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Role of parenting on self-regulation from a cross-cultural perspective: Major empirical findings from the first quarter of the 21st century

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ABSTRACT

This paper focuses on the extant evidence about the ways children around the globe master self-regulation (SR). Our goal was to summarize emerging evidence on cross-cultural comparison of SR in young children, and evaluate culturally common as well as distinct caregiver-child interaction patterns in relation to SR. Studies retrieved from major databases spanning from 2000 to 2025 were selected if they entailed samples of caregiver-infant/toddler dyads and compared at least two cultural groups. Ethnographic field studies and in-depth interview studies on emotion-related socialization for SR were also included. Findings were presented in three sections. First, the definition of SR and its milestones in early childhood are presented. Second, taking the cultural pathways as a conceptual framework, key findings from cross-cultural research with samples of infants and toddlers are synthesized that included studies on Face-to-Face Still-Face paradigm, moment-to-moment co-regulation, compliance, emotion regulation, and temperamental effortful control. Evidence supports both cultural universals and distinct socialization processes for the development of SR. In the third section, key conclusions are discussed in light of the cultural pathways hypothesis. The final section entails recommendations to advance future research, both theoretically and methodologically.

Self-regulation (SR) is a critical predictor of adjustment over the entire lifespan. Children's ability to modulate their behavior and affect in line with contextual demands contributes to a range of immediate and long-term adaptive outcomes (e.g., physical health, learning, social competence, behavioral adjustment), whereas deficits in SR predict behavioral dysfunction, poor peer relations and academic problems (Blair & Raver, 2015; Robson, Allen, & Howard, 2020). Yet, most evidence regarding the associated outcomes of SR and its developmental correlates in early childhood, including the role of parenting, comes from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) samples (Leerkes & Bailes, 2019; Robson et al., 2020). Given the pervasive role of cultural values and beliefs on the socialization processes (Trommsdorff & Cole, 2011), there are research calls to reveal the diversity in developmental trajectories of infants (Singh, Cristia, Karasik, Rajendra, & Oakes, 2023) and older children (Draper et al., 2023) to avoid ethnocentric biases in research.

The key idea that child development, parenting, and their multiple determinants are embedded in the surrounding cultural context

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was proposed by Whiting and Whiting (1975). The impact of their *Six Culture Study of the Socialization of the Child,* started in the 1950s, was profound and shaped the thinking of many scholars who came after them in cross-cultural psychology, developmental psychology, and anthropology in the second half of the 20th century (Weisner, 2010). As a result, concepts such as *cultural organization of parenting* (Miller & Harwood, 2002), *cultural pathways* (Greenfield, Keller, Fuligni, & Maynard, 2003), *cultural solutions to universal tasks* (Keller & Kärtner, 2013), and *cultural scripts* (Bornstein, 2015) were advanced to refer to the cultural aspects in developmental trajectories.

As the first quarter of the 21st century comes to a close, this paper focuses on the extant evidence emerging from cross-cultural research about the ways children around the globe master SR, with particular attention to the role of early caregiver-child interactions. The goal of this review was to synthesize the emerging evidence on cross-cultural comparison of SR in young children, and the culturally common as well as distinct caregiver-child interaction patterns in relation to SR. The review is restricted to cross-cultural studies with samples of caregiver and infant/toddler dyads (0–36 months) that compared at least two cultural groups, including ethnographic field studies and in-depth interview studies. First, we start with the definition of SR and its milestones in infancy and toddlerhood. Second, taking the cultural pathways as a conceptual framework, we summarize relevant research on SR among infants and toddlers in relation to parenting with cross-cultural samples, including research on temperamental effortful control (EC). Third, we synthesize key conclusions that have emerged from prior empirical studies. Finally, recommendations for future research are offered, both theoretically and methodologically.

1. Definition and milestones of SR in infancy and toddlerhood

SR is a broad, multifaceted construct, defined as a volitional process involving cognitive, emotional, and behavioral regulation to maintain arousal levels that support positive adjustment and adaptation (Blair & Ku, 2022). A fine-grained analysis of the concept indicates that SR refers to executive functions (EF), emotion regulation (ER) and temperamental EC. As a set of cognitive processes, EF involves the top-down control of behavior in the service of a goal and includes three core processes: inhibitory control, working memory and flexibility/set shifting (Bailey & Jones, 2019). ER refers to changes in emotion valence, intensity, or time course to accomplish one's goals (Thompson, 1990), whereas temperamental EC represents the ability to suppress a dominant response in favor of a less dominant one to regulate emotion, attention, and behavior (Rothbart & Bates, 2006). EC is conceptualized as a predisposition, thought to be under genetic control yet sensitive to environmental influences (Ganiban et al., 2021).

