osman, 2019). Thus, *phronesis* should be distinguished from mere cleverness. Darnell et al. (2019) noted that Aristotle's description of *phronesis* implied elements of the category of natural virtues such as honesty, kindness, consideration, and compassion and was similar to the neo-Kohlbergian concept of "moral judgment", that is, the ability to weigh or adjudicate the relative priority of virtues in complex, problematic situations.

The keyword-burst analysis identified a significant revival of Aristotle's philosophy of moral education. This result confirms the present value of classical moral philosophy, in sharp contrast with the decline of Kohlberg's moral education paradigm (Kristjánsson, 2017). This contrast is a problem worth the pondering of all moral education scholars. In the past two decades of the moral education research, few research paradigms have been introduced that appear universal and in line with the needs of the times. The philosophical discussions of and theoretical research on moral education have fallen into a strange circle, as Kristjánsson wrote in a 2021 editorial. Apparently, no major, new academic trends have emerged—like Athena from the forehead of Zeus—in the past 3 years.



FIGURE 5
Top 10 keywords with the strongest citation bursts.

Despite this fact, Kristjánsson (2021) remained hopeful about the future, waiting for the owl of Minerva to take her flight at dusk.

6. Conclusions, limitations, and future research implications

6.1. Conclusions

Based on a careful review of and reflection upon the research field of moral education, this paper reorganizes the theoretical connotation of moral education under the framework of virtue ethics. The reasoning follows the value judgment of Aristotle's *Nicomachean Ethics* that virtue is a kind of good quality based on acts and habits, and that it is distinguished from intellectual virtue (Ameriks and Clarke, 2000). Therefore, moral education uses various forms and systematic teaching designs (such as the establishment of moral models) to help form, cultivate, and maintain this kind of good quality through certain practices and guidance.

The evolution of any research field, including moral education, is a dynamic development process. Therefore, it is necessary to recognize, explain and analyze it from a dynamic perspective to understand the reasons for its evolution. Through a keyword performance analysis and a relevant keyword visual analysis, the following conclusions are obtained in this paper:

1. This paper systematically analyzes the scientific productivity of authors, organizations, and countries. The highly productive authors include Han and Kristjánsson, and the highly productive organizations include the University of Birmingham and Stanford University. This paper also

shows the top-four countries with the largest published article volume and with close cooperation in this field (i.e., USA, United Kingdom, China, and the Netherlands), and summarizes and comments on their research focuses.

2. This paper also pays attention to the core journals (e.g., *Journal of Moral Education* etc.) and highly cited articles in the field. Additionally, it examines the scope of moral education at the academic level through the discipline categories to which the core journals belong and the key elements of the differentiation and analysis of highly cited articles. Finally, it analyzes the discipline categories related to moral education.
3. Through a cluster analysis, this paper outlines the macro-disciplinary structure of the moral education research topics, identifies the schools represented by the three clusters and their specific subject concerns, and presents different prospects for moral education as an interdisciplinary topic in various disciplines.
4. An evolutionary analysis presents the development trend of moral education over the past 20+ years. Combined with the keyword-burst analysis, this paper finds that the discipline structure has tended to be stable in the past 10 years. The classical philosophical trend represented by Aristotle has reemerged as a hot topic in the study of moral education in recent years, but the decline of some classic research paradigms has caused the discipline's development to enter a slow period.

A comprehensive review of moral education can reveal the problems existing in the current development and the direction that scholars in this field should actively explore. Firstly, the biggest gap in the current moral education research is the lack of a systematic paradigm to guide the discipline's development and to standardize its construction of a system, which is

consistent with Kristjánsson (2021) viewpoints. At present, moral education is in urgent need of a disciplinary paradigm that stands on a solid theoretical basis and can keep pace with the times. A reasonable paradigm is also key to solving the problem of the slow development and evolution of moral education that was criticized by Krettenauer (2021). Secondly, more education continues to have some unsolved cross-century problems, such as the question raised by MacIntyre: whether it is possible to build a common public moral education system in the current pluralistic society (MacIntyre, 1999). Such questions have not been unanimously recognized by the academic community after more than 20 years and are not rare (Kristjánsson, 2017). Lastly, the overall review of moral education reveals that the discipline system of moral education spans positive psychology, ethics, education, and other disciplines. However, the current research all falls under a certain discourse system that analyzes moral phenomena and problems. Meanwhile, few scholars are trying to break through the disciplinary barriers of moral education or are looking for consistency among the research elements involved in the different disciplines of moral education. Future studies could try to build the multi-disciplinary thematic imagery behind moral education and construct a discourse system of universal significance for it.

6.2. Limitations and future research

This paper has some limitations because of some objective factors. Firstly, the bibliometric analytical software has high data standards and specifications. Therefore, to ensure the quality and integrity of the collected data, only journal articles from the SSCI of the Web of Science core collection were selected, and indexes such as the Science Citation Index Expanded (SCIE), Conference Proceedings Citation Index–Social Sciences & Humanities (CPCI-SSH) and Conference Proceedings Citation Index–Science (CPCI-S) were excluded to avoid excessive noise, which inevitably leads to the problem that the analytical data are not comprehensive. Secondly, quantitative analyses require data analyses and interpretation, which requires researchers to have a deep and comprehensive understanding of this field. Although we make efforts to overcome the adverse influence caused by personal subjective factors, some subjective color inevitably remains. To overcome these limitations, in a future study, we will expand the scope of the literature filtering, learn more widely the trends and hot topics of the moral education research, actively contact the field's scholars, and acquire objective and cutting-edge insights in the field. These efforts will greatly reduce the adverse impacts of personal subjectivity on the research and analyses.

As society dynamically evolves, technological changes will place new requirements on moral education, making it an enduring issue. This paper summarizes the main research themes of moral education research topics through systematic

scientific research methods while reviewing the problems and current situation in this issue's development process. In addition, based on the research analysis, this paper puts forward some academic questions worthy of further analysis, such as why the rapid development of the moral research has failed to promote its prosperity and how to break through the strange circle of the fuzzy moral education research paradigm. Limited by its length, this paper also contains some content that has not yet been proven, including that the research methods commonly used in the field of moral education are neither classified nor quantified. Future research efforts should be made to extract quantitative information that is more comprehensive and to obtain conclusions that are more precise, which will provide interpretations that are more valuable on the development of the moral education research.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

Conceptualization and writing—original draft preparation: JC and YL. Methodology: YL, JD, and CW. Software: CW and JD. Writing—review and editing: JC and JD. Visualization: YL and CW. Supervision, project administration, and funding acquisition: JC. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.1079955/full#supplementary-material>

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EDITED BY

Laura Franchin,
University of Trento,
Italy

REVIEWED BY

Kristen Ann Dunfield,
Concordia University,
Canada
Markus Paulus,
Ludwig Maximilian University of Munich,
Germany

*CORRESPONDENCE

Jeremy I. M. Carpendale
✉ jcarpend@sfu.ca

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From action to ethics: A process-relational approach to prosocial development

Jeremy I. M. Carpendale* and Beau Wallbridge

Department of Psychology, Simon Fraser University, Burnaby, BC, Canada

Explaining how children first become active prosocial and then later moral agents requires, we argue, beginning with action and interaction with others. We take a process-relational perspective and draw on developmental systems theory in arguing that infants cannot be born knowing about prosociality or morality or anything else. Instead, they are born with emerging abilities to act and react. Their biological embodiment links them to their environment and creates the social environment in which they develop. A clear distinction between biological and social levels cannot be made in the context of ongoing development because they are thoroughly interwoven in a bidirectional system in which they mutually create each other. We focus on infants' emerging ability to interact and develop within a human developmental system, and prosociality and morality emerge at the level of interaction. Caring is a constitutive aspect of the forms of experience in which infants are embedded in the process of becoming persons. Infants are immersed in a world of mutual responsiveness within caring relationships that are infused with concern, interest, and enjoyment. In such a developmental system, infants become persons when they are treated as persons.

KEYWORDS

moral development, prosocial, infancy, socio-moral development, emotional involvement, process-relational approach, engagement, worldviews

Introduction

Our relations with others, from interpersonal caring to social justice, are central in human cultures. Thus, it is crucial to account for the emergence of these skills in human development. We argue that addressing the question of how children become active prosocial agents requires beginning with action and interaction with others. By contrast, one current claim is that a moral sense is innate. We have argued that such claims are problematic at the conceptual, methodological, and biological levels (e.g., [Carpendale et al., 2021a](#)). Another claim is that socio-moral development can be explained in terms of children coming to accept the behavioral norms of their culture. Although this aspect of development needs to be explained, such conformity to rules is not a complete account of morality because as well as accepting some norms, children and adolescents also challenge and change societal norms, and this needs to be explained in a full developmental account (e.g., [Carpendale et al., 2013](#)).

We argue that infants cannot be born knowing about morality or anything else. Instead, they are agents, born after 9 months of development, with emerging abilities to interact, act, and react. Their biological embodiment links them to their environment, and it also creates the social environment in which they develop. For example, human infants' helplessness requires that they be cared for, and this results in a social-emotional context for their development (e.g., [Portmann, 1990](#); [Savage-Rumbaugh and Fields, 2011](#)). Infants' neurological development is shaped by this social experience (e.g., [Carpendale and Lewis, 2021](#)). This is a developmental system account in which a clear distinction

between biological and social levels cannot be made in the context of ongoing development because they are thoroughly interwoven in a bidirectional system in which they mutually create each other. In our account, we focus on infants' emerging ability to interact and develop within a human developmental system. Prosociality and morality emerge at the level of interaction. We argue that the concern for others that underlies moral development does not need to be added later to human relations, but rather that caring is a constitutive aspect of the forms of experience in which infants are embedded and require in the process of becoming persons. The world in which infants are immersed from the beginning is saturated with engagement. They live in a world of mutual responsiveness, within caring relationships that are infused with concern, interest, and enjoyment. In such a developmental system, infants become persons when they are treated as persons (Carpendale and Lewis, 2021).

To understand and evaluate research on prosocial development, it is important to be clear that the presuppositions researchers start from matter for the theories they work with because "starting points have a tendency to haunt us all the way through to our theoretical conclusions" (Jopling, 1993, p. 290). We compare two starting points in terms of the presuppositions regarding cognition and relations on which theories are based: (1) either cognition is assumed to be necessary to make interpersonal relations possible or (2) it is relations that are primary, and cognition emerges from interaction within such relations (Jopling, 1993). The first approach is the cognitivist perspective, also referred to as a Cartesian, split, mechanistic worldview (Overton, 2015). The second approach begins with relations as primary and as the explanation for the development of cognition. From this perspective, "gesture and communication come before mind and self" (Jopling, 1993, p. 526). Relations are primary and they make higher-order cognitive relations possible, not the other way around (Jopling, 1993). These two approaches to understanding prosocial and moral relations start from opposite directions. One is exemplified by the subtitle for Pinker (1994) book, "*The Language Instinct*," that is, "*How the mind creates language*." This begins from, but does not explain, the mind. This framework contrasts with the alternative that concerns how communication, thinking, and mind emerge from interaction (e.g., Mead, 1934). We argue that cognitivism presupposes what it should explain. Instead, we begin with process, relations, systems, and interaction.

Although we have mentioned both prosocial action and morality, in this article, we focus on the development of prosocial action. But this development is linked to morality, and it is important to think about this distinction. We discuss this in the following section. Then, we briefly and critically examine nativist approaches to this area of development and claims of innate infant morality. We then introduce a process-relational, action-based approach to development, and in the next section apply this perspective to understanding the development of prosocial action. Following this, we consider different forms of prosocial action, such as helping, sharing, and comforting, and how they might initially develop somewhat independently. Finally, we consider the methodological implications that follow from the process-relational approach.

Prosocial action, morality, and interaction

There is an important distinction between prosocial action and morality, but we suggest that to understand development in these areas, we should resist assuming a hard dividing line between them. Prosocial action benefits others. But so does moral action, so they overlap in this

way. Morality is a broader domain than prosociality, as it includes prosocial action and also concerns obligations and moral norms regarding what is right and wrong. This then raises the question of where moral norms concerning right and wrong come from. How do they develop? Explaining the origin of such moral norms is a difficult but important task that we address elsewhere (Carpendale et al., 2013, 2021a). We explicate the problem of accounting for moral norms and critique the following two commonly proposed solutions: moral norms are either innate and explained in terms of biology, or moral norms are imposed on children through parents and culture. We critique claims that such norms could be innate or completely imposed on children and argue instead for an alternative that they emerge through interpersonal agreement. Since we take a developmental perspective on this issue and do not assume that moral norms pre-exist in either the individual's biology or in the culture, we need to explain how they develop. From this perspective, it is important to think about forms of human interaction that gradually become more complex as morality emerges. When we look at interaction even in infancy, we see that the basic structure of communication involves responding to others; therefore, there is already something ethical in treating the other as a person. This is the structure of the interaction that infants experience and develop within (Jopling, 1993; Carpendale, 2018).

We argue that the skills we think of as linked to being a person emerge within relations, and these relations are fundamentally ethical because they are based on responsiveness, respect, and responsibility. Thus, these social relations in which persons develop are ethical in their foundations (Jopling, 1993). In addition, these interpersonal relations are mastered by children to become what we think of as individual cognitive skills, but they are social and ethical in their origins and their foundations. Thus, ethics is not something added later in development. It is already in some sense present within human relations. In this article, we focus on prosocial development and expand on early development from the perspective of an action-based or process-relational approach. To do so, we describe the emergence and development of infants' enjoyment of interacting with others and their development of new ways to elicit such interaction.

We begin with intersubjectivity or lived activity (Jopling, 1993). By contrast, if researchers already start with individuals and cognitive skills, then it is necessary to figure out how to glue them back together, and reasons are needed for why they should care about each other (e.g., Dunfield, 2014; Tomasello, 2020). But if one begins from our starting point in relations, then caring is a foundational aspect of the structure of interaction that emerges at the beginning of parent–infant interaction. It is not something that has to be added later. Emotions, including interest and enjoyment, and curiosity are aspects of this interaction (Carpendale and Lewis, 2020, 2021).

Nativism, infant morality, and process-relational approaches

Strong claims have been made regarding infants being born with innate morality (e.g., Hauser, 2006a,b; Hamlin et al., 2007; Mikhail, 2007; Bloom, 2010, 2012; Graham et al., 2013; Hamlin, 2013; Margolis and Laurence, 2013; Warneken, 2016). For instance, it has been claimed that infants "have a rudimentary moral sense from the very start of life" (Bloom, 2010, p. 46), that "genes (collectively) write the first draft [of the infant's moral mind] into neural tissue" (Graham et al., 2013, p. 61), and that this first draft includes an abstract expectation of fairness (see Bian et al., 2018, p. 2705; Buyukozur Dawkins et al., 2019, p. 16).

Our developmental position contrasts with these current nativist claims regarding infants' moral competence. Elsewhere, we and others have critiqued such claims from conceptual as well as methodological perspectives (e.g., [Carpendale et al., 2021b,c](#); [Carpendale and Lewis, 2021](#)). Here, we briefly reiterate that although these claims of innate knowledge might seem to be based on biology, these researchers do not cite current research in biology and instead what is defining about their claims is the notion of pre-existing moral knowledge or essentialism. These claims seem to clash with what is currently known about the functioning of genes (e.g., [Fisher, 2006](#); [Gottlieb, 2007](#); [Meaney, 2010](#)) as well as neural development (e.g., [Stiles, 2009](#); [Stiles et al., 2015](#)). Thus, this is a curious nativism that seems to exist independently of biological knowledge, similar to [Chomsky \(2007\)](#) logical claims.

It might be thought that because we recognize the capacities that infants demonstrate at birth, we draw something from nativism, but this is not the case. Nativism presupposes pre-existence and essentialism ([Lerner, 2016](#)) rather than development. The assumption is that something must pre-exist. Instead, we draw on developmental systems theory according to which it is necessary to explain development, and we should do without the dichotomy between biology and social factors because infants' biological characteristics structure their experience which, in turn, shapes infants' biology in a bidirectional manner. Biological and social factors cannot be meaningfully separated, and the dichotomy is misleading because they mutually create each other (e.g., [Griffiths and Stotz, 2000](#); [Gottlieb, 2007](#)). Our work is consistent with a systems biology that focuses on relations and the process of development rather than making claims of pre-existence and essentialism ([Lerner, 2016](#)). This developmental systems approach to biology that we draw on is consistent with neuroconstructivism, according to which neural pathways are shaped through experience (e.g., [Mareschal et al., 2007](#); [Stiles, 2009](#); [Stiles et al., 2015](#)).

Beyond the problematic biological assumptions on which nativism is based, we also criticize the assumptions regarding knowledge and thinking that nativism presupposes. Claims of innate knowledge rest on a representational view of knowledge and the view of thinking as computation, both assumptions that we and others have extensively critiqued (e.g., [Heil, 1981](#); [Carpendale et al., 2021a](#)). By contrast, we argue that to understand human development, it is essential to begin with relations. Cognition cannot be prepared in advance of experience because it has to be meaningfully linked to the world. It develops in relations; it is not a mechanical connection.

A process-relational, action-based worldview

We have argued that where we start from matters. Rather than starting with and thus presupposing individual cognition to explain relations, we begin instead with relations as primary. Many approaches presuppose humans as capable of living self-sufficient, isolated, independent lives. This presupposes a split between the first and third person; minds are presupposed as primary. According to this starting position, it is cognitive competence that makes relations possible. This requires what [Hobson \(2004\)](#) called a joining together account that presupposes a split between self and other. The problem with this starting assumption is that persons are presupposed yet that is what we must explain. By contrast, we take a differentiating out account according to which the development of individuals occurs as emerging out of relations. The relational view of persons is that they become persons in relation to others.

There are many sources of the broad worldview that we draw on. We draw on action-based approaches such as [Mead \(1934\)](#), [Piaget \(1965\)](#), [Wittgenstein \(2009\)](#), and [Carpendale and Lewis \(2021\)](#). These are currently referred to as process-relational approaches ([Overton, 2015](#)). They could be grouped into a family of approaches with interactivism ([Bickhard, 2009](#); [Allen and Bickhard, 2013](#)), enactivism (e.g., [Maturana and Varela, 1987](#); [De Jaegher and Di Palolo, 2007](#); [De Jaegher et al., 2010](#)), and other approaches in cognitive science (e.g., [Hutto and Myin, 2013](#)). [Jopling \(1993\)](#) contrasts what he refers to as the philosophy of subjectivity which begins from cognition to explain relations with the philosophy of intersubjectivity or dialog, drawing on Buber and Levinas, which begins from relations. The focus on relations is also central in work in feminist theory and the idea of an ethic of care (e.g., [Gilligan, 1982](#); [Noddings, 1984](#)). The foundational idea of human interdependence is clear in the African social and ethical concept of Ubuntu, that is, the idea that a person becomes a person in relation to other persons ([Tutu, 1999](#); [Waghid and Smeyers, 2012](#)). This way of thinking about the importance of relations also seems to be embedded in Japanese and Chinese thinking (e.g., [Carpendale and Lewis, 2021](#)) and is central in many indigenous worldviews (e.g., [Ross, 2006](#)). Another source of approaches focused on relations derives from developmental systems theory in biology, in which this idea applies at all levels from genetics to neuroscience ([Griffiths and Stotz, 2000](#); [Gottlieb, 2007](#)). These various approaches apply the idea of relations at contrasting levels from the cytoplasm and the synapse to society and social justice. It is a further task, however, to distinguish and analyze differences among these perspectives. We now consider approaches more well-known in psychology.

Within psychology, there are a variety of approaches taking what is currently referred to as 4E approaches to cognition, which acknowledge that human cognition is embodied, embedded, enacted, and extended (see the Oxford Handbook on 4E cognition; [Newen et al., 2018](#)). Although these approaches recognize that human cognition is embedded in relations, there is still considerable diversity and debate among researchers ([Newen et al., 2018](#)). To draw out the developmental implications of these approaches, we suggest that it is necessary to extend this way of thinking by adding an E for emergence (see [Bickhard, 2009](#), on emergence). Furthermore, to get to the sixth E of ethics, we need to consider other Es. In particular, the E for emotions because our actions need to be linked meaningfully to the world. Emotions viewed as interpersonal relatedness and interest draw infants into relations with others ([Hobson, 2012](#); [Hammond and Drummond, 2019](#); [Reddy and Vanello, 2022](#)). Furthermore, another E should be added for enjoyment in interacting with others as a crucial ingredient in structuring the human developmental systems in which persons develop, and this is linked to interest ([Jopling, 1993](#); [Hammond and Drummond, 2019](#)).

Within these interpersonal relations, we could also add the 4Rs related to these relations of response, responsibility, respect, and relational autonomy, as well as the 4Cs of care, compassion, concern, and connection. This brings out the ethical nature of such relations. The nature of the interaction is already ethical because we typically respond to others as persons, that is, as someone and not something ([Spaemann, 2006](#)), as in [Buber \(1958\)](#) distinction between human relations as "I-Thou" versus "I-it." We argue that concern for others does not need to be added to human relations, but rather is a constitutive aspect of the forms of experience that infants are embedded in during the process of becoming a person.

Another approach that is similar to what we are proposing is currently referred to as a "second-person" approach (e.g., [Reddy, 2018](#)). This is presented as an alternative to approaches presupposing that development begins with the first-person perspective, referring to the subjective or

experiencing perspective, and the third-person or the observer perspective. This sets up the traditional problem of other minds because the individual is assumed to have privileged access to her mind, the first-person perspective, and must make inferences about minds in other bodies, the third-person perspective. These assumptions presuppose the split between self and other and the problem of other minds. By contrast, the second-person perspective is the intersubjective, participant, or co-experiencing perspective (Fuchs, 2013). Second-person relations are fundamentally about direct engagement with, rather than observation of, the other (Fuchs, 2013; Reddy, 2018).

Engagement involves an immediate (i.e., unmediated and non-representational) way of interacting with others as whole persons—rather than as bodies, minds, or minds-within-bodies (Jopling, 1993; Fuchs, 2013). Second-person engagement is fundamentally characterized by addressing the other and being addressed in an act of “momentary openness to each other” (Reddy and Vanello, 2022, p. 254). These moments involve mutual responsiveness that gives spontaneity to the interaction, affording the possibility of creating novel shared experiences. Engagements do not exist within two first-person subjects, but rather *between* the interactants (Reddy, 2018).

As Reddy (2018) argues, this is the world of second-person engagement, and it is the world that infants are immersed in from the beginning. Thus, they are living in a world of addressing and being addressed, of mutual responsiveness, tied up in a caring relationship that is infused with strong emotions of concern, interest, and enjoyment. In such a developmental system, infants become persons when they are treated as persons (Carpendale and Lewis, 2020, 2021). It is through treating, or failing to treat, others as a person that infants learn the interpersonal consequences of their actions. From the current second-person perspective, this remains the core as children begin to develop an awareness of the perspectives involved in a moral conflict—including their own—which allows them to engage in a moral process of coordinating the conflicting perspectives (Mead, 1934; Piaget, 1965; Carpendale et al., 2013). Thus, morality does not need to be added to human relations, but rather is a constitutive aspect of the forms of experience that infants require to become a person.

We agree with the spirit of the second-person approach, but we question whether the term “second-person” is the best description of this intersubjective perspective. The term “second person” is in contrast to first- and third-person perspectives, but it is a bit odd because, at that point in early development, there is no perspective of a person, at least in the cognitive, mentalistic sense that is often assumed, instead, there are direct relations that are not mediated. Fuchs (2013) noted that he was aware that it is a problematic term but believed it is worth the cost.

Accounting for prosocial development by beginning from relations

We take the perspective that the development of social knowledge emerges as social skills (Bibok et al., 2008). In understanding how young children enter the social, emotional, and moral forms of relations with others, we draw on the philosophy of intersubjectivity and dialog (Jopling, 1993) and the idea that “the reality of interpersonal relations is a given rather than a cognitive achievement” (Jopling, 1993, p. 292). This is a reversal of the cognitivist position that we critically evaluated earlier. We suggest that our perspective is Darwinian because we begin with relations. That is, we begin with something observable and explain instead of presupposing cognition. In discussing this approach, Jopling (1993) explicates ideas from Levinas and Buber according to which first-order

ethical relations make higher-order cognitive relations possible, not the other way around. Caring is not something that is added later based on cognition. Instead, care and respect are part of the structure of the human developmental system that makes the development of cognition possible (Carpendale, 2020; Carpendale et al., 2021a).

In taking this perspective, the goal is to chart the gradual development within relations of young children’s social skills and emerging concern for others. In the initial research on the topic of young children’s helping, Rheingold (1982, p. 115) suggested that a “fundamental characteristic of human infants that underlies helping, and many other prosocial behaviors, is their interest in people and their activities.” This insight was overlooked in Warneken (2016) claims that there are biological foundations for infants’ helping and that social experience is of little importance in its emergence. In evaluating this claim, it is essential to clarify what is meant by biological foundations because, in one sense, everything has biological foundations. But Warneken (2016) means that prosociality is primarily explained by biology, that it pre-exists in biology. This claim, however, appears to be inconsistent with current biology and an understanding of the functioning of genes (e.g., Gottlieb, 2007; Meaney, 2010). Instead, in taking a developmental systems approach, the biological embodiment of infants and parents results in forms of engagement with each other. The question then is, what are the biological characteristics of human embodiment that make history and societies both possible and necessary (Elias, 1978)? Infants are born helpless and their embodiment, in contrast to chimpanzees and bonobos, results in social forms of interaction and thus in different developmental pathways. There is a lot more to be said here (see, e.g., Reddy, 2011, 2018; Savage-Rumbaugh and Fields, 2011; Dahl, 2017), but we will focus on forms of relations beginning at the end of the first year of life.

Rheingold (1982) insight regarding the importance of infants’ interest in participating in the activities of others has now been revived. This is the idea that infants’ early activities such as those labeled helping may initially not be motivated just by concern for others’ welfare but instead are more likely due to their interest in engaging with others in their activity. What are labeled prosocial behaviors in infants may not initially be motivated in terms of acting for others’ welfare. Instead, these activities may at first be motivated by interest and enjoyment in engaging in interaction with others (e.g., Carpendale et al., 2015; Dahl and Brownell, 2019; Dahl and Paulus, 2019; Carpendale and Lewis, 2021).

In taking this perspective, the question becomes how is it that infants develop what Rheingold (1982, p. 115) insightfully pointed out was characteristic of human infants which are “their interest in people and their activities”? We need to trace the developmental emergence of infants’ interest in engaging with other people. We briefly outline infants’ development in learning new ways to achieve engaging with adult’s attention—i.e., social interaction as a goal in itself—drawing on Bates and Reddy and others. In the context of communicative development within parent–infant interaction, Bates et al. (1975, p. 213) suggested that “the mutual joy taken in such interactions provides the first loop in the construction of declarative communication: the formulation of social interaction as a goal in itself.” Bates et al. (1975) further described the increasingly complex ways in which infants attempt to reach the goal of social interaction such as by engaging with others’ attention in various ways from showing objects, to showing off, to giving objects (Carpendale et al., 2021a; Broesch and Carpendale, 2022). Reddy (2003, 2011) also describes how infants engage with others’ attention such as through joking, humor, and clowning. This is not just a frivolous activity but reflects their interest and enjoyment of engaging with others.

In explicating the transitions in prosocial development, Dahl and Paulus (2019, p. 11) outline four phases in a sequence in early prosocial

development in a pathway to altruism from “interest to obligation”: “(a) social preference for interacting with others (prealtruistic), (b) preference for action fulfillment (prealtruistic), (c) concern with promoting others’ well-being (altruistic), and (d) norm-based concerns (altruistic).” The second phase, to help achieve an action goal, is likely linked to learning about social routines and the ways actions are completed. This interest in others’ instrumental goals still does not necessarily require concern for others’ welfare, which is a later form in this development (Dahl and Paulus, 2019).

We have emphasized that development occurs within a system so it is important to consider the various factors involved such as the child’s characteristics as well as the influence of parents and the culture. For example, Newton et al. (2014) reported longitudinal bidirectional influences between maternal sensitivity and children’s prosocial behaviors over middle childhood.

Relations among forms of prosocial action

Various forms of prosocial action have been studied. In particular, helping, sharing, and comforting have been focused on. An apparent puzzle that has emerged in this area of research is the finding that forms of prosocial behavior such as helping, sharing, and comforting tend not to be correlated in early development and seem to have different developmental trajectories (Laible and Karahuta, 2014; Paulus, 2014, 2018). The first step is to consider why that finding might be unexpected. If these are all examples of prosocial behavior that are motivated by concern for others, then once an infant can engage in one form, it might be expected that she would also engage in other forms. However, we refer to this as “an apparent puzzle” because it arises based on certain presuppositions, and not from other perspectives.

One approach to explaining this finding is that different forms of prosocial behavior involve different social-cognitive constraints (Dunfield, 2014). This follows from the assumption that it is social-cognitive abilities that make these relations possible. This is the idea that “early prosocial behaviors rest on the ability to recognize that another is having a negative experience, the ability to determine what an appropriate response would entail, and finally, the motivation to intervene” (Dunfield, 2014, p. 3). That is, the infant has to represent the problem, represent the solution, and have the motivation to carry out the action. From this perspective, the process is conceptualized as involving recognition and response to some negative state in others. Dunfield (2014, p. 3) suggests that “prosocial behaviors can be thought to require three components: (1) the ability to take the perspective of another person and recognize that they are having a problem; (2) the ability to determine the cause of that problem; and (3) the motivation to help them overcome the problem.” A general motivation to counteract the negative state of the other would be assumed, but different social cognitive skills may be required to engage in different forms of prosocial behavior. The various forms of prosocial behavior emerge at slightly different ages. Helping develops first during the first half of the second year, sharing later in the second year, and finally comforting (Dunfield, 2014).

However, this presupposes that all of these early activities are prosocial. But earlier we have reviewed objections to this assumption (e.g., Carpendale et al., 2015; Dahl and Paulus, 2019). Furthermore, we questioned the assumption that it is cognition that makes early relations possible. Instead, from an action-based perspective, we argue that various forms of prosocial behavior may emerge in different ways.

The evidence of a lack of correlations among various forms of prosocial behavior in young children is a puzzle from a cognitivist/individualist perspective, but not, we suggest, from an action-based perspective. The cognitivist perspective begins from thinking and mind to get to relations, but from a relational perspective, this is backward and does not allow for an explanation of how thinking and mind emerge, instead they must just be given. By contrast, from a process-relational perspective, we begin from relations and cognition emerges from this. These forms of prosocial behavior all emerge within different activities. From this perspective, helping begins with children enjoying participating in the activities of adults (Bates et al., 1975; Rheingold, 1982; Reddy, 2003; Carpendale et al., 2015; Dahl and Paulus, 2019).

Most of the work on prosocial development from a process-relational perspective has focused on helping, but we now briefly extend this to consider sharing and comforting. Different developmental pathways likely underlie the different forms of prosocial behavior. Sharing may be linked to giving and may emerge within routines at least partially and initially initiated by parents (Carpendale et al., 2021a; Wallbridge, 2022). Some early examples of what looks like sharing might be explained in other ways. For example, a child at 21 months upon opening an Easter egg and seeing three chocolates immediately gave one to her mother, one to her father, and kept one for herself (Carpendale et al., 2021a). But what happened later that day with Easter eggs and chocolates suggest that this child still had much to learn about sharing. The fact that that this initial interaction resulted in equality might be due to seeing the matching of three objects and three people. Progress through the various forms of interaction leading to sharing may be driven by young children learning about the social and emotional consequences of their actions for themselves as well as the others whom they are interacting with. For example, preschoolers’ inclination to share resources with others can be facilitated by their anticipation of others’ potential negative emotions if they are not shared with (Paulus and Moore, 2015). Furthermore, preschool-aged children do understand that sharing with others does make one happy, and children who are more aware of their potential for feeling good after sharing tended to share more than other children (Paulus and Moore, 2016). Through such experiences, children develop an understanding of such social situations by coming to anticipate the positive and negative emotional consequences for all involved—self and others.

Comforting is yet another complex prosocial activity that may have had the least attention from an action-based perspective. It can be conceptualized from the cognition-first perspective based on theories about empathy such as Martin Hoffman’s theory (Johansson, 2008). By contrast, it can be approached from a relations-first perspective in which the focus is on the world that infants are immersed in and learn the typical patterns of interaction (Johansson, 2008). This social skill of comforting needs further investigation with naturalistic observations, but here are some examples. An infant at 10 months while nursing saw his mother massage his father’s sore back. He stopped nursing, sat up, and started rubbing his father’s back. His mother reported that this “was so sweet” (Carpendale et al., 2015). Thus, his action was likely responded to positively by her and was an enjoyable experience for the child. This could be considered similar to helping because he was participating in his mother’s activity, or it could be considered comforting, but it is very unlikely that the infant at 10 months understood his action as comforting. In an example with an older child at 2 years and 6 months, she saw her mother lying on the couch and not feeling well. The child’s response was, “do not worry mama, I’ll help you feel better. How about a toy?” And she found a toy and gave it to her mother (Carpendale et al., 2021a). This interaction involves giving and sharing and can also

be considered comforting. The difference between these two forms of interaction at 10 months and at 30 months shows the gap that must be filled in with a developmental explanation.

