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Early Development in cross-country perspective: A systematic review of a quarter century of developmental research

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ABSTRACT

The first years of life are characterized by rapid developmental changes across multiple domains, including neurobiological maturation, motor skills, socio-emotional characteristics, and cognitive abilities. These developmental processes are, in part, influenced by external factors such as culture and country. For this reason, the predominant contemporary reliance on so-called WEIRD populations poses a significant limitation to the generalizability of developmental theories. For the Special Issue, this review aims to present a cross-country perspective on early development by analyzing literature from the first 25 years of the 21st century published in *Infant Behavior and Development*. We screened 1768 documents and identified 58 studies that included data from multiple countries. The majority of these studies were authored by researchers from the United States, the United Kingdom, Germany, and the Netherlands. In this review, we categorized and discussed the studies into five recurring research domains, which encompass developmental processes: temperament, socio-emotional development, communication and language development, cognitive development, and motor development. The current review documents the growing interest in cross-country research on early development, yet also reveals notable gaps, particularly in studies of cognitive and motor development as well as neurodevelopmental processes. Most studies have focused on the influence of parenting and socialization practices on early development, mainly using cross-sectional data from high-income countries. However, expanding research to encompass a broader range of cultural contexts and developmental domains is essential to advancing the science of infancy. By fostering greater diversity in cultural perspectives, future studies can provide a more comprehensive understanding of how different environments shape early development. This development, in turn, can inform more effective, culturally responsive early childhood care and education practices worldwide.

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1. Introduction

The first years of life represent a critical period in human development, marked by rapid physiological, physical, and psychological changes that lay the foundation for later functioning (Blankenship et al., 2019; Bornstein, 2014). For example, during this period, infants typically progress from being unable to hold up their head to walking independently, while also developing the capacity to recognize caregivers, vocalize more articulately, and express a range of emotions (e.g., Cohen & Billard, 2018; Grossmann & Johnson, 2007; Malik & Marwaha, 2018; Malina, 2004; Sroufe, 1982; Tsao et al. 2004). This rapid development results from interactions between biological predispositions and environmental inputs, including both culture-general experiences and culture-specific influences. Innate, phylogenetically preserved mechanisms guide early learning (Carollo et al., 2025; Vallortigara, 2021), but they are shaped and refined by interactions with caregivers and the surrounding context (Bornstein & Esposito, 2023).

That is, infant development does not occur in a vacuum; rather, it is shaped by interactions among biological, psychological, social, and environmental factors (Zeanah et al., 1997). Bronfenbrenner's (1997) *Ecological Systems Theory* underscores the critical role of ecological factors in child development, conceptualizing the child's environment as a set of nested systems that influence individual growth (Eriksson et al., 2018). In the *Ecological Systems Theory*, the microsystem encompasses the infant's immediate surroundings, such as family, caregivers, and daily interactions. The mesosystem refers to the connections between these environments, such as the relation between home and childcare settings. The exosystem includes broader social structures, such as parental workplaces and media influences, which indirectly affect the child. Finally, the macrosystem comprises overarching cultural values, laws, and societal norms that shape child-rearing practices and developmental expectations (Bronfenbrenner, 1978). Different countries, with their unique cultures, traditions, and values, create distinct frameworks that shape early development. This theory underscores the need to study how infants' experiences and developmental trajectories vary across different cultural contexts (Bronfenbrenner, 1979; Tudge & Rosa, 2019). Understanding such variation is crucial for capturing the full diversity and complexity of infant development and ensuring whether research findings are applicable across diverse populations.

Recognizing that development is shaped by environmental influences also raises critical questions about the extents to which existing developmental theories account for cultural and contextual variability. Developmental scientists increasingly highlight the need to assess the generalizability of theories across diverse cultural contexts (e.g., Bornstein, 2002, 2010; Nielsen et al. 2017; Singh et al. 2023, 2024; Singh & Rajendra, 2024). For example, studies by Tomlinson and Swartz (2003) and Tomlinson et al. (2014) have demonstrated that the vast majority of publications in developmental science journals disproportionately rely on convenience samples drawn from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) populations. These findings raise concerns that culturally specific patterns observed in WEIRD samples may be mistakenly treated as culture-general traits in developmental science. This issue is especially pressing given that over 90 % of the world's infants are born in low- and middle-income countries, which are vastly underrepresented in developmental research (Tomlinson et al., 2014).

To summarize, while contextual factors such as country and culture play fundamental roles in shaping early development, they have often been overlooked in developmental theories and research. These oversights raise the risk of interpreting culture-specific patterns as culture-general principles. In response to this issue, and as part of the Special Issue "A Quarter Century Review of Research on Infant Behavior and Development", our systematic review aims to investigate the contributions of *Infant Behavior and Development* to promoting findings that are generalizable across cultural contexts and to guiding the development of theories that are contextually informed. To do so, this work examines how research published by *Infant Behavior and Development* on cross-cultural and cross-country differences in early development has evolved over time. Specifically, we analyze publication trends in the existing literature and outline the predominant thematic domains explored in developmental studies.

2. Method

2.1. Data collection from Scopus

To investigate research on early development, we focused on publications from *Infant Behavior and Development*. All data were retrieved from Scopus, where the journal is indexed, with the search restricted to studies published between 2000 and 2025 to ensure a focus on the contemporary literature, aligning with the scope of the Special Issue. The search was conducted on January 15, 2025 and yielded a total of 1768 documents.