During infancy, the SR system is primarily concerned with the regulation of affective, arousal, and attention states (Santos et al., 2024). Around 3–6 months, a major shift from other- to self-regulation occurs with the infant's emerging executive attention system. Endogenous attention enables infants to shift attention between competing spatial locations at around 4 months, and disengaging/orienting attention facilitates redirecting attention away from distressing stimuli at around 6 months (Crockenberg & Leerkes, 2004). Other indicators of SR also emerge around this age such as self-soothing (e.g., thumb sucking) and fearful inhibition to modulate approach. Over toddlerhood, children shift attention more voluntarily for distraction, initiate bids to request help from others, and use self-directed verbalization with simple language to regulate affect. They also attain behavioral SR abilities such as compliance, inhibitory control, and delay of gratification (Wesarg-Menzel et al., 2023).

Although SR processes have neurobiological basis and become increasingly differentiated and self-initiated, parenting provides a sociocultural input for the acquisition of this milestone for children (Samdan et al., 2020). High levels of sensitivity that involves mothers' recognition of their infants' cues and their contingent responses (e.g., affect mirroring, comforting), as well as positive affect combined with gentle control (e.g., guidance, suggestions), distraction alone or together with limit setting responses (e.g., explanation of rules) have been shown to predict young children's greater SR. On the other hand, mothers' display of verbal and non-verbal negative affect as well as physical interference were related to poorer SR (see reviews by Grolnick, Caruso, & Levitt, 2019; Leerkes & Bailes, 2019; Samdan et al., 2020).

2. Cross-cultural research on SR in relation to parenting

In this review, we adopt a broad definition of SR and focus on its development as shaped by early parenting across various cultural niches. This section initially focuses on the cultural pathways concept as a conceptual framework for cross-cultural research on the socialization of SR. Next, we synthesize available cross-cultural research with samples of infants followed by samples of toddlers. Representative research using the emic approach is also included to better capture culturally grounded understanding of caregivers' socialization responses for SR by exploring participants' own descriptions, interpretations, and meanings of their behaviors and experiences. Finally, we synthesize cross-cultural research on temperamental EC across 0–36 months.

2.1. Cultural pathways towards child development

This review paper centers on the conceptual framework of cultural pathways (Greenfield et al., 2003), which highlights how culture shapes the way children accomplish universal developmental tasks like SR (Kopp, 1982), affecting the timing or the caregiving factors involved. The ecocultural model of development (Keller, 2007) offers a conceptual framework for understanding how these developmental pathways are shaped by the varying cultural models centered around autonomy and relatedness, which in turn, serve as guiding principles in child socialization. These cultural models and their associated socialization goals, ethnotheories (i.e., beliefs about the child's nature and ideal caregiving), and parenting practices are considered to be adaptive to the population-level ecological conditions (e.g., climate, geography) and ecosocial characteristics such as the economic system, household features, and maternal education (Keller & Kärtner, 2013).

Table 1 summarizes two prototypical cultural models, the autonomous cultural model, mostly prevalent in the US and Western Europe, and the relational cultural model, mostly prevalent in subsistence-based agricultural societies. These cultural models have implications for the development of its members' prevailing self-construal (i.e, how separate or connected one sees him/herself in relation to others, Singelis, 1994), and how one's emotions and behaviors should be displayed and regulated based on the autonomy and relatedness modes. In a relational cultural model, proximal caregiving (e.g., body contact with the infant, tactile soothing, motor synchronization via body contact) is emphasized to promote relatedness goals. Children would be also socialized to suppress negative emotions and express calm or neutral ones, to demonstrate cooperation, respect, and proper behavior, and to consider others even when acting independently for instilling the goals of social obligation, interdependence, and interpersonal harmony that are adaptive in rural, subsistence-based ecosocial contexts. In contrast, in an autonomous cultural model, infants are regarded as separate agents, and autonomy goals are instantiated by distal caregiving (e.g., verbal and face-to-face interactions imbued with positive emotions, object stimulation with toys). Children would be also socialized to openly express themselves, particularly their happiness, to shift their emotional focus from negative to positive ones, engage in problem-solving, seek support, and learn to regulate emotions as well as behaviors on their own–for instilling the goals of self-sufficiency, autonomy, and assertiveness that are adaptive in urban, post-industrialized, and high-technology societies (Keller, 2020; Rothbaum & Rusk, 2011).