Comforting others in older children involves awareness of others' distress and concern for them, thus there is an emotional underpinning in this development. We should also consider the role of emotions in all forms of prosocial action, although they may be different emotions. In the context of sharing, we note the influence of anticipating the positive and negative consequences for self and others of sharing or not sharing. Regarding helping, interest may initially draw children into the activity, and concern for others may become more important later in development. In the context of developing skills in comforting others, an important emotional context is that infants are responsive to the distress of others. But it is not clear if this empathic reaction initially reflects an understanding of the emotional distress of others and a concern for others (e.g., Laible and Karahuta, 2014). Instead, this is something that must develop. This early empathic response is a form of coordination with others at a pre-reflective level of interactivity. In this early form of participating in social interactivity, we can see the emergence of perspectives at a pre-reflective level. This is an indication of the origin of perspectives in our relations with others and the world that we live in, and in taking this approach, we begin with interactivity as primarily social and relational rather than cognitive, mentalistic, and individual (Martin et al., 2008). This is the context in which infants learn about the self and others. Further development toward reflective interactivity is facilitated by language development and becoming able to talk about emotions in oneself and others and thus to become aware of and able to reflect on such emotions. Learning to talk about emotions is based on infants' experience in interaction with others in which emotions are expressed and talked about (e.g., Carpendale and Lewis, 2021). This skill in the use of language about emotions results in the further development of a concern for others.

The two observations provide examples at varying ages and levels of complexity and illustrate how they are based on social routines the child is learning about in their homes with their caregivers. It is also likely that caregivers appreciate such activities and that it results in an enjoyable interaction for both caregivers and children and that this would scaffold the development of such skills (Dahl et al., 2011). These activities emerge and develop within relations and so this involves learning routines with parents. But characteristics of children such as their sociability will also influence the interaction they elicit and in which they develop (Paulus, 2018). In further developments, these various prosocial activities may likely become increasingly correlated, for example, children may begin to see these activities as linked to being a good and nice person and thus linked to their sense of self as a good person (Paulus, 2018).

Here, we have far too briefly touched on a complex theoretical and empirical issue regarding the interrelations among forms of prosocial action, but we want to suggest ways in which this issue could be grappled with from an action-based, process-relational perspective, in which rather than beginning with cognition to explain relations, we begin with relations to explain the development of cognition. We argue that increasingly complex forms of prosocial behavior are not primarily explained by more complex social cognitive abilities, but rather that children acquire more experience in typical social routines and can anticipate outcomes of interaction so that it is their emerging skill within these relations that explains the development of social cognitive abilities.

Considering examples of research that might clash with a process-relational perspective

We would now like to further clarify our position by considering examples of research on prosocial development that might at first seem to be inconsistent with our approach. Because we have emphasized development within social contexts, we might overlook neurological development. For example, distinct patterns of neural activity are linked to different forms of prosocial action (Paulus et al., 2013). Although this finding might appear to be inconsistent with our approach, it is expected from our perspective because, consistent with neuroconstructivism, we assume that activity shapes neural pathways (Mareschal et al., 2007). Stiles and her colleagues further explicate the neuronal processes involved in the strengthening of synapses. Thus, particular forms of neural activity would be expected to be linked to particular social activities (Mareschal et al., 2007; Stiles, 2009; Stiles et al., 2015).

A line of research drawn on to support claims that prosociality is "rooted deeply in human nature" (Hepach, 2017, p. 50) makes use of measuring infants' pupil dilation in an attempt to measure their emotional processes. Hepach et al. (2012) measured 2-year-olds' pupil dilation and found no difference between the conditions in which a child helped the adult needing help or a third person provided the help rather than the child. They interpret this as supporting their social arousal hypothesis and the claim that children are intrinsically altruistic and just want to see the person helped but do not need to perform the action themselves. This might seem to be inconsistent with our view that early forms of infants' helping might be due to their interest in being involved in the activities of adults. A problem with this methodology, however, is that pupil dilation is not specific, and it might be the result of various cognitive and emotional processes. It might indicate "increased attention, emotional arousal, cognitive effort such as memory processes, target detection and/or surprise" (Pletti et al., 2017, p. 2). Although Hepach et al. (2012) assert that their results are consistent with their hypothesis, they have not ruled out other possible hypotheses. The third condition in their experiment in which they did find increased pupil dilation was when the child was prevented from helping the adult. Increased arousal in this condition is consistent with the other hypotheses that the child was interested in engaging in interaction, wished to fulfill the adult's goal, or wanted to complete the task, or it could be due to greater memory load in that condition (Pletti et al., 2017).

Hepach (2017) claims that prosociality is "rooted deeply in human nature" (p. 50). Whether we agree with this claim depends crucially on what is meant. If he means that prosocial action is a form of activity that tends to reliably emerge within human developmental systems, then this would likely receive the broad agreement. But it is still necessary to explain how it develops, and in doing so, we take a developmental systems perspective. However, we suspect that Hepach is making a stronger claim and is suggesting that this is somehow "biological." But this assumes a split between biological and social processes, and it is not clear what biological processes can get him from the zygote to intrinsic altruism, and he does not cite any biological sources. If we read the work of geneticists and neuroscientists, it seems that they are not happy with the strong claims made by psychologists. Instead, we have to describe the developmental processes involved (e.g., Fisher, 2006; Gottlieb, 2007; Stiles, 2009; Meaney, 2010).

There are also other claims that we suggest are based on problematic methodologies. For example, Köster et al. (2016) interpret their results as indicating that 9- to 18-month-old infants understand others' needs in a

helping situation. We are cautious about this interpretation, given the method, it is based on. Paulus (2022) argued that the VoE method is based on questionable assumptions and is too speculative to be relied on (see also Tafreshi et al., 2014). From our action-based perspective, infants are gradually learning about others' needs and goals in increasingly complex situations through learning to anticipate outcomes of actions. Thus, their understanding of goals at this point is at the sensorimotor level, and we resist assuming a mentalistic perspective. It does not seem likely that understanding the situation in this study is already mastered at 9 months. Understanding others' needs will certainly become an important factor in explaining later prosocial actions such as helping and comforting. But as developmentalists, is it our job to explain the development of such skills rather than presuppose them. This is our goal in taking a process-relational, action-based, developmental systems approach.

To be clear, we suggest that toddlers' beginning engagement in activities that we refer to as helping may be due to their interest in participating in the activities of adults, a point made by Rheingold (1982). However, through continued experience in such activities, children will learn about the social contexts and the positive and negative emotional consequences of such activities for the self and others, and thus their reasons for engaging in such actions will change over development. Furthermore, in the context of other activities, considered prosocial, such as sharing and comforting, other factors, such as empathic concern regarding others' distress, may be important in initially drawing infants into these patterns of interaction that may differ from those that draw them into helping.

Methodology following from a process-relational perspective

We have argued that the presuppositions our theories are based on influence how we frame questions and draw conclusions. They also influence the form of the methodology used in research. If it is correct that children learn to act to benefit others within their relations with others, then it follows that a way to study this development is to observe it as it is in the process of emergence within the interaction. This is a methodology that follows from the perspective we take, and it requires detailed longitudinal naturalistic observations. Psychology, however, has been critiqued as being observation-and description-deprived (ODD; Rai and Alan Fiske, 2010; see also Dahl, 2017). From our perspective, naturalistic observations are essential in studying development, and a detailed longitudinal description of the emergence of a skill is a developmental explanation for the development of such skills (Hendriks-Jansen, 1996).

There are several ways in which to obtain such detailed longitudinal observations. Ideally, the researcher could always be present to make such observations, but this is rarely the case unless the researcher is also the caregiver. Alternatives are recording observations either with video at regular, and hopefully closely spaced, visits or with parental diary observations used to fill in gaps in development. Diary studies can be conducted as case studies or multiple case studies (Carpendale and Carpendale, 2010; Kettner and Carpendale, 2018). It is also possible to combine both designs to obtain parental observations during the time between home visits because otherwise crucial transitional phenomena might be missed (Wallbridge, 2022). Infant development is variable; either significant changes can occur over a short time or there can be little change. Good observations require recording enough detail and this means that talented and interested observers are needed.

Researchers can provide some training, but parents do need to be interested and willing to devote the time required.

Based on expectation that social skills emerge within interaction, we suggest close observation with dyads or families and multiple case studies following dyads or families; the emphasis would be on more, and more detailed, observations rather than more participants. It is also important to be cautious about averaging across many participants in case important differences in developmental pathways are obscured. Differences in developmental pathways can be due to infants' differences as well as parental and cultural differences.

Conclusion

We have argued that the presuppositions researchers begin with already structure the possible answers to their questions, as well as the methods they draw on so that the philosophical assumptions they take for granted follow them through the design of their empirical work to their theoretical conclusions. Thus, we have suggested that it behooves us to examine these crucial assumptions. We have critiqued the cognitivist perspective, according to which it is necessary to begin from cognition to explain human relations. We have suggested an alternative worldview according to which it is relations that are primary, and these relations account for the development of human forms of thinking, rather than the other way around. Furthermore, these relations are ethical in their nature (Jopling, 1993). We have applied this framework—sometimes referred to as a process-relational worldview—to account for the development of prosocial action. An ethical dimension is already there in responsiveness because we treat others as someone, not something (Spaemann, 2006), and this is Buber (1958) distinction between “I-thou” versus “I-it.” We suggest that this is a fruitful perspective from which to view the emergence of prosocial and moral development. In this article, we have focused on early prosocial development and have discussed possible pathways in the development of various forms of prosocial action such as helping, sharing, and comforting. Accounting for further moral development and the emergence of views about what is right and wrong involves additional development, which we suggest involves arriving at an interpersonal agreement through coordinating conflicting perspectives (see Carpendale et al., 2013, 2021a). In addition, we have briefly sketched the methodology that follows from this metatheoretical perspective.

Author contributions

JC wrote the first draft. BW contributed sections to the manuscript. Both authors contributed to the article and approved the submitted version.

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

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EDITED BY

Alessandra Geraci,
Dante Alighieri University for Foreigners,
Italy

REVIEWED BY

Kelsey Lucca,
Arizona State University,
United States
Laura Franchin,
University of Trento,
Italy

*CORRESPONDENCE

Tara A. Karasewich
✉ 13tk29@queensu.ca

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Examining the influence of shyness on children's helping and comforting behaviour

Tara A. Karasewich^{1*}, Cameron Hines², Sylvia G. V. Pinheiro¹,
Nina Buchenrieder¹, Kristen A. Dunfield² and
Valerie A. Kuhlmeier¹

¹Department of Psychology, Queen's University, Kingston, ON, Canada, ²Department of Psychology, Concordia University, Montreal, QC, Canada

Introduction: Shy children, who tend to feel anxious around others and withdraw from social interactions, are found to be less prosocial than their not-shy peers in some studies, though not in others. To examine the contexts in which shy children may be more or less likely to engage in prosocial behaviour, we compared children's willingness and ability to intervene during in-person tasks that differed in *social engagement demands* and *complexity*, factors that have been conflated in past research.

Methods: We presented 42, 3.5- to 4.5-year-old children with prosocial problems that varied, in a 2 x 2 within-subjects design, by the type of intervention required (i.e., simple helping or complex comforting) and the source of the problem (i.e., social: within the experimenter's personal space; or object: a target object distanced from her).

Results: Most of the children acted prosocially, with little prompting, in the two helping tasks and in the object-centered comforting task. In contrast, fewer than half of the children acted prosocially in the social-centered comforting task. Shyer children were not less likely to intervene in any of the four tasks, but they were slower to intervene in the object-centred comforting task, in which the experimenter was upset about a broken toy.

Discussion: Thus, providing social-centered comfort to a recently-introduced adult is challenging for young children, regardless of shyness, though shy children do show hesitancy with object-centered comforting. Further, these findings provide insights into the methodological challenges of disentangling children's prosocial motivation and understanding, and we propose solutions to these challenges for future research.

KEYWORDS

shyness, helping, comforting, social cognition, moral development, prosocial behaviour, methodology, individual differences

Introduction

The early emergence of *prosocial behaviour* (i.e., acting with the intent to benefit someone in need) has been well-established by developmental research (e.g., Radke-Yarrow et al., 1976; Eisenberg and Mussen, 1989; Warneken and Tomasello, 2006; Dunfield et al., 2011; Geraci and Franchin, 2021; Tavassoli et al., 2022). Children as young as 12 months have been observed to *help* others meet instrumental goals, and older preschoolers have been found to *share* material resources, *comfort* those in emotional distress, and *cooperate* with others to meet joint goals

(Liszkowski, 2005; Warneken and Tomasello, 2007; Svetlova et al., 2010; Dunfield and Kuhlmeier, 2013). Yet, less is known about possible individual differences in children's prosocial interventions (e.g., Pettygrove et al., 2013; Imuta et al., 2016; Chernyak et al., 2018). For example, *shy* children, who tend to feel anxious around others and withdraw from social interactions (Coplan and Armer, 2007), may be less prosocial than their not-shy peers, under certain conditions. As examples, shyer children have been found to intervene less often on behalf of an experimenter than their own mothers, to intervene less in socially engaged ways, and to require more prompting in order to intervene (e.g., Young et al., 1999; Beier et al., 2017; Karasewich et al., 2019; MacGowan and Schmidt, 2021). It is important to note, however, that shyness effects on young children's prosocial behaviour have not been found in all studies (e.g., Schuhmacher et al., 2017; Grossmann et al., 2020).

In the current study, we examine the prosocial behaviour of shy children from two angles: the *motivation* to intervene on behalf of a person in need and the *understanding* of how to do so (Dunfield, 2014; Paulus, 2014; Martin and Olson, 2015; Eisenberg et al., 2016). Many related definitions of shyness have been used in the research literature (e.g., Buss, 1986; Henderson and Zimbardo, 2010; Hassan et al., 2021); in this study we consider shyness to be a tendency to feel anxious around others and withdraw from social interactions (Coplan and Armer, 2007). It is likely that shy children will be less willing to intervene whenever they are feeling anxious, and they may also struggle to process prosocial situations in order to effectively intervene (e.g., Young et al., 1999; MacGowan and Schmidt, 2021). Thus, we tested how preschool children ranging in shyness would respond to four prosocial tasks that varied in *social engagement demands* and *complexity*, which are two factors that have been conflated in past research (e.g., Beier et al., 2017; Karasewich et al., 2019). To foreshadow, the results of the present study subverted our expectations in interesting ways, which in turn allowed for a consideration of the methods currently used to study shyness and the early development of prosociality.

Social engagement demands

Previous research suggests that positive emotions such as interest in others can support the production and development of prosocial behaviour (Hammond and Drummond, 2019). Yet, prosocial situations can vary greatly in the amount of social engagement they encourage from, or even require of, children who want to intervene. Many of the prosocial problems featured in laboratory studies could be considered *low* in social engagement demands because they allow children to intervene without drawing a lot of attention to themselves. For example, a child could help a person struggling to get an object that is out of their reach by just handing the object to them, without speaking to or coming into contact with anyone (e.g., Warneken and Tomasello, 2006; Dunfield and Kuhlmeier, 2013; Pettygrove et al., 2013). We would expect *shy* children to feel more motivated to act prosocially whenever social engagement demands are low as compared to when these demands are high (but see: MacGowan and Schmidt, 2021). This prediction is supported by Beier et al. (2017), in which shyer children readily helped an experimenter in a typical out-of-reach object task (i.e., picking up a pen that had

fallen from her desk), but needed more prompting to help her in a highly social one (i.e., getting someone else's attention). Similarly, Karasewich et al. (2019) found shy children to be less likely to help in an out-of-reach object task that was modified to be very socially demanding (i.e., asking an unfamiliar adult to get the experimenter's toy from a high shelf).

In the present study, we categorized the social engagement demands of our tasks by whether or not they encouraged children to *approach* the experimenter while intervening. Thus, our highly demanding "social-centred" tasks consisted of problems within the experimenter's personal space, while our less demanding "object-centred" tasks involved at least one object that was more distant from her. We also examined *how* children intervened, when they chose to do so. In particular, we expected shyer children to focus on objects while intervening (i.e., to be "object-oriented") instead of focusing on the experimenter herself (i.e., "social-oriented").

Complexity of prosocial problems

Prosocial tasks can also vary in their complexity. For a child to intervene effectively, they must first understand what problem the person in need is having and then come up with a solution that they could, realistically, enact (Dunfield, 2014). *Helping* others to meet their instrumental goals tends to be a simple task for young children. Most helping problems have one clear solution, with any variability in response constrained by the goal needing to be met. Take, for example, a teacher who needs a book from the far side of their desk: a child could help by *either* handing it over or pushing it closer, but both actions enact the same "retrieve book" solution. In contrast, there are many potential ways that a child could *comfort* someone experiencing emotional distress (e.g., reassuring them it will be okay, giving them a hug, fixing something broken, etc.), so there is no uniquely "correct" or "obvious" response to that type of problem. Children must also be able to recognize when another person is upset before they can provide comfort, and this ability emerges later in development than the goal-understanding required for helping (Hoffman, 1982; Sommerville and Woodward, 2005; Rosenqvist et al., 2014; see also Paulus et al., 2013). It is unsurprising, then, that preschool children have been found to more readily help others than comfort them in lab settings (e.g., Radke-Yarrow et al., 1976; Svetlova et al., 2010; Dunfield and Kuhlmeier, 2013). Complex prosocial problems may be especially difficult for shy children, who have been found to differ in how they process social situations, more broadly, and in what they understand of others' mental states (e.g., LoBue and Pérez-Edgar, 2014; Gal-Szabo et al., 2017). We explored this possibility in our study by comparing children's responses in helping and comforting tasks.

Yet, the distinction we have just made between helping and comforting is actually oversimplified. Not all helping problems have a solution that would be obvious to young children. In Karasewich et al.' (2019) study, for example, there was no way that a child could help the experimenter on their own. Because the experimenter's toy was on a high shelf, children could only help her *indirectly*, by first determining who could reach the shelf and then asking that person to intervene. Recognizing *why* someone needs help can also be fairly complex. To understand why the experimenter in Beier et al.' (2017) social helping task was failing to get someone's attention, children had to recognize that she could not raise her voice (she was speaking in a raspy whisper)

and that the other person was not looking at her. Both of these helping tasks could be considered more complex than the ones that have been directly compared to comforting tasks in past research (e.g., Dunfield et al., 2011; Chernyak et al., 2018). They are also, as highlighted above, both higher in social engagement demands, which makes interpreting their findings more difficult. We cannot know whether the shyness effects found in these studies were the result of shy children being reluctant to intervene in highly social ways, having trouble figuring out what to do, or some combination of both. Here, we designed our prosocial tasks to vary *systematically* in social engagement demands and complexity. Thus, our social-centred helping problem was made to be just as simple as our object-centred one, while our comforting problems were meant to be more obscure.

The present study

To summarize, in this study we examined 3.5- to 4.5-year-old children's willingness and ability to respond prosocially in four within-subjects tasks that varied in social engagement demands (i.e., "object-centred" vs. "social-centred" problems) and complexity (i.e., simple helping vs. more complex comforting problems). We predicted that shyer children would intervene more frequently and spontaneously in the object-centred tasks than the social-centred tasks. Further, we predicted that all children would find it easier to help the experimenter than to comfort her, but that this would be especially true of shyer children. Finally, we expected shyer children who did intervene to use fewer "social-oriented" strategies and more "object-oriented" ones. Thus, our systematic approach to varying the social demands and complexity of our prosocial tasks allowed us to examine individual differences in children's motivation to intervene and understanding of how to do so. As noted above, this approach yielded unexpected results that provided the opportunity for nuanced consideration of the methods by which developmental researchers study the relationship between shyness and prosocial behaviour.

Methods

Participants

Testing occurred in the Social Cognition laboratory at Queen's University. Participants were 42 preschool children (19 male; 23 female), with an average age of 47.7 months (range: 42–54 months). This age range was chosen in order to examine children during a point in development in which they typically begin to provide direct comfort more regularly (e.g., Svetlova et al., 2010; Dunfield et al., 2011). Nine additional children were tested but excluded from the final analysis due to experimenter error (4), equipment failure (1), and participant factors (4); for further detail, see [Supplementary Table S1](#) on our [Open Science Framework](#) page. Sample size was assessed through a post-hoc power analysis, using G*Power 3.1.9.2 (Faul et al., 2007). With an α of 0.05 and an effect size of 0.36, which was found in a prior study assessing the relation between shyness and comforting in preschool children (Young et al., 1999), power was calculated to be 0.79 for our sample size. We found similar results by plotting a sensitivity power curve (see [Supplementary Figure S1](#)). Families were recruited from Kingston, a

small city in Canada that has a predominantly White and middle-class population, and participants were representative of the region. Data was collected prior to the COVID-19 pandemic. All children were given a small gift at the end of the study to thank them for participating. This study was conducted with approval from Queen's General Research Ethics Board.

Procedure

Attachment Q-Sort and the shyness subscale

While children participated in the experimental paradigm, their mothers completed the Attachment Q-Sort in a separate room (computerized version 2.1.2: Waters, 1995; Soria, 2015), which we then used to create a shyness subscale. A research assistant explained the Q-Sort instructions and provided help when requested, but the task was otherwise completed independently. On a computer, mothers were shown 90 cards with statements describing a young child's behaviour (e.g., "Child is lighthearted and playful most of the time"; "Child easily becomes angry with toys") and were asked to create nine piles of 10 cards each, from *most uncharacteristic* of their child (pile 1) to *most characteristic* (pile 9; see [Supplementary Figure S2](#)). At the end of the sort, mothers were asked to review and confirm their choices.

Although the Q-Sort is a measure of attachment security (which we do calculate in the online supplement), we primarily used it to create an *ad-hoc* "shyness" subscale. Following the procedure described by Waters (n.d.), three of the study authors first identified and reached consensus on 14 items from the original 90-item scale that describe the child behaving withdrawn around other people (e.g., "Child runs to mother with a shy smile when new people visit the home") or the opposite (e.g., "Child laughs and smiles easily with a lot of different people"), the latter of which were reverse-coded. We then examined the relation between each pair of items within our sample and removed 5 items that had a low number of significant inter-item correlations. The internal consistency of the subscale was improved by removing each of these items, until we were left with a 9-item subscale that had high internal consistency (Cronbach's $\alpha = 0.810$). A shyness score for each child was calculated by summing the mother's sort-value (i.e., 1–9) for each subscale item, with higher scores indicating that the child displays shy behaviours more often than not. [Supplementary Table S2](#) lists the 9 items that were used in the final subscale and the 5 items that were removed. Although we did not look at Waters' (1987) original rationale for each Q-sort item when creating the shyness subscale, it is interesting to note that he considered 11 of the 14 items we tested (6 of which were included in the final subscale) to be items that either mask the purpose of the Attachment Q-Sort from raters or discriminate between attachment security and temperament.

Prosocial tasks

In the testing room, children completed four prosocial tasks that varied in a 2 (type: help, comfort) x 2 (source of the problem: object, social) design. Helping tasks were characterized by instrumental need: the experimenter had a goal that she could not complete on her own. Comforting tasks were characterized by emotional distress: she was upset after an unfortunate event. In social-centred tasks, the source of the experimenter's problem was

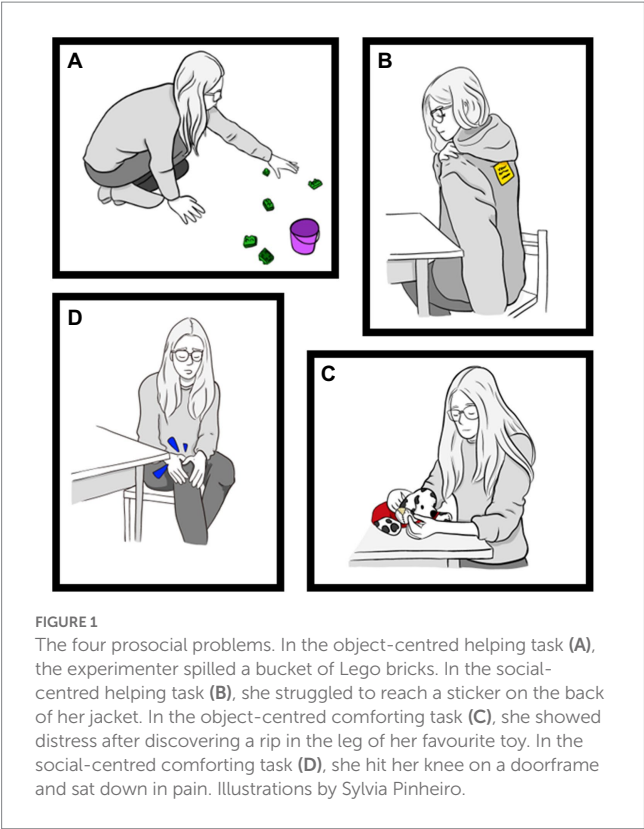


TABLE 1 Coding level of engagement in the prosocial tasks.

	Response type	Lego	Sticker	Broken toy	Hurt knee
Non-prosocial responses	No response	0	0	0	0
	Empty response	1	1	1	1
	Concerned response	2	2	2	2
Prosocial responses	Verbal help/comfort	3	3	3	3
	Physical help: Pick up bricks	3	--	--	--
	Physical comfort: Fix toy	--	--	3	--
	Physical help/comfort: Approach experimenter	--	4	4	4

within her personal space, so the child would have to focus on (and potentially come in contact with) her to respond effectively. In object-centred tasks, her problem involved a target object (s) that was outside of her personal space, allowing the child to respond while focusing solely on the object (s). The order of the prosocial tasks (see [Supplementary Tables S3, S4](#)) was counterbalanced, with approximately half of the sample receiving a helping task first ($n = 22$) and half receiving a comforting task first ($n = 20$). Two

individuals acted as the experimenter for approximately half of the sample each (i.e., 23 vs. 19 participants).

[Figure 1](#) depicts the experimenter’s problem in each of the four prosocial tasks. In the object-centred helping task, she “accidentally” spilled a bucket of Lego bricks onto the floor. In the social-centred helping task, she “realized” there was a sticker on the back of her jacket that she could not reach. In the object-centred comforting task, she became upset after she “noticed” a rip in the leg of her favourite toy dog. Finally, in the social-centred comforting task, she “hurt” herself by banging her knee on the doorframe of an adjoining room. Within each task, the experimenter gave up to three cues to prompt the child to respond, spaced approximately 5 s apart for a total of 15 s. She always began by stating her problem (cue 1), then provided detail to clarify her problem (cue 2), and finally asked the child directly if they could intervene (cue 3). Each task ended if the child performed a prosocial act at the highest level of engagement (i.e., picking up the target objects in the helping tasks and approaching the experimenter to provide physical comfort in the comforting tasks). In all four tasks, the experimenter thanked the child after they intervened. When a child started to help in the object-centred helping task, she moved away to let them pick up the rest of the bricks alone, under the pretense that she had to put away another toy. We describe the full task procedures in [Supplementary Table S5](#).

Delay games

The experimenter and child played four “delay” games in between the prosocial tasks, to give them a more naturalistic appearance. The first game, which acted as a warm-up period for the child, involved completing a puzzle. On average, children spent 6.15 min completing the puzzle with the experimenter (range: 3.08–10.90 min). In the second game they built a tower together out of the same Lego bricks that would then be used in the object-centred helping task. The third game was “Memory,” in which the child and experimenter took turns picking animal cards laid upside-down on the table to find matching pairs. The final game was two or three rounds of “tic-tac-toe,” in which they took turns putting their symbol on a 3×3 grid to make a line of 3 in a row.

Coding and interrater analyses

Coding for this study was completed at two separate time-points: before and after we [pre-registered](#) the analysis plan on OSF. Video recordings of the test sessions were transcribed and all behaviours were coded by two independent raters who overlapped on over 25% of the sample, which was used to calculate interrater reliability/agreement. Disagreements in ratings were resolved by the principal investigator. We describe additional coding used for exploratory analyses in the online supplement.

Responses to the prosocial tasks were categorized on ordinal scales of increasing engagement with the experimenter. The levels of each scale are summarized in [Table 1](#), below. There were three categories of non-prosocial responses in all four tasks. First, at the lowest level of engagement, a child could not respond at all (e.g., watching the experimenter without doing or saying anything). The next level of engagement, an “empty response,” indicated that the child spoke during the task but did not address the experimenter’s problem (e.g., “I see puppets!”, “What is this [marking] on the table?”). Finally, a “concerned response” indicated that the child spoke to the experimenter about her problem but did not offer a solution (e.g., “I

know those kinds of things, they hurt really bad”; “Are you upset?”). A concerned response (a form of *hypothesis testing*; Zahn-Waxler et al., 1992) can be considered one step away from prosocial behaviour – the child recognizes that something has happened to the person in need, but may not understand *what* their problem is or how to intervene (e.g., Knafo et al., 2008; Liew et al., 2011; MacGowan and Schmidt, 2021).

“Prosocial responses” varied by task but always required that the child try to solve the experimenter’s problem. In all four tasks, the lowest level of prosocial response was to provide verbal help or comfort (e.g., “It will feel better in a few days”; “You can tape it”). The highest level of prosocial response for three of the tasks was to approach the experimenter to physically solve her problem: in the social-centred helping task, children could take the sticker off of the experimenter’s jacket, in the object- and social-centred comforting tasks they could give her a hug or other form of physical affection, and in the social-centred comforting task they could also kiss or rub her knee to make it feel better. The object-centred helping task did not have an equivalent level of engagement; physically helping the experimenter by picking up (at least some) of the spilled Lego bricks did not involve approaching her, so it was categorized at the same level of engagement as verbal helping. Similarly, trying to fix the broken toy in the object-centred comforting task by pushing the stuffing back inside was categorized as the same level as verbal comfort.

Interrater reliability (i.e., intraclass correlation) was strong for categorizing level of engagement in all four tasks (object-centred helping: 0.848; social-centred helping: 1.000, object-centred comforting: 0.935, social-centred comforting: 0.956). Because each verbal response could be categorized in one of three ways (i.e., empty, concern, or comfort; children who made no response at all were categorized as “empty” for the interrater analyses), we also examined the raters’ codes for verbal responses separately. In both comforting tasks (very few children responded verbally to either helping task), interrater agreement for distinguishing between the three types of verbal response was moderate (object-centred comforting: $K = 0.660$, $p < 0.001$, 78.6% agreement; social-centred comforting: $K = 0.490$, $p < 0.001$, 84.4% agreement). Given the fairly high percent agreement between the raters here, these lower Kappa values likely reflect unbalanced marginal totals (Feinstein and Cicchetti, 1990), particularly in the social-centred comforting task, where both raters used the “empty” code far more often than the other two.

The raters also identified *when* the child gave their highest level of response to each of the prosocial tasks (i.e., at the first, second, or third cue). This code was used to create a measure of spontaneity for prosocial acts: helping and comforting responses that occurred at the first cue were considered “most spontaneous,” responses at the second cue were “moderately spontaneous,” and responses at the third cue were “least spontaneous.” Interrater reliability (i.e., intraclass correlation) for identifying when the highest response occurred was strong in all four tasks (object-centred helping: 0.960, social-centred helping: 0.838, object-centred comforting: 0.902, social-centred comforting: 0.751).

Initial review of the data revealed little variance in children’s helping behaviour: most children physically helped the experimenter in both tasks. In contrast, children’s comforting behaviour was far more varied, so we examined it more closely. Specifically, raters categorized children’s verbal responses during the comforting tasks as either object-oriented in content (i.e., the comment was focused on an

object relevant to the situation, like the toy or a band-aid), social-oriented (i.e., the comment was focused on the experimenter’s feelings), or irrelevant to the situation (i.e., empty). Interrater agreement for identifying the orientation of verbal responses was moderate in both tasks (object-centred comforting: $K = 0.653$, $p < 0.001$, 81.0% agreement; social-centred comforting: $K = 0.394$, $p < 0.001$, 81.3% agreement). Once again, these lower Kappa values seem to be caused by unbalanced marginal totals.

We combined the verbal and physical comforting codes in order to identify comforting *strategies* the children used: either object-oriented (e.g., saying “I can get a band-aid” or fixing the broken toy) or social-oriented (e.g., saying “It’s okay” or kissing the experimenter’s knee). Children often made more than one comforting response to a single task, but because we were interested in whether shyness interferes with using social-oriented strategies specifically, we prioritized those responses. That is, *any* social-oriented response earned the social-oriented strategy label, while the object-oriented strategy label was given to children who made *only* object-oriented responses (see the supplemental spreadsheet “Coding Summary for the Comforting Tasks” on our [OSF page](#) for further detail).

Results

We [pre-registered](#) the analysis plan for this study on OSF. Changes made to the analysis plan since the pre-registration are outlined in a document on the [project’s main page](#), where we have also made the data and statistical analysis available.

Prosocial behaviour

[Supplementary Table S4](#) shows how many participants, divided by gender, were given each testing order (A or B) and paired with each experimenter (1 or 2). There were no significant gender or order effects in how children responded to the prosocial tasks. Children’s responses in the two helping tasks and the object-centred comforting task were not affected by the experimenter with whom they were paired, but an experimenter effect was found in the social-centred comforting task. That is, children who were paired with Experimenter 1 ($n = 23$; $Mdn = 3$) responded to her injury with a higher level of engagement, on a scale including both prosocial and non-prosocial responses, than those who were paired with Experimenter 2 ($n = 19$; $Mdn = 1$): Mann–Whitney $U = 114.50$, $p = 0.007$.