2.2. Screening of eligible documents

The collected data were screened for eligibility to include only publications that adopted a cross-country perspective on early development. Two screening criteria were applied: *(i)* studies had to focus on children aged 0–36 months and *(ii)* studies had to include participants from more than one country. We did not differentiate explicitly between culture and country as separate constructs. Rather, we used the phrasing in the original publications.

3. Overall trends in the eligible documents

In total, 58 documents (3.28 % of the total literature) were deemed eligible for this study (see the Supplementary Materials for the complete list of eligible documents). Notably, the proportion of cross-country studies published in *Infant Behavior and Development* showed a slightly increasing trend in these years, suggesting increasing recognition of the importance of cross-cultural perspectives in

developmental research (see Fig. 1).

Analysis of authors' country affiliations revealed that most contributors originated in the United States (US), the United Kingdom (UK), Germany, and the Netherlands (see Fig. 2), highlighting the prevalence of Western, high-income countries in this field. The most frequent collaborations involve US-based authors working with colleagues from Italy and South Korea (see Fig. 3). Additionally, strong research collaborations were observed between Belgium and the Netherlands and between the UK and Japan. Despite these collaborative efforts, the findings suggest that research from underrepresented regions remains limited. Expanding cross-country studies to include a broader range of cultural contexts—especially from low- and middle-income countries—would provide a more comprehensive understanding of infant development worldwide.

4. Frequent thematic domains of research

In the following sections, we have grouped eligible documents by thematic domain within developmental science. Thematic domains were derived through a qualitative inspection of the documents conducted by two authors (AC and DS). The division of infant development into discrete areas was chosen for readability purposes and does not imply that these developments occur independently from one another or can be categorized rigidly. The purpose of the next section is to provide a narrative review of what is currently known about the influence of country and culture on early development based on research published in *Infant Behavior and Development*. This review specifically aims to address the critical gap in developmental theories where contextual factors, such as country and culture, have often been overlooked, raising the risk of interpreting culturally specific patterns as culturally general principles.

4.1. Temperament

A recurring theme in cross-country developmental studies is temperament (e.g., Kirchhoff et al. 2019), which is defined as stable individual differences in reactivity and self-regulation (Farkas & Vallotton, 2016). Studies in our sample examined temperament across a range of ages in early development, from birth through toddlerhood, highlighting how both the expression and perception of temperament traits vary across cultural contexts. This line of research was often accompanied by efforts to adapt and validate assessment instruments for use in underrepresented populations, ensuring their cultural relevance and measurement reliability.

Regarding newborn temperament, Katus et al. (2025) adapted the Neonatal Behavioral Assessment Scale (NBAS), originally developed by Brazelton and Nugent (1995), for use in rural Gambia, comparing the scores of Gambian newborns with that of newborns from the UK aged 7–14 days. The NBAS is a comprehensive tool designed to assess newborns' behavioral and neurological responses to their environment, including motor skills, reflexes, and orientation to stimuli. The study found that, compared to UK newborns, Gambian newborns exhibited fewer state changes (i.e., transitions between calm alert and crying/fussing states) and required greater facilitation from the examiner. This study showed that the NBAS can be used across diverse cultural settings for more inclusive research on newborn behavior. However, missing data on the NBAS habituation subscale in the Gambian sample highlights the need to optimize testing protocols when specific indices are key. For example, the authors suggested that, if habituation is a focus, sessions should ideally be scheduled when infants are more likely to be asleep at the start to increase data reliability.

In infants, temperament has been widely studied across countries using the Infant Behavior Questionnaire-Revised (IBQ-R), developed by Gartstein and Rothbart (2003). Across samples, exploratory factor analyses consistently support a three-factor structure for the IBQ-R, assessing surgency/positive affectivity, negative emotionality, and effortful control. Using this instrument, researchers have compared the temperament of infants from the US with those from Russia (Gartstein et al., 2005), Chile (Farkas & Vallotton,

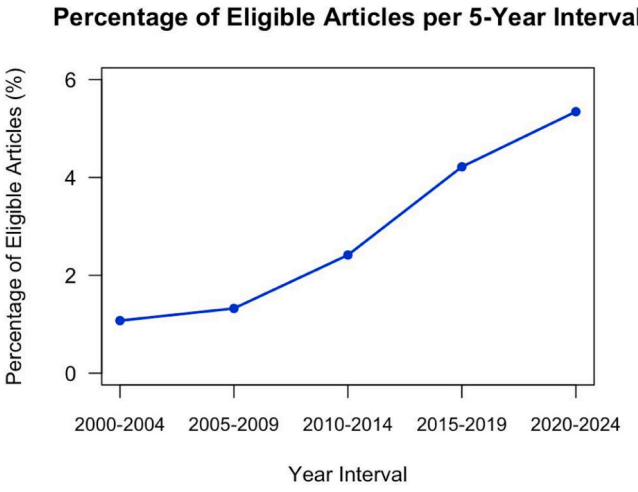

Fig. 1. Percentage of eligible articles per 5-year interval over the past 25 years. Eligible articles focused on children aged 0–36 months old and included participants from at least two different countries.