The ecocultural model is sensitive to the cultural variations around the globe and recognizes the possibility of many different combinations of the autonomy and relatedness modes as the best adaptation to unique ecosocial contexts (Keller & Kärtner, 2013). For example, urban middle-class, highly educated caregivers from non-Western countries (e.g., China, Japan, South Korea, Romania) can combine strong relational values such as socially responsible communal acting with personal intentions and motivations to adapt to new lifestyle demands. In such hybrid autonomous-relational models, socialization involves greater caregiver-child verbal exchange,

Table 1
Summary Description of the Prototypical Cultural Models.

	Autonomous Cultural Model	**Relational Cultural Model**
Ecology	Western, urban, postindustrial societies (e.g., US, Canada, Germany, UK)	Non-western, rural, agricultural societies (e.g., Cameroon Nso; indigenous Costa Ricans)
Ecosocial context	Free market economy Middle- to upper-middle-class families High maternal education Few children Late parenthood Nuclear family	Subsistence economy Low-class to middle-class families Low maternal education Many children Early parenthood Extended family
World views based on autonomy and relatedness (adaptive to the ecosocial context)	*Psychological autonomy:* Primacy of personal preferences, choices, mental agency attributed to others *Psychological relatedness*: Individuals establish self-selected relations to others	*Action autonomy:* Primacy of fulfilling the obligations for family functioning and group life in an independent and self reliant way *Hierarchical relatedness:* Individuals accept role-based authority, and obligations, pursue social harmony
Socialization goals	• Independence • Assertiveness • Quick adaptation to rapid technological and societal changes • Happiness	• Obedience, compliance • Respect elderly • Contribution to the family system • Social harmony • Calmness
Parenting Ethnotheories	• Children need to learn about themselves (i.e., self-concept) • Children need to spend time on their own to become more independent • Emotions are direct expressions of the self • It is important to foster self-esteem • Experience and expression of high-intesity positive emotions are desirable • Children need to manage emotions	• Children need to learn about the community • Good parents control and train their infants • A well-developing child is emotionally calm • Emotions are disruptive and expected to be controlled • Children have to learn that they have to fit in and not to stick out
Parenting behaviors	• Distal caregiving style by face-to-face interactions (e.g., looking, smiling, and vocalizing) and object stimulation • Exclusive dyadic interaction • Caregivers sensitivity to the baby's lead • Quasi-equal communication with a dialogical structure • Treating infants as intentional agents • Encouragement of emotion expression • Positive affect mirroring that allows emotional excitement • Reactive responses upon the child's emotion expression	• Proximal parenting with body contact and body/kinesthetic stimulation with rhythmic speech • Orienting the infant towards the external social environment • Caregiver's lead and directiveness of infant activities • Infant-directed speech as a means of instilling respect and obedience • Prompting and soothing child to suppress negative emotionality and modulate excitement • Anticipatory responses to prevent child's negative emotions or excitement

Note. a Table 1 was adapted from Keller and Kärtner (2013). b Autonomous-relational model is not included into Table 1 as this hybrid cultural model is not a homogeneous category as the other two prototypical cultural models.

increased face-to-face interactions and child-led play, more autonomy granting to support child's self-sufficiency than in relational models, while also fostering cooperation with others and rules to maintain social harmony (Keller, 2012). It is difficult to define a prototypical hybrid cultural model given that caregivers from two hybrid cultures may prioritize different goals or exhibit distinct behaviors when integrating elements of both autonomous and relational orientations.

2.2. Evidence for the cultural pathways to SR in infancy

The Face-to-Face Still-Face (FFSF) is a prototypical paradigm to assess infants' affect sharing with parents and co-regulation before and after a social stressor (caregiver still-face), based on normative Euro-American middle-class, face-to-face infant-caregiver exchanges (Pinto & Figueiredo, 2023). The FFSF consists of three phases: (1) face-to-face caregiver-infant interaction (i.e., baseline), (2) a still and unresponsive caregiver, and (3) resumption of the dyadic interaction (i.e., reunion). FFSF findings from WEIRD samples (primarily U.S.) with an autonomous cultural model show a still-face effect, with decreased positive affect and gaze from baseline to still-face, followed by an increase during reunion, along with increased negative affect during still face and reunion compared to baseline. The most common regulatory pattern involves positive affect in the caregiver-child dyad interactions during baseline and reunion as well as quick stress recovery, predicted by high maternal sensitivity (Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009).

There is growing evidence on cultural differences in infant emotional expression and regulation during the FFSF. For example, urban Chinese infants showed less negative affect than Dutch infants, while both groups of infants used gazing away to avoid distress and displayed less positive affect from baseline to still-face (Li et al., 2019). This result, along with Liu et al.'s (2020) study, supports the expected emotional restraint among Chinese infants, consistent with the relational values of their cultural model that emphasizes social harmony, compared to Euro-American middle-class families who follow the autonomous cultural model, where open emotion expression is seen to facilitate autonomy and individuality (Friedlmeier, Corapci, & Cole, 2011).