Comparing performance on the prosocial tasks

We observed a relatively high frequency of prosocial behaviour in our sample, with all children intervening in at least one of the four tasks. [Figure 2](#) below and [Supplementary Table S6](#) summarize children’s prosocial and non-prosocial responses in each task, arranged by level of engagement. Consistent with past research (e.g., Kienbaum et al., 2001; Dunfield and Kuhlmeier, 2013), one task yielded fewer prosocial acts than the others: only 40.5% of the sample intervened in the social-centred comforting task, compared to 88.1% in the object-centred comforting task, 95.2% in the social-centred helping task, and 100% in the object-centred helping task. Thus, there was little variation in children’s rate of intervention in the two helping tasks. We used Fisher’s exact test to compare children’s interventions

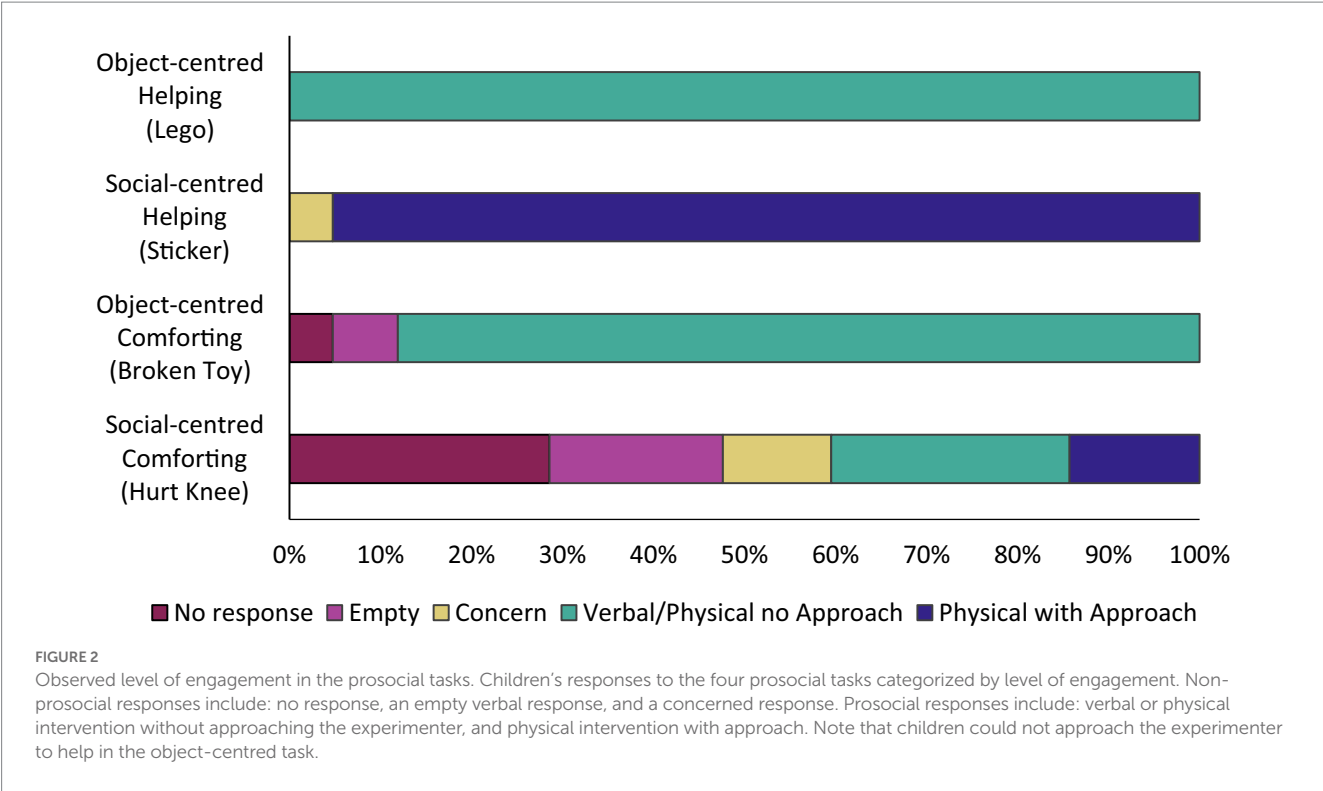


TABLE 2 Spontaneity of Prosocial Responses.

	Spontaneity			Total (of 42 participants)
	Least spontaneous (3 rd cue)	Moderately spontaneous (2 nd cue)	Most spontaneous (1 st cue)	
Object-centred Helping	1	15	26	<i>n</i> = 42
Social-centred Helping	5	14	21	<i>n</i> = 40
Object-centred Comforting	9	7	21	<i>n</i> = 37
Social-centred Comforting	9	2	6	<i>n</i> = 17

The counts in this table represent the number of children in each task that intervened at the specified cue.

in the object-centred and social-centred comforting tasks, but found no significant association between them ($p=0.632$).

We further categorized children's comforting by the type of strategy they used in each task. For the object-centred comforting task, where the experimenter was upset about her broken toy, a binomial test found that the number of children who used an object-oriented strategy (e.g., pushing the stuffing back inside; $n=26$) compared to a social-oriented one (e.g., saying "It's okay"; $n=11$) was greater than what would be expected by chance ($p=0.020$). In contrast, when the experimenter hurt her knee in the social-centred task, the number of children who used an object-oriented strategy (e.g., suggesting they get a band-aid; $n=8$) compared to a social-oriented one (e.g., giving her knee a kiss; $n=9$) did not differ ($p=1.000$).

As detailed in Table 2, children were quite spontaneous when intervening in three of the four tasks: in the object-and social-centred helping tasks, and the object-centred comforting task, more than half of the children who intervened did so at the first cue (i.e., when the experimenter merely stated her problem). Children were less

spontaneous in the social-centred comforting task: among the children who intervened when the experimenter hurt her knee, only 35.3% did so at the first cue, while 52.9% did not comfort until the third cue (i.e., when she asked the child directly if they could intervene). We used the Friedman test to examine the spontaneity of children's prosocial behaviour, which varied significantly across the four tasks: $\chi^2(3) = 13.48$, $p=0.004$ ($n=16$). Post-hoc Wilcoxon signed-rank tests using a Bonferroni corrected α of 0.008 revealed a significant difference between children's spontaneity in the object-centred helping and social-centred comforting tasks ($z=-2.74$, $p=0.006$) and a marginally significant difference between the social-centred helping and social-centred comforting tasks ($z=-2.60$, $p=0.009$).

Parent-reported shyness

Because we calculated a shyness score for each child by summing their mother's ratings for the 9 items in the Q-Sort shyness subscale,

the scores could range from 9 (i.e., a rating of “1” on all items) to 81 (i.e., a rating of “9” on all items). In our sample, shyness scores were less extreme, but still varied: the lowest score was 20 and the highest was 63 ($M=37.74$; $SD=11.77$). These scores were approximately normally distributed and did not vary significantly by the gender of the child, the order of the tasks, or the experimenter paired with the child.

Shyness and prosociality

We tested the relation between children's shyness and the *spontaneity* of their interventions in all four of the prosocial tasks. When examining *whether* children intervened and *how* they did so, however, we found little variation in either helping task (i.e., most children physically helped the experimenter), so we have focused on the comforting tasks alone for those analyses.

Helping: Object-centred and social-centred

Children's scores on the Q-Sort shyness subscale did not significantly relate to how spontaneously they helped the experimenter in either the object-centred helping task ($n=42$; Kendall's $\tau_b = -0.11$, $p=0.403$) or the social-centred helping task ($n=40$; Kendall's $\tau_b = -0.09$, $p=0.490$).

Comforting: Object-centred

In the object-centred comforting task, we used a binomial logistic regression to examine whether scores on the Q-Sort shyness subscale would predict which children comforted. This analysis was not significant: $\chi^2(1)=1.52$, $p=0.217$, $OR=0.01$. We also used logistic regression to examine whether shyness would predict which of the children who comforted ($n=37$) used a social-oriented strategy, as opposed to an object-oriented one, and found no relation: $\chi^2(1)=1.91$, $p=0.167$, $OR=55.42$. We did, however, find a significant relation between shyness and spontaneity of comforting: Kendall's $\tau_b = -0.29$, $p=0.027$. That is, among the 37 children who comforted the experimenter when she was upset about her broken toy, higher scores on the shyness subscale were moderately associated with less spontaneous comforting (i.e., the child acted only after multiple cues were given).

Comforting: Social-centred

In the social-centred comforting task, shyness scores did not significantly predict which children comforted the experimenter: $\chi^2(1)=0.25$, $p=0.620$, $OR=0.68$. Shyness also did not predict which of the children who comforted ($n=17$) used a social-oriented strategy, as opposed to an object-oriented one: $\chi^2(1)=0.90$, $p=0.342$, $OR=8.85$. Finally, there was no significant relation between shyness and the spontaneity of children's social-centred comforting ($n=17$): Kendall's $\tau_b = -0.21$, $p=0.308$.

Discussion

The main goal of our study was to examine whether shy children differ in their motivation to act on behalf of a person in need and/or their understanding of how to do so. Specifically, we examined two factors that may prevent shy children from intervening: social

engagement demands and the complexity of the problem to be solved. Because these factors have been conflated in past research (e.g., Beier et al., 2017; Karasewich et al., 2019), we set up our tasks to vary in the source of the experimenter's problem (i.e., object-vs. social-centred) and the type of intervention required (i.e., helping vs. comforting). Our study provides valuable insights into approaches future research could take to examine individual differences in the prosocial motivation and understanding of young children, both shy and not-shy alike. In particular, our findings present new methodological challenges for researchers interested in separating the effects of social demands and complexity on children's interventions.

Of the four prosocial tasks that we gave to the 3.5- to 4.5-year-old children in our sample, the social-centred comforting task stood out for its apparent difficulty. Only half as many children intervened when the experimenter was distressed after hitting her knee than in any of the other three tasks. Interventions in the social-centred comforting task were also less spontaneous: around half of the children who comforted did so only at the third cue, while most children required only one cue to act in the other tasks. Even the 16 children who intervened all four times acted less spontaneously in the social-centred comforting task compared to the two helping tasks. These findings are consistent with past research that has found that preschool children help more often than they comfort and are more likely to comfort someone upset over a damaged object than an injury (e.g., Kienbaum et al., 2001; Dunfield et al., 2011; Dunfield and Kuhlmeier, 2013). What is surprising, however, is that responding to the injured experimenter, a complex and highly socially demanding task, was not more difficult for shy children. The only shyness effect that we found was in the *object-centred* comforting task, where children who scored more highly on the Q-Sort shyness subscale provided comfort less spontaneously. Shyer children were just as likely as less-shy children to be spontaneous when intervening in the object-centred helping, social-centred helping, and social-centred comforting tasks, and shyness had no bearing on whether children comforted or which strategy they used in both comforting tasks.

One explanation for this pattern of results is that we did not have a good representation of shy children in our data. That is, it would be more accurate to consider the subscale we created from the Attachment Q-Sort a measure of *social withdrawal*, because most of its items refer to behaviours associated with shyness rather than feelings (see [Supplementary Table S2](#)). It is common for prosocial behaviour researchers to use social withdrawal as a proxy measure for shyness (e.g., Allen et al., 2018; Karasewich et al., 2019). The problem with this method is that shy children are not the only ones who withdraw from social situations. Young children can, for example, be disinterested in other people (i.e., *unsociable*) without also feeling anxious around them (Coplan and Armer, 2007; Rubin et al., 2009). Many of the behaviours described in our shyness subscale could just as likely be displayed by unsociable children, including: avoiding visitors, refusing to talk to strangers, and being slow to smile. It should be noted, however, that three of the five items removed from the subscale for having low inter-item correlation within our sample are very clear measures of unsociability (Waters, 1987): they describe a child who is less interested in people than their own toys, activities, and other

things. This suggests that mothers interpreted the nine items that were included in the final subscale as distinct from pure social disinterest.

If we do take the shyness subscale at face value, it is interesting to note that no child scored within the top 20%. This restricted range was not due to shy children being excluded from the analyses; we only excluded one child for not assenting to participate (Supplementary Table S1). Instead, it may be that parents of very shy children are reluctant to bring them to lab-based studies, as they likely feel uncomfortable in unfamiliar social settings. The shyness scores in our sample were, however, just as restricted at the other end of the scale, so it may just be an outcome of the sorting system, with mothers prioritizing other Q-Sort items when forming their “extreme” piles. It is also worth asking whether our testing situation was *too* comfortable. Shy children tend to be anxious around unfamiliar people and intervene less on their behalf, but they can be made to feel more at ease with relatively short, positive interactions (e.g., Young et al., 1999; Allen et al., 2018). Our study included a moderately long warm-up period, which could have made shy children feel comfortable enough to come to the experimenter’s aid. The experimenter effect we observed in the social-centred comforting task further highlights the dynamic, interpersonal nature of prosociality (Barragan and Dweck, 2014; Martin and Olson, 2015; Kuhlmeier et al., 2020).

Our findings also, necessarily, reflect the design of our tasks. We attempted to use four prosocial problems to disentangle the impacts of social engagement demands and complexity on shy children’s interventions. Our intention was to vary these two factors systematically: to have one task that was both simple and low in social demands (i.e., object-centred helping), one that was both complex and highly demanding (i.e., social-centred comforting), and two that were in-between (i.e., social-centred helping and object-centred comforting). We were most interested in how shy children would perform in these last, in-between tasks. Would they hesitate to help in a straightforward way if it meant entering someone’s personal space? Would they struggle to figure out how to comfort even when they could do so from a safe distance?

The shy children in our sample had no problem providing social-centred help. In fact, children’s performance, overall, did not differ between the two helping tasks: they were just as likely to help, and to help spontaneously, when the experimenter had a sticker on her jacket as when she spilled Lego bricks on the floor. We could take this finding to mean that the shyness effects observed in other socially demanding helping tasks (i.e., Beier et al., 2017; Karasewich et al., 2019) were due to their complexity, but that would be a mistake. It is far more likely that our social-centred helping task was not as demanding as we intended. That is, although the experimenter’s problem was within her personal space and thus encouraged children to approach her, it also involved a target object. Shy children were likely able to focus on the sticker itself and quickly remove it, without feeling taxed by being in close contact with her. This task could thus be considered more similar to the two object-centred tasks than the social-centred comforting task. We should, however, question whether the object-centred-tasks were equivalent to *each other* in social demands. Although the spilled Lego bricks and broken toy were both objects a child could focus on while intervening, there was more potential for them to

engage with the experimenter while providing comfort. We did not even have a fourth level of engagement in the object-centred helping task; there was no reason for a child to approach the experimenter while they picked up the bricks, especially after she moved to put another toy away. In contrast, offering the experimenter a hug or another form of affection could reasonably make her feel better about her broken toy.

On the surface, the *potential* to be more engaged while intervening does not sound much like a social “demand.” Can we really be sure, though, that all the children in our sample *understood* that they had other options? One of the main reasons we consider comforting problems to be complex for young children is that there is not one clear solution, but many ways they could appropriately respond to the person in distress. Indeed, the children in our sample showed a greater variety of responses to the two comforting tasks, and we were able to categorize their interventions in multiple ways: by form (i.e., verbal or physical), strategy (i.e., object- or social-oriented), and the specific words spoken or actions taken (see the coding summary at our OSF page). Overall, children’s comforting responses in the object-centred task were less engaged than the social-centred task: no child approached the experimenter to comfort her about her broken toy, and the majority used an object-oriented strategy while intervening. We did, however, find that shy children provided comfort less spontaneously in this task. Again, we could take this finding to mean that complexity is the greatest barrier to shy children’s interventions. This assumes, however, that we were successful in isolating complexity from social demands, but that very complexity may have made it harder for shy children to initially *see* that they could comfort without a lot of interaction – that trying to fix the toy would be enough to make the experimenter feel better. Future researchers interested in the prosocial decision-making of young children, shy and not-shy alike, should consider how a child’s motivation to intervene may actually *depend* on their understanding of what can be done.

No matter how we explain shy children’s slow response to the experimenter breaking her toy, it is still puzzling that we did not see a similar shyness effect when she hurt her knee. It is certainly not the case that the object-centred comforting task was more socially demanding. The social-centred task, after all, had no real equivalent to the broken toy, a concrete object sitting right in front of the child – instead, most of the children who used an object-oriented strategy to comfort the injured experimenter did so in an abstract way, like offering to get a band-aid. The prosocial problem here seemed to pull children’s focus to the experimenter herself, and some did engage with her to the highest extent by approaching to kiss her hurt knee. There was an exception: one child focused on the *door* to the room, which he opened wide to show how she could have avoided getting hurt. We did not anticipate this type of response, especially given that the experimenter bumped into the *frame* of the door while it was already ajar. It is important to note, however, that prosocial situations involving an injury *can* include manipulatable objects. Experimenters in other studies, for example, have simulated pinching their fingers in clipboards, dropping baskets on their toes, or hitting their thumbs with toy mallets (Young et al., 1999; Liew et al., 2011; Laible et al., 2021; MacGowan and Schmidt, 2021). All of these comforting problems could be considered object-centred versions of our injury-based task.

A better explanation for the lack of shyness effects in our social-centred comforting task is that children of this age will struggle to comfort an injured person *regardless* of their level of shyness (but see: Young et al., 1999, where shy toddlers were less likely to comfort a distressed experimenter). After all, only 17 children comforted the experimenter when she hurt her knee, despite most of the sample intervening in all of the other tasks. It seems likely that our two comforting tasks were not equal in complexity. In the social-centred task, children had to think of a way to either soothe the experimenter or heal her injury, but in the object-centred task, they did not need to know how to personally soothe her if they could think of a way her toy may be fixed (Hoffman, 1982; Dunfield, 2014). Thus, while neither problem had an *obvious* solution, as shown by the variety of responses, fixing the broken toy seems to have been a more *accessible* solution. In hindsight, a more equivalent counterpart to our social-centred problem would have been an injury-based task involving a tangible object. For example, MacGowan and Schmidt (2021) examined shy children's (non-prosocial) empathic responses to an experimenter who "pinched" her finger in a clipboard. At six-years-old, shy children in their sample were less likely to engage in hypothesis testing (e.g., asking about what happened, pushing down on the clipboard, etc.), which may suggest that they had trouble recognizing why she was upset. In our study, we may have been able to get a more nuanced picture of what children understood about the experimenter hurting her knee if we had examined their non-prosocial behaviours to the same depth as we had their interventions. Another interesting direction for future research would be to examine whether shy children differ in when they see comforting as a normative, obligatory response and how that may relate to their own comforting behaviour (e.g., Paulus et al., 2019; Geraci et al., 2021).

Conclusion

In this study, we sought to explore how particular aspects of a prosocial situation may affect shy children's motivation to intervene and their understanding of how to do so. We thus set out to design four prosocial tasks that varied in social engagement demands and complexity. Based on previous research (e.g., Beier et al., 2017; Karasewich et al., 2019), we expected shy children to be less motivated to intervene in social-centred tasks that encouraged them to engage at a higher level with the person in need. We also expected shy children, in particular, to have trouble figuring out how to comfort the experimenter when she was distressed. Our findings subverted our expectations in interesting ways. Contrary to our first expectation, the shy children in our sample did not differ in how often they intervened or their type of response, in any of the four tasks. Regarding the second expectation, we observed that providing social-centered comfort to a recently-introduced adult was challenging for young children in general, regardless of shyness, though shy children did show hesitancy with object-centered comforting.

Although we do need to be cautious in interpreting our social withdrawal-based shyness measure, the results of our study still highlight some of the challenges researchers face in disentangling

the effects of social engagement demands from complexity. For example, it is likely that our social-centred helping task was too simple to be socially demanding – shy children may have been more reluctant to help the experimenter if her problem could not have been solved so quickly. In turn, we suggest that the complexity of the object-centred comforting task made it appear socially demanding – shy children took longer to intervene because they did not realize, at first, that they *could* act through the broken toy. Finally, few children in our sample comforted the experimenter when she was injured in the social-centred task, implying that this is a difficult problem for shy and not-shy preschoolers alike. Future research could examine shy children's prosocial motivation and understanding more closely by giving them opportunities to intervene in tasks that are as equivalent as possible and by meticulously measuring their *non*-prosocial responses as well.

Data availability statement

The original contributions presented in the study are publicly available. This data can be found here: <https://osf.io/ykzs9/>.

Ethics statement

The studies involving human participants were reviewed and approved by Queen's University General Ethics Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

NB, TK, SP, and VK designed the study and collected the data. TK, CH, and KD conceptualized and completed the analysis and data figures. SP created the method figure. TK, KD, and VK drafted and edited the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1128588/full#supplementary-material>

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EDITED BY

Paola Rigo,
University of Padua,
Padua, Italy

REVIEWED BY

Valerie Kuhlmeier,
Queen's University,
Canada
Valerio Capraro,
Middlesex University,
United Kingdom

*CORRESPONDENCE

Elizabeth Theodora Hallers-Haalboom
✉ e.t.hallers-haalboom@uu.nl

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Food sharing with friends and acquaintances: A study in preschool boys and girls

Elizabeth T. Hallers-Haalboom^{1*}, Marjolijn M. Vermande¹,
Edwin J. C. van Leeuwen^{2,3} and Elisabeth H. M. Sterck^{2,4}

¹Department of Clinical Child and Family Studies, Faculty of Social and Behavioural Sciences, Utrecht University, Utrecht, Netherlands, ²Department of Biology, Faculty of Science, Utrecht University, Utrecht, Netherlands, ³Department of Comparative Cultural Psychology, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany, ⁴Animal Science Department, Biomedical Primate Research Centre, Rijswijk, Netherlands

Introduction: The current study examined whether preschoolers in a (semi-) natural situation shared more food with friends or acquaintances, and whether this was different between boys and girls, older and younger children, and for preferred and non-preferred food. In order to do so, we replicated and extended the classical work of Birch and Billman in a Dutch sample.

Methods: Participants included 91 children aged between 3 to 6 years (52.7% boys, 93.4% Western European) from a middle- to upper-middle-class neighborhood in the Netherlands.

Results: The results revealed that children shared more non-preferred than preferred food with others. Girls gave more non-preferred food to acquaintances than to friends, whereas boys gave more to friends than to acquaintances. No effect of relationship was found for preferred food. Older children shared more food than younger children. Compared to acquaintances, friends made more active attempts to get food. Moreover, children who were not shared with were just as likely to share food as children who were shared with.

Discussion: Overall, only a small degree of agreement with the original study was found: Some significant findings could not be replicated, and some unconfirmed hypotheses of the original study were supported. The results underscore both the need for replications and studying the effect of social-contextual factors in natural settings.

KEYWORDS

sharing behavior, relationship, food preference, previous experience, sex, age

Introduction

Prosocial behavior has been broadly defined as voluntary actions intended to benefit others (Hay, 1994; Eisenberg et al., 2006) and comprises a diverse set of behaviors, such as helping, sharing, comforting, and cooperating (Dirks et al., 2018). In most societies, prosocial behavior is highly valued and an important marker of competence in children. Prosocial behavior not only contributes to the well-being of others, but also to that of the benefactors (Curry et al., 2018; Mesurado et al., 2019; Hui et al., 2020).

To foster better understanding of other-oriented behaviors, Dunfield (2014) proposed that the broad class of prosocial behavior should be divided into more specific behaviors that each address a unique negative state in the other (e.g., emotional distress in the case of comforting, instrumental need in the case of helping) and require distinctive social cognitive demands to

alleviate this need. As a result, it becomes easier to understand why different prosocial behaviors are not or only minimally correlated with each other and follow separate developmental trajectories (Dunfield, 2014; Padilla-Walker and Carlo, 2014; Song, 2019). According to this taxonomy, the prosocial act of sharing (i.e., giving up a (limited) resource; Hay, 1979) is elicited by another's unmet material desire. To effectively alleviate this negative state requires the ability to recognize unequal distribution of resources, the motivation to see equality restored, and the ability to overcome an egocentric desire to monopolize resources (Dunfield, 2014).

The priors of sharing, such as the ability to understand another's unmet material desire and the unequal distribution of sharing, appear early in life. During the second year of life, children begin to be able to overcome their own material desire to have resources, as shown by increases in passive (tolerated theft) and active sharing (either spontaneous or instigated by the interaction partner; Eisenberg et al., 2006; Dunfield, 2014; Song, 2019). However, sharing behavior appears to be rather complex and preschool children do not share in every situation to the same extent (Paulus and Moore, 2014; Martin and Olson, 2015). A wide array of social-contextual factors have been proposed to affect sharing behavior, but findings are not always consistent and many questions about the nature of sharing and the motivations that lead to decisions of young children to share are still unanswered (Dunfield, 2014; Martin and Olson, 2015; Dirks et al., 2018).

Due to the limited cognitive abilities of young children, researchers have often used parent and teacher reports to assess sharing and the mechanisms influencing it (Eisenberg and Fabes, 1998). Questionnaire data have the disadvantage that they do not always reflect actual prosocial behavior (e.g., Kogut, 2012). More recently, specific standardized tasks have been applied. In these tasks, adult experimenters often stimulate/scaffold young children's sharing behavior (e.g., Dunfield et al., 2011) and/or use puppets (e.g., Chernyak and Sobel, 2016; Ulber et al., 2017) or imaginary others (e.g., Blake and Rand, 2010; Liu et al., 2016) to study sharing. Although these studies have contributed significantly to our understanding of children's sharing, experimental studies do not always resemble children's natural social context. As children enter school or daycare, their social experiences with (same-age) peers become increasingly important (Eisenberg et al., 2006). Compared to the experimental studies above, interaction with real peers may be more cognitively challenging (Song, 2019) and more dependent on the behavior of the peer (Birch and Billman, 1986). Yet, a recent meta-analysis showed that most of the studies on sharing in infancy through adolescence used experimental tasks rather than (semi-)natural observations in schools or daycare (Song, 2019).

Of the resources used to study sharing by young children, food occupies a special place. First of all, food sharing is one of the most common cross-cultural manifestations of sharing (Bird et al., 2018) and allows for cross-cultural comparisons (Rao and Stewart, 1999). Secondly, studying food sharing enables us to compare human and nonhuman primates to unravel the evolutionary roots of sharing behavior (Hare et al., 2007; Jaeggi et al., 2010). Thirdly, sharing of food tends to be more definitive than sharing of objects (e.g., toys or stickers), as there is a high probability that the recipient will eat the food immediately. Finally, children appear to value food (particularly candy) more than other types of resources (Murnighan and Saxon, 1998).

Correspondingly, a recent meta-analysis found that during preschool age sharing increased when the resources were toys, but no increase was found when sharing food (Song, 2019).

One of the few studies that examined young children's food sharing at school and multiple social-contextual factors influencing it, was conducted by Birch and Billman (1986). Owing to the encompassing nature, their study has rather uniquely transcended scholarly disciplines, as indicated by the diversity of research fields citing the work (ranging from developmental psychology to behavioral biology). Using a semi-naturalistic situation, they observed 57 pairs of same-sex American preschoolers during food sharing sessions with friends and acquaintances at school, where the potential sharer had 10 pieces of preferred and 10 pieces of non-preferred food and the friend/acquaintance only one piece of each. In that way, they were able to study how age and sex, the relational context (friends vs. acquaintances), the value of the resources (high vs. low), and social experience (previous experience as a recipient) influence young children's sharing, aspects that still need controlled investigations today (Dirks et al., 2018).

One of the main conclusions drawn by Birch and Billman (1986) was that girls shared more food with friends than with acquaintances, while boys did not share differently across friends or acquaintances. According to the authors, this fits with the idea that boys and girls differ in their social experiences and friendship patterns; girls distinguish more clearly between friends and others, whereas boys form larger, more fluid, extensive groups. Further, most sharing was triggered by soliciting, with friends more actively soliciting for food than acquaintances. The behavior of the potential recipient thus seems to play an important role in determining whether or not sharing occurs, and (elicited) sharing might be particularly a component of friendship (i.e., one of the things expected of a friend). Lastly, although there was no effect of simply having previous experience as a recipient or not, the authors concluded that preschoolers' sharing behavior appeared to be influenced by the *quality* of their previous experience as a recipient. Almost all children who were shared with subsequently shared themselves, whereas only half of the children who were not shared with did so, supporting the idea of modeling in the socialization of sharing among young children (Birch and Billman, 1986). Surprisingly, no effects of age and food preference were found.

Despite its many strengths, Birch and Billman's (1986) study has several shortcomings. One limitation is that their conclusion that girls share more with friends than with acquaintances, whereas boys do not, was based on multivariate results on food in general that were only supported by univariate results on *non-preferred* food (and not by results on preferred food). Moreover, the finding that girls gave more disliked food to friends than acquaintances whereas boys did not, does not fit with their interpretation stated above in terms of differences in boys' and girls' social experiences and friendship patterns and is therefore rather counterintuitive. In addition, in the Discussion of their paper, the authors suggest that the lack of an effect of food preferences on sharing (i.e., children did not share more readily non-preferred than preferred food as predicted) could be explained by the observation that children (particularly boys) often "dumped" the non-preferred food despite the recipient's protest and sometimes giving it back. Birch and Billman therefore argued that dumping is not actually prosocial behavior, as it does

TABLE 1 Overview and comparison of results by Birch and Billman (1986) and the current study.

	Birch and Billman (1986)	Current study
Quantity of sharing (frequency and amount)		
Preferred (favored) food	Relationship: Children shared more preferred food with friends than with acquaintances.	Relationship: No effect
	Sex: No effect	Sex: No effect
	Age: No effect	Age: Older children shared more preferred food with others than younger children did.
	Previous experience: No effect	Previous experience: No effect
Non-preferred (disliked) food	Relationship*Sex: Girls shared more non-preferred food with friends than with acquaintances. For boys, patterns of sharing did not differ between friends and acquaintances.	Relationship*Sex: Girls shared more non-preferred food with acquaintances than with friends, whereas boys gave more non-preferred food to friends than to acquaintances.
	Age: No effect	Age: Older children more often shared non-preferred food with others than did younger children.
	Previous experience: No effect	Previous experience: No effect
Food preference	No effect	Children shared more non-preferred food than preferred food with others.
Type of sharing		
Spontaneous	Relationship: No effect	Relationship*Sex: Girls shared more (non-preferred) food spontaneously with acquaintances than with friends, but for boys patterns of sharing did not differ between friends and acquaintances.
	Sex: No effect	
	Age: No effect	Age: No effect
	Previous experience: No effect	Previous experience: No effect
Elicited	Relationship: More food was shared more frequently with friends than with acquaintances.	Relationship: Elicited sharing was more frequent among friends than acquaintances.
	Sex: No effect	Sex: No effect
	Age: No effect	Age: No effect
	Previous experience: No effect	Previous experience: No effect
Passive	Relationship: No effect	Relationship: Passive sharing was more frequent among friends than acquaintances.
	Sex: No effect	Sex: No effect
	Age: No effect	Age: Passive sharing was more frequent among older children than younger children.
	Previous experience: No effect	Previous experience: Passive sharing was more frequent among children without previous experience as a recipient.
Previous experience		
Type of experience	A successful experience as a recipient facilitated subsequent sharing, whereas unsuccessful experiences did not.	Children who were not shared with were just as likely to share food as children who were shared with.

not involve either self-sacrifice by the sharer or benefit to the other. However, this was progressive insight; they did not examine this possibility.

Current study

The goal of the current study was to conduct a direct replication (LeBel et al., 2018) of Birch and Billman's (1986) classical study on food sharing in preschool children, while dealing with the above-mentioned shortcomings. Because of both the remarkable results and lack of studies in this area, we were especially interested in the absence of an effect of food preference (i.e., children did not share

more non-preferred food compared to preferred food) and the aforementioned interaction between relationship quality and sex (i.e., girls gave more disliked food to friends than acquaintances, whereas boys did not). Our main hypotheses were based on Birch and Billman's (1986) results (see also Table 1) and recent literature when available.

First, Birch and Billman (1986) rather unexpectedly found no effect of food preference on sharing. The effect of resource value has received little attention in previous research, as many experiments only used one type of tokens (often of uncertain or potentially little value to children; Shaw and Olson, 2013). To date, a few recent studies showed that even young children take resource value into account when deciding how to minimize inequality in outcomes between

others (e.g., children donating more of their least favorite sticker than their favorite sticker; Blake and Rand, 2010; Shaw and Olson, 2013). Moreover, a recent meta-analysis showed that individuals are less generous in a Dictator Game when the stakes are higher (Larney et al., 2019). A possible explanation for this finding is that sharing less desirable resources requires less self-sacrifice compared to the sharing of more desirable ones. Therefore, we still expected preschoolers to give more disliked food than favored food.

Second, Birch and Billman (1986) found an interaction effect of relationship quality and sex on food sharing. As explained above, the finding that girls gave more disliked food to friends than acquaintances, whereas boys did not, does not fit with their own description of differences in boys' and girls' experiences and friendship patterns. Given that more recent literature underscores sex differences in peer relations (i.e., girls' relationships seem to be characterized by prosocial behavior to a greater degree than boys and girls tend to distinguish more clearly between friends and other peers than boys; Schneider et al., 2005; Rose and Rudolph, 2006; Martin et al., 2018), we therefore expected that girls would give *less* disliked food to friends than acquaintances. Following this train of thought, it could also be expected that girls would give more favored food to friends than acquaintances, but Birch and Billman found no such effect. Instead, their results showed that both boys and girls shared more preferred food with friends than with acquaintances. Recent research found additional evidence that children tend to share more objects (mostly nonfood) with friends than with either non-friends, disliked peers, strangers, or out-group members (e.g., Fehr et al., 2008; Moore, 2009; Paulus, 2016; Sparks et al., 2017; Lenz and Paulus, 2021). A recent meta-analysis, however, did not find support that sharing is dependent on relationship type (friend vs. stranger) from the preschool years to childhood, although this effect may be due to the lack of studies (Song, 2019). So, we tentatively expected that children shared more (preferred) food with friends than with acquaintances.