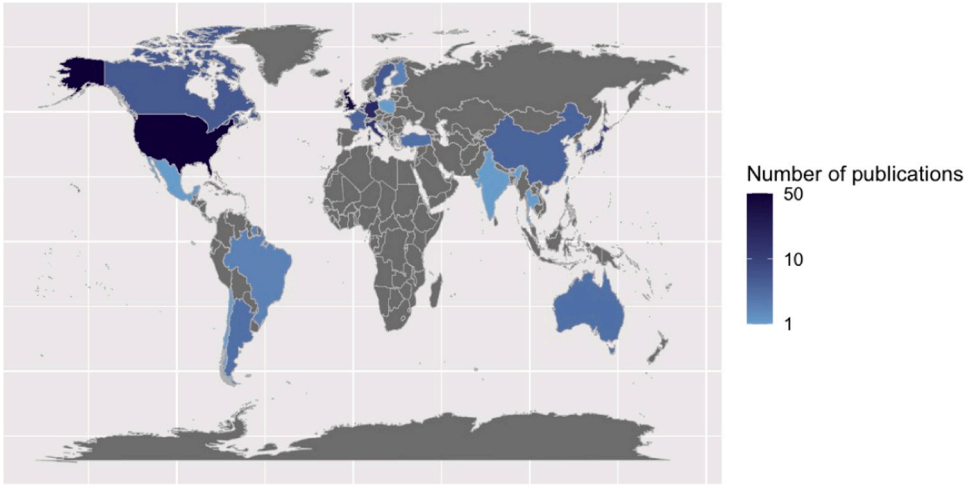

Fig. 2. Frequency of eligible publications by country based on the authors' affiliation strings. Countries shown in grey did not appear in the sample.

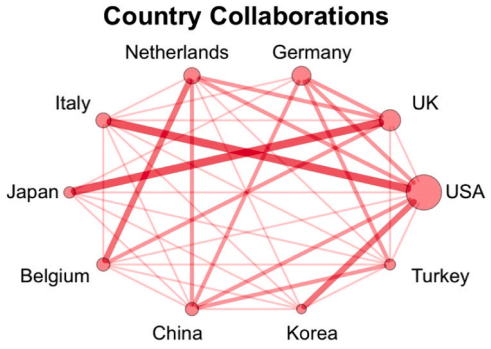

Fig. 3. Country co-occurrence network among eligible publications, where stronger co-occurrences are represented by wider links between countries.

2016), and Ethiopia (Gartstein et al., 2016). These studies confirmed the validity of the IBQ-R's three-factor structure across all tested populations, although cross-cultural differences emerged in the relations between factors. For instance, a comparison of US and Russian infants (3–12 months old) revealed that Russian parents reported higher levels of negative emotionality (e.g., distress to limitation, fear) and lower levels of surgency (e.g., smiling/laughter, approach) compared to US parents. Likewise, US and Chilean infants (10–15 months old) displayed differences in temperament, with Chilean parents reporting higher effortful control and lower negative emotionality than their US counterparts. Lastly, in the comparison between US and Ethiopian infants (US: 3–12 months; Ethiopia: 2–12 months), US infants exhibited higher surgency, whereas Ethiopian infants showed greater negative emotionality. Despite their contributions, the three studies share key methodological limitations. A major concern is whether the measurement tools accurately capture temperament across cultures and developmental stages. Additionally, small sample sizes, limited socioeconomic diversity, and narrow demographic representation (e.g., only center-based care, no rural/urban comparisons) restrict the generalizability of the findings. The exclusion of low-income families or home-cared children may have led to an underrepresentation of important temperament variations.

Using the Early Childhood Behavior Questionnaire, Cozzi et al. (2013) compared the temperament of US and Italian toddlers (18–36 months old). The study results showed that Italian toddlers had higher scores on cuddliness, impulsivity, low-intensity pleasure, perceptual sensitivity, and positive anticipation. Conversely, US toddlers were higher on frustration, high-intensity pleasure, inhibitory control, shyness, and soothability. Although the study improved cross-cultural research by including diverse locations in the US and Italy, the samples were not fully representative. Another limitation is the reliance on parent reports, which, despite prior validation, may introduce bias by reflecting parental perceptions rather than direct observations of infant behavior.

4.1.1. Internalizing and externalizing problems

In the literature reviewed, temperament was also explored in relation to internalizing and externalizing behavior problems. For instance, Cassiano et al. (2018) used the Child Behavior Checklist, developed by Achenbach and Edelbrock (1991), to assess behavior problems in Italian and Brazilian very preterm toddlers (18–24 months old). Their findings revealed an interaction between country

and sociodemographic factors in predicting behavior problems. Specifically, Brazilian toddlers exhibited higher levels of internalizing, externalizing, and total behavior problems compared to their Italian counterparts. Sociodemographic factors (i.e., maternal age at childbirth, maternal education) mediated the relation between the country and toddlers' internalizing and total behavior problems. In Brazil, younger maternal age and lower levels of education were associated with a higher risk of internalizing and overall behavior problems in preterm toddlers. This study's novelty lies in its cross-country comparison of behavior problems in preterm toddlers, suggesting that preterm children in low- and high-income countries may face different levels of risk. Moreover, the findings highlight how sociodemographic factors can exacerbate behavior difficulties associated with prematurity.