Third, the majority of sharing in Birch and Billman's (1986) study was the result of active elicitation on the part of the recipients. Even in the case of the glaring inequality that was created, spontaneous sharing was very rare. Birch and Billman concluded that recipients do not simply wait for spontaneous sharing to occur, but rather were verbally and physically active in eliciting it. Within friendship dyads, recipients were particularly vigorous elicitors. This fits with other research indicating that behaving prosocially is an important component of friendship, and that children expect their friends to help and support each other (Furman and Bierman, 1983; Dirks et al., 2018). Based on these findings, we also expected friends to be more active elicitors of sharing than acquaintances.

Fourth, Birch and Billman (1986) found that the *quality* of previous experiences as a recipient influenced subsequent sharing behavior. Recent studies also found young children's sharing behavior to be affected by others' generosity or stinginess, but most of these studies focused on direct reciprocity (i.e., exchange of acts between the same two individuals; e.g., House et al., 2013; Warneken and Tomasello, 2013; Messer et al., 2017; Vaish et al., 2018; Wörle et al., 2020), whereas in Birch and Billman's study children were not re-paired with the same child who shared with them before. By observing subsequent sharing with another child, Birch and Billman focused on indirect "upstream" reciprocity (i.e., paying forward an act not to the person from whom it had been received, but to a different person instead). To the best of our knowledge, only a few other studies

found support for upstream reciprocity among preschoolers (Leimgruber et al., 2014; Beeler-Duden and Vaish, 2020; Wörle et al., 2020), but these studies used experiments rather than (semi-)natural observations with peers. Therefore, we tentatively expected positive previous experience as a receiver to stimulate sharing.

Fifth, although Birch and Billman (1986) did not find an effect of age or sex on sharing, recent studies indicated that sharing behavior increases with age (Fehr et al., 2008; Blake and Rand, 2010; Malti et al., 2016). Moreover, a recent meta-analysis reported that older preschoolers (mean 68.79 months) showed more sharing than early preschoolers (mean 54.9 months; Song, 2019). Although sex was not included in this meta-analysis, other studies suggested higher levels of prosocial behavior among girls than boys (Eisenberg and Fabes, 1998; Blake and Rand, 2010). However, the effects were small for sharing and in case the target was another child (Eisenberg and Fabes, 1998). Among adults, sex differences in generosity are however well-established (i.e., women tend to share more than men; Engel, 2011; Rand et al., 2016; Brañas-Garza et al., 2018). Therefore, we tentatively expected an effect of age (i.e., more sharing among older children) and sex (i.e., more sharing among girls).

Method

Participants

Birch and Billman's (1986) sample consisted of 57 3-5-year-old children from five classrooms at the University of Illinois Child Development Laboratory. To obtain a similar sample, we recruited participants from five Kindergarten classes with 4-6 year-old children of an elementary school and one preschool class offering early education to 2-4 year-olds in the Netherlands. Both schools were situated at the same location in a middle- to upper-middle-class neighborhood. After obtaining consent from the schools and classroom teachers, all parents received a brochure with information about the procedures and data storage and were asked to return a signed consent form. Children who only recently entered school and did not yet have formed relationships with their classmates could not participate. Consent was obtained for 61.5% ($N=96$) of the eligible children. Children with food allergies ($n=1$) and children with missing data due to technical failure or unexpected absence from school ($n=4$) were excluded, resulting in a final sample of 91 children from six classes (age range 2.8 to 6.5 years; $M_{\text{age}}=4.88$, $SD=0.96$; 52.7% boys). Most of the children were Dutch (90.1%), the other children originated from Western (3.3%) or non-Western (6.6%) countries other than the Netherlands.

Procedure

To replicate the procedure as precisely as possible, one of the authors of the original publication (dr. L. L. Birch) was contacted. Following the original study and Billman's (1984) thesis, all children completed assessments to obtain information about their sociometric choices and food preferences. Based on this information, the children were then paired with a friend and with an acquaintance on two different occasions, separated by a period of about 2 weeks. The order in which children were coupled with a friend or acquaintance was

counterbalanced. The observations consisted of a snack moment, during which the children had the opportunity to share most- and least-preferred food. The potential sharer received large quantities of the food relative to the recipient. All sessions were filmed and were led by pairs of trained (under)graduate students. For each session, the pair of children was taken from their classroom to a separate room where they could not be disturbed by others. Ethical approval for this study was provided by the Faculty Ethics Review Board (FERB) of the Faculty of Social and Behavioural Sciences of Utrecht University, the Netherlands.

According to LeBel et al. (2018) Replication Continuum, our study can be considered a direct and “very close” replication of the original study with only differences in contextual variables beyond a researcher’s control (e.g., history, culture, language) and procedural details.

Measurements

Sociometric tests

Photographs of the children’s heads and torsos were made. These photographs served as the stimuli in the Paired-Comparisons Sociometric Test (PCST) and the Peer Preference Assessment (PPA). Two tests were used, as convergence of the information would provide a more valid assessment of the children’s friends and acquaintances (Birch and Billman, 1986). The two tests were administered 1 week apart to ensure that the relationships between children were stable. The PCST was administered before the PPA.

For both sociometric tests, children judged same-sex peers within their classroom by their likeability. In the Birch and Billman (1986) study, children and their peers differed at most 8 months in age. In the present study, this restriction regarding the age of the children was not feasible, because in the Netherlands the two lowest grades of elementary school (i.e., Kindergarten) are usually combined into composite classes, which was also the case in the present sample. As a result, children may form relationships with older or younger classmates and restricting the age range would lower the ecological validity. The number of peers to evaluate ranged from 3 to 10 children.

Paired-comparisons sociometric test

The children were presented with all possible combinations of pairs of photographs of their same-sex classmates. The number of possible pairs ranged from 3 to 45. The order in which the pairs were presented and the position of the photographs (i.e., on the left or right side) were randomly determined. For each pair of photographs, the child was asked to choose the person they would like to play with the most. Each time a classmate was chosen from a pair, that classmate was given a point. At the end, all choices by the child were summed to obtain a rank order for the (same-sex) peers.

Peer preference assessment

The children were asked to place each photograph (in random order) into one category: “like to play with,” “do not like to play with,” or “just okay.” Pictures of three gender-neutral smiley faces, varying in expression (happy, sad, and neutral), were used to represent the categories. After categorizing all photographs, the child then had to rank the photographs within each category (i.e., through repeated nominations of the best liked person left in that category), resulting in a complete rank order.

Dyad selection

For each child, the designated friend was determined by selecting the classmate who was ranked first or second on the PCST and who was categorized in the “like to play with” category on the PPA. Acquaintances were selected by using the following criteria: (i) the acquaintance was never the least-liked classmate on either measure (to eliminate children who were disliked), (ii) the acquaintance was never the first or second-best-liked classmate on either of the measures, (iii) the acquaintance was preferably rated in the “neutral” category on the PPA. In case several options were available, the selection for the designated acquaintance was random. In the eight ambiguous cases that did not fit all three criteria, the child’s teacher was consulted to make decisions.

Food preference assessment

The procedure of the Food preference assessment (FPA; Birch et al., 1980) was similar to the PPA described above. Pictures of three gender-neutral smiley faces were used, varying in expression (happy, sad, and neutral). Similar to Birch and Billman (1986), children were presented with seven samples of foods in small, clear-plastic cups: M&M’s, mini-marshmallows, Pepperidge Farm Goldfish Crackers, bite-sized pieces of cheese, (uncooked) carrot slices, bite-sized pieces of raw broccoli, and bite size pieces of radish. The child was asked to taste each food and place the cup in front of the face that matched with their affective response to the food. After categorizing all the foods, the experimenter focused the child’s attention to the set of foods that were placed in the “like” category and asked the child to select the very best-tasting food. Then, the child was asked to choose the best-tasting food from the remaining food in that category. The same procedure was applied to the “neutral” and “dislike” categories, resulting in a complete rank order of the food.

Snack-time sharing and coding

The snack-time sessions started approximately 1 week following the second sociometric test and were planned right before the regularly scheduled snack moment at the school. In the Birch and Billman (1986) study, children each received a small brown bag with their name. The bag of the potential sharer contained 10 pieces of his/her preferred and non-preferred food and the bag of the potential recipient contained one piece of each of the same foods. Based on a pilot with 12 children, a small adjustment in this procedure had to be made. The main reason for this was that the children in our study were not used to getting a snack in a bag marked with their name, as schools in the Netherlands generally do not provide snacks to the children (but children bring their own snack of choice from home). Because we could not create a situation that exactly resembled that of the Birch and Billman study, we instead used one bag with food for each pair of children and the experimenter then distributed the food as in the original study. Prior to the session, the bags were prepared with the target child’s most preferred and least preferred foods. After the children were seated at the table, the experimenter gave each of the children their name-labeled paper plate and showed them the bag of food. While the experimenter put the food on the children’s plates, she asked the children to wait until she was done. All the food was first placed on the plate of the target child, after which the experimenter took one piece of the preferred and non-preferred food and put it on the plate of the non-target child. As a result, the target child received 10 pieces of each food, and the non-target child received only one

piece of each of the same foods. The experimenter then said she suddenly had to go, but that the children could eat while she was gone. The children were videotaped by a second experimenter. Sessions were limited to 5 minutes, after which the experimenter returned and escorted the children back to their classroom.

Each child was observed twice as a potential sharer, once with a friend and once with an acquaintance. The order of these observations was counterbalanced, resulting in a group of 43 children first seen with a friend and 48 first seen with an acquaintance. Further, scheduling was arranged in such a way that two groups were formed: one group of children who had no previous experience as a potential recipient ($n=41$) and one group who had already been a recipient in the snack session once ($n=50$).

Coding procedures were based on Birch and Billman (1986) and Billman (1984). Both *number of sharing incidents* (i.e., occurrences during which the target child shared preferred and/or non-preferred food with the recipient; frequency of sharing) and the *number of pieces of preferred and non-preferred food* shared with the recipient were counted. When a child took food back from the recipient after sharing, this was subtracted from the total number of food shared. Further, three types of sharing modes were coded: spontaneous, elicited, and passive. *Spontaneous sharing* was coded when the target child took the initiative for sharing, without any prior verbal or physical behaviors on the part of the recipient to get food. *Elicited sharing* was coded when the target child shared food in response to verbal (e.g., asking, demanding) or physical actions (e.g., extending hands, pointing) of the recipient to get food (i.e., the recipient's behavior was instrumental in initiating sharing). *Passive sharing* was coded when the target child allowed the recipient to take food of their plate (i.e., the initiative for sharing was taken by the recipient). For each sharing mode, the *number of sharing incidents* and *number of pieces of food* were counted. With respect to sharing incidents, a distinction was made between successful and unsuccessful elicitations and attempts to take or share food. No distinction between elicitations for preferred and non-preferred food was made, because according to Birch and Billman (1986; p. 392) it was not always possible to specify whether the elicitations referred to preferred or non-preferred food.

Three trained coders rated the videotapes. To guarantee independence among ratings, no coder rated a target child twice. Coder reliabilities were computed on 22% of the videotapes ($n=40$). The mean intraclass correlation coefficient (absolute agreement) for incidents sharing preferred food was 0.96 (range 0.94–0.98), for incidents sharing non-preferred food was 0.96 (range 0.95–0.98), for pieces of preferred food was 0.99 (range 0.99–1.00), for pieces of non-preferred food was 0.99 (range 0.99–1.00), for spontaneous sharing was 0.96 (range 0.94–0.99), for elicited sharing was 0.92 (range 0.86–0.97), and for passive sharing was 0.93 (range 0.80–0.99). During the coding process, 20% of the videotapes ($n=37$) were coded twice by separate coders to prevent coder drift. Further, all coding forms were double checked to ensure that no counting errors were made.

Data-analyses

We followed the same analytic strategy as in the original study. Following Birch and Billman (1986), the sample was divided into a younger (≤ 50 months, $n=17$) and an older group (>50 months, $n=74$). Analyses of children's food sharing with friends and

acquaintances were conducted using GLM Repeated Measures MANOVA, as was done in the original study. The analysis regarding the *quantity of sharing* (i.e., frequency of sharing and amount of food shared) included the following dependent variables: number of incidents sharing preferred food, number of pieces of preferred food shared, number of incidents sharing non-preferred food, number of pieces of non-preferred food shared. For the analyses regarding the *type of sharing* (i.e., spontaneous, elicited, passive sharing), separate analyses were conducted. The dependent variables in these analyses were the number of sharing incidents (i.e., both successful and unsuccessful) and number of pieces of food shared within the sharing mode of interest. For all analyses, main effects and two-way interactions between the within-subjects factor (relationship) and between-subjects variables (age, sex, having previous experience as a recipient, friend-acquaintance/acquaintance-friend order) were examined. Birch and Billman did not report higher order interaction effects. For the interpretation of results, we first evaluated (significant) two-way interactions and then assessed any additional main effects. Moreover, in case of significant multivariate effects, the univariate analyses were inspected for further clarification.¹

Results

Quantity of sharing (frequency and amount)

Table 2 shows the mean number of sharing incidents and mean number of pieces of preferred and non-preferred food shared with friends and acquaintances, separately for boys and girls. The two measures of preferred food were strongly positively associated, $r=0.81$, $p<0.001$. The same pattern was found for the measures of non-preferred food, $r=0.57$, $p<0.001$. When looking at correlations between preferred and non-preferred food, medium positive associations for sharing incidents, $r=0.30$, $p<0.01$, and pieces of food, $r=0.22$, $p<0.05$, were found. Similar patterns of correlations were found in the original study (see Birch and Billman (1986), p. 391).

Table 1 gives an overview of Birch and Billman's (1986) results. They concluded that no overall effect of food preference was present. The findings of the current study, however, indicated that children shared more pieces of non-preferred food than preferred food with both friends, $t(90)=-3.86$, $p<0.001$, $d=0.48$, and acquaintances, $t(90)=-3.61$, $p=0.001$, $d=0.49$ (both small-medium effects). No differences were found regarding the number of incidents (p -values ranged from 0.186 to 0.306). Interestingly, after taking dumping into account, we no longer found any differences in the amount of preferred and non-preferred food shared with others (p -values ranged from 0.232 to 0.615). See also [Supplementary information](#).

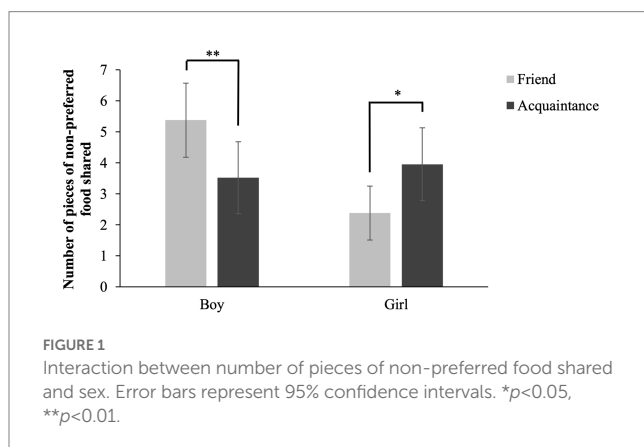
¹ Birch and Billman (1986) suggested that the lack of a main effect of food preference could be due to not taking "dumping" into account. Therefore, we did not only analyze the data using Birch and Billman's original coding system, but we also analyzed the data adopting a narrower definition of sharing in which dumping behavior was not considered as sharing (i.e., excluding food that did not involve either self-sacrifice by the sharer or benefit to the other). See [Supplementary information](#) for details.

TABLE 2 Means and standard deviations for sharing incidents and number of pieces of preferred and non-preferred food shared with friends and acquaintances, separately for boys and girls.

	Boy (<i>n</i> =48)	Girl (<i>n</i> =43)	Total (<i>n</i> =91)		<i>F</i> (1,86)	η_p^2
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	Range		
Incidents P					1.11	0.013
Friend	1.56 (1.47)	1.70 (1.37)	1.63 (1.42)	0–6		
Acquaintance	1.17 (1.24)	1.47 (1.49)	1.31 (1.36)	0–5		
Incidents NP					0.79	0.009
Friend	1.96 (1.76)	1.70 (1.73)	1.84 (1.74)	0–8		
Acquaintance	1.42 (1.71)	1.77 (1.82)	1.58 (1.76)	0–7		
Pieces P					0.17	0.002
Friend	2.93 (2.51)	1.93 (1.64)	2.46 (2.19)	0–8.5 ¹		
Acquaintance	2.04 (2.35)	2.27 (2.39)	2.15 (2.36)	0–10		
Pieces NP					0.003	<0.001
Friend	5.38 (4.13) ^a	2.38 (2.82) ^a	3.96 (3.86)	0–10		
Acquaintance	3.52 (3.98) ^b	3.95 (3.82) ^b	3.73 (3.89)	0–10		

P, preferred food; NP, non-preferred food. *F*-value represents the univariate results for the effect of relationship (friend vs. acquaintance). Different superscripts indicate significant differences within columns.

¹If children broke a piece of food in half, only half a piece was scored.



Similar to Birch and Billman (1986), we found a significant multivariate interaction between relationship and sex, *Pillai's* $F(4,83)=4.63$, $p=0.002$, $\eta_p^2=0.182$ (large effect). The univariate analyses, however, revealed only a significant interaction when comparing the number of pieces of non-preferred food shared by boys and girls, $F(1,86)=13.08$, $p=0.001$, $\eta_p^2=0.132$ (medium-large effect). Follow-up paired *t*-tests showed that boys shared more pieces of non-preferred food with friends than with acquaintances, $t(47)=2.97$, $p=0.005$, $d=0.46$, whereas girls gave more pieces of non-preferred food to acquaintances than to friends, $t(42)=-2.43$, $p=0.020$, $d=0.47$ (Figure 1). This result is in the opposite direction as the original study. Although in the original study also an interaction between relationship and sex was found for the number of incidents sharing non-preferred food, this was not the case in our study ($p=0.208$).

Birch and Billman (1986) further found a significant univariate main effect of relationship for both measures of preferred food variables (i.e., with respect to preferred food, children shared more and more often with friends than with acquaintances), but we did not find such effects in our study (p -values ranged from 0.294 to 0.678).

No other effects were significant in Birch and Billman's (1986) study. However, as hypothesized by Birch and Billman, in the current study additional significant main effects were found for age: older children engaged in sharing non-preferred food more often than younger children, $F(1,86)=4.97$, $p=0.028$, $\eta_p^2=0.055$ (small-medium effect), and also shared more pieces of preferred food than younger children, $F(1,86)=4.75$, $p=0.032$, $\eta_p^2=0.052$ (small-medium effect). None of the other effects were significant (p -values ranged from 0.067 to 0.976).

Type of sharing

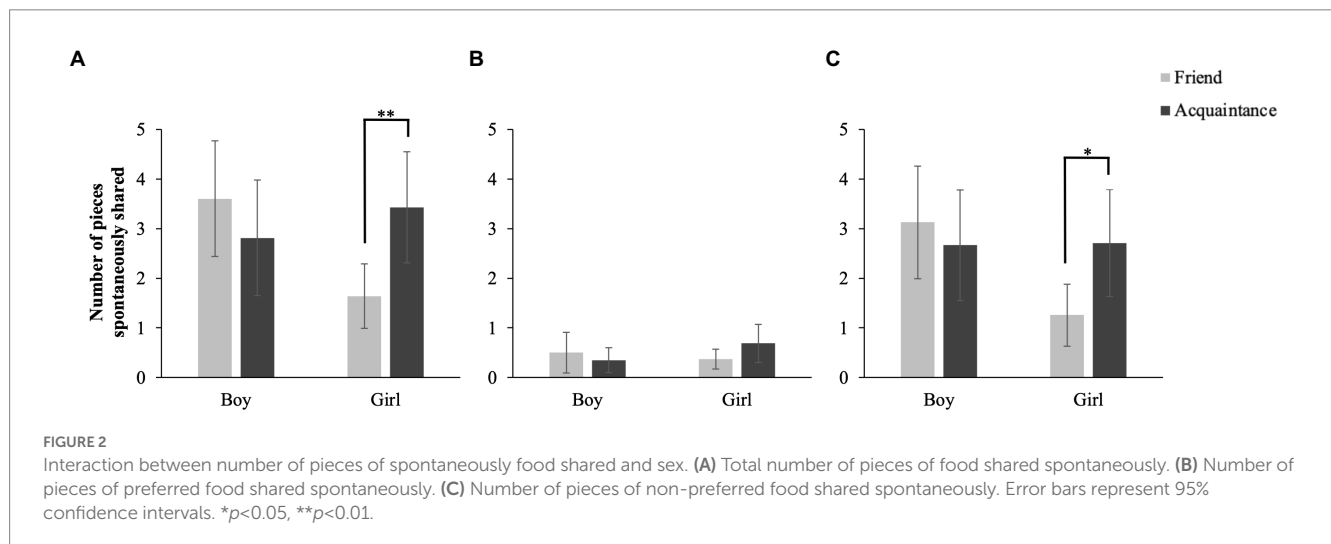
For each sharing mode (spontaneous, elicited, passive), Table 3 shows the mean number of sharing incidents and mean number of pieces of food shared with friends and acquaintances separately for boys and girls. Whereas Birch and Billman (1986, p. 392),² reported relatively low frequencies of spontaneous sharing, children in our study clearly shared more food spontaneously (Table 2). The two measures (i.e., number of sharing incidents, number of pieces of food) of spontaneous sharing were strongly positively associated, $r=0.65$, $p<0.001$. The same pattern was found for elicited sharing, $r=0.44$, $p<0.001$, and passive sharing, $r=0.73$, $p<0.001$. Notably, the correlations for our measures were somewhat lower than in the original study.

² In Birch and Billman's (1986) Table, the number of sharing incidents seems to be accidentally mistaken for the number of pieces of food and vice versa, since the distinction between successful and unsuccessful attempts can only be made for sharing incidents.

TABLE 3 Means and standard deviations for spontaneous, elicited, and passive sharing with friends and acquaintances, separately for boys and girls.

	Boy (<i>n</i> =48)	Girl (<i>n</i> =43)	Total (<i>n</i> =91)		<i>F</i> (1,86)	η_p^2
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	Range		
Spontaneous sharing						
Incidents					0.35	0.004
Friend	1.33 (1.45)	1.58 (1.67)	1.45 (1.55)	0–6		
Acquaintance	1.29 (1.61)	1.84 (1.94)	1.55 (1.78)	0–7		
Pieces					2.13	0.024
Friend	3.60 (4.01)	1.64 (2.10) ^b	2.68 (3.38)	0–10		
Acquaintance	2.81 (4.00)	3.43 (3.65) ^a	3.10 (3.83)	0–12		
Elicited sharing						
Incidents					4.42*	0.049
Friend	1.15 (1.86)	1.35 (1.41)	1.24 (1.66) ^a	0–8		
Acquaintance	0.88 (1.36)	1.00 (1.27)	0.93 (1.31) ^b	0–7		
Pieces					0.02	<0.001
Friend	0.97 (1.78)	0.86 (1.79)	0.92 (1.78)	0–10		
Acquaintance	0.85 (2.31)	1.01 (2.23)	0.93 (2.26)	0–11		
Passive sharing						
Incidents					5.04*	0.055
Friend	2.15 (2.10)	1.88 (1.95)	2.02 (2.03) ^a	0–10		
Acquaintance	1.19 (1.68)	1.23 (1.54)	1.21 (1.61) ^b	0–6		
Pieces					2.56	0.029
Friend	3.50 (4.01)	1.79 (2.42)	2.69 (3.44)	0–13		
Acquaintance	1.90 (2.78)	1.78 (2.85)	1.84 (2.80)	0–10		

F-value represents the univariate results for the effect of relationship (friend vs. acquaintance). Different superscripts indicate significant differences within columns. **p* < 0.05.



Spontaneous sharing

The initial study did not find any (multivariate) significant interaction effects or main effects for spontaneous sharing, but in the current study a significant multivariate interaction between relationship and sex was found, *Pillai's F*(2,85) = 6.07, *p* = 0.003, η_p^2 = 0.125 (medium-large effect). Within-subjects contrasts revealed a significant interaction when comparing the number of pieces shared spontaneously by boys and girls, *F*(1,86) = 7.99, *p* = 0.006,

η_p^2 = 0.085 (medium effect). Girls spontaneously shared more food with acquaintances than with friends, *t*(42) = −3.16, *p* = 0.003, *d* = 0.60 (Figure 2A). For boys, patterns of spontaneous sharing did not differ between friends and acquaintances, *t*(47) = 1.26, *p* = 0.205, *d* = 0.20. No other effects were significant (*p*-values ranged from 0.087 to 0.988).

Birch and Billman (1986) did not make a distinction between preferred and non-preferred food for the variables concerning

spontaneous sharing. However, spontaneous sharing might be related to the target child's preference for food. To increase our understanding of the interaction between relationship and sex for the number of pieces that were shared spontaneously, we reran our analyses separately for the amount of preferred and non-preferred food shared spontaneously. The results revealed that the relationship*sex interaction only remained present when considering the number of pieces of non-preferred food, $F(1,86) = 5.45$, $p = 0.022$, $\eta_p^2 = 0.060$ (medium effect), indicating that the girls' greater amount of food shared spontaneously with acquaintances than friends was attributable to the sharing of non-preferred food (Figure 2).

Elicited sharing

In line with the findings of Birch and Billman (1986), a significant multivariate main effect of relationship was found for elicited sharing, Pillai's $F(2,85) = 4.07$, $p = 0.021$, $\eta_p^2 = 0.087$ (medium effect). Contrasts revealed that elicited sharing incidents occurred more often when sharing with friends compared to acquaintances, $F(1,86) = 4.42$, $p = 0.038$, $\eta_p^2 = 0.049$ (small effect). Unlike the original study, this was not found for the number of pieces shared ($p = 0.897$). No other effects were significant (p -values ranged from 0.285 to 0.983).

Passive sharing

The original study did not find (multivariate) significant interaction or main effects for passive sharing. We also did not find any significant interactions (p -values ranged from 0.080 to 0.976), but our results showed significant multivariate main effects of age, Pillai's $F(2,85) = 4.23$, $p = 0.018$, $\eta_p^2 = 0.091$ (medium effect), and previous experience, Pillai's $F(2,85) = 3.18$, $p = 0.047$, $\eta_p^2 = 0.070$ (medium effect). Inspection of the between-subjects tests revealed only an effect of age, $F(1,86) = 8.35$, $p = 0.005$, $\eta_p^2 = 0.088$ (medium effect), and previous experience, $F(1,86) = 5.75$, $p = 0.019$, $\eta_p^2 = 0.063$ (medium effect), on the number of passive sharing incidents (i.e., higher among older children and children with no previous experience). Moreover, a significant univariate main effect of relationship was found for passive sharing incidents, $F(1,86) = 5.04$, $p = 0.027$, $\eta_p^2 = 0.055$ (small-medium effect). Within-subjects contrasts showed that passive sharing was more frequent among friends than acquaintances. No other effects were significant (p -values ranged from 0.055 to 0.780).

Success rate of attempts

Our results showed that the total number of elicited and passive sharing incidents were more frequent with friends than with acquaintances. For all these sharing incidents, the success of the attempts to get food was coded (see Table 4). In the original study, the

greater proportion of total sharing incidents with friends appeared to be attributable to a higher rate of attempted initiations made by friends, while the success rates for friends (38%) and acquaintances (30%) did not differ significantly. In line with these findings, our results showed that the success rates of the elicited and passive sharing incidents with friends (63.5%) and acquaintances (65.9%) were also largely similar, but substantially higher compared to those reported by Birch and Billman (1986, p. 392).

Type of previous experience

The sharing behavior of the group of children with previous experience as a recipient ($n = 50$) was examined more closely following the rationale explained in the Introduction that not simply having experience as a recipient (see above), but also the *quality* of this experience might be relevant in determining subsequent sharing behavior. For one child, the type of previous experience could not be determined due to technical issues with the videotape.

Birch and Billman (1986) reported that the subgroup of children who had previous experience as recipients ($n = 27$) was nearly equally divided with respect to whether they had been shared with ($n = 14$) or not ($n = 13$). In the present study, the group of children with previous experience as a recipient ($n = 49$) appeared to be *unequally* divided with respect to whether they had been shared with ($n = 36$) or not ($n = 13$). In contrast to Birch and Billman, we found no association between the nature of their previous experience (i.e., been shared with or not) and children's subsequent sharing behavior at T1 in our study, $\chi^2(1) = 0.59$, $p = 0.442$. Of the children who were shared with, the majority of them shared subsequently ($n = 31$). Only five children in this subgroup did not share with their peer. For the children who were not shared with, however, a similar pattern was found. Most of the children in this group shared subsequently ($n = 10$), whereas three children did not. A binomial test (with μ set to 0.5 to test against chance level) indicated that the proportion of children who subsequently shared (86%) after a positive experience (i.e., been shared with) was in the expected direction ($p < 0.001$, 1-sided), but that the proportion of children who subsequently shared (77%) after a negative experience (i.e., not been shared with) was also higher than expected ($p = 0.090$, 2-sided).

Discussion

The main objective of the current study was to replicate and extend Birch and Billman's (1986) semi-natural study of food sharing in young children. We were especially interested in the effect of food preference and the interaction between relationship quality and sex on sharing. We were able to create a similar situation of inequality to test the effect of social-contextual factors on young children's food sharing behavior (direct "very close" replication; LeBel et al., 2018). An overview and comparison of the results by Birch and Billman and those of the current study can be found in Table 1. We discuss some notable similarities and differences.

Birch and Billman (1986) were not able to support their hypothesis that children would more readily share non-preferred food compared to preferred food. In the current study, however, we did find that children were more likely to share disliked food compared to more

TABLE 4 Mean number of successful and unsuccessful attempts to acquire food.

	Successful attempts <i>M</i> (<i>SD</i>)	Unsuccessful attempts <i>M</i> (<i>SD</i>)
Elicited sharing		
Friend	0.53 (0.96)	0.71 (1.25)
Acquaintance	0.42 (0.75)	0.52 (1.06)
Passive sharing		
Friend	1.54 (1.77)	0.48 (0.98)
Acquaintance	0.99 (1.44)	0.23 (0.56)

avored food. This is in line with our hypothesis and previous research (Blake and Rand, 2010; Shaw and Olson, 2013). Interestingly, after excluding dumping from sharing behavior the difference between sharing preferred and non-preferred food was no longer present (see [Supplementary information](#)). Thus, a substantial portion of the non-preferred food that was given to the recipient turned out to be part of dumping unappetizing food that the recipient not wanted, instead of being an act of prosociality (i.e., to benefit others).

As expected, like Birch and Billman (1986) we found a relationship*sex interaction for non-preferred food, but in the opposite direction: Girls gave more non-preferred food to acquaintances than to friends, whereas boys actually shared more non-preferred food with friends than with acquaintances. A similar interaction emerged for spontaneous sharing, indicating that girls also spontaneously shared more non-preferred food with acquaintances than with friends. So, girls in our study seem to want to spare their friends from unattractive food, whereas boys were less considerate with friends (note that Birch and Billman did not find differences in boys' sharing with friends and acquaintances). This is in line with differences in interaction patterns between male and female dyads described in the Introduction. Moreover, boys are more likely than girls to endorse status-oriented or agentic goals within relationships (Rose and Rudolph, 2006). A certain amount of competition seems to be normative in boys' friendships but not in girls' (Schneider et al., 2005), and it has been suggested that the greater male attention to mastery and status is particularly evident during interactions with friends compared to those with nonfriends (Hartup et al., 1993). Regarding our study's findings, it is possible that boys felt more comfortable to assert their power (by giving undesired objects) within friendship dyads as compared to acquaintances. Overall, our results thus better fit with Birch and Billman's reasoning and the current literature than their (own) results.

Although Birch and Billman (1986) found no relationship*sex interaction for sharing preferred food, they did find that children shared more preferred food with friends than with acquaintances. However, contrary to our expectations, these findings were not replicated in our study. The literature is inconsistent at this point. In line with our findings, some studies found that children shared preferred food with others irrespective of whether the recipient was a friend or not (Berndt, 1981; Rao and Stewart, 1999; Song, 2019), whereas several other studies concluded that the quality of social relationships does affect preschoolers sharing decisions. These studies compared sharing with friends vs. non-friends, disliked peers, strangers, or out-group members (e.g., Fehr et al., 2008; Moore, 2009; Paulus, 2016; Sparks et al., 2017; Lenz and Paulus, 2021). An effect of relationship might emerge more clearly when the social distance between potential sharer and recipient is greater (Komter, 2010). Nevertheless, we did find an effect of relationship on the type of sharing. In line with the findings by Birch and Billman, we found that friends were more active elicitors than acquaintances. Our study extended these findings by showing that this also applied to passive sharing (i.e., friends were allowed to take away food more often than acquaintances).

Birch and Billman (1986) concluded that successful experiences as a recipient (i.e., been shared with) facilitated sharing. In the present study, the only effect of previous experience was found for passive sharing (i.e., children with no previous experience were more likely to allow food to be taken from their plates), which probably has to do with

familiarity with the setting. We did not find an effect of the *quality* (been shared with or not) of the experience. Compared to Birch and Billman, relatively many children in our study had a positive previous experience as a recipient and those who had not often still shared food. Since prosocial behavior, such as sharing, was highly stimulated at both the preschool and elementary school included in our study, this might have contributed to our observation that children behaved prosocially regardless of the quality of their previous experiences. Notably, there was also more sharing (particularly spontaneous) in this study than in the original one. The fact that Dutch preschoolers showed more sharing than American preschoolers 35 years ago, may also point to the role of environmental influences. For example, societal and educational changes have resulted in a shift in educational goals over the last decades. Instead of the traditional focus on cognitive development, social-emotional skills are now also highly valued and often included in a school's formal curriculum as important learning goals (Van Daalen and De Regt, 2003; D'Emidio-Caston, 2019).

While Birch and Billman (1986) did not find any effects of age, our findings showed that older children (>50 months) shared more preferred food with others compared to younger children (≤50 months). Moreover, passive sharing was more frequent among older children than younger children. These findings are in line with other studies suggesting that sharing behavior increases with age (Fehr et al., 2008; Blake and Rand, 2010; Malti et al., 2016). Whereas young children tend to behave selfishly, older children increasingly prefer resource allocations that removes inequality (Fehr et al., 2008). Moreover, older children may be more capable to consider the wishes and needs of their peers (i.e., perspective-taking) and give normative/moral considerations more weight (Smith et al., 2013). Combined with a stronger inequality aversion, this may result in higher levels of sharing behavior compared to the younger children in our study. Note that the division in age groups corresponds with the age at which children in the Netherlands enter elementary school (Kindergarten), which is at 4 years.

Strengths, limitations, and future directions

Overall, we managed to perform a direct replication of Birch and Billman's (1986) classical study using a larger sample size (i.e., increasing the power of our findings). Only direct replications with methodology sufficiently similar to that of the original study, can provide the sort of strict falsification attempt that is needed (LeBel et al., 2018). Nevertheless, some limitations should be noted. First, to facilitate direct comparisons of results (LeBel et al., 2018), the nature of our sample was similar to that of Birch and Billman. However, this reduced the representativeness with respect to the population of Dutch children. That is, our sample consisted of mainly White children from a middle- to upper-class neighborhood who attended the same school site. Sharing behavior should also be examined in more diverse samples (e.g., Schäfer et al., 2015; Dirks et al., 2018). Second, only a few studies have looked at the value of resources. The relationship*sex interaction was only found for sharing non-preferred food, showing the importance of including resources that differ in value. However, some sharing of non-preferred food can be considered dumping with no costs for the sharer (see [Supplementary information](#)). We therefore recommend future researchers to focus on the sharing of objects that are desired to a lesser or greater degree. Finally, future work could also benefit from focusing on the strategies children use

to acquire food as recipient when confronted with a situation in which objects are unequally distributed (Vermande and Sterck, 2020). More insight into the strategies that are more or less successful in obtaining resources may contribute to a deeper understanding of young children's sharing behavior.

Conclusion

Our study showed effects of food preference (i.e., children shared non-preferred food more easily than preferred food), age (i.e., older children shared more food than younger children), and type of relationship (i.e., friends made more active attempts to get food than acquaintances but did not receive more). The effect of type of relationship was qualified by sex and food preference (i.e., girls gave more non-preferred food to acquaintances, but boys gave more to friends). Children who had a negative experience as a recipient (i.e., not shared with) often still shared food when they were potential sharers themselves. These results showed only a low degree of agreement with the original study of Birch and Billman (1986). This was also true when the dumping of disliked food was disregarded as prosocial sharing, as Birch and Billman advised but did not do themselves. However, we also found support for some unconfirmed hypotheses of Birch and Billman, such as the effect of object value and age on sharing behavior. Overall, our study underscores both the need for replications and for studying the effect of social-contextual factors on young children's sharing behavior in (semi-)natural settings.

Data availability statement

The data for the current study are not publicly available, but are available from the corresponding author upon reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by the Faculty of Ethics Review Board (FERB) of the Faculty of Social and Behavioural Sciences, Utrecht University, the Netherlands. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

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Author contributions

MV, EvL, and ES conceptualized the study. EH collected and analyzed the data and wrote the first draft of the manuscript. MV made critical revisions. All authors contributed to the article and approved the submitted version.

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

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1130632/full#supplementary-material>

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EDITED BY

Alessandra Geraci,
Dante Alighieri University for Foreigners,
Italy

REVIEWED BY

Paula Dôge,
Free University of Bozen-Bolzano,
Italy
Antonio Hernández-Mendo,
University of Malaga,
Spain

*CORRESPONDENCE

Dongjie Xie
✉ xdj066@126.com

[†]These authors have contributed equally to this work and share first authorship

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The influence of children's emotional comprehension on peer conflict resolution strategies

Yanfei Cao^{1†}, Haowei Wang^{1,2†}, Yaojian Lv¹ and Dongjie Xie^{1*}

¹College of Children's Development and Education, Zhejiang Normal University, Hangzhou, China,

²Dongyang Experimental Kindergarten, Dongyang, China

Peer conflicts commonly happen in children's daily interaction, and strategies they employed to deal with the conflicts have an impact on peer conflict resolution. It has been illustrated that children's understanding of emotion plays an important role in social communication. However, there is little research focusing on the relation between emotional comprehension and peer conflict resolution strategies. In this study, 90 children of 3 to 6 finished the Test of Emotional Comprehension, and their preschool teachers were required to complete the Conflict Resolution Strategy Questionnaire, which scored each child's conflict resolution strategies. The results showed that: (a) the preference of conflict resolution strategies differed in age, and girls tended to adopt positive strategies; (b) children's emotional comprehension grew with age; and (c) children's conflict resolution strategies and emotional comprehension were closely related. Children's emotional comprehension can positively predict the overall conflict resolution strategies and negatively predicted negative strategies, whereas mental emotional comprehension can positively predict positive strategies. The factors affecting children's emotional comprehension and conflict resolution strategies, and their relationship were discussed in depth.

KEYWORDS

influence, children, emotional comprehension, peer conflict, resolution strategies

1. Introduction

Peer conflict, refers to mutual opposition between people of equal power, and occurs with the increase of children's peer interaction (Noakes and Rinaldi, 2006; Sidorowicz and Hair, 2009; Liao et al., 2014). The previous studies have examined peer conflict issues from multiple perspectives, mostly focusing on the definition and structure of children's conflict, including reasons, styles, resolution strategies, characteristics, significance, and the influential factors (Sheehan and Wheeler, 2012; Raikes et al., 2013). Researchers have documented that individual differences in peer sociometric status and teachers' reactions to disruptive behavior resulted in peer conflict; also, it was considered an essential developmental task as children mature (Miller and Olson, 2000). If the conflict is not properly resolved, it is likely to damage the relationship between children, hinder the cultivation of children's prosocial behavior, and even affect children's physical and mental health. Conflict resolution strategies were strategies used for managing conflicts. Since the original conflict model was proposed by Blake and Mouton, researchers provided several instruments to measure conflict strategies, e.g., Rahim developed the Rahim Organizational Conflict Inventory-II (ROCI-II) to measure interpersonal conflict resolution strategies--integrating, obliging, dominating, avoiding, and compromising (Rahim, 1983; Rahim and Magner, 1995; Cai, 2015). Compared with adults, children's ability of conflict resolving is developing, and is usually associated with children's understanding of social

conventions, cognitive abilities, mastery of expressive language and background of growth (Killen and Turiel, 1991). Family backgrounds are associated with children's perceptions of peer conflict resolution strategies, e.g., children's disposition to use negative conflict strategies and aggressive behaviors against peers is likely to be learned from parents (Schudlich et al., 2004). Children who experience positive forms of conflict resolution in family prefer the same strategies with interaction outside the family. The more tolerant the parents are, the more children will take peaceful settlement, exchange and other positive strategies; The more parents punish children, the more children will use force, aggression and other negative strategies. Children are likely to adopt similar strategies to their parents when solving peer conflicts (Lee et al., 2022). Rubin et al. (1998) conducted a follow-up study of children aged 2 to 4, and concluded that negative parenting might lead to a greater tendency to adopt overtly aggressive or destructive solutions. Simultaneously, children's resolution strategies are situated in conflict process. The perception, understanding and identification of the situation affect the responsive behaviors. Thornberg (2006) found the preschool children's resolution strategies were influenced by the opponent's aggressive or non-aggressive responses towards them. Thus, resolution skill learning and intervention from other peers and adults are necessary to facilitate children's peer conflict resolution, such as teacher training, and drama programs on peer-to-peer conflict for children (Catterall, 2007; Doppler-Bourassa et al., 2008; Majorano et al., 2015). As children mature, their experience in interacting with peers increases, and their social skills get improved (Chen et al., 2001; Sheehan and Wheeler, 2012). Then, they are able to display better resolution strategies and are more inclined to use strategies such as cooperation and negotiation (Ohbuchi and Yamamoto, 1990; Laursen et al., 2001).

Emotional comprehension is a component of emotional competence, which refers to understanding of perspective taking, desire beliefs, intentions related to emotions of themselves and other's (Lagattuta and Hansen, 2014; Rocha et al., 2015). Arterberry et al. (2020) insisted that emotional comprehension consists of understanding of the external causes, emotional states and expectations of emotions. Additionally, there may be a relationship between emotional comprehension and social ability. Children aged 3 to 5 developed their emotional comprehension ability faster, and 4-year-old is the critical developmental stage of emotional comprehension (Chen et al., 2001). Researchers also established that children's social experience and cognitive development had a profound impact on their emotional comprehension; if children developed better social and cognitive competence than their peers, they can reach higher level of emotional comprehension (Pons et al., 2014). Further, parents' meta-emotional philosophy and their relationships with children predicted the development of children's emotional comprehension to a certain extent (Katz and Windecker-Nelson, 2004). Camras and Shuster (2013) showed that emotional comprehension helped to develop social responsiveness, which in turn fostered the ability of communication and emotional resilience; also, children's emotional comprehension can predict their social adaptation, especially their relationship with peers (Gross, 2002; Ciarrochi et al., 2008; Deneault and Ricard, 2013). It is because children's understanding of emotions promotes their emotional expression and the formation of thinking. At the same time, it helps children to deal with personal emotions and interpersonal relationships, and reach consensus in peer conflicts (Lu, 2010).

Therefore, children with better emotional comprehension have the strength to gain acceptance and build new friendship relationships (Kouvava et al., 2022).

Peer Conflict is usually driven by certain emotional experience in peer interaction, so it is viewed as the result of emotion management (Chen et al., 2001). Researches have pointed out the correlation between peer conflict and emotional comprehension. The main conclusion is that children's peer conflict plays an important role in development of social competencies, including obtaining an understanding of peers' feelings and intentions (Licht et al., 2008). However, it requires a more explicit explanation of how preschool children's emotional comprehension affect peer conflict resolution strategies and the process mechanism. Therefore, the purpose of this study was to investigate the development of emotional comprehension and peer conflict resolution strategies of children aged 3 to 6, and the relationship between them. Based on relevant researches, the following assumptions are made: (a) the effective use of conflict resolution strategies and emotional comprehension of children develop with age, and there are gender differences; (b) emotional comprehension ability is closely related to children's conflict resolution strategies, and the former can predict the latter.

2. Materials and methods

2.1. Research design

This study selected preschool children of different ages by random cluster sampling, and evaluated their emotional comprehension and peer conflict resolution strategies. It consists of two parts: First, it examines the gender and age differences of children's emotional comprehension and peer conflict resolution strategies; Secondly, by controlling children's gender and age, linear regression method was used to explore the impact of children's emotional comprehension on peer conflict resolution strategies.

2.2. Participants

The original sample consisted of 108 preschool children aged 3 to 6 in Zhejiang Province, and 18 were excluded because they encountered difficulties in completing the tasks. Thus, there were 90 valid participants, 30 in 3-year-old group ($M = 3.44$, $SD = 0.28$, 15 boys), 30 in 4-year-old group ($M = 4.56$, $SD = 0.32$, 15 boys), and 30 in 5-year-old group ($M = 5.45$, $SD = 0.27$, 15 boys). The sample size met the requirements calculated according to G*Power (Erdfelder et al., 1996; Faul et al., 2007, 2009). Before participation, parents of preschool children signed informed consent forms.

2.3. Instruments

2.3.1. The test of emotion comprehension

The Test of Emotion Comprehension (TEC) is scored one-to-one by the teachers (Pons et al., 2004, 2014). There are nine components in total, and these components are hierarchically organized into three groups, including external emotional

comprehension, mental emotional comprehension, and reflective emotional comprehension. The external emotional comprehension consists of expression recognition, understanding of external causes and of the impact of associated external events or reminders. The mental emotional comprehension includes understanding of beliefs and desires on emotions, and the distinction between outwardly expressed and privately felt emotions. The reflective emotional comprehension focuses on mixed feelings, emotional regulation, and understanding of emotions ensured from morally action (Pons et al., 2004, 2014). According to TEC, the higher the score, the better the child's emotional comprehension.

2.3.2. The conflict resolution strategy questionnaire

The Conflict Resolution Strategy Questionnaire (CRSQ) was adapted with reference to the research of Liu (2017). There are a total of 10 strategy items, including 5 negative strategies and 5 positive strategies. The items on negative strategies are as follows: "When he/she wants the same toy as another child, he/she would grab it directly," "He/She often complains to the teacher," "He/She uses warnings or threats to stop others' words and deeds," "When dissatisfied with others in game, he/she would use force to attack companions," and "When fighting for the right to play, he/she tends to yield." Meanwhile, the items on the positive strategies include "He/She is able to resolve conflicts through negotiation," "He/She proposes rock-paper-scissors game to resolve conflicts," "He/She tends to reason in disagreements," "He/She can resolve conflicts peacefully," and "If he/she wants to take toys from others, he/she would propose toy exchange or take turns." Each item is coded on a 5-point Likert scale including specific frequency ratings ("Never," "Occasionally," "Sometimes," "Often," "Very often"). The total score of conflict resolution strategies is composed of the sum of the scores for negative and positive strategies, where the negative strategies are scored reversely. Higher scores indicate better conflict resolution strategies in children.

2.4. Procedure

TEC was conducted in a quiet, warm and familiar place, such as a book corner or a small balcony in the classroom. According to the principle of random cluster sampling, participants were selected. Before the test started, the researchers conducted a five-day familiarization period with the participants to ensure the smooth progress of the study. When children relaxed, researchers began to test the nine components of TEC. It took 10–15 min for each child. After the test of emotional comprehension, the researchers sent the CRSQ to the teacher of the child participant, and he/she was required to fill the CRSQ based on his/her daily observation and understanding of the child's behavior.

2.5. Statistical analysis

SPSS25.0 was used for statistical analysis, including descriptive statistics, analysis of variance, independent sample t-test, Kruskal-Wallis test, Mann-Whitney U test, correlation analysis and regression analysis.

3. Results

3.1. Descriptive statistics

The scores of children's peer conflict resolution strategies and emotional comprehension are shown in Table 1. The former conformed to normal distribution, but the latter non-normal distribution.

3.2. The developmental characteristics of children's peer conflict resolution strategies

Taking children's age and gender as independent variables, and children's conflict resolution strategies as dependent variables, multiple analysis of variance was performed. The results showed that there was no interaction (all p -values > 0.05).

3.2.1. The age differences in children's peer conflict resolution strategies

The results of one-way ANOVA indicated that there were age differences in children's strategies selection. Further, the post-hoc analysis suggested that the older children were, the more inclined they were to choose positive strategies (see Table 2). In the use of negative strategies, children in 5-year-old group were significantly lower than those at other ages.

3.2.2. The gender differences in children's peer conflict resolution strategies

The results of independent sample t-test showed that there were significant gender differences in strategies selection between boys and girls. Girls used more positive strategies, and boys tended to use more negative strategies (see Table 3).

3.3. The developmental characteristics of children's emotional comprehension

3.3.1. The age differences in children's emotional comprehension

The results of Kruskal-Wallis test (see Table 4) showed that there were age differences in the medians of the total score and each dimension of children's emotional comprehension, and the scores of children in the 3-year-old group were the lowest.

3.3.2. The gender differences in children's emotional comprehension

The Mann-Whitney U test results (see Table 5) indicated that there was no gender difference in emotional comprehension.

3.4. The influence of children's emotional comprehension on peer conflict resolution strategies

Through correlation analysis (see Table 6), it was found that external emotional comprehension, mental emotional comprehension,

TABLE 1 Scores of peer conflict resolution strategies and emotional comprehension in children.

	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Kolmogorov–Smirnov
Positive strategies	15.18	3.73	0.54	0.25	0.08
Negative strategies	15.26	2.83	−0.15	−0.47	0.09
Total score of strategies	30.00	5.55	0.27	−0.43	0.07
External	1.88	0.95	−0.32	−0.91	0.20***
Mental	0.89	0.87	0.43	−1.02	0.26***
Reflective	0.73	0.72	0.82	0.74	0.25***
Total score of emotional comprehension	3.50	1.92	−0.02	−0.64	0.15***

*** $p < 0.001$.TABLE 2 Results of age difference on children's peer conflict resolution strategies ($M \pm SD$).

	3-year-old group	4-year-old group	5-year-old group	<i>F</i>	<i>Post-hoc</i>
Positive strategies	11.73 \pm 1.91	15.27 \pm 1.96	18.57 \pm 3.36	55.92***	5 > 4 > 3
Negative strategies	15.43 \pm 2.98	16.37 \pm 2.74	13.77 \pm 2.33	7.17**	4, 3 > 5
Total score of strategies	26.30 \pm 4.02	28.97 \pm 4.30	34.83 \pm 4.61	30.72***	5 > 4 > 3

3 = 3-year-old group; 4 = 4-years-old group; 5 = 5-years-old group. ** $p < 0.01$; *** $p < 0.001$.

TABLE 3 Results of gender difference on children's peer conflict resolution strategies.

	Boys	Girls	<i>t</i>	<i>p</i>
Positive strategies	14.22 \pm 3.44	16.16 \pm 3.82	−2.52	0.013
Negative strategies	15.78 \pm 3.07	14.60 \pm 2.57	1.97	0.051
Total score of strategies	28.44 \pm 5.53	31.62 \pm 5.20	−2.81	0.006

and reflective emotional comprehension were positively correlated with positive strategies and the total score of peer conflict resolution strategies, and negatively correlated with children's negative strategies.

The results of linear analysis (see Table 7) showed that after controlling children's gender and age, children's external, mental and reflective emotional comprehension could positively predict the total score of peer conflict resolution strategies and negatively predict their negative resolution strategies. Additionally, the mental emotional comprehension could positively predict children's positive resolution strategies.

4. Discussion

4.1. Characteristics of children's peer conflict resolution strategies

4.1.1. Age differences in children's peer conflict resolution strategies

This study found that with the growth of age, children gradually reduce using negative strategies and adopt positive ones in coping

with conflict, which is consistent with the previous researches. Children's conflict-resolving behaviors are related to their age and maturity (Miller and Olson, 2000). In conflict situation, young children were more inclined to choose negative strategies, such as grab and yielding; however, older children preferred positive strategies, such as negotiation and exchange, which is consistent with the conclusions of Ohbuchi and Yamamoto (1990). Children in the 3-year-old group were still in the self-centered developmental stage, so it is difficult for them to solve conflicts with positive strategies, e.g., empathizing with others' experiences and feelings in peer conflicts. As children's social cognitive and communication ability developing with age, they gradually realize that positive strategies play an important role in peer interaction, and are more conducive to their interaction, i. e., children use more positive strategies in peer conflict resolution, and new types of positive strategies are constantly emerging.

4.1.2. Gender differences in children's peer conflict resolution strategies

The results indicated that boys preferred negative strategies to positive ones, while the opposite was true for girls. Relevant studies have illustrated that there were gender differences in aggressive behavior, withdrawal behavior and exclusion. Girls are more likely to adopt prosocial behavior than boys, and boys tend to use more physically aggressive strategies and withdrawal behavior than girls (Miller et al., 1986; Rose and Asher, 1999; Sadri and Rahmatian, 2003; Spivak, 2016). In other words, prosocial behavior significantly predicts children's conflict resolution strategies. Girls mature socially earlier than boys, which leads to gender differences in conflict resolution strategies. Further, social expectations and culturally shared norms reinforce gender-specific stereotypes (Eagly, 2009). Girls are trained to be more affective and to minimize aggressive display, whereas boys are expected not to show an overabundance of affection (Kostelnik et al., 2011). Williams and Bybee (1994) noted that the gender role

TABLE 4 Results of age difference on children's emotional comprehension.

	3-year-old group	4-year-old group	5-year-old group	Kruskal–Wallis	Post-hoc
External	1(0.00)	2(0.50)	3(0.50)	44.64***	5,4 > 3
Mental	0(0.50)	1(1.00)	1(0.50)	21.74***	5,4 > 3
Reflective	0(0.13)	1(0.50)	1(0.13)	24.60***	5,4 > 3
Total score of emotional comprehension	1(1.00)	4(1.00)	5(1.00)	48.51***	5,4 > 3

Data is presented as median (quartile deviation). *** $p < 0.001$.

TABLE 5 Results of gender difference on children's emotional comprehension.

	Boys	Girls	<i>U</i>	<i>p</i>
External	2(1.00)	2(1.00)	994.50	0.879
Mental	1(1.00)	1(1.00)	989.00	0.840
Reflective	1(0.50)	1(0.50)	986.50	0.817
Total score of emotional comprehension	4(1.50)	4(1.50)	1006.50	0.961

prescriptions compel girls to act considerably to peers, otherwise transgressions lead to feelings of guilt.

4.2. Characteristics of children's emotional comprehension

4.2.1. Age differences in children's emotional comprehension

Children's emotional comprehension has age differences and develops with age. The 3-year-olds have a certain ability to understand emotions, which is consistent with previous studies. Pons et al. (2014) documented that the more social experience and cognitive development children had, the higher level of emotional comprehension the children could reach, which partly explained the age differences. As age grows, children's social cognitive competencies increase, leading to improved social emotional competence, as well as emotional comprehension. Besides, the scores of the three dimensions of emotional comprehension in different age groups indicated that the development of each dimension may have a sequence. Previous study has found that infants respond differently to various facial emotional expressions starting at 7 months old (Vanderwert et al., 2015). Compared with the other two dimensions of emotional comprehension, the mixed emotional comprehension developed the slowest (Rocha et al., 2015). It is illustrated that children are limited by maturity, and lack of cognitive ability has an impact on children's understanding of mixed emotions (Zajdel et al., 2013). Several studies have confirmed that there are age differences in the development of the components of emotional comprehension, and the differences appear to be stable from age three to six (Brown and Dunn, 1996; Pons et al., 2003). Indeed, children's emotional comprehension is a gradual development process, and early childhood is an important stage of emotional comprehension development.

TABLE 6 Correlation analysis results of children's peer conflict resolution strategies and emotional comprehension.

	Positive strategies	Negative strategies	Total score of strategies
External	0.61**	−0.36**	0.60**
Mental	0.47**	−0.51**	0.59**
Reflective	0.45**	−0.28**	0.45**
Total score of emotional comprehension	0.67**	−0.52**	0.73**

** $p < 0.01$.

TABLE 7 Regression analysis results of emotional comprehension on children's peer conflict resolution strategies.

	Positive strategies	Negative strategies	Total score of strategies
Gender	−0.26***	0.19*	−0.28***
3-year-old group or not	−0.78***	−0.43**	−0.18
4-year-old group or not	−0.39***	0.20*	−0.32***
Mental	0.15*	−0.50***	0.35***
External		−0.35**	0.30**
Reflective		−0.28**	0.23**
R^2	0.65	0.53	0.69
ΔR^2	0.02	0.35	0.20
<i>F</i>	39.12**	15.66**	31.39**

The R^2 corresponds to the complete regression, and the ΔR^2 corresponds to the increment after excluding the influence of gender and age. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.2.2. Gender differences in children's emotional comprehension

The present study found that there was no significant difference in the development of emotional comprehension between boys and girls. Researchers also insisted that though boys seemed more aggressive than girls, there was no difference in their knowledge of emotions (Cassidy et al., 1992; Arsenio et al., 2000). The finding is in line with the previous researches (Pons et al., 2014). However, some researchers maintained that girls outperformed boys at understanding complex and mixed emotions. The difference may be due to the fact that the

surrounding environment makes girls more sensitive to the feelings of their peers and tend to express their felt emotions (Bosacki and Moore, 2004; Kostelnik et al., 2011; Zajdel et al., 2013). However, the social climate and parenting style play a pivotal role in shaping children's self-awareness of gender, and subsequent gender-typed behavior (Root and Denham, 2010). Therefore, children aged 3 to 6 may display gender differences in social behavior, but there is no significant difference in emotional comprehension. Emotional comprehension is one of the main social skills in early childhood, and only during the long-term socialization process will the differences between children become obvious. Thus, gender differences in the development of emotional comprehension may not be obvious in early childhood.

4.3. The influence of children's emotional comprehension on peer conflict resolution strategies

Through the research, it was found that the components of children's emotional comprehension were positively correlated with children's positive strategies and the total score of peer conflict resolution strategies, and negatively correlated with children's negative strategies. This means the higher children's emotional comprehension, the more positive strategies they will use in the peer conflict; If not, they will use more negative strategies. According to previous research, emotional comprehension is the key contextual factor that influence one's social behavior (Coulombe et al., 2019), which suggests that children with better ability of understanding emotions have better prosocial behavior, including succeeding in peer interaction.

The results of regression analysis showed that children's emotional comprehension could significantly predict children's conflict resolution strategies. Specially, the mental emotional comprehension had a positive prediction effect on the positive strategies and negative prediction effect on the negative strategies, and the external and reflective emotional comprehension had a negative prediction effect on the negative strategies. It means children with better mental emotional comprehension, which consists of three components, such as desire-based emotional comprehension, belief-based emotional comprehension and understanding of the possibility of hiding an emotion state, are more inclined to take appropriate ways to resolve peer conflicts, instead of aggressive ways (Camras and Shuster, 2013). However, children's poor development in any of the emotional comprehension dimensions may lead to the adopt the negative peer conflict resolution strategies.

Emotional comprehension is an important part of social cognitive comprehension, and is regarded as a crucial predictor of development of social competences (de Rosnay and Hughes, 2006; Belacchi and Farina, 2010; Coulombe et al., 2019). Different dimensions of emotional comprehension have different impacts on children's conflict resolution strategies. Educators and caregivers should pay attention to the specific factors of emotional comprehension that influence the conflict resolution strategies, e, g., when children frequently display negative strategies, it may be because of development delays in external, mental and reflective emotional

comprehension. Additionally, the dimensions of emotional comprehension are not fragmented but share a common cognitive basis, and the development of emotional comprehension should lay the groundwork for the mutual improvement of the various components. Social climate and educational programs should be tailored to the development of children's emotional comprehension, e.g., the facilitation program should focus on the basic dimension for the 3-year-old children, such as expression recognition and external emotional comprehension.

5. Limitations and future research

Children's peer conflict resolution strategies are affected by various factors. Studies have shown that peer conflict resolution strategies are related to their family environment, especially parenting styles (Schudlich et al., 2004), opponents' reaction (Thornberg, 2006) and adults' intervention (Blunk et al., 2017). The present study does not consider the influence of these factors on the peer conflict resolution strategies of the subjects, which has certain limitations. The interaction between these factors can be further examined in the future. In addition, this study assessed children's conflict resolution strategies through teachers' rating, which is an indirect way and may have certain problems. However, under the comparison of multiple rating approaches, this study determined teacher rating is the better choice. Also, more direct measurement approaches need to be developed in future research, which is also the research direction to be deepened in this study.

6. Conclusion

This study found that children's peer conflict resolution strategies had age differences. With the growth of age, children adopted more positive strategies than negative ones, and girls may use more positive strategies. Children's emotional comprehension also developed gradually with the age. Moreover, children's conflict resolution strategies were closely related to their emotional comprehension. Children's mental, external, and reflective emotional comprehension can positively predict the overall conflict resolution strategies and negatively predicted negative strategies, whereas mental emotional comprehension can positively predict positive strategies.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate

in this study was provided by the participants' legal guardian/next of kin.

Author contributions

HW, DX, and YC designed the research and wrote the manuscript. HW and YL collected and analyzed the data. All authors contributed to the article and approved the submitted version.

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

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EDITED BY
Aner Govrin,
Bar-Ilan University, Israel

REVIEWED BY
Shanshan Ma,
California Lutheran University, United States
Rodolfo Barragan,
University of Washington, United States

*CORRESPONDENCE
Mary S. Tarsha
✉ mtarsha@nd.edu

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The evolved nest, oxytocin functioning, and prosocial development

Mary S. Tarsha* and Darcia Narvaez

Department of Psychology, Kroc Institute for International Peace Research, University of Notre Dame, Notre Dame, IN, United States

Prosociality, orientation to attuned, empathic relationships, is built from the ground up, through supportive care in early life that fosters healthy neurobiological structures that shape behavior. Numerous social and environmental factors within early life have been identified as critical variables influencing child physiological and psychological outcomes indicating a growing need to synthesize which factors are the most influential. To address this gap, we examined the influence of early life experiences according to the evolved developmental niche or *evolved nest* and its influence on child neurobiological and sociomoral outcomes, specifically, the oxytocinergic system and prosociality, respectively. To-date, this is the first review to utilize the evolved nest framework as an investigatory lens to probe connections between early life experience and child neurobiological and sociomoral outcomes. The evolved nest is comprised of characteristics over 30 million years old and is organized to meet a child's basic needs as they mature. Converging evidence indicates that humanity's evolved nest meets the needs of a rapidly developing brain, optimizing normal development. The evolved nest for young children includes soothing perinatal experiences, breastfeeding, positive touch, responsive care, multiple allomothers, self-directed play, social embeddedness, and nature immersion. We examined what is known about the effects of each evolved nest component on oxytocinergic functioning, a critical neurobiological building block for pro-sociomorality. We also examined the effects of the evolved nest on prosociality generally. We reviewed empirical studies from human and animal research, meta-analyses and theoretical articles. The review suggests that evolved nest components influence oxytocinergic functioning in parents and children and help form the foundations for prosociality. Future research and policy should consider the importance of the first years of life in programming the neuroendocrine system that undergirds wellbeing and prosociality. Complex, interaction effects among evolved nest components as well as among physiological and sociomoral processes need to be studied. The most sensible framework for examining what builds and enhances prosociality may be the millions-year-old evolved nest.

KEYWORDS

oxytocin, early life experience, empathy, evolved nest, parenting, prosocial

Introduction

Individual and societal thriving depend upon sociomoral capacities, such as empathy, and prosociality, an orientation to attuned, empathic relationships. Though western traditions have largely emphasized top-down socialization of sociomorality (i.e., verbal teaching and coercion; Kant, 1964), emerging research in developmental neurobiology demonstrates that prosocial

capacities are rooted in neurophysiological structures that are shaped in early life through supportive care (Atzil et al., 2018). This is because the brain is most plastic in early life, experience expectant, and shaped by social experience (Coulombe et al., 2019; Phua et al., 2020). We address humanity's evolved system for raising the young, the *evolved nest* (Narvaez, 2014), focusing on one biological aspect known to correlate with empathy and prosociality, the neuropeptide oxytocin, whose function is influenced by early life experience.

Oxytocin: critical neuropeptide for health and prosociality

Oxytocin is a powerful neuropeptide, a pleiotropic hormone of critical importance for social bonding and health across the lifespan. Consisting of nine amino acids, oxytocin is produced in the hypothalamus and plays a role in integrative functions (coordination of physiology and behavior) such as birth, lactation, maternal behavior, and romantic bonding (Carter, 2014). The complex pathways oxytocin travels contribute to its widespread function, allowing it to operate not only as a hormone, but also as a neurotransmitter and a paracrine substance (cell-to-cell communicator), enabling it to play a role in regulating numerous physiological systems including reproductive, immune, and autonomic and central nervous systems (Carter et al., 2020). It also supports the functioning of the vagus nerve, a major branch of the parasympathetic nervous system that innervates all the major organs of the body to maintain health (Porges, 2007). The well-functioning vagus is associated with a sense of safety, contributing to capacities for social closeness and sensitivity within caregiver-infant interactions as well as in adult romantic relationships (Porges, 1998, 2003). Oxytocin supports patterns of growth, resilience and healing by increasing anti-inflammatory and antioxidant capabilities and supporting stress coping (Carter et al., 2020). In early life, parental oxytocin release combined with behavioral synchrony between parent and child influence child sociality (Feldman, 2015).

Research into oxytocin has taken two approaches. Some studies involve *exogenous* oxytocin, the administration of the neuropeptide in experimental protocols, whereas other studies investigate *endogenous* (embodied or made naturally within the body) oxytocin. Both exogenous and endogenous oxytocin are closely associated with social behavior which makes sense in light of the broad range of oxytocin receptors present throughout the brain. Receptors are specifically expressed in the social brain network, comprised of the prefrontal cortex, cingulate cortex, and amygdala, areas of the brain that are involved in reproduction, maternal behavior, affiliation, and attachment (Nishizato et al., 2017).

Exogenous oxytocin, typically administered nasally, decreases threat reactivity by dampening amygdala reactivity to emotional stimuli, making it useful in treating social anxiety (Jones et al., 2022). Exogenous oxytocin also boosts empathy and prosocial behavior in adults (Domes et al., 2007; Kanat et al., 2015). However, the relationship between prosociality and exogenous oxytocin is more complicated than simply increasing positive outcomes. Depending upon personal history, including attachment style, it can increase antisocial behaviors such as gloating, envy, out-group hostility and ethnocentrism (Keltner et al., 2014). Further, sociomoral outcomes vary. For example, one study found that exogenous oxytocin enhanced *emotional* empathy (feeling with) but not *cognitive* empathy

(perspective taking; Hurlmann et al., 2010), and another found that it increased compassion-focused imagery but only in individuals with higher attachment security (Rockliff et al., 2011).