4.1.2. Self-regulation and co-regulation

The theme of self-regulation often emerged in the reviewed literature. The research sample primarily focused on two key aspects of self-regulation: eating and sleep-wake cycles (e.g., Feng et al. 2001). Regarding eating behaviors, van den Engel-Hoek et al. (2014) studied the development and stabilization of oral motor skills required for spoon feeding in infants from the Netherlands and Germany. Most previous studies have used scales and checklists to assess infant feeding and swallowing and offered limited detail about specific aspects of oral motor development, such as spoon feeding. By tracking infants aged 17–33 weeks at the initial assessment, Engel-Hoek et al. found that mastering this skill took an average of 5.7 weeks, with some infants requiring up to 8 weeks. Moreover, the study found no significant correlation between the age at which spoon feeding began and the number of weeks needed to acquire the skill. Finally, it was observed that, while oral motor behavior consolidated, abnormal behavior diminished. These findings suggest that, for diagnosing oral motor difficulties related to spoon feeding, the duration of skill acquisition may be more informative than the infant's starting age. However, a limitation of the study is that it included infants only from Western European contexts, which may limit the generalizability of the findings. Feeding practices and caregiver expectations vary widely across cultures, and these factors could influence the pace and style of oral motor development in different populations.

Eating and sleep are closely connected. In a systematic review, Manková et al. (2023) examined how different infant feeding methods impact sleep patterns. The findings revealed that breastfed infants woke more frequently during the night; however, their total sleep time and time spent awake were comparable to formula-fed infants. Additionally, the study found no significant differences in maternal sleep quality based on the feeding method.

In examining infant sleep-wake cycle, Super et al. (2021) explored differences between the Netherlands and the US, focusing on cultures with distinct parenting beliefs and practices. Using actigraphy and parental diaries, the study found that Dutch infants (8 months old) slept an average of 1.67 h more per day than US infants, primarily due to longer daytime sleep. Additionally, Dutch infants had shorter wake episodes, slightly longer sleep episodes, and spent more time in quiet sleep, beginning it earlier in the evening than their US counterparts. Similarly, Hewitt et al. (2017) conducted a systematic review of 15 studies across seven countries to examine factors associated with tummy time—the practice of placing an awake infant on their stomach while under supervision. Tummy time was positively correlated with several factors, including time spent in the bath and prone sleeping.

Another important influence on self-regulation is represented by the use of digital media (Ribner & McHarg, 2021). Desmarais et al. (2021), with toddler (15–41 months old) data collected from 14 countries, showed that more time watching TV was associated with higher negative emotionality, attention problems, emotional reactivity, aggression, and lower soothability. The study also revealed culture-dependent patterns, particularly regarding attention problems and soothability. For instance, in the Netherlands, TV exposure had more pronounced negative effects compared to other cultural contexts, such as Spain. However, it is important to note that the study relied on cross-sectional data, limiting causal interpretations. Furthermore, it did not account for the content of the media or the context in which television was viewed, both of which could influence developmental outcomes.

All these studies also highlight the role of co-regulation, where caregivers actively support and guide their infants' self-regulation through practices like feeding, soothing, and sleep management, which can vary based on cultural norms and parenting practices (Negayama & Trevarthen, 2022; Negayama et al., 2023; Ribner & McHarg, 2021). For example, Negayama and Trevarthen (2022) compared Scottish and Japanese mothers with regard to distance co-regulation at home in relation to the development of locomotion, object-oriented play, and intention recognition. Cultural differences were found, as Scottish mothers more often initiated contact and encouraged independence, whereas Japanese mothers emphasized infant-centered care by maintaining contact during sleep and responding promptly to crying.

Together, these findings emphasize the role of parenting practices in shaping early self-regulatory abilities and illustrate the cross-cultural variability in these caregiving behaviors. Additionally, they demonstrate that even maturational processes like sleep are influenced and structured by external cultural and caregiving factors.

4.2. Socio-emotional development

4.2.1. Parental practices

A significant portion of the sample used a cross-country approach to examine infants' socio-emotional development, particularly how sociocultural contexts influence parental practices and caregiver-infant interactions.

For instance, Hsu and Lavelli (2005) compared American and Italian mothers, identifying both similarities and differences in parenting perceptions and behaviors. The authors employed a longitudinal design, collecting data at three time points: before birth, when the infant was 1 month old, and again at 3 months of age. Results of self-report measures showed that mothers in both countries reported increased parental efficacy from 1 to 3 months. Moreover, micro- and macro-coding of videotaped mother-child interactions revealed that Italian mothers engaged more in social and affective interactions and physical contact, whereas US mothers exhibited more synchronous responses when infants were resting. Conversely, Senese et al. (2012) found different patterns when comparing

Italian and American mothers of 20-month-old toddlers by collecting data using the Parental Style Questionnaire. At this stage, Italian mothers reported engaging less frequently than US mothers in both social and didactic interactions with their children. Hence, Italian mothers appeared to engage more in social and affective exchanges with their infants compared to their US counterparts, a pattern that reversed once the children reached toddlerhood. However, these contrasting findings may also reflect methodological differences, as the first study involved a smaller sample but included behavioral coding, whereas the second study relied solely on self-reports but with a larger sample.

Italian mothers have also been compared to West African immigrant mothers regarding infant body stimulation during the first 3 months of life (Carra et al., 2014). Using a mixed-method approach, the authors observed spontaneous mother-infant interactions and investigated parenting ethnotheories through interviews with mothers. Immigrant mothers prioritized motor stimulation, engaging in longer durations of rhythmic motor and tactile behaviors compared to Italian mothers. In contrast, Italian mothers placed greater emphasis on tactile stimulation than their immigrant counterparts. The study also found that immigrant mothers adapted their motor stimulation practices to align with the values of their new cultural environment. This adaptation transformed motor stimulation into a positive interactive experience, characterized by mutual exchanges of positive emotions between mother and infant.

4.2.2. Theory of mind

The role of the cultural context in the development of action understanding and theory of mind has been highlighted in several cross-national studies. Hohenberger et al. (2012) investigated the relation between early cognitive development and mother-infant interaction in infants from Germany, the UK, and France at 6 and 10 months. Two cognitive tasks (goal-directed action and physical causality) were used and mother-infant interactions were assessed using the CARE-Index. Cognitive performance improved with age and was influenced by maternal interaction quality. At 6 months, only infants of moderately controlling mothers responded to goal-directed actions, while none discriminated physical causality. By 10 months, all infants could distinguish goal-directed actions, and those with highly sensitive mothers showed better performance on the physical causality task. The findings indicate that maternal behavior significantly impacts cognitive development at specific stages. Additionally, Norimatsu et al. (2014) examined the development of theory of mind in children under 3 years, focusing on linguistic aspects of the task. A new disambiguation task using proper nouns was conducted with children aged 16–38 months in France and Japan. Children over 30 months were able to interpret proper nouns while considering their partner's knowledge, while younger children struggled. Error analysis revealed that younger children mostly exhibited memory bias, while association bias was rare. No significant cultural differences were found between the French and Japanese children, suggesting that the task design minimized language-related cultural influences.

4.2.3. Imitation and maternal responsiveness

Several studies focused on imitation, mirroring in social interactions, and maternal responsiveness in cross-cultural perspective (e.g., Borchert et al. 2013; Wörmann et al. 2012). For instance, Wörmann et al. (2012) found cultural differences in mother-infant (6–12 weeks old) imitation and the frequency of smiling. Specifically, the authors observed that, in both Germany and Cameroon, at 6 months of age, infants and their mothers smiled at each other for similar amounts of time and rarely imitated each other's smiling. Conversely, cross-cultural differences emerged at 12 weeks, when German mother-infant dyads smiled at and imitated each other more often than did Nso mothers and their infants. The study by Cote et al. (2023) compared maternal responsiveness across cultural settings. Mother-infant (5.5 months old) dyads from Japan, South Korea, South America, and the US showed consistent and similar patterns of contingency and attunement in moments where the mother was talking and the infant was listening. In the same task as well as when the mother was speaking and the infant vocalizing, cultural effects emerged in maternal responsiveness.

4.2.4. Emotional regulation

To study cultural differences in caregiver-infant interactions and emotional regulation in early development, some studies have employed the Still-Face Paradigm. Lowe et al. (2016) examined the role of maternal touch in infant emotional regulation across two cultural groups: Ecuadorian mothers and Hispanic mothers from the US. The mother-infant (4 months old) dyads participated in the Still-Face Paradigm, with second-by-second coding of maternal touch and infant affect. The findings revealed that Ecuadorian mothers used more nurturing and accompaniment touch, and less attention-seeking touch compared to their US counterparts during the baseline phase. Moreover, playful touch led to an increase in infant affect, while accompaniment and attention-seeking touch resulted in a decrease. Similarly, Broesch et al. (2022) explored infant emotional responses in Bolivia, the US, and Fiji, focusing on how different caregiving practices (proximal care in Bolivia *vs.* distal care in the US and Fiji) influence infant behavior. In the Still-Face Paradigm, US and Fijian infants showed typical reactions, such as increased negative affect and reduced social engagement, during the still-face episode, whereas Bolivian infants showed no change. Additionally, Bolivian infants increased tactile self-stimulation during the still-face episode, whereas US infants did not. In a second study, a body-to-body version of the paradigm (reflecting the physical contact typical in Bolivia) showed similar results: Bolivian infants remained unaffected, whereas US infants exhibited decreased positive affect. However, both studies relied on small sample sizes, which limit the generalizability of the findings. Moreover, in Lowe et al. (2016), differences in testing environments — with Ecuadorian dyads assessed at home and US dyads in a clinic setting — may have introduced additional variability.

Beyond experimental paradigms like the Still-Face, other studies have explored cross-country differences in naturally occurring social interactions. For example, Kärtner et al. (2022) conducted a longitudinal, naturalistic study of mother-infant interactions in Kichwa families (i.e., an indigenous group coming from the Ecuadorian Andes) and urban middle-class families in Germany, focusing on the development of high-intensity infant smiling between 9 and 13 weeks of age. Infants' high-intensity positive affect increased from 9 to 13 weeks in the German sample, but not in the Kichwa sample, leading to significant cross-cultural differences at 13 weeks.