Endogenous oxytocin is also associated with prosociality, including compassionate behavior (Eisenberg and Eggum, 2008). In a convenience sample of adults ranging from 18 to 99, Zak et al. (2022) found correlations of oxytocin release with prosocial behaviors (donations to charity, volunteering). Oxytocin release increased with age and moderated the impact of age on prosocial behaviors. However, the association between endogenous oxytocin and prosociality may not be a direct linear association but may depend upon context. For example, increased endogenous oxytocin levels within the parent-infant relationship promote affiliative and nurturant behaviors such as *tend-befriend* behavior but when engaged in in-group vs. out-group interactions, oxytocin supports affiliative *tend-defend* motivations and behavior (Taylor et al., 2006; Campbell, 2008; Crockford et al., 2014). Variations in oxytocin release and social behavior may be attributed to its widespread interactions with other neuroendocrine systems (Crockford et al., 2014).

Advances in developmental psychobiological research demonstrate that dynamic interactions in early life—the interplay between the child and the caregiving environment—shape biological processes, including oxytocinergic functioning (Lomanowska et al., 2017). For example, when optimally operative, oxytocin serves as a protective mechanism against stress and adversity, supporting resilience and adaptation at every age (Smeets, 2010; Sharma et al., 2020). However, the degree to which the oxytocinergic system develops optimally depends upon experience, specifically, early relationships (Carter et al., 2009; Köhler-Dauner et al., 2019). Consequently, the last two decades of developmental psychobiological research has focused on examining a wide range of environmental influences including the quality and nature of caregiving on child outcomes (Calkins, 2011; Veenema, 2012; Sandi and Haller, 2015; Onaka and Takayanagi, 2021).

The focus of this review was to address what is known regarding the role of early experience on oxytocinergic functioning and its relation to prosocial capacities. The specific sociomoral capacities targeted were empathy and prosociality, especially as they relate to oxytocinergic functioning (e.g., Apter-Levy et al., 2013; Carter et al., 2017). It was expected that studies would show that the developmental trajectory of oxytocinergic functioning depends upon and is influenced by early care consistent with our species' developmental system, the *evolved nest*.

The evolved nest

Humanity's *evolved nest* emerged from the social mammalian line which is over 30 million years old (Konner, 2005). Like every animal's developmental system, the *evolved nest* is organized to meet the basic needs of the young as they mature (Gottlieb, 2002). Also named the hunter-gatherer childhood model (Konner, 2005), *evolved nest* provision is still apparent in today's nomadic foraging communities, the type of society in which humanity spent at least 95% of its existence, which we call our ancestral context (Lee and Daly, 2005; Fry, 2006). Over the course of human evolution, a large social brain emerged, with distinctive capacities from those of chimpanzees, accompanied by intense child raising (Burkart et al., 2009; Hrdy,

2009a). Because they are highly immature at birth with only about a quarter of adult brain volume, resembling fetuses of other animals until about 18 months of age, humans are particularly dependent on their *evolved nest* (Trevathan, 2011). Human infants expect an ‘external womb’ experience during the early months of life, which facilitates healthy development (Montagu, 1986). Well-nurtured, species-normal organisms exhibit biological self-regulation, good health, and fittedness in the ecological and social environment in which they exist, operating effectively with conspecifics and other organisms. Humanity’s *evolved nest* is designed to prepare a child for self-regulation, good health, social and ecological fittedness and, theoretically, enhanced sociomoral capacities of prosociality and empathy, required for adaptation (Narvaez, 2014).

Provisioned by a community and not simply by mothers, the *evolved nest* for young children includes (Hewlett and Lamb, 2005; Narvaez and Bradshaw, 2023): (1) soothing perinatal experiences; (2) breastfeeding on request for several years; (3) nearly constant positive touch; (4) appropriate responses to keep baby optimally aroused; (5) multiple allomothers (care by responsive individuals other than mothers such as fathers and grandmothers); (6) multiage self-directed free play; and (7) social embeddedness, with a positive, welcoming social climate, and (8) nature immersion. Ethnographic evidence suggests that communities that provide the *evolved nest*—nomadic foragers—exhibit highly prosocial, compassionate, generous, caring, and egalitarian behavior (Wolff, 2001; Ingold, 2005; Fry and Souillac, 2013; Narvaez et al., 2013c; Narvaez, 2019; Topa and Narvaez, 2022). Thus, it has been proposed that the *evolved nest* may be necessary for the development of species-typical sociomoral capacities (Narvaez, 2014). Converging evidence from developmental psychology, neuroscience, evolutionary biology, and epigenetics suggests that *evolved nest* components may be critical variables in shaping oxytocinergic functioning (e.g., Schore, 2003; Kim et al., 2011; Carter and Porges, 2013; Champagne, 2018). We examined empirical evidence regarding the relation of *evolved nest* components to oxytocin system functioning. Oxytocin system development may be part of the physiological foundations for humanity’s social fittedness.

The review of direct and indirect effects

In this review, we note what is species-normal in humanity’s *evolved nest* context. We examine what is known regarding the specific effects on oxytocinergic functioning of each *evolved nest* component (perinatal factors, breastfeeding, touch, responsiveness, alloparents, free play, social embeddedness or positive climate, and nature connection). Across the numerous empirical and theoretical studies reviewed, the terms “adaptive,” “optimal,” and “regulated” are employed to refer to behavioral and physiological processes that are advantageous. That is, oxytocin levels considered adaptive or regulated are discussed in terms of specific empirical contexts (Porges, 2007). For example, if a stress condition is employed, researchers discuss adaptive responses in terms of self-regulatory processes and successful completion of tasks.

Regarding scope, each *evolved nest* component is discussed in relation to empirical evidence available for oxytocinergic functioning (see Figure 1, Path a). Next, the relation between the *evolved nest* component and empathy and prosociality is discussed, again, in terms

of empirical evidence of oxytocin functioning (Figure 1, Path b). We call this path the indirect path because it examines how *evolved nest* components relate to empathy and prosociality through oxytocinergic functioning (Paths a and b). We also examine connections between evolved nest components and empathy and prosociality, not taking into account oxytocin (Figure 1, Path c). We call this path the direct path. When little information is available regarding a specific *evolved nest* component and empathy or prosociality, correlates of prosociality are employed. Lastly, gaps in the literature regarding the *evolved nest*, oxytocin and prosociality are highlighted, noting areas for future research.

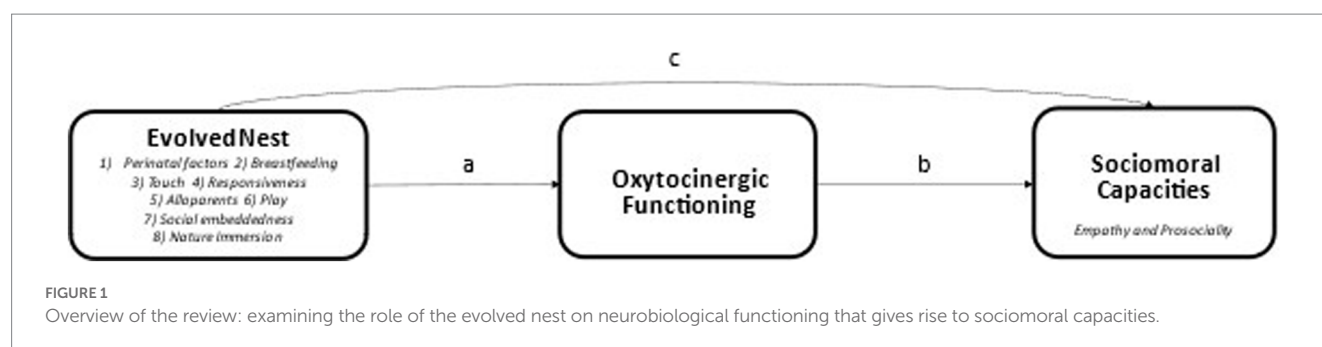
Soothing perinatal experiences

Within the *evolved nest* context, the mother is supported by other women and community members during pregnancy, at birth and postnatally. Birth follows the natural rhythms of the mother and child, which allows optimal physiological and psychological processes to prepare the mother’s and infant’s bodies for labor and birth (Trevathan and McKenna, 1994; Trevathan, 2013). For the mother, physiological preparedness before the onset of labor and birth includes low social stress and a rise in oxytocin as well as other hormones (e.g., estrogen, beta-endorphins and prolactin; Buckley, 2015). For infants, who vary in womb residence by about 55 days, determining their own birth date is more likely to enable physiological preparedness such as maturation of lungs and other organs to facilitate adjustment to life outside the womb (Trevathan, 2011, 2013). At birth, increases in catecholamines promote breathing, glucose production and heart regulation. *Evolved nest* provision during the perinatal period means the child experiences supportive, comforting, and soothing care and harsh, intrusive, and painful procedures are avoided. There is little interference in natural processes. Support of the dyad provides opportunity for physiologically-driven maternal–infant bonding, along with breastfeeding success, infant adaptation, and a healthy start (Buckley, 2015).

Perinatal experiences and oxytocin

The effects of endogenous oxytocin during birth are specific—e.g., inducing uterine contractions—and broad—impacting numerous neurobiological systems in both mother and infant. Mice studies demonstrate that during birth, oxytocin operates through a series of pathways that overlap with numerous other hormonal systems such as cortisol and corticotrophin-releasing hormone (Gross et al., 2000; Ratajczak and Muglia, 2008). Similarly, in humans, oxytocin is part of a much larger cascade of neuroendocrine pathways that overlap and interact with each other to initiate and sustain successful childbirth. Disrupting experiences, such as interference or complications during birth, potentially alter this complex cascade of neurobiological pathways, including oxytocin release. For example, when comparing birth types and measuring oxytocin levels immediately before delivery, vaginal births are associated with the highest level of maternal venous oxytocin concentrations whereas cesarean section births have the lowest levels (Marchini et al., 1988; Moberg and Prime, 2013). The same oxytocin patterns (assessed via umbilical cord) are observed in corresponding infants.

Neurobiological factors that contribute to the onset of the birth process involve a complex interaction among mother, infant, and



placenta (Kenkel et al., 2014). Maternal oxytocin increases throughout pregnancy to facilitate calmness and preparedness for childbearing. During birth, maternal oxytocin is released both centrally (in the brain) as well as induced through activation of afferent sensory nerve fibers in the mother's pelvis (Uvnäs-Moberg et al., 2020b). When the infant's head exerts pressure on the cervix and vaginal wall, oxytocin is released into the mother, an effect known as the Ferguson reflex. Maternal pulses of oxytocin in the brain released during the childbearing process activates her reward system, decreasing pain, fear, and stress, and increasing bonding to the newborn (Buckley, 2015). In addition, the actual process of childbirth itself increases maternal oxytocin receptor expression (Broad et al., 1999), thought to promote breastfeeding and healthy attachment.

For the fetus before birth, oxytocin is released into fetal circulation from the fetal brain (via the posterior pituitary gland) bringing about multiple physiological benefits (Strathearn, 2011). These benefits include preparing the infant for birth and the extrauterine environment, and triggering changes to fetal gamma-aminobutyric acid (GABA), a neuroinhibitory transmitter that functions to reduce excitability in neurons, which is critical for healthy neuronal development (Tyzio et al., 2006; Khazipov et al., 2008). Prior to delivery, GABA functions as an *excitatory neurotransmitter* in the fetus, rather than its usual role as a prototypical *inhibitory signal* in the mature brain. Oxytocin supports the critical transition from excitatory to inhibitory functioning, catalyzing neurons to undergo electrophysical changes, critical for the infant's survival because the oxytocin-dependent GABA transition protects the fetal brain from hypoxic conditions that otherwise might take place during parturition. In addition, the oxytocin-induced GABA transition also acts as an analgesic, reducing polarization of GABA on nociceptive (pain) neurons. Thus, oxytocin not only initiates birth through maternal uterine contraction, but also changes the infant's GABA neuromodulators from inhibitory to excitatory which later protects the newborn from both pain and hypoxia.

What about synthetic (exogenous) oxytocin given to pregnant women to induce labor? Perinatal exogenous oxytocin is linked to detrimental outcomes such as neonatal jaundice, decreased breastfeeding and interference with mother-infant bonding (Schiefelhövel and Trevathan, 2019; Trevathan and Rosenberg, 2019). In addition, higher synthetic oxytocin administration during labor is associated with an increase in maternal depression, anxiety, and somatization symptoms 2 months after giving birth, even controlling for perinatal posttraumatic stress related to childbirth experiences (Gu et al., 2016). Consequently, there is a growing interest in investigating the routine practice of administering synthetic oxytocin during labor. However, some evidence indicates that oxytocin administration can

curb the effects, not only of dangerous, prolonged labor but under some conditions, postpartum hemorrhage (Kenkel et al., 2014). Nonetheless, its routine use is questionable considering the potential long-term adverse effects (Harris and Carter, 2013).

Considering the growing consensus regarding the potential adverse effects of routine oxytocin administration during childbirth, there is increased interest in facilitating endogenous oxytocin through natural methods that were common in our ancestral context (Trevathan, 2013). These include physiological manipulations such as tactile stimulation of sensory nerves (e.g., nipples), gentle touch, and calming, supportive social interactions (Olza et al., 2020). The latter can be implemented by the woman's partner or midwife to reduce stress, pain, and anxiety. However, few studies have been conducted that measure the rise of oxytocin during such body-centered interventions during childbirth (Tarsha et al., 2020). Following the natural rhythms of the mother-child dyad in the perinatal period may also provide rich data.

Perinatal experiences and prosociality

Regarding prosociality, during pregnancy mothers with higher *endogenous* oxytocin show higher scores on theory of mind, a construct closely associated with empathy, even after controlling for parity, maternal education, prenatal psychosocial risk, and general anxiety (MacKinnon et al., 2014). Endogenous perinatal oxytocin effects are understudied, though uninterrupted natural birth practices may be associated with greater maternal empathy for the neonate because of natural oxytocin flow. More empirical evidence is available for *exogenous* perinatal oxytocin and its influence on disorders associated with deficits in empathy, as well as increased risk for child psychiatric conditions such as bipolar disorder and cognitive impairment (Freedman et al., 2015). However, a recent meta-analysis by Lønfeldt et al. (2019) concluded that administered perinatal oxytocin's relationship to psychiatric conditions is premature and more research is needed to accurately assess its influence on child development.

Breastfeeding

Within the *evolved nest* context, breastfeeding takes place on-request, following the subtle and overt signals of the infant, and begins immediately following birth, persisting anywhere from 2.5 to 5 years or longer, with an average age of weaning around 4 years (Hrdy, 2009a). Unfortunately, in the United States, only 25% of women exclusively breastfeed their infants at 6 months of age with 34% at 1 year (Louis-Jacques and Alison Stuebe, 2018). Most studies comparing

breastfeeding with formula-feeding examine only 3 months' worth of feeding, thus findings do not encompass species-typical practice. Moreover, studies typically do not report on whether the infant is in charge of feeding, or how often or whether the infant's signals to feed are always fulfilled.

Breast milk is the most beneficial source of nutrition for an infant, but breastfeeding involves much more than the delivery of nutrition. Comprised of water (87%), proteins (1.0%), fat (3.8%), and lactose (7%), breast milk also has a host of immune cells such as microRNAs, hormones, bioactive compounds with anti-inflammatory and anti-infective properties such as cytokines, chemokines, immunoglobulins, growth factors, oligosaccharides, and antimicrobial peptides such as bacteriocin and lactoferrin (Duale et al., 2022). In comparison to infant formula, the benefits of breastfeeding—for both the mother and the infant—are numerous. For the infant, benefits encompass healthier brain development including greater neuronal myelination (Der et al., 2006; Victora et al., 2015), higher intelligence scores (Horta et al., 2015), and lower risk of infections and death (Rollins et al., 2016). Benefits for breastfeeding mothers comprise reduced stress and depressive symptoms and increased maternal–infant attachment (Krol and Grossmann, 2018), as well as long term protection against ovarian and breast cancer (Victora et al., 2016). Breastfeeding mothers also demonstrate enhanced emotion cue detection (Krol et al., 2014; Matsunaga et al., 2020).

Breastfeeding and oxytocin

Breastfeeding can be regarded as the final stage of labor (Labbok, 2001), providing a natural analgesic for infants (Gray et al., 2002). Oxytocin is critical for breastfeeding success due to its role in the milk ejection reflex (Erickson et al., 2020). Prolactin promotes milk synthesis and oxytocin milk release. When breastfeeding occurs, oxytocin, along with other hormones including estrogen, are released into the maternal brain, resulting in numerous physiological changes (Moberg and Prime, 2013).

Oxytocin in breastmilk, specifically colostrum which is not found in infant formula, is associated with anti-inflammatory effects in rats. More specifically, Klein et al. (2017) found that oxytocin in breast milk protected enterocytes (cells in the intestinal lining) from apoptotic cell death and supported cellular metabolism to promote enterocyte cell differentiation (cells becoming individualized for different functions). Further, oxytocin present in colostrum and breastmilk protected the intestinal villi from cellular stress. Oxytocin also downregulates inflammation processes by impeding protein translation and the promotion of autophagy (the cleaning out of damaged cells). As such, at least in rats, oxytocin in colostrum and breastmilk may be an important component of building a healthy gut microbiome and reducing inflammation.

In human mothers, release of oxytocin is catalyzed through sensory nerves in the mother's breasts which release, on average, pulses of oxytocin every 90-s over the first 10 min of breastfeeding (Jonas et al., 2009). Within the first minute of infant suckling or stimulation with a breast pump, milk ejection takes place (Ramsay et al., 2004). During milk ejection, oxytocin is released from the magnocellular neurons of the pituitary gland's supraoptic (SON) and paraventricular (PVN) nuclei of the hypothalamus, which also cause uterine contractions, facilitating the expulsion of the placenta. The PVN also have axons that go directly into the brain which influence activity of the hypothalamus–pituitary–adrenal axis (HPA), the

autonomic nervous system including the vagus nerve, affecting general wellbeing and social interactions (Veenema and Neumann, 2008), thereby increasing maternal wellbeing.

For the infant, multiple sensory nerves are stimulated during breastfeeding through which oxytocin is released. Sensory nerves present in the infant's oral mucosa and other parts of the infant's face and body, including the stomach itself, are all stimulated by breastmilk and breastfeeding (Moberg and Prime, 2013). All of these sensory nerves lead directly into the PVN and SON to catalyze oxytocin release in the breastfeeding infant.

Breastfeeding has also been associated with maternal stress reduction and enhanced positive mood through oxytocinergic functioning. Surges in oxytocin during breastfeeding are known to dampen the effects of stress hormones (Cox et al., 2015). Oxytocin interacts with the HPA by lowering adrenocorticotropin hormone (ATCH) and cortisol (Uvnäs-Moberg et al., 2020a). Self-report studies confirm oxytocin's role in reducing stress: breast-feeders reported less perceived stress than bottle-feeders, than mothers who never breastfed before, and than those who breastfed in the past but who had stopped breastfeeding (Mezzacappa and Katkin, 2002). Further, there was a difference in women's mood before and after feeding. Breastfeeding mothers reported a decrease in *negative* mood whereas bottle-feeding mothers reported a decrease in *positive* mood. This association makes sense in light of the relationship between breastfeeding and increased maternal oxytocin levels. For example, Grewen et al. (2010) compared mothers who reported breastfeeding 90% or more of the time in comparison to mothers who reported formula feeding at least 80% of the time. Across five changing experimental conditions, breastfeeding mothers had significantly higher levels of oxytocin than bottle-feeding mothers—measured by both plasma and saliva. The neurochemical and the self-report studies provide converging evidence that breastfeeding is related to increased oxytocin levels and may play an important part in reducing maternal stress and enhancing mood, as well as facilitating the continuation of breastfeeding. Their connection may be rooted in oxytocin being released by the PVN, as outlined above, because its axons both facilitate milk let down and also connect to numerous other systems that enhance wellbeing (Veenema and Neumann, 2008).

Given the difference in maternal oxytocin levels and breast/bottle feeding, other studies have investigated the relation of feeding type, maternal mental health and oxytocin levels. Several studies found that mothers who report more anxiety and depression also demonstrate lower levels of oxytocin when breastfeeding than asymptomatic breastfeeding mothers (Stuebe et al., 2013; Cox et al., 2015; Pawluski et al., 2017). More recently, Whitley et al. (2020) found evidence to challenge this claim. Utilizing longitudinal methods, the group investigated oxytocin levels in 222 breastfeeding mothers when infants were 2 and 6 months of age and also measured antidepressant use and anxiety and depression symptoms. Maternal anxiety and depressive scores were not related to oxytocin levels at either time point. However, the group did find an interaction between antidepressant use and oxytocin levels. Mothers taking antidepressants had significantly lower oxytocin levels when breastfeeding than mothers not on medication. Given their findings, more research is needed to disentangle the relationship between maternal oxytocin, depression, anxiety, antidepressant use and breastfeeding.

Regarding *exogenous* oxytocin when given to induce labor, there are connections between maternal endogenous oxytocin levels and

breastfeeding behavior. Jonas et al. (2009) found an inverse association such that as the dose of synthetic oxytocin given during labor *increased*, the level of endogenous oxytocin during breastfeeding postpartum (day 2) *decreased*. Further, women who had both administered oxytocin *and* an epidural (painkiller) had the *lowest* endogenous oxytocin levels when breastfeeding compared to other women (natural birth, or epidural but no administered oxytocin). Gu et al. (2016) found that higher doses of administered oxytocin during labor *decreased* maternal breastfeeding duration. As the dosage of administered oxytocin given during labor increased, mothers at 2 months postpartum were less likely to continue breastfeeding. Together, these findings suggest that breastfeeding increases maternal endogenous oxytocin whereas administering synthetic oxytocin during labor interferes with this association and may decrease breastfeeding duration. This also underscores the possible interrelatedness of *evolved nest* components on neurobiological processes that influence behavior: perinatal experiences, such as oxytocin administration, may influence maternal oxytocin levels later (after the infant is born), affecting subsequent breastfeeding behavior.

Breastfeeding and prosociality

For mothers, breastfeeding supports empathic, attuned, prosocial responses that include emotion recognition. For example, Krol et al. (2014) found that longer durations of exclusive breastfeeding were associated with faster recognition of happiness and slower recognition of anger, both responses that are associated with prosocial responsiveness. This combination of emotional detection (high emotional detection for happiness but low for anger recognition) is thought to be important for rapid responses to affiliative stimuli by also reducing the importance of threatening influences. Breastfeeding mothers show increased empathy to their own infant crying (Kim et al., 2011). Finally, a more recent study found that oxytocin was positively related with empathy and breastfeeding intention (Permatasari and Syafruddin, 2022).

For children, breastfeeding may be associated with increased empathy. Narvaez et al. (2011) found that breastfeeding length was correlated with reported empathy in three-year old children. Saarinen et al. (2020) examined the longitudinal effects of breastfeeding on adult dispositional compassion and empathy. Utilizing a large sample ($N = 1,394$), breastfeeding did not predict either sociomoral outcomes even when controlling for age, gender, socioeconomic factors and family environment. However, most participants (913) were breastfed for less than 5 months and only 36 were breastfed more than 12 months. As noted earlier, no known studies examine the average length of species-typical breastfeeding (4 years). More research is needed that pays attention to dosage and includes a more species-typical range in investigating the possible long-term effects of breastfeeding on empathy.

Positive touch

Touch is a complex set of behaviors but can generally be divided into positive or negative categories. Positive touch experiences refer to welcomed affectionate touch, whereas we discuss negative touch as the presence of harsh touch. Within nomadic forager communities, contexts where the *evolved nest* is provided, Schiefenhövel and

Trevathan (2019) noted how positive touch is abundant and provided from the first moments after birth. A short initial cry immediately after birth, as the lungs take in air for the first time, is an expected phenomenon in these societies but otherwise crying is not expected since it is a costly metabolic expenditure. Crying is mitigated in order to facilitate infant survival both in terms of energy preservation and the possible alerting of predators to the vulnerable mother and infant. Consequently, immediately after birth, the initial cry of the infant is met with an abundance of affectionate touch that includes cradling and soothing. After this, babies and young children continue to remain physically close, in contact with their mothers and others at all times, including at nighttime (Hewlett and Lamb, 2005).

As social mammals, infants and children need extensive positive (affectionate) touch for proper development and are more likely to suffer adverse outcomes if they are deprived of it (Montagu, 1986; Narvaez et al., 2019). Decades of empirical evidence (Spitz, 1945; Maitre et al., 2017) demonstrate that affectionate touch is the cornerstone of interpersonal interactions and sensory-cognitive development. Positive touch facilitates social and emotional (Feldman and Eidelman, 2004), neurobehavioral and cognitive development (Feldman and Eidelman, 2003). Frequency of maternal affectionate touch is also associated with increased social orientation in infants, which contributes to the development of the social brain (Reece et al., 2016) and body awareness (Crucianelli and Filippetti, 2020). Adverse outcomes associated with deprivation of tactile stimulation have been well documented in orphanages (e.g., Maclean, 2003). Orphans deprived of touch demonstrated adverse intellectual, physical, behavioral, and socio-emotional outcomes in addition to diminished capacities to modulate sensory experiences (Wilbarger et al., 2010).

Recent neuroimaging studies support the view that infants evolved for positive touch from the first months of life. Using diffuse optical tomography with 2-month-old infants, Jönsson et al. (2018) found that slow stroking touch (similar to emotionally valent touch or caressing), but not fast touch, yielded neurological activations similar to activations in developed, adult brains. From the earliest months of life, positive emotional or affective touch is not only encoded in the infant's brain in a mature way, but infants are also able to discern types of touch. This suggests that infants are wired for emotional touch from the first months of life.

In addition to caressing touch, human infants may expect positive *moving* touch, which promotes brain development. A recent study demonstrated the calming effects of moving touch on an infant (Ohmura et al., 2022). At the societal level, those that keep young children 'in arms' and breastfeed for at least 2.5 years are more likely to be peaceful, explaining 80% of the variance among over 400 societies; no sanction of premarital sex, a touch-filled activity, explained 100% of the variance (Prescott, 1996).

Negative touch

Corporal punishment is a type of negative touch that has different connotations both in the vernacular as well as in different cultural settings. Following legal definitions, Gershoff (2002) defined corporal punishment as "the use of physical force with the intention of causing a child to experience pain but not injury for the purposes of correction or control of the child's behavior" (p. 540). A wealth of literature has delineated the long-term negative consequences of corporal punishment, such as spanking, hitting, and pinching children

(Fergusson et al., 2008; Grogan-Kaylor et al., 2018). Over a span of five decades, numerous cross-cultural studies, longitudinal investigations (Berlin et al., 2009; Gershoff et al., 2012), and large meta-analyses (Gershoff, 2002; Gershoff and Grogan-Kaylor, 2016) provide converging evidence regarding the harmful outcomes, which include depression or depressed mood (Fergusson et al., 2008), antisocial behavior (Straus et al., 1997), substance use, suicidal ideations (including attempts) and self-injurious behavior (Afifi et al., 2017). The meta-analysis of Gershoff and Grogan-Kaylor (2016) found no effect size difference between spanking and physical abuse, demonstrating that both share similar associations with detrimental child outcomes. This is consistent with previous findings investigating spanking alone, suggesting “spanking is empirically similar to physical and emotional abuse” (Afifi et al., 2017, p. 25).

Touch and oxytocin

Together with caregiver warmth and odor, positive touch induces the release of oxytocin (Uvnäs-Moberg et al., 1987), which is particularly evident in both members of the mother-infant dyad immediately after birth (Uvnäs-Moberg et al., 2015; Moberg et al., 2020). Pulses of oxytocin are released in the mother and infant postpartum when in physical contact with one another (Bigelow and Power, 2020). Matthiesen et al. (2001) observed that, similar to other mammals, newborn human infants manipulate the mother's breast to initiate breastfeeding. In addition, a coordinated pattern of infant hand movements and suckling was identified; the repetitive breast massage by the infant stimulated a significant increase in maternal plasma oxytocin ($p < 0.005$). Skin-to-skin contact immediately following birth promoted greater oxytocin levels in fathers as well (Cong et al., 2015) demonstrating a possible biological mechanism for healthy parent-infant attachment (Levine et al., 2007). As the child develops, positive touch experiences such as hugs, back rubs, and other forms of affectionate touch continue to facilitate the release of oxytocin (Field, 2014). The short- and long-term benefits of oxytocin induced via positive touch experienced across the lifespan are numerous and include increased social bonding, wellbeing, vagal stimulation, and decreased aggression, sympathetic activation, stress reduction (decreased HPA activity), pain, and fear (Uvnäs-Moberg et al., 2020a).

Regarding negative touch and oxytocin, more studies have investigated the role of *deprivation* of touch (or low vs. high positive touch) rather than harsh touch or corporal punishment. For example, variations in maternal care are associated with differences in oxytocin receptor levels in the rat (Champagne et al., 2001). Specifically, maternal licking and grooming (LG), a form of tactile stimulation and affiliative care, is related to oxytocin receptor levels such that mothers who demonstrated higher LG have significantly higher receptor oxytocin levels. The relationship between maternal affiliative touch and maternal oxytocin levels has been observed in other mammals (monogamous and polygamous voles; Insel and Shapiro, 1992). Further, cross-fostering provides evidence that differences in oxytocin levels in mothers were dependent upon their childhood maternal care (Champagne et al., 2006). Cross-fostering involves the rearing of pups from offspring of mothers with significantly different levels of oxytocin and estrogen—the latter hormone is known to influence levels of oxytocin. When pups from mothers with low oxytocin and estrogen levels were placed in the care of mothers with high oxytocin and estrogen levels, pups developed high estrogen and oxytocin levels.

Touch and prosociality

In observation studies of the effects of touch on behavior, people are more responsive to requests when they are accompanied by touch, such as rating salespersons more highly or providing higher tips to wait staff (Heslin and Patterson, 1982; Joule and Gueguen, 2003; Gueguen, 2004). We can assume that such behaviors are guided, at least in part, by oxytocin release, which friendly touch promotes.

Narvaez et al. (2019) conducted several studies examining connections between touch and sociomoral behavior. In Study 1 ($n = 156$), moderate to strong correlations were found between maternal reports of touch (in infancy and touch concurrently) with their preschoolers' sociomoral capacities, including empathy. In Study 2 ($n = 682$), using an existing longitudinal observational and interview dataset with at-risk mothers and their children in the first 3 years of life, children whose mothers were more affectionate through the years were more concerned and caring about others. Low corporal punishment and high touch predicted empathy and other sociomoral outcomes. In Study 3 ($n = 607$), adult reports of *evolved nest*-history indicated relations between positive touch and empathy. Specifically, positive touch predicted greater emotional empathy and perspective taking whereas corporal punishment predicted less. In general, across studies, more affectionate touch and less punishing touch were positively associated with wellbeing and development of sociomoral capacities.

Responsive relational care

Providing responsive care means meeting the needs of the infant or child in the present moment, keeping infants in an optimal state of arousal—not stressed and not under aroused (Schore, 2019). Within the *evolved nest* context, children receive consistently warm, responsive care by mothers and other caregivers (see section on alloparents), starting from their earliest moments of life throughout childhood (Narvaez et al., 2019).

According to western science, responsive care requires the implementation of consistent and accurate detection and recognition of children's overt signals, especially in times when the infant or child is distressed (Szymanska et al., 2017). Responsivity includes mutual gaze transactions that are synchronized or attuned. The caregiver synchronizes behavior to the child's, helping regulate the child's changing emotions and behaviors, using both verbal and nonverbal expressions, communicating emotions back to the child. Similarly, the National Scientific Council on the Developing Child (2004) described optimal responsive care through the metaphor of “serve and return.” Parents, teachers and other alloparents provide responsive care, initiating and then appropriately responding to infant signals. According to Schore (2009), responsivity involves a wider view of dyadic behavior that involves psychobiological attunement, affective communication between the mother (or caregiver) and infant or child that is bodily based. In non-Westernized contexts, typically, responsive care is provided by a set of caregivers (discussed in the next section) who anticipate the needs of the child and meet them to prevent distress (Gaskins et al., 2017).

Responsivity and oxytocin

Responsivity may be the most well studied of the *evolved nest* components regarding effects on oxytocinergic functioning. Often considered the “love hormone” or “bonding hormone,” oxytocin's role

within the parent–child relationship and within responsivity in particular, has garnered years of empirical investigation. This may be due to the fact that parental recognition of their child's signals is related to brain circuits that belong to a reward system saturated with oxytocin receptors (Wittfoth-Schardt et al., 2012). When fathers view their children's faces, fMRI scanning shows activation of the ventral striatum and the oxytocin-associated hypothalamus/pituitary region, areas that correspond with reward and attachment. Atzil et al. (2018) found that plasma oxytocin levels were the same for both mothers and fathers when they responded to their infant, highlighting the connection between parental oxytocin levels and the simple task of recognizing or viewing their own child. But there were differences in brain activation locations: in mothers the limbic system was activated whereas in fathers the social-cognitive network was activated.

Other studies have further delineated the connection between oxytocin and parental responsivity by examining synchronous, bio-coregulated behavior. The neuroendocrinological mechanisms that comprise this complex set of interactions are not yet fully known but it is apparent that oxytocin plays a significant role (Szymanska et al., 2017). For example, endogenous oxytocin is known to be associated with increased maternal affectionate behavior, including “motherese” vocalizations, affectionate touch, and expressions of positive affect (Gordon et al., 2010a). For fathers, endogenous oxytocin positively related to stimulatory behavior such as proprioceptive contact, tactile stimulation, and object presentation. Paternal endogenous oxytocin was also associated with father–infant synchrony, especially when fathers played with their infants (Gordon et al., 2010b).

Effects of responsivity on child endogenous oxytocin has also been studied in family situations. Feldman et al. (2010b) examined cross-generational effects by sampling from both parents and their 4–6 months old infants before and after a play interaction. Across both time points, oxytocin levels for both parents and infants increased. However, stronger correlations were associated with higher oxytocin levels in the parent and child dyads that displayed affect synchrony. The research group concluded that oxytocin—and more generally the neuroendocrine system—plays a critical role in supporting bond formation and they highlighted the importance of early experiences in shaping cross-generation transmission of social bonds.

For both parents, endogenous oxytocin has been associated with the degree of physical proximity and affectionate contact with their child. Gordon et al. (2010c) examined both oxytocin and cortisol triadic interactions among infants (6 months), mothers, and fathers. Oxytocin levels in both mothers and fathers predicted higher levels of triadic synchrony, specifically, physical closeness, providing affectionate touch, and coordinating social gaze with the child from one of the parents. For mothers only, higher levels of cortisol were related to lower levels of family synchrony.

Differences in adult attachment styles have been associated with modulation of endogenous oxytocin levels. Attachment quality in adults is a strong positive predictor of oxytocin levels and moderates the relationship between oxytocin and state anxiety (Tops et al., 2007). New mothers who viewed their own 11-month infant smiling and crying showed brain activation differences based upon adult attachment type (Strathearn et al., 2009). Mothers with a secure attachment style showed greater activation in brain reward regions of the ventral striatum and in the oxytocin-associated hypothalamus/pituitary region compared to mothers with an insecure adult

attachment style. Plasma oxytocin was also higher in secure mothers. Insecure mothers showed decreased endogenous oxytocin and increased activation in their anterior insula (a region associated with feelings of disgust, pain and unfairness) when viewing their own infant's face.

Regarding *exogenous* oxytocin, it is associated with changes in paternal parenting behaviors, including alterations to vagal tone. Administration of oxytocin to fathers of 5-month-olds increased paternal vagal tone during free play and facilitated bonding behaviors such as social gaze, affectionate touch, and infant-directed speech (Weisman et al., 2012). Infant oxytocin levels, vagal tone, and social engagement, including social reciprocity, increased in a parallel manner. The results were the first to demonstrate that giving oxytocin to one attachment partner—the father in this case—can induce similar effects in the child, suggesting oxytocin has a potential cross-generational transmission effect through increased social engagement.

Responsivity and prosociality

In relation to prosociality, the type of relationship between the parent and child and its influence on oxytocin may be critical. Relationships characterized by a mutual responsive orientation (MRO; Kochanska et al., 1999) are close, mutually binding, cooperative, and affectively positive. MRO between parent and child leads to secure attachment, greater conscience development and prosocial behavior. One can infer that the synchronization that the dyad experiences promotes oxytocin release, facilitating empathy and prosociality. For example, Spinrad and Stifter (2006) investigated maternal responsivity longitudinally, testing infant temperament at 10 months of age in relation to toddler observed empathy at 18 months. Maternal responsivity at 10 months of age predicted higher concerned attention and lower personal distress reactions at 18 months. In another study by Kochanska et al. (1999), maternal responsiveness and shared interactive positivity at 9 and 14 months of age was associated with increased child empathy at 22 months of age. Emotional responsiveness and prosocial tendencies including empathy are correlated in mothers and children (Fabes et al., 1990).

The connection between caregiver responsivity and empathy development makes sense from an evolutionary framework which suggests that responsivity evolved from caregiving behavior rooted in parental investment of offspring (Di Bello et al., 2020). Mothers who are attentive to the changing needs of their infants increase the likelihood that their children develop healthy, regulated physiologies that helps them survive, thrive and reproduce. Thus, mothers and other caregivers would be motivated to sensitively and compassionately recognize and respond to the changing needs of the young offspring. Consequently, adult cooperative sociomoral behaviors would be considered an extension of the caregiving system and intrinsically related to caregiver sensitivity (Swain and Ho, 2017; Gilbert, 2021).

Alloparents

Allomothers or alloparents refers to multiple, consistently present, responsive caregivers. Within the *evolved nest* context, grandmothers, aunts, siblings, and other related and unrelated kin participate in caring concurrently for the youngest members of the community (“cooperative breeding”; Hrdy, 2009b). Such cooperative child raising, where mother is present but others are caring for the child, increases

responsive care from the mother as well as other caregivers who share in the responsibility of meeting the needs of both kin and non-kin children. For example, in a Mayan community, only about half of infant care is typically provided by mothers whereas the other half is provided by other family or community members (Kramer, 2005).

A greater number of alloparents increases the likelihood that children will receive consistent, responsive care (Hrady, 2009a) and experience longer breastfeeding duration (Quinlan and Quinlan, 2008), improving child adjustment (Pianta and Ball, 1993). When parents are surrounded by a supportive community of alloparents, their knowledge and expectations about parenting increase whereas stress surrounding parenting decreases, allowing for more positive rather than negative interactions with the child (Serrano-Villar et al., 2017). Because alloparents increase wellbeing, they are understood to be a protective factor for both parent and child (Hrady, 2009a) and may protect against the development of psychopathology (Kenkel et al., 2015). In this way, alloparenting intersects several of the other *evolved nest* components because it involves support for both the parent(s) as well as the developing child.

Alloparents and oxytocin

Regarding oxytocinergic functioning, few human studies have examined the role of alloparents. However, there are several animal studies that have examined the role of oxytocin among species who practice alloparenting. For example, among virgin female prairie voles, a cooperative breeding species, alloparent behavior was positively correlated with oxytocin receptor density (Olazabal and Young, 2006) and when given an oxytocin receptor antagonist, adult female alloparent behavior was completely absent. The relationship between oxytocin and alloparenting behavior has also been established in adult male prairie voles (Bales et al., 2004a). In other communal mammals, such as the eusocial naked mole rat, the same association between higher levels of oxytocin receptor density and alloparenting behavior has been observed (Kalamatianos et al., 2010). These studies demonstrate that level of oxytocin receptor density may be a critical determining factor in juvenile and adult mammal alloparenting behavior.

Other animal studies have examined the role of oxytocin as a predictor of future alloparenting behavior. For example, Bales et al. (2004b) found that early exposure to oxytocin, or its antagonist, influences its developmental trajectory and future alloparenting behavior in both adolescence and adulthood. Male offspring given oxytocin *antagonists* on postnatal day 1 had decreased alloparent behavior and increased future attack rates. However, females administered oxytocin (not the antagonist) on postnatal day 1 *increased* alloparenting behavior. These results suggest that oxytocin exposure or deprivation in early life matters for future alloparenting behavior.

Regarding direct effects of alloparenting on human children's oxytocin, the authors are not aware of any work beyond what has been mentioned for parents. Many non-Western cultures provide a set of consistently present caregivers for the child, offering an area ripe for research.

Alloparents and prosociality

Humanity's heritage of raising children together is associated with psychological changes that enhance social relations such as mind reading and shared intentionality (Burkart et al., 2009). Cross-species

studies that include human groups find that extensive alloparental care is the best predictor of variation in proactive prosociality, confirming the origin of humanity's hyper-cooperation (Burkart et al., 2014).

Laboratory evidence investigating the effect of alloparents on child prosociality is scarce. In a study examining moral socialization in preschool children, the number of kin primary caregivers positively predicted behavior regulation scores when number of primary kin caregivers was less than 4.31, yet negatively predicted scores when the number was greater than 4.31, after controlling for maternal education and household income (Narvaez et al., 2013b). Future research should take into account both number and quality of additional caregivers, whether mother is present during alloparenting, and the effects on children's prosociality.

Self-directed free play

Play is a vital part of mammalian childhoods and is shown to promote numerous positive outcomes in children. In nomadic forager communities, humor and playful attitudes infuse daily affairs and activities of all ages, not only through rough-and-tumble play, but in creatively generated riddles, songs, and jokes (Gray, 2011, 2013a). Children are free to explore and play at will. The focus on play is thought to counteract tendencies toward dominance, with other community members deliberately using playful response to quell aggressive and egotistical behaviors (Gray, 2013b; Fry, 2014).

Although play may include organized or structured play, athletic play (sports), pretend play, social play and nonsocial play (Luckey and Fabes, 2005), within the *evolved nest* context, *self-directed free play* is fundamental. Such play promotes affectively beneficial gene expression profiles, emotion regulation, resilience to stress, and may prevent attention-deficit-hyperactivity disorder (ADHD; Panksepp, 2007). The changing dynamics of self-directed free play provides opportunities to learn how to shift and adapt to unexpected actions of playmates, building emotional and relational flexibility (Spinka et al., 2001). A lack of self-directed free play in childhood may contribute to altered social, sexual and conflict interactions with peers (Van den Berg et al., 1999).

Play and oxytocin

Self-directed play is a common social behavior and oxytocin's role in social behavior generally is well established (for a review, see Caldwell, 2017), yet few investigations have examined the role of oxytocin in play. However, there are a few studies that highlight the rise in oxytocin in parents during free play with their children. Feldman et al. (2010a) found that plasma and salivary oxytocin from mothers and fathers increased during play episodes but only for parents who provided high levels of affectionate touch. Social-affective play with their infant but not object-directed stimulatory play increased parental oxytocin in both mothers and fathers (Gordon et al., 2010a). Maternal and paternal oxytocin—measured via plasma, saliva and in urine—were also correlated with the degree of interactive synchrony between parents and their 6-months-old infants during observed play episodes (Feldman et al., 2011). Finally, correlations between parental and infant oxytocin were strongest during play periods when dyads share affect synchrony (Feldman et al., 2010b). However, Markova (2018) failed to find an association between parent-infant play and infant oxytocin levels. Utilizing a sample of 43

mothers and their 4-month-old infants, social game playing was coded for both type and frequency which resulted in 76% of the interactions between the dyads consisted of playful social games and 46 different types of games were identified. Although maternal oxytocin levels were positively associated with the *number* of games played and the *time* spent playing games, infant oxytocin levels demonstrated the *opposite* pattern. Time spent playing games was inversely related to infants' rise in oxytocin. However, this study did not consider physical proximity or affiliative touch between the dyad, integral aspects of both free play experiences and oxytocin regulation. In addition, the study did not assess dyad synchrony and dys-synchrony.

There is also evidence regarding exogenous oxytocin and fathers' involvement during play. In a double-blind, placebo-controlled, within-subject designed study, Naber et al. (2010) found that fathers who were administered oxytocin before play sessions with their preschool children were significantly less hostile and more structuring of play to involve the child than in the control condition. This suggests that the fathers were more socially involved and less rigid in their expectations of the play session.

In animal models, the relationship between oxytocin and play is more clearly defined. The reason for the clarity has to do with methodological controls and administration of both oxytocin and its antagonist, experimental conditions that are likely unethical in human studies. For example, blocking oxytocin is known to reduce social play in juvenile rats but only for females and only in certain contexts (Bredewold et al., 2014). Females that are given an oxytocin antagonist show decreased social play but only in new environments. If females are given oxytocin, they also show a decrease in social play behavior but only in the home environment (not novel environment). Males did not show these effects. Taken together, the findings suggests that both context and gender can influence oxytocin's role in social play behavior.

Play and prosociality

In terms of prosociality, by its nature cooperative rough-and-tumble play promotes oxytocin release and empathy (or the playing will stop). For example, Panksepp (2007) demonstrated that play supports the emotion-systems of the brain that give rise to altruism and empathy. Social play accomplishes this by developing the frontal lobe inhibitory skills that underly impulsive emotional urges. Enhancing the development of the frontal cortex promotes abilities to be behaviorally adaptive, self-reflective, and empathic (Panksepp et al., 2003). In this way, social free play builds brains that are socially flexible and relationally attuned to others, skills needed to practice enhanced sociomoral behaviors such as empathy. Indeed, Narvaez et al. (2013b) found that play was associated with greater empathy in preschoolers, even after controls.

Empirical evidence connecting play and prosocial behaviors, such as cooperation, is found in children as young as 2 years of age. For example, Breeland et al. (2022) found that quality of play between unfamiliar 2-year-old dyads predicted subsequent cooperation behaviors. Quality of play was evaluated through affiliation (e.g., helping, directing with a positive tone, encouragement), antagonism (e.g., competing, directing with a negative tone, hitting, neglecting) and dyad coordination. Children who displayed more affiliation during the play period demonstrated greater cooperative motivation in a subsequent novel cooperative task. Quality of play between 2-year-old and *adult* dyads also predicts subsequent child prosociality.

In four separate studies, Barragan and Dweck (2014) found that reciprocal play but not parallel play within the dyad related to altruistic behaviors such as helping the adult reach a block, a bottle, a clothespin, and a pencil. The reciprocal play condition included play that engaged the child (such as rolling a ball back and forth) whereas the parallel play condition included the adult playing next to the child with a separate set of toys. The results suggest that reciprocal interactions during play that are characteristic of mutual responsiveness may be strong catalysts for altruism in young children.

Social embeddedness

Social embeddedness refers to the quantity and quality of connections that surround the individual, both in the family and in the larger environment (Cacioppo and Patrick, 2008). Within nomadic forager communities, relationality and sociality are expansive and the majority of time is spent in social leisure (Gowdy, 1998). In these and village communities, children learn by observing community members and pitching in Rogoff et al. (2015). One aspect integral to social embeddedness observed in nomadic forager communities is a positive emotional climate, an environment that is welcoming and accepting. For children, this means feeling cherished, respected, and appreciated (Tarsha and Narvaez, 2020). In studies with adults, retrospective reports of positive childhood home climate were correlated with higher scores on secure attachment and mental health, whereas negative home climate experiences were associated with low scores on secure attachment and higher scores on anxiety and depression (Narvaez et al., 2016b,c).

Social embeddedness and oxytocin

The construct of social embeddedness and its relationship to endogenous oxytocin is largely understudied, although social support and oxytocin release interact to decrease physiological and psychological stress (Heinrichs et al., 2003). Studies comparing children from orphanages to children under typical conditions demonstrate that the buffering effect of oxytocin and social support are dependent upon early experience. Unlike birth children, adopted children do not show an increase in oxytocin levels after playing a physical contact game with their mothers (Wismer Fries et al., 2005). Further, birth children had a decrease in cortisol whereas the adopted children showed an increase, a response that is comparable to engaging with a stranger. These findings suggest that the social buffering effects of oxytocin may be dependent upon the early relationship with a responsive caregiver and that individuals with an unsupportive early life may not derive the same stress relief and oxytocin rise from social support (Hostinar and Gunnar, 2015). Stated succinctly, the effectiveness of the social buffering of stress through oxytocin may be dependent upon other *evolved nest* components, such as positive touch and responsive caregiving.

Regarding *exogenous* oxytocin, several studies demonstrate a connection between experiences of social support and oxytocin. For adults, several studies found that administering oxytocin intranasally may increase the effect of social support and even change attachment styles. For example, in adult males who were categorized as insecurely attached, a single dose of intranasal oxytocin significantly increased their security level (attachment style; Buchheim et al., 2009). Oxytocin in men also enhanced the

effect of social support (presence of their best friend) during a stress condition. Exogenous oxytocin also decreased men's cortisol and anxiety levels significantly, boosting their sense of calmness when their friend was present (Heinrichs et al., 2003). As such, these findings, in addition to other empirical studies with women (Ozbay et al., 2007; McQuaid et al., 2016), suggest that perceived social support and oxytocin may be intrinsically linked.

Social embeddedness and prosociality

Regarding prosociality, to the authors' knowledge, there are no studies that examine physiological correlates of social embeddedness, especially oxytocin, and its relation to empathy and prosociality across development. More research is needed that examines the relation among these constructs. However, social exclusion is shown to decrease prosocial behavior (decreased helpfulness, cooperation, volunteering, donating) in laboratory studies (e.g., Twenge et al., 2007). There is also some evidence that social support can push adults toward pro- or anti-sociality (against outgroups; Declerck et al., 2010; De Dreu et al., 2011). Oxytocin is also sometimes associated with antisocial behavior and aggression (DeWall et al., 2014). For example, both endogenous and exogenous oxytocin's effects on sociomoral behavior are influenced by complex interactions involving social embeddedness and group identity (Berry, 2013). These sociomoral outcomes include increased outgroup discrimination and reduced affiliative behavior following exogenous oxytocin administration. However, oxytocin's antisocial effects are not associated with unprovoked hateful intergroup behavior (when administered intranasally; De Dreu et al., 2011). As such, oxytocin's effects on strengthening bonds may be one aspect of its influence on prosociality, especially when considering social groups and group identity.

Nature immersion

In our ancestral context, human communities were immersed in and attached to the rest of the natural world from an early age, feeling a part of nature, observing animals and plants, enabling awareness of how to promote wellbeing in the biocommunity (Kimmerer, 2013). Several scholars have pointed to the lack of ecological attachment—emotional connection—to the natural world as a factor contributing to human conflict and our current ecological crises (Louv, 2005; Berry, 2013). Because more than half of the global population lives in urban areas, research regarding the effects of nature experiences is increasing (Mayer and Frantz, 2004; Matthew et al., 2009; Ives et al., 2017). Several population-based studies found that nature exposure or frequency of interacting with a green space increased positive emotions and general wellbeing as well as reduced stress and possibly even morbidity and mortality (Cleary et al., 2017).

Nature immersion and oxytocin

Like many of the *evolved nest* components, nature immersion promotes calmness, lowering cortisol, improving immune function (Frumkin et al., 2017; Bratman et al., 2019). However, there is a dearth of research examining one of the contributors to all these factors, oxytocin release. To the authors' knowledge, no studies have examined nature immersion and oxytocinergic functioning, suggesting more research is needed in this area.

Nature immersion and prosociality

Nature immersion promotes prosociality such as generosity, ethical decision making, prosocial values (Piff et al., 2015) and cooperation (Zelenski et al., 2015). In a within-subjects design with elementary school students, Dopko et al. (2019) compared children after experiences at a forest and nature school with experiences at an aviation and space museum. They compared not only positive/negative emotion, connection to nature and its protection but prosocial behaviors. Students behaved more prosocially after the nature school experience. More recently, Putra et al. (2020) conducted a systematic review of evidence relating green space and child prosocial behaviors. Utilizing 15 studies, 44 positive associations were identified of which 18 were statistically significant, suggesting that green space may augment prosocial behavior in children and adolescents. However, given variations in green space exposure as well as a lack of consideration of moderators, evidence for the association as well as causality should be interpreted as preliminary. This area of study is ripe for research.

The direct path between the *evolved nest* and prosociality

Apart from physiological effects, there are emerging connections for both children and adults regarding *evolved-nest* consistency experience and prosociality generally. The *evolved nest* enables individuals to develop rich social connections that catalyze personal growth, thriving, and virtue across the lifespan (Narvaez, 2016). Such capacities support societal functioning at large, enabling cooperative interactions in families (Lomanowska et al., 2017) and communities (Narvaez, 2014). As such, evidence from both animal and human studies suggest connections between *evolved nest* experience and prosociality without taking into account oxytocin functioning (Figure 1, path c). For example, in mice, communal rearing and alloparents are known to increase the amount of maternal care the offspring receives which is highly correlated with increased sociality (Branchi et al., 2006; Curley et al., 2009). There are also observed differences regarding communal rearing and sociality in prairie voles. Compared to those raised by a single mother, prairie vole offspring in the communal reared environments show increased social interactions, higher social competency and form social hierarchies quicker (Kenkel et al., 2015). The increased sociality is seen with both peers and nonpeers, effects evident into adulthood. This suggests that for social mammals communal rearing facilitates an increased ability to engage and interact appropriately with differing environments and contexts (Branchi et al., 2013).

Regarding human studies, there are connections emerging regarding *evolved nest* experience and prosociality in adulthood. For example, adults ($N=606$) reported on *evolved nest* experience in childhood and sociomoral capacities of perspective taking and empathy as well as sociomoral orientations of engagement, social opposition, and social withdrawal (Narvaez et al., 2016c). Mediation analysis demonstrated that early childhood experiences consistent with the *evolved nest* related to greater perspective taking and lower social opposition as well as lower personal distress and lower social withdrawal. Mediators included secure adult attachment and lower psychopathology. In this sample, mediation analysis did not explain empathy by way of *evolved nest* experience, which the authors suggest

may be attributed to the influence of psychopathology, specifically, depression, which can increase empathy. In a corroborating study, *evolved nest* history followed similar pathways (Narvaez et al., 2016a). Those with greater nestedness or experiences that aligned with the *evolved nest*, had higher secure attachment, better mental health and perspective taking which led to greater social engagement. Those with less nestedness either followed a pathway of lower secure attachment, low mental health, and low perspective taking leading to social oppositionalism or a pathway with low secure attachment, low mental health, high personal distress and social withdrawal in social situations.

There are also connections between *evolved-nest* experience and childhood prosociality. In a 3-year longitudinal (prenatal to age 3) study of mother–child dyads at risk for child neglect using observation and interview, *evolved nest* experience longitudinally predicted increased child prosociality at 18 and 30 months of age (Narvaez et al., 2013a).

Taken together, the evidence suggests that each *evolved nest* component may support capacities for empathy and prosociality. Evidence suggests that a mediator between *evolved nest* experience and capacities for empathy and prosociality may be oxytocinergic functioning.

Discussion

Our review addresses a major gap within the literature regarding investigations that examine all three constructs of early life *evolved nest* experience, oxytocinergic and sociomoral functioning. We examined what is known about how each *evolved nest* component—soothing perinatal experiences, breastfeeding, touch, responsivity, allomothers, play, social embeddedness, and nature connection—is associated with oxytocinergic functioning and sociomorality, specifically, empathy and prosociality. Across studies that were available, *evolved nest* provision was associated with increased *endogenous* oxytocinergic functioning and positive sociomoral outcomes in both children and adults. *Exogenous* oxytocin was associated with *evolved nest* provision behaviors, though with mixed results concerning perinatal experiences. That is, exogenous oxytocin administered to the mother during the perinatal period has potential adverse effects, decreasing the probability of bonding and breastfeeding duration.

Availability of empirical investigations varied for the triumvirate focus (*evolved nest*, oxytocin, prosociality). Most studies addressed responsivity whereas few studies examined social embeddedness and nature immersion. Of the few studies that include all three constructs, most focus on *negative* early life experiences and their influence on oxytocin and sociomoral development. For example, Kompier et al. (2019) conducted a review examining unnested experience or experiences that are antithetical to the *evolved nest* (early life stress of maternal separation, paternal deprivation, and postnatal isolation) on adult social behavior and oxytocin and vasopressin. Integrating causal animal studies, the researchers found that early life stress significantly impacted the oxytocinergic system in brain regions associated with social behavior and suggested similar connections in humans. Their review highlights the role of negative early life experiences in altering both oxytocinergic functioning and adult sociality. Our review flipped the perspective, examining the importance of *positive* early life experiences of the *evolved nest* that may optimize physiological and sociomoral outcomes.

Our review also highlights possible interaction effects that should be investigated. First, there may be interactions among *evolved nest* components themselves. For example, during breastfeeding (one *evolved nest* component), the infant is bathed in numerous sensory experiences that include other *evolved nest* components such as touch and maternal responsiveness (vocalizations and eye contact). How long the infant is breastfed may be influenced by how much exogenous oxytocin was given to his/her mother during childbirth (Gu et al., 2016), another *evolved nest* component. In this way, *evolved nest* components of perinatal history, touch, breastfeeding, and maternal responsivity interact, possibly exponentiating effects on child physiological and sociomoral development. Second, there may be complex interactions between parental physiological processes and prosocial, empathic parenting behaviors. Nurturing parenting behavior is dependent upon healthy physiological processes that co-regulate the development of child physiological functioning and pro-social behaviors. For example, a recent review by Froemke and Young (2021) demonstrated that virgin female rats' exposure to maternal behavior increased their oxytocin responses. Housed with other mothers, virgin females' pattern of oxytocin release changed to match the experienced mothers when they heard infants crying. This demonstrates the powerful impact of the social environment on shaping *evolved nest* provision and oxytocin responses, at least in animal models. Thus, the interaction and directionality among these three constructs (*evolved nest*, oxytocinergic functioning and prosociality) appears to be more complex than direct linear associations and may include exponentiating, mediating, and moderating effects. In summary, there is emerging evidence that each *evolved nest* component may contain complex, bidirectional interaction effects both between *evolved nest* components themselves as well as among physiological and sociomoral processes. When *evolved nest* experience is provided in full, it represents a type of ecological context that can be understood as childhood companionship care or experiences that support the biology of love.

Is the *evolved nest* integral to a biology of love?

The ecological context of the *evolved nest* may be critical for humanity's species-typical moral development because our morality is rooted in our neurobiology (Narvaez, 2017). The *evolved nest* represents part of what biologist Humberto Maturana calls the *biology of love*, childhood companionship care that is critical for species normal development (Maturana and Verden-Zöller, 2008). Maturana argues that humans are the kind of biological beings they are because love has grounded the course of evolutionary history that originated the species, which he calls *homo sapiens-amans*. He says that animals generally, but mammals particularly, have two modes of being: mutual relational trust or dominance hierarchy. In other species, the former characterizes mother–offspring relations and the latter adult relations. In contrast, the human lineage maintained the relational dynamics of mother–child love into adulthood (called neoteny), like trust, tenderness, sensuality, and playfulness. “Humans are cooperative animals dependent on love at all ages” (Maturana and Verden-Zöller, 2008, p. 54) and “become ill at any age if we have to live a life centered in mistrust, instrumentalization, and manipulation of relations” (Maturana and Verden-Zöller, 2008, p. 52).

Evolved nest provision in early life may represent the biology of *love in action*. *Evolved nest* provision communicates that the child matters, that their needs are legitimate as a fellow being. Experiencing the *evolved nest* may marinate the child in a positive biochemistry that supports the healthy development of neurobiological systems, such as the oxytocin system. Concurrently, the child builds psychosocial memories and skills for living, including getting along with others. Experiences of love in action starting in the perinatal period provide the child the ecological context that optimizes physiological and psychological processes needed to learn how to love (Carter, 2022). This includes behavior interactions associated with love such as emotional safety and healthy sexuality.

The oxytocinergic system may be a critical feature of emotional safety and healthy sexuality, or the biology of love, providing “sociostasis” throughout life (Carter, 2022). Sociostasis refers to the influence each person has on the other in terms of regulating the other person’s physiology, psychology, and state of mind (Cozolino, 2014). Carter employs a wider use of the term to capture the importance of sociality regarding both homeostatic and allostatic processes of physiology and behavior. The central role of oxytocin in sociostasis may be attributed to its role in modulating reactions to stress after experiences of challenge by interacting with the HPA axis to calm the organism, reducing inflammation, and anticipating future allostatic demands (Carter, 2021). Oxytocin’s anti-stress properties may facilitate prosociality because of its role in maintaining allostasis which undergirds sociostasis (Carter et al., 2020).

Maturana expressed concern that the biology of love has been forsaken by the dominant culture, undermining the development of *homo sapiens-amans* and instead shifting human evolution toward *homo sapiens-aggressans* and *homo sapiens-arrogans* because “the manner of living conserved from one generation to the next, as a particular configuration of organism-niche relations, becomes the operational dynamic center around which everything else is open to change” (Maturana and Verden-Zoller, 2008, p. 2). As one of humanity’s extra-genetic inheritances, along with cells, body plans, ecology, and culture (Oyama et al., 2001; Jablonka and Lamb, 2005), the *evolved nest* may be critical for shaping the biology that undergirds health through sociostasis (Carter, 2022) and the biology that shapes culture. If attachment is a regulatory theory (Schore, 2003) that fosters various forms of self-regulation in the child, the *evolved nest* may provide the mechanism by which regulation occurs, affecting multiple systems including the oxytocinergic system.

Given the importance of sociostasis and oxytocin functioning, the most critical aspect of *evolved nest*-oxytocin interactions may be social relationships. For example, endogenous oxytocin release and exogenous oxytocin administration demonstrate varying effects dependent upon relationship, specifically, the social context yielding either evocation of affiliation or anxiety. This suggests that the quality and type of relationship matters for what neurobiological reactions occur. With affiliation and feelings of safety, oxytocin and the social brain network are activated. With a feeling of unsafety or threat, the HPA axis will be activated, disrupting oxytocin release (Carter, 2022).

Limitations

There are multiple limitations for this investigation. We did not address epigenetics, such as the methylation of the oxytocin receptor

gene. Caregiver behavior is associated with epigenetic manipulations of the oxytocinergic system in early childhood (e.g., Krol et al., 2019).

In terms of empirical evidence reviewed, the separation of variables from context is problematic. Ethnographic studies that describe the *evolved nest* in nomadic forager communities are ecological contexts where *all* of the *evolved nest* components are provided simultaneously and generously. In contrast, empirical studies use variable measures and do not measure amount or frequency in the *evolved nest* manner (e.g., breastfeeding on request; holding and carrying in arms). Thus, when comparing findings from empirical studies and ethnographic observations, there may be major differences in frequency or exposure of each *evolved nest* component. In our review, studies that controlled specific amounts or deprivation of a particular *evolved nest* component were animal studies (more touch vs. less touch, low responsivity vs. high responsivity), though it is not always clear whether the component was isolated from other component effects. Conducting similar studies with human samples may be too onerous and if involving negative treatment, unethical. Moreover, when the *evolved nest* is provided in full, this may influence neurobiological and sociomoral development in ways that are beyond the summation of its parts given that multidimensional, complex interactions are taking place both behaviorally and neurobiologically.

We only examined empathy and its correlates. There are multiple other sociomoral outcomes that could be examined. For example, Narvaez et al. (2013b) found that after controls; breastfeeding was related to preschoolers’ inhibitory control, guilt and concern after wrongdoing; positive touch was related to inhibitory control, self-regulation and concern after wrongdoing (as well as empathy), family social embeddedness and play to inhibitory control; self-regulation and concern after wrongdoing were associated.

Finally, there were limitations regarding the empirical evidence reviewed and developmental processes of timing. By definition, the *evolved nest* is the ecological system of care that aligns with the child’s maturational schedule: each *evolved nest* component is provided in such a way that it supports the child’s varying physical and psychological needs (e.g., abundant touch in the first year of life through carrying, rocking vs. affectionate touch of hugs and hand holding later in development). The empirical evidence reviewed largely does not take into account the developmental timing of each *evolved nest* component. Moreover, variations exist within each *evolved nest* component regarding intensity, duration and exposure needed to support optimal child development and enhance both the oxytocinergic system and sociomoral development.

Future directions

There are many opportunities for future work knitting together early experience, particularly experiences reflective of the *evolved nest*, oxytocinergic development, and prosociality. Whereas the construct of oxytocin has become more precise (Carter, 2022), the definitions and constructs of *evolved nest* provision are less established. The eight components of the *evolved nest* are descriptors garnered from observations of humanity’s evolved context. But likely additional components could be extracted such as agency/autonomy and embedded relations with wild plants and animals. Moreover, we need to study contextualized *evolved nest* components, such as *moving*

touch for its obvious benefits (e.g., Mason and Berkson, 1975; Ohmura et al., 2022).

Furthermore, several authors associate and mix sociomoral behaviors with parenting behaviors, often considering nurturing responsive care and prosocial behavior, compassion, and empathy as synonymous. For example, nurturing responsive care is sometimes viewed as containing elements of sociomoral behaviors where nurturing care is compassionate parenting; nurturing care is empathic; nurturing care is prosocial (Saturn, 2017; Swain and Ho, 2017). Often in the literature these constructs are interchangeable or interwoven. This evokes the need for a general consensus regarding constructs and definitions of both parenting behaviors and their relationship to prosociality. Future research should consider ways to clarify and operationalize both evolved nest provision and sociomoral constructs.

Conclusion

Research into sociomoral development typically focuses on parent socialization practices such as verbal guidance and discipline, as if an unruly body must be sorted out by the rational mind of the adult until the child's own rationality is in place. If biology is addressed, it usually focuses on genes and built-in temperament, as if children are born a particular way. The sciences have advanced us beyond these limited perspectives. The central core of development is children's psychobiological self-organization as an interaction between in-built maturational schedules and experience (Maturana and Varela, 1980; Sansom and Brandon, 2007). The interactions of external and internal signals are constant in early life as the brain grows rapidly, building synapses and pruning them, based on experience in a type of contingent "constructive interactionism" (Oyama, 2000; Oyama et al.,

2001), forming a life cycle. Only when we integrate biology, psychology and evolution in a holistic manner, will we be able to discern the species-normal course of sociomoral development (Narvaez, 2014). Thus, investigations into prosociality need to start in the relational contexts and the contingencies a child experiences that build the body-mind (Narvaez et al., 2022). The most sensible framework for examining what builds a healthy life cycle and optimizes prosociality may be the millions-year-old *evolved nest*.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

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

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EDITED BY

Alessandra Geraci,
Dante Alighieri University for Foreigners, Italy

REVIEWED BY

Jonathan F. Kominsky,
Central European University, Austria
Luca Surian,
University of Trento, Italy

*CORRESPONDENCE

Inderpreet K. Gill
✉ inderpreet.gill@mail.utoronto.ca

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Generalizing across moral sub-domains: infants bidirectionally link fairness and unfairness to helping and hindering

Inderpreet K. Gill* and Jessica A. Sommerville

Department of Psychology, University of Toronto, Toronto, ON, Canada

Across two experiments, we investigated whether infants use prior behavior to form expectations about future behavior within the moral domain, focusing on the sub-domains of fairness and help/harm. In Experiment 1, 14- to 27-month-old infants were familiarized to an agent who either helped or hindered another agent to obtain her goal. At test, infants saw the helper or hinderer perform either a fair or unfair distribution of resources to two recipients. Infants familiarized to helping looked longer to the unfair distribution than the fair distribution at test, whereas infants familiarized to hindering looked equally at both test events, suggesting that hindering led infants to suspend baseline expectations of fairness. In Experiment 2, infants saw these events in reverse. Following familiarization to fair behavior, infants looked equally to helping and hindering; in contrast, following familiarization to unfair behavior, infants looked significantly longer to helping than hindering on test, suggesting that prior unfair behavior led infants to expect the agent to hinder another agent's goals. These results suggest that infants utilize prior information from one moral sub-domain to form expectations of how an individual will behave in another sub-domain, and that this tendency seems to manifest more strongly when infants initially see hindering and unfair distributions than when they see helping and fair distributions. Together, these findings provide evidence for consilience within the moral domain, starting by at least the second year of life.