4.3. Communication and language development

4.3.1. Timing

Language and communication development are essential aspects of an infant's growth, evolving in tandem with social and emotional development. Social interactions are fundamental in shaping language acquisition (Katus et al., 2024). For this reason, several studies in the reviewed literature examined language development through caregiver-child interactions from a cross-country perspective, often emphasizing the rhythmicity and timing of those exchanges. For example, Keller et al. (2008) studied the temporal organization of spontaneous verbal and vocal behavior in mother-infant dyads (0–3 months old) from Germany and rural Nso communities in Cameroon, analyzing free-play interactions. German infants produced more vocalizations, especially negative ones, compared to Nso infants. There were no significant cultural differences in mothers' responsiveness to infant signals, but Nso mothers exhibited a greater tendency not to respond as their infants grew, whereas German mothers did not show the same tendency. Furthermore, Nso mothers were more likely to synchronize their vocalizations with their infants than German mothers, highlighting cultural differences in verbal interaction patterns. Although the study provided a longitudinal perspective, the findings were based on a small sample. Similarly, Van Puyvelde et al. (2015) compared mother-infant (3 months old) face-to-face free-play sessions between Mexican and Flemish dyads. Both groups relied on tonal synchrony, using similar pitch ratios and timing patterns, although differences emerged in the infants' vocal pitch imitation behavior. Flemish dyads frequently used pitch and interval imitations, with infants imitating their mothers twice as often as the reverse. In contrast, Mexican dyads rarely used pitch or interval imitations, and no significant difference was found in the direction of imitation.

4.3.2. Communication

Communication in parent-infant interactions can be structured and expressed differently depending on parental practices across cultures. In terms of child-directed speech, studies have commonly reported an increase in mothers' mean fundamental frequency and pitch range when speaking to infants. However, Kitamura et al. (2001) found cross-linguistic variations in these pitch modifications, comparing a tonal language (Thai) with a non-tonal one (Australian English). The authors conducted a longitudinal study, recording infant-directed speech in participants' homes. Overall, Australian English-speaking mothers tended to use more expressive intonation, whereas Thai mothers limited pitch variation to preserve lexical tone clarity. Despite these differences, both groups conveyed affective intent effectively, sometimes using alternative strategies such as lexical content or sentence-final particles.

Communication extends beyond verbal language to include gestures and non-verbal signs. Infant signs are symbolic gestures that allow young children to represent objects, actions, requests, and mental states, enabling communication with caregivers even before they begin speaking (Wang & Vallotton, 2016). These gestures serve as an early form of communication, supporting verbal development and varying across cultural contexts. Given their significance, several studies have examined cross-cultural differences in infant gestural communication. For instance, Kwon et al. (2018) explored cultural variation in gestural communication by comparing infants (6–36 months old) from English-, German-, and Chinese-speaking families, further highlighting differences in the use and function of gestures across linguistic and cultural contexts. Additionally, Wang and Vallotton (2016) showed that communicative preferences are shaped by cultural child-rearing goals and interaction styles. Typically, parents who speak East Asian languages tend to use verbs more frequently when communicating with their children than English-speaking parents. As a result, Chinese children are more likely than their English-learning counterparts to acquire verbs as their first spoken words. By comparing infants (6–37 months old) from the US and Taiwan, Wang and Vallotton (2016) observed that this cultural bias towards nouns and verbs manifests in sign use even before spoken language. There are limitations common to both studies, however. One major limitation shared by both studies is the use of parent reports to assess infants' gesture or sign use, which may be influenced by differences in how parents perceive, recall, and interpret their children's behaviors. Furthermore, both studies lack longitudinal data, which restricts the ability to identify the precise timing and individual variability in gesture emergence. Cultural factors such as parenting goals and communication styles likely shaped infants' gesture use, but these influences were not directly examined. Lastly, the relatively homogeneous socioeconomic backgrounds of participants and limited cultural representation reduce the generalizability of the findings within and across cultural contexts.

A particularly crucial gesture in infant development is pointing. Observing infants aged 3–24 months, Lovcevic et al. (2024) found that, as infants grew older, social pointing became more prevalent than non-social index-finger use. Additionally, the frequency of social pointing varied across cultures, with infants from Turkey, China, and Germany pointing significantly more often than those from Japan. Similar to previous studies, this research relied on parental reports to assess infants' pointing, which may introduce bias due to inaccuracies in adults' perception and memory. Additionally, the cross-sectional design limits the ability to track the development of pointing over time, a factor to consider when interpreting the findings.

4.3.3. Language

As infants begin to acquire language, they grow in both vocabulary and communicative skills. To investigate internal and external factors influencing language development, Kuvač-Kraljević et al. (2021) examined data from 24-month-old toddlers in Croatia, Estonia, and Finland. Specifically, they investigated the role of gender (internal factor), birth order, and parental education level (external factors) in language development. No significant differences emerged among the three linguistic groups, but the study found that gender had a greater influence than external factors on toddlers' lexical skills and ability to combine words. Across all three languages, girls exhibited larger expressive vocabularies than boys and were more likely to form word combinations into clauses. Two important limitations of the study are the omission of other key factors influencing vocabulary development, such as the geographic area in which a child lives (Southwood et al., 2021), and the restriction of the sample to parents with secondary or tertiary education.

In language development, speech perception and speech production are two key processes. Both were explored in the reviewed literature through a cross-country lens. Regarding phonetic perception, Werker (2024) provided a review of the body of work derived from the observation that, during the first year of life there is a change from broad-based to language-specific phonetic discrimination (Werker & Tees, 1984). In line with these observations, Nam et al. (2025) examined the sensitivity of 4- to 6-month-old Korean and Japanese infants to non-native Thai phoneme contrasts to test the perceptual narrowing hypothesis (Maurer & Werker, 2014). According to this theory, infants are initially able to perceive a wide range of phoneme categories, including those not present in their native language, but gradually lose sensitivity to non-native sounds as they focus on their own language's phonetic structure. The study by Nam et al. (2025) found cross-linguistic differences in early perceptual sensitivity, suggesting that language environment may have a more immediate influence on consonant perception than previously asserted by perceptual narrowing theory. Both these studies relied on cross-sectional designs and were based on parent-report data, both of which may compromise accuracy and introduce bias.

One study in our review investigated speech production using a cross-country approach. Specifically, Ha et al. (2021) studied vocal development in Korean- and English-learning infants (9–21 months old). Ha et al. (2021) found no significant cross-linguistic differences in the total amount of vocalizations or in the proportion of canonical syllables infants produced. However, they observed differences in the types of canonical syllables used by infants from the two language backgrounds. Korean-learning infants were more likely to produce vowel-consonant-vowel sequences, whereas consonant-vowel syllables were more prevalent among English-learning infants. This study offers a first step in comparing early vocalizations across English- and Korean-learning infants, but it is limited by a lack of longitudinal data and by an absence of information on child–caregiver interactions, which may significantly influence vocal development.

Further examining early vocal development, Lee et al. (2018) investigated cross-linguistic differences in canonical babbling patterns among infants (6–11 months old) exposed to different language environments in the US and Taiwan. Their findings suggest that the development of canonical babbling is influenced by a complex interplay of factors, including age, language/culture, and social context (infant-directed speech, overhearing adult-directed speech, and the absence of social interaction). Specifically, in both language groups, canonical babbling occurred more frequently at 11 months of age and was slightly, although not significantly, more prevalent among Chinese-learning infants.

4.4. Cognitive development

The early development of cognition is also influenced by a variety of factors, including cultural context, early experience, and neurodevelopmental processes. Significant changes in brain regions as children grow are responsible for different cognitive functions.

4.4.1. Memory

One study in our review explored the role of mother-child interactions in the development of autobiographical memory from a cross-country perspective., Schröder et al. (2012) examined German and Indian toddlers to understand how maternal behaviors contribute to infant memory formation. They found that in both cultures maternal elaborations during reminiscing were associated with children's memory contributions. For German toddlers, maternal support for toddlers' self-expression during free play at 19 months was a significant predictor of children's memory elaborations at 3 years. Conversely, in India, the toddlers' willingness to comply with their mothers' requests at 19 months was strongly related to memory elaborations at 3 years.

4.4.2. Executive functions

In early childhood, executive functions undergo rapid development. Executive functions refer to higher-order cognitive processes that regulate thoughts and behaviors, including inhibition, working memory, and cognitive flexibility. Miller et al. (2023) examined both the culture-general and culture-specific aspects of executive function development, highlighting common patterns across diverse cultural settings. Research suggests that executive function development follows a similar trajectory in North America, Europe, Asia, and South America. Despite these broad trends, factors such as socioeconomic status, bilingualism, and educational systems influence executive function development in culture-specific ways. However, limitations persist, including a predominance of WEIRD samples and reliance on studies from the same research labs. A notable cross-country study by Li et al. (2023) investigated factors influencing executive function development in samples of Dutch and Chinese toddlers (14 months old). The study examined whether parental autonomy support mediated the relation between caregivers and toddlers' executive functions. Autonomy support did not significantly mediate this relation, with similar results observed across the two cultural groups. However, the study had some limitations. The sample was mostly from middle- to high-socioeconomic backgrounds, limiting generalizability; and parental executive function was assessed with only two tasks, possibly affecting the detection of associations with scaffolding.

4.4.3. Attention and perception

Cross-country research as represented in our review also explored early cognitive, perceptual, and attentional processes. One popular area of early development involves the integration of auditory and visual stimuli. Dorn et al. (2018) examined how 4.5-month-old German and Swedish infants matched visual and auditory speech cues in their native languages. Infants were able to detect and match subtle phonetic and phonological characteristics of speech across modalities, even when prosodic differences were removed. These results suggest that the ability to process and retain cross-modal linguistic information develops early in infancy and functions similarly across diverse linguistic environments. In a similar vein, Haensel et al. (2020) examined how cultural differences shape face-scanning in British and Japanese infants (10–16 months old). British infants focused more on the mouth area, whereas Japanese infants exhibited greater attention to the central part of the face, particularly while viewing dynamic stimuli. This pattern

indicates that infants adopt visual processing strategies influenced by their cultural context, pointing to the development of a face-processing system that adapts to early sociocultural experiences.