KEYWORDS

fairness, infants (birth to 2 years), moral development, moral judgment, trait inference

Introduction

The ability to use an individual's behavior in one context to make inferences about how that individual will behave in a different context (Wernimont and Campbell, 1968; Lammers et al., 2017), provides a basis for coordinating our actions with other people, and enables us to make decisions regarding whom to approach and whom to avoid. One means by which (Western) adults predict others' future behavior is through the rapid attribution of traits based on limited behavioral evidence (Lupfer et al., 2000; Uleman et al., 2008; Shimizu, 2012). The tendency to infer morally relevant traits, in particular, is prevalent in adults, as an individual's moral character may have consequences for one's own welfare (Goodwin et al., 2014). At present the earliest developmental origins of this ability is relatively uncharted, given debates concerning the nature of young children's moral understanding (see Killen and Smetana, 2015 for a review), and the emergence of trait reasoning in childhood (see Heyman, 2009 for a review). Here we investigate the developmental origins of the ability to use information from one moral

sub-domain to make inferences about how an individual will behave in another sub-domain in infancy, focusing on fairness and help/harm given their prominence in theories of morality (Ting et al., 2019; Decety et al., 2021).

The developmental origins of children's trait inferences

Research indicates that children's ability to make trait inferences, broadly construed, varies considerably according to the experimental approach and task requirements. Initial work suggested that it is not until mid-childhood that children reason about others' traits: children first describe others' behaviors using trait terms at about age 8 (Livesley and Bromley, 1973; Peevers and Secord, 1973; Heyman and Gelman, 1999), and whereas 9- and 10-year-old children expect behavioral consistency across contexts, younger children do not (Rholes and Ruble, 1984; Kalish, 2002). Subsequent studies, however, demonstrated that children as young as 4 infer traits when multiple exemplars of an initial behavior are provided (Heller and Berndt, 1981; Cain et al., 1997; Boseovski and Lee, 2006), when children are told about two different actors that act in opposing directions (e.g., generous versus selfish; Heller and Berndt, 1981; Cain et al., 1997), or when they are asked to identify a trait from a given behavior, or use a trait to infer a subsequent behavior (Heyman and Gelman, 1999; Liu et al., 2007).

Moral trait inferences may emerge before the preschool years given the importance of this tendency in everyday social interactions (i.e., Rakoczy et al., 2016). Indeed, moral trait terms are some of the first that are utilized in children's language output (Yuill, 1992; see Franchin et al., 2019): as early as 19–22 months, infants use terms such as 'good,' 'bad,' 'naughty,' and 'nice' (Bloom et al., 1975; Fenson et al., 1994), and by 30 months children start to apply words like 'good' and 'bad' to moral contexts (Snow, 1987). These findings raise the possibility that young children may make moral trait inferences, even if they struggle to form trait inferences for non-moral traits.

Moral sensitivities in infancy

Recent work suggests that infants possess moral sensitivities in the sub-domains of fairness and help/harm. Infants expect other agents to approach those that previously helped versus those that harmed (Kuhlmeier et al., 2003), and prefer agents that help over agents that hinder in third-party settings by 6 months of age (Hamlin et al., 2007; Hamlin and Wynn, 2011; Hamlin, 2015). By roughly 10 months of age (or earlier, when distributions featuring 2:0 versus 1:1 are used; see Buyukozur Dawkins et al., 2019) infants show a nascent sensitivity to fairness, expecting equal distributions (Meristo et al., 2016; Ziv and Sommerville, 2017), and by 13 months of age, evaluate others based on their distributive behavior, showing preferences for those that distribute resources equally over those that do so unequally (Burns and Sommerville, 2014), and link fair and unfair behavior to positive and negative stimuli, respectively (DesChamps et al., 2016; see also Geraci and Surian, 2023). Infants' sensitivity to equal distributions can also be seen in cases where a distributor intended to perform an equal distribution but failed: 9-month-olds prefer a distributor that tried to divide resources equally but failed to a distributor who tried but failed

to divide resources unequally (Geraci et al., 2022; but also see Strid and Meristo, 2020).

Of course, mature moral understanding entails a recognition that behavior from one moral sub-domain may have consequences for how an individual will act in another sub-domain; adults may expect a stranger who returns their dropped wallet to also hold the door open for them as they exit the bus. In a recent study, Gill et al. (under review)¹ demonstrated that children aged 4- to 7 show similar tendencies: children reported greater surprise to fair (versus unfair behavior) after a protagonist hindered versus helped another individual. In addition, children reported greater surprise to the protagonist helping (versus hindering) another person after she previously distributed resources unfairly versus fairly. While children generalize from help/harm to fairness, and from fairness to help/harm, they did so uniquely from negative behavior: children's surprise reports following fair behavior or helping behavior did not vary based on the test event. Thus, by age 4 children generalize across moral sub-domains after seeing moral transgressions.

This generalization tendency may extend to infants. Surian and colleagues (Surian et al., 2018) investigated infants' ability to engage in moral generalization from help/harm to fairness (see also Ting and Baillargeon, 2021) by familiarizing 14-month-old infants to a protagonist helping another agent by pushing them up a hill or hindering the agent by pushing them down a hill. On test, infants in both conditions saw the previously helpful/hindering protagonist distribute two strawberries to two recipients equally (1:1) or unequally (0:2). After seeing the protagonist help another agent, infants looked longer to unfair than fair behavior. However, after seeing the protagonist hinder another agent, infants looked equally to fair and unfair behavior. These findings suggest that infants suspend expectations for fair behavior after learning that an agent hindered another agent's goals.

In the current study, we investigated 14- to 27-month-old infants' tendency to generalize across the sub-domains of fairness and help/harm. We first sought to conduct a conceptual replication of Surian et al. (2018): after seeing an actor help or hinder another individual, infants saw that actor perform equal or unequal resource distributions and their looking was recorded. Our study differed from Surian et al. (2018) in three ways. First, we used real-world actors rather than animations; a demonstration that infants show similar patterns documented by Surian et al. (2018) with real-world actors would provide increased confidence that infants apply such generalization tendencies in everyday life. Second, we used different helping and hindering events, modeled after Hamlin and Wynn (2011) and Hamlin (2015), to provide increased confidence that the results generalize across multiple instances of helping/hindering. Third, and perhaps most critically, our distribution events featured 5:1 versus 3:3 distributions, rather than 2:0 versus 1:1 distributions given concerns that 2:0 distributions may conflate social exclusion with unfairness because the actor who receives no resources is not included in the exchange (see DesChamps et al., 2016). As in Surian et al. (2018), we predicted that infants shown helping will look longer to unfair

¹ Gill, I. K., Curtin, A., and Sommerville, J. A. (under review). Children's inferences of moral character across different moral sub-domains. *Dev. Psychol.*

versus fair events, but that these expectations would be suspended following hindering leading infants to look equally at the fair versus unfair events.

In Experiment 2, infants watched these events in reverse: they saw fair or unfair distributions followed by helping or hindering behavior. Thus, we investigated whether infants possess a tendency to generalize across fairness and help/harm in a bi-directional manner. We also sought to compare the relative strength of these generalizations based on the original sub-domain. On the one hand, one might predict that infants will generalize more strongly from hindering versus unfairness given that hindering is often seen as more egregious than unfairness (Yucel et al., 2022), and that infants appear to be sensitive to help/harm before fairness/unfairness in their evaluations (Sommerville, 2022). On the other hand, we might expect the opposing pattern given that some work suggests that while infants have baseline expectations for fair distributions, they do not have baseline expectations for helpful behavior (but see Hamlin et al., 2007; Lucca et al., 2018).

Experiment 1

Method

Participants

The final sample consisted of 56 14- to 27-month-old infants (age range: 14 months 2 days to 27 months; $M = 17$ months 28 days; 33 female, 23 male). Participants were recruited from an online database maintained by a large university in North America. Our sample² consisted of 42% White, 19% Biracial (i.e., Black/Indigenous and/or Metis, East Asian/White, Latin, Central or South American/White, South Asian/White, or West Asian/White), 12% East Asian, 9% South Asian, 6% Southeast Asian, 3% Asian Indian, and 3% Other. The data of 23 additional participants was excluded due to fuss out ($n = 2$), inattentive child ($n = 4$), procedural errors ($n = 3$), technical errors ($n = 3$) or other errors (i.e., parental interference, environmental interference; $n = 11$). Parental consent was obtained on behalf of all the infants through a Qualtrics survey parents completed prior to testing.

Materials

PowerPoint presentations were used to display pre-recorded videos for the tasks. Infants' looking was measured online via Zoom by the experimenter using jHab (Casstevens, 2007), a computer-based program that allows researchers to measure duration looking.

Procedure

The experiment took place over Zoom and was presented to infants through a PowerPoint presentation screensharing. The experimenter guided parents in turning off 'side-by-side' mode in Zoom, hiding the infants' self-view and the experimenter's video on their end so that infants only saw the PowerPoint slides. Parents had

their eyes closed and/or covered. They were told to remain silent and neutral throughout the session; compliance was monitored by the primary experimenter.

The experiment utilized a violation of expectation (VOE) paradigm. Infants watched a series of familiarization trials and then a test event, and their duration attention to the outcome of the events were recorded.

Familiarization preview

Before familiarization, infants were shown a video of an agent struggling to open a translucent box to retrieve a toy, to ensure that infants appreciated that the agent had the goal of opening the box to get the toy inside.

Familiarization

Infants were randomly assigned to the helping condition or hindering condition. They watched a total of four 15-s-long familiarization trials.³ Infants' duration looking was recorded from the end of the familiarization trial (to the still screen image) until they looked away for 2 s or 30 s elapsed.

Across both conditions, infants saw the agent struggle to open the box two times. In the helping condition, on her third try, the protagonist reached over and lifted the lid on the side of the box closest to her, enabling the agent to retrieve the toy. In hindering condition, on her third try, the agent lifted the lid such that the box was half-way open, and the protagonist then reached over and slammed the lid of the box down preventing the agent from retrieving the toy.

Test trials

Infants were randomly assigned to the fair or unfair test event (between subjects).

Both test events featured the same protagonist from the familiarization trials, and two recipients, sitting at a table. In the fair test event. The protagonist held up a bowl of cookies and said, "Mmm, yummy." The other two actors, after seeing the cookies, said "please" and moved their empty plates forward toward the protagonist at the same time. The protagonist then preceded to distribute the cookies fairly (e.g., giving an equal number of cookies to each recipient) saying "here" as she placed the cookies on each plate. At the end of the distribution she said, "There! All done." The unfair test event was identical except that in this event one actor received 5 cookies and the other actor received only 1 cookie. Infants saw a single test event: either the fair test event or the unfair test event.

Reliability coding

Infants looking was coded online using jHab (Casstevens, 2007) by an experimenter and a secondary coder, unaware of which condition a participant was run in, coded infants' looking time. The

² Parent and child demographic information were acquired *post hoc*. As such, response rates were low.

³ The experimenter verified that infants watched each familiarization trial in entirety. Though rare, if infants looked away during the critical period of the trial, the trial was restarted; this was recorded for 2 participants across both experiments.

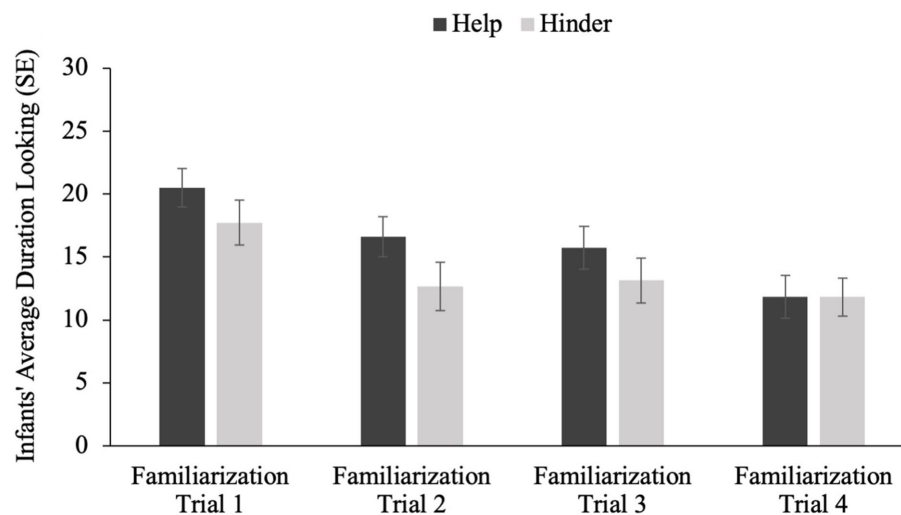


FIGURE 1
Average looking time on each familiarization trial number by familiarization trial type.

secondary coder reliability coded 33% of the total sample.⁴ The original coder and secondary coder's looking times were highly correlated on familiarization trials, $r=0.995$, $p<0.001$, and on test trial, $r=0.982$, $p<0.001$.

Results

Across both experiments, we adopted the same analytic strategy. First, we analyzed for effects of familiarization trial type and familiarization trial number, to determine whether, in the current context, infants showed differential attention to the familiarization trials (which could account for differential attention to the test events), and to ensure that infants' attention was declining across familiarization trials, indicating that they were encoding the familiarization events. Separate ANOVAS for each familiarization type were then conducted to ensure that infants' attention declined equally for each familiarization type.

We next conducted omnibus analyses on looking on test trials as a function of familiarization type and test trial and their interaction. We conducted planned comparisons of looking to each test trial type, split by familiarization type, regardless of the outcome of the omnibus analyses, to provide direct comparisons across studies.

Familiarization trials

A 2 (Familiarization Type: help vs. hinder) \times 4 (Familiarization Trial Number) ANOVA revealed a significant main effect of familiarization trial number ($F(3, 53)=9.766$, $p<0.001$), but no effect of familiarization type [$F(1, 55)=2.381$, $p=0.129$] and no interaction between familiarization type and trial number [$F(3, 53)=1.008$, $p=0.391$]. Infants'

average looking time decreased with each familiarization trial irrespective of the familiarization type (see Figure 1⁵).

Two separate repeated measures ANOVAS, with Familiarization Trial Number as a within-subject factor, demonstrated that infants' looking times significantly declined for both the helping familiarization trials [$F(1, 3)=7.472$, $p<0.001$] and the hindering familiarization trials [$F(1, 3)=3.495$, $p=0.019$].

Test trials

An ANOVA looking at infants' looking time at test as a function of familiarization and test trial, indicated no main effects of familiarization, $F(1, 55)=0.337$, $p=0.542$, or test trial, $F(1, 55)=2.662$, $p=0.109$. Critically, a significant interaction between familiarization and test trial was obtained, $F(1, 55)=5.373$, $p=0.024$; see Figure 2.

An independent samples t-test revealed that infants who were familiarized to helping behavior looked longer at the unfair distribution ($M=22.53$, $SE=1.83$) versus the fair distribution ($M=13.45$, $SE=2.65$), indicating they were surprised to observe the helper subsequently distributing resources unequally, $t(26)=2.82$, $p=0.009$, $d=1.067$. In comparison, infants who were familiarized to the hindering condition looked equally to the unfair ($M=15.79$, $SE=2.17$), and fair ($M=17.37$, $SE=2.47$) distributions, $t(26)=0.48$, $p=0.635$, $d=0.182$, suggesting that following hindering infants suspended their baseline expectations for fair resource distributions.

Experiment 2

In Experiment 1, consistent with Surian et al. (2018), we found that infants who were familiarized to helping behavior were surprised when the helper subsequently distributed resources unfairly, whereas

⁴ Though we aimed for 50% of the sample for reliability coding, due to lack of parental consent and Zoom errors, we did not have videos for all participants.

⁵ One participant did not look at Familiarization Trial 4 and the results are the same with the participant included or excluded.

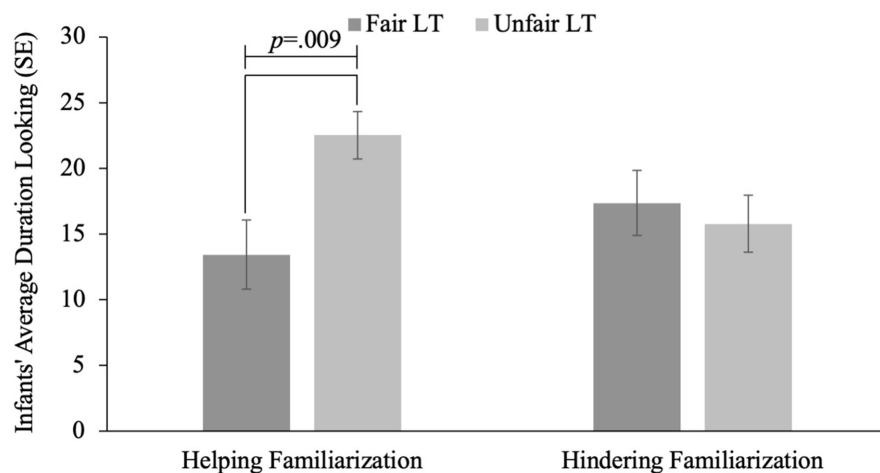


FIGURE 2
Infants' average looking time to fair and unfair distributions following helping and hindering behavior.

infants who were familiarized to hindering behavior suspended expectations for fair or unfair distributions. In Experiment 2, we reversed the direction of moral behavior to investigate if infants generalize from fairness/unfairness to help/hinder, to determine whether infants make the link between the sub-domains of help/harm and fairness in a bi-directional manner.

Method

Participants

The final sample consisted of 56 14- to 26-month-old infants (age range: 14 months 5 days to 26 months 15 days; $M = 18$ months 9 days; 31 female, 25 male). Participants were recruited from an online database. Our sample⁶ consisted of 56% White, 18% Biracial (i.e., East Asian/Southeast Asian, East Asian/Indo-Caribbean, East Asian/White, Southeast Asian/White or South Asian/White), 8% East Asian, 5% Multi-Racial (i.e., East Asian/Jewish/Eastern European) or South Asian/Southeast Asian/White, 5% Arab, 2% Black, and 2% Caribbean/West Indian. The data of 23 additional participants was excluded due to fuss out ($n = 4$), inattentive child ($n = 6$), procedural errors ($n = 1$), technical errors ($n = 1$) or other errors (i.e., parental interference, environmental interference; $n = 11$). Parental consent was obtained on behalf of all the infants through a Qualtrics survey parents completed prior to testing.

Procedure

Infants participated in the same procedure as in Experiment 1, with the exception that the events were reversed: infants saw familiarization trials (fair or unfair distributions), a preview trial

(actor struggling to open a box), and a test event (either helping or hindering).

Reliability coding

Infants looking was coded online using jHab (Casstevens, 2007) by an experimenter and a secondary coder, unaware of which condition a participant was run in, coded infants' looking time. The secondary coder reliability coded 98% of the total sample.⁷ The original coder and secondary coder's looking times were highly correlated on familiarization trials, $r = 0.968$, $p < 0.001$, and on test trials, $r = 0.985$, $p < 0.001$.

Results

Familiarization trials

A 2 (Familiarization Type: fair distribution vs. unfair distribution) \times 4 (Familiarization Trial Number) ANOVA revealed a main effect of familiarization trial number [$F(3, 53) = 5.412$, $p = 0.001$], but no effect of familiarization condition [$F(1, 55) = 1.529$, $p = 0.222$] and no significant interaction [$F(3, 53) = 1.027$, $p = 0.382$]; see Figure 3.

Two separate repeated measures ANOVAs, with Familiarization Trial Number as a within-subjects factor, demonstrated that while infants' looking significantly declined for the fair distribution [$F(1, 3) = 5.131$, $p = 0.003$] it did not for the unfair distribution [$F(1, 3) = 1.723$, $p = 0.169$]. These findings suggest that although infants did not look longer overall at the unfair familiarization event, as might be expected by prior work (i.e., Geraci and Surian, 2011; Schmidt and Sommerville, 2011; Sloane et al., 2012), there is some evidence that infants found the unfair distribution to be more unexpected than the fair distribution.

⁶ Parent and child demographic information were acquired post-hoc. As such, response rates were low.

⁷ Excluding the parents who declined consent to have their testing session recorded.

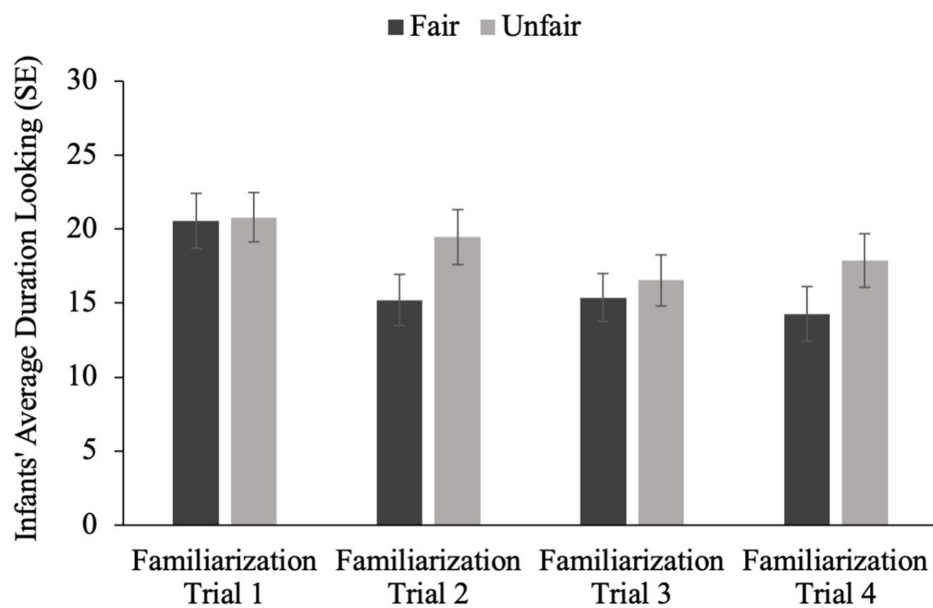


FIGURE 3
Average looking time on each familiarization trial number by familiarization trial type.

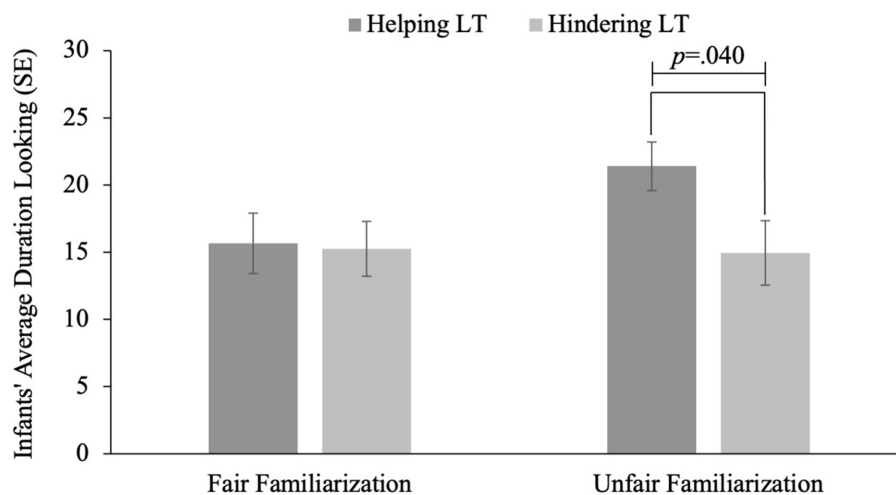


FIGURE 4
Infants' average duration looking to helping and hindering following fair and unfair behavior.

Test trials

An ANOVA looking at infants' looking time at test as a function of familiarization and test trial revealed no significant main effects of familiarization, $F(1, 55) = 1.639$, $p = 0.206$, or test event, $F(1, 55) = 2.608$, $p = 0.112$. The interaction between familiarization and test trial was not significant, $F(1, 55) = 2.016$, $p = 0.162$; however, given our analytic plan we proceeded to conduct planned comparisons on looking times to the test events as a function of condition.

An independent samples t -test revealed that infants who were familiarized to fair distributions looked equally to the helping ($M = 15.67$, $SE = 2.25$) and the hindering behavior ($M = 15.25$, $SE = 2.03$), $t(26) = 0.137$, $p = 0.892$, $d = 0.052$. In comparison, infants who were familiarized to the unfair distribution looked longer at the

helping ($M = 21.42$, $SE = 1.81$) behavior, than the hindering ($M = 14.96$, $SE = 2.39$) behavior, indicating that infants were surprised when the unfair distributor later helped rather than hindered, $t(26) = 2.157$, $p = 0.040$, $d = 0.815$ (Figure 4).

Discussion

We sought to investigate whether infants use information from one sub-domain to form expectations of how an individual will act in another sub-domain, whether they do so in a bi-directional manner, and whether the strength of their tendency to do so varies according to the source sub-domain. In Experiment 1, we found that after infants were familiarized to an agent who helped another agent in obtaining

her goal, infants looked longer to that individual perform unfair versus fair resource distributions. In contrast, after seeing an agent hinder another agent, infants suspend expectations for equal resource distributions for that agent. Together, these results provide a conceptual replication of Surian et al. (2018) and extend these results to events that involve human actors (rather than animated agents) and novel exemplars of helping/hindering behavior. Additionally, whereas Surian et al. (2018) used a 2:0 versus 1:1 distribution, our experiments featured a 5:1 versus 3:3 distribution. Distributions that feature 2:0 outcomes may conflate social exclusion (since one recipient is not included in the exchange at all) with unfairness; in our experiment, by ensuring that each recipient was involved in the exchange but one recipient received more resources than another, our experiments deconfounded unfairness from social exclusion, and demonstrate that infants use hindering behavior to make inferences to guide their expectations about fairness/unfairness *per se*.

In Experiment 2 infants were familiarized with a fair or unfair distribution and then saw helping or hindering on test. On test trials, infants' attention to the helping and hindering varied based on their familiarization type. Infants looked equally at helping or hindering actions performed following an agent's fair distribution. In contrast, infants looked longer at helping than hindering after seeing an agent perform an unfair distribution. These results suggest that whereas prior fair behavior has no impact on infants' helping and hindering expectations, unfair behavior leads infants to believe that the individual will subsequently hinder, rather than help, another agent achieve her goal.

Across our two experiments, we found differential effects of the initial event on infants' subsequent reactions to a second morally valenced behavior. Specifically, in Experiment 1, witnessing helping (a positive moral behavior) led infants to expect subsequent fairness (versus unfairness) whereas witnessing hindering (a negative moral behavior) led infants to have no expectations for fair or unfair behavior. In Experiment 2, witnessing fairness (a positive moral behavior) led to no expectations for helping versus hindering, whereas witnessing unfairness (a negative moral behavior) led infants to expect subsequent hindering behavior (vs. helping behavior). This pattern of findings is consistent with two distinct possibilities.

The first possibility is that infants' fairness/unfairness and help/hinder expectations are differentially affected by the valence of prior moral behavior; from this perspective, witnessing helping led infants to form subsequent prosocial expectations whereas as witnessing unfairness led to subsequent anti-social expectations. Another way to put this is that infants may see hindering as more influential than helping for forming specific subsequent expectations in the fair/unfair sub-domain, and, conversely, that infants may see unfairness as more influential than fairness in forming subsequent expectations for helping/hindering. Other work has revealed differential effects of positive and negative information on competence versus morality judgments, showing that positive information more strongly influences competence judgments and negative information more strongly influences moral judgments (Wojciszke et al., 1993; Trafimow, 2001). It is possible that such differential effects of initial positive versus negative information also exist between sub-domains of morality, particularly since many prior studies manipulate morality primarily through harm/care scenarios (i.e., Wojciszke et al., 1993).

A second possible interpretation of our findings is that the results reflect initial differences in baseline expectations across the two sub-domains: much work has found that infants have baseline

expectations for fair over unfair behavior (Geraci and Surian, 2011; Schmidt and Sommerville, 2011; Sloane et al., 2012; Ziv and Sommerville, 2017; Sommerville and Enright, 2018), whereas no particular expectations for whether a given individual will be helpful or hindering (Hamlin et al., 2007; Fawcett and Liszkowski, 2012; Hamlin, 2013; Margoni and Surian, 2018; Tan and Hamlin, 2022). Although infants did not look significantly longer at the unfair distribution (versus fair) during familiarization in Experiment 1, as might be expected by prior work (Geraci and Surian, 2011; Schmidt and Sommerville, 2011; Sloane et al., 2012; Burns and Sommerville, 2014), infants' attention declined to the fair distribution across familiarization trials but not the unfair familiarization (whereas this was not true for either helping or hindering behavior during familiarization trials; in both cases, infants' attention declined significantly). Thus, it is possible that in the current experiment infants may show a weak baseline expectation for fair distributions which may be due to either the difference in the task structure (i.e., no preview of familiarization trial, recipients' faces not visible to infant) or the fact that testing occurred via Zoom. From this perspective, across both experiments witnessing initial prosocial behavior (i.e., helping, fairness) has no impact on baseline expectations for subsequent prosocial or anti-social behavior, whereas initial antisocial behavior (unfairness, hindering) shifts baseline expectations. Critically, this perspective is in keeping with work from adults showing stronger effects of negative moral information on moral trait inferences than positive information (Wojciszke et al., 1993); however, our current findings do not allow us to distinguish these alternatives.

Regardless, both interpretations are consistent with the broader claim that in the second year of life infants are capable of generalization across moral sub-domains. But are there qualitatively distinct interpretations possible that do not necessarily involve moral reasoning on the infants' part at all? One possibility is that infants may have construed the protagonist's behavior in the familiarization trials in terms of whether it facilitates another agents' goals or disrupts it; in other words, infants may represent these events solely in terms of the protagonists' role in an inter-personal interaction. Agents that help and enact fair distributions act as goal facilitators (by helping another agent get their desired toy or get an optimal number of resources), whereas those that hinder and enact unfair distributions (by hindering another agent's access to a desired toy or minimizing the number of resources obtained) disrupt others' goals. It is possible that infants respond on test based on the role that the protagonist adopts as either a goal facilitator or goal disruptor, and whether it is consistent with their prior role (i.e., looking longer when a goal facilitator becomes a goal disruptor and vice versa). However, it seems less likely than other interpretations given the asymmetry we observed in our data; thus, we favor the broader conclusion that our data support the interpretation that infants generalize across moral sub-domains while recognizing the exact way that they do so requires further study.

While our findings suggest a bidirectional tendency to generalize from moral norm violations from help/harm to fairness and vice versa, a descriptive characterization of the effect sizes across studies indicates that infants generalize more strongly from hindering behavior to unfairness ($d = 1.067$) than they do from unfair behavior to hindering ($d = 0.815$). Coupled with the fact that infants show a sensitivity to help/harm prior to when they show a sensitivity to fairness/unfairness (Sommerville, 2022), and the fact that individuals tend to see hindering as more egregious than unfairness (Yucel et al., 2022), these findings raise the possibility that the degree to which infants will

generalize from a given moral behavior may vary according to the severity of that behavior. Future work can directly test this idea.

There are several possible limitations of our work that bear consideration. One possible limitation is that we only used single examples of helping/hindering actions, and fair/unfair distributions. Future work should confirm whether our findings generalize more broadly to other exemplars of these behaviors. Another limitation of our work could be that our sample did not formally test infants younger than 14-months, and as such we cannot speak to the developmental origins (or lack thereof) of infants' generalization. However, preliminary findings in our lab testing 12- and 13-month-old infants provide no evidence that infants of this age generalize across moral sub-domains. Assuming this developmental transition is replicated, one possibility is that the transition to generalization reflects a domain-general change in infants' generalization abilities. Alternately, this transition may be better explained by a domain-specific shift in behavioral generalization that is spurred by infants' increasing language comprehension and exposure to common moral trait terms (i.e., nice, mean) provided by parents and caregivers. Young children show evidence of using moral trait terms between 19- and 22-months (Bloom et al., 1975; Fenson et al., 1994), and by 30-months, they even begin to apply these terms to morally relevant contexts (Snow, 1987). Given that infants' language comprehension frequently exceeds their production, future studies can empirically test the role of exposure to common trait terms in the face of both adherence to and transgressions of moral norms to determine their role in infants' generalization across moral sub-domains.

In closing, here we demonstrate that infants possess an ability to generalize across moral sub-domains of fairness and help/harm. Given findings that young children show similar patterns of generalization across moral sub-domains (Gill et al., under review; see footnote 1), these results point to striking commonalities between older children and infants' tendency to rapidly generalize from moral transgressions. These results open the door to a more fulsome investigation into infants' tendency to engage in behavioral generalizations, and raise important directions for future work, including the age of emergence of this tendency, the scope of generalization, and the underlying mechanisms supporting these generalizations.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Ethics statement

The studies involving human participants were reviewed and approved by University of Toronto (U of T) Research Ethics Board (REB). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

IG and JS conceptualized the study, performed the formal analyses, developed and designed the methodology, were responsible for project administration, and reviewed and edited the final draft. IG was responsible for data collection and investigation, wrote the original draft, and prepared and presented the work throughout data collection under JS supervision. JS acquired funding for the project. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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

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