Another comparison between British and Japanese toddlers (18–24 months old) was conducted by Ishibashi et al. (2021) to investigate relations between children's scale errors and categorization ability. Scale errors occur when children try to interact with miniature objects inappropriately, such as attempting to sit in a toy chair or climb into a toy car, reflecting a mismatch between their perception of size and their action representation (Arterberry et al., 2020; DeLoache et al., 2004). British toddlers, who tended to focus more on local details in their visual processing, made more scale errors than Japanese toddlers. In contrast, Japanese children, who exhibited a greater tendency to process information globally, did not show the same pattern of errors. This difference suggests that the ability to suppress scale errors may not be directly related to attention to size alone but may arise from how children integrate both global (size) and local (specific object features) information during object processing.

4.4.4. Assessing neurodevelopment and atypical trajectories

Our review revealed cross-country studies conducted to evaluate the psychometric properties of neurodevelopment assessment tools and analytical pipelines across countries (e.g., Doennecke et al. 2023; Jones et al. 2019). Specifically, two cross-country studies in the review employed the Bayley Infant Neurodevelopmental Screener (BINS), a standardized tool designed to assess an infant's risk of neurodevelopmental issues across various developmental domains. McCarthy et al. (2012) tested the instrument on a sample of South American children aged 3–24 months. The BINS was a feasible tool for use in this population. Notably, South American infants scored significantly higher than the US sample, and a lower proportion of South American infants were classified as at high risk for neurodevelopmental concerns compared to the US standardization sample. Another study by Wehby and Trujillo (2017) used the BINS to examine ethnic disparities in infant neurodevelopment in Brazil and Argentina. Focusing on children aged 3–24 months with normal birth outcomes, the study found significant differences in cognitive and receptive-expressive development based on ethnic ancestry. In Brazil, children of African ancestry scored lower than those of European ancestry, and in Argentina, children of Native ancestry showed similar gaps. These disparities were largely explained by geographic location and household characteristics, highlighting the need for policies addressing socioeconomic and geographic inequalities to reduce ethnic disparities in neurodevelopment.

4.5. Motor development

Cross-country research published in *Infant Behavior and Development* has explored how country practices influence infant motor development. Building on the assessment of the feasibility and applicability of the BINS discussed in Section 4.4.4, Fleurkens-Peeters et al. (2024) examined the motor scale of the third edition of the Bayley Scales of Infant and Toddler Development. Their findings confirmed that this assessment tool is appropriate for evaluating motor development in Surinamese infants.

Additionally, Hewitt et al. (2018) compared childcare adherence to infant physical activity and screen time recommendations in Australia, Canada, and the United States. Childcare centers generally followed guidelines supporting infant movement, such as supervised free play, tummy time, and providing stimulating environments while minimizing screen time. However, adherence was lower for limiting restrictive equipment, such as cribs and high chairs, and educating families on physical activity. Differences across countries were also noted: Australian centers were less likely to engage with infants on the ground, Canadian centers had gaps in staff training and parent education, and US centers had the lowest compliance with outdoor exploration and movement-restricting equipment limits.

5. Conclusion

By analyzing literature from the first 25 years of the 21st century published in *Infant Behavior and Development*, this review provides a cross-country and cross-cultural perspective on infant development. The quantitative findings reveal that cross-country studies are increasing. Most of this literature is shaped by contributors from the US, the UK, Germany, and the Netherlands, with the strongest research collaborations occurring between the US and Italy, and between the UK and Japan. Collaborations between US and Italian authors were particularly frequent in studies of parental practices and parent–child interactions, and collaborations between UK and Japanese scholars were more common in research on attention and perception. Additionally, our review categorizes cross-country studies into key research domains, revealing that they have primarily focused on understanding how variations in parenting and socialization practices influence early development. Cross-country studies remain relatively limited, but our findings emphasize increasingly significant research efforts dedicated to understanding how culture impacts early social development and, in turn, various aspects of early growth, including temperament, socio-emotional development, and language acquisition. To date, cognitive and motor development, as well as neurodevelopmental processes—both typical and atypical—have received less attention in cross-cultural research.

Given the increasing trend of cross-country studies, future research should prioritize these underexplored domains to provide a more comprehensive understanding of early development across cultures. Expanding research to include a broader range of cultural contexts would offer deeper insights into the diverse environmental influences on early development.

The existing body of work has contributed valuable knowledge, but there is still much to uncover. Notably, many of the studies reviewed are limited by small sample sizes and cross-sectional designs, which constrain the generalizability and depth of the findings. Addressing these methodological limitations through larger, longitudinal, and more representative studies will be crucial for future progress. By fostering greater diversity in cultural perspectives and addressing gaps in developmental research, studies in the second quarter of the 21st century willk enhance our understanding of early growth trajectories and contribute to the integration of cultural

variation into developmental theories. This advance, in turn, will inform more effective, culturally responsive early childhood care and education practices worldwide.

CRediT authorship contribution statement

Marc H. Bornstein: Writing – review & editing, Conceptualization. **Michelle Pederzolli:** Investigation. **Pietro Pizzo:** Investigation. **Giada Carrer:** Investigation. **Gaia Doderovic:** Investigation. **Dorina Shermadhi:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Alessandro Carollo:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Gianluca Esposito:** Writing – review & editing, Supervision, Conceptualization. **Angela Mazzon:** Investigation.

Declaration of Competing Interest

The authors declare no conflict of interest.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.infbeh.2025.102124.

Data availability

The dataset with the eligible documents can be found in the Supplementary Materials

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