Broesch et al.'s (2022) study with the classic FFSF and a culturally adapted "Still-Body" paradigm compared indigenous Bolivian, middle-class Euro-American, and Fijian infants. In the Still Body paradigm, caregivers held their infants on their laps facing outward to minimize face-to-face contact during baseline, followed by a still phase with no vocal and tactile interaction. Bolivian infants displayed lower emotional reactivity and more self-soothing in both paradigms, whereas European-American and Fijian infants were more likely to protest or try to re-engage their mothers. As the proximal caregiving style with sustained physical contact and tactile soothing characterizes the typical infant care in the rural highlands of Bolivia, this distinctive caregiving, seen highly adaptive in the relational cultural model (Keller, 2018), might contribute to Bolivian infants' ability to self-soothe and minimize overt expressions of negative emotions. The similarity of the Fiji infants to their European-American counterparts was explained due to the British colonial influence on their native culture.

Wefers, Schuhmacher, Chacón, and Kärtner (2023) compared very young infants (3- and 4.5-month-olds) from Münster (urban Germany) and the Kichwa ethnic group in rural Ecuador during a standard FFSF and a No-Touch paradigm (i.e., the experimenter touched and held the infant in baseline, with no tactile contact during the no-touch phase, no eye contact and neutral face). Infants from both cultures responded to the still-face and no-touch phases with decreased gaze and positive affect, and Kichwa infants responded more strongly to the interruption of proximal interaction patterns during the No-Touch paradigm. Although this result appears contradictory to the study with 4- to 14-month-old Bolivian infants with a mean age of 11 months, who also represent a similar cultural model, the relatively younger age of Ecuadorian infants may explain this inconsistency.

There are a few cross-cultural studies on maternal regulatory responses during the FFSF. For example, a study with Ecuadorian and U.S. Hispanic mother-infant dyads found culturally prevalent forms of maternal touch during baseline—Ecuadorian mothers used more nurturing touch, while U.S. Hispanic mothers engaged in more playful touch—yet infants from both groups showed increased positive affect and quicker recovery from distress following playful touch after the still-face episode, suggesting a universal role for playful touch in modulating infants distress (Lowe et al., 2016).

Comparing Brazilian and Portuguese dyads, two sample representative of the autonomous-relational cultural model, Fuertes et al. (2021) found that 3-month-old Brazilian infants typically showed high negative affect during still-face, persisting or increasing negative affect in reunion, while Portuguese infants typically displayed a decrease of positive affect at still-face, but they were able to recover during the last minute of the reunion episode. Yet, a pattern of positive interaction at baseline followed by distress recovery at reunion was predicted in each sample by high maternal sensitivity (e.g., affection, turn-taking contingencies) during free play prior to the FFSF. Finally, using both a standard and a double FFSF paradigm, incorporating an additional still-face and reunion episodes, Liu, Zhang, Snidman, and Tronick (2020) found that Chinese-American infants showed less negative and more neutral affect compared to US infants in the double FFSF. On the other hand, if mothers exhibited high levels of negative affect and neutrality, and decreased positivity during face-to-face play episodes, the double FFSF had to be interrupted because infants across both groups experienced intense distress.

Taken together, cultural differences were observed in infants' distress in the FFSF that follow the expected socialization goals of their cultural model (i.e. emotion suppression in cultures favoring relatedness). On the other hand, maternal behaviors that modulated infant distress showed cultural similarities.

The second line of research in infancy addresses how mothers and infants develop attuned interactions through verbal and nonverbal synchronous exchanges, ultimately supporting infants' ER development. Also known as co-regulation, moment-to-moment unfolding responses between the caregiver and child are in line with growing research interest at the turn of the 21st century (Cole, Ram, & English, 2019). Existing research shows that, for Italian (Lavelli, Carra, Rossi, & Keller, 2019) and Israeli-Jewish mothers (Abu-Salih et al., 2023), the prototypical synchronization involved warm, affectionate speech, smiling, and face-to-face, mutual

affective matching, starting at 2 months, in line with the distal caregiving style of their autonomous cultural model. In contrast, rural Cameroonian dyads displayed continuous body contact and motor stimulation such as mothers lifting and rocking their infants with rhythmic vocalizations, followed by the infants' active engagement with their surroundings (i.e., facing outwards and paying attention to the environment). This co-regulation characterizes the proximal caregiving style of their relational cultural model that allows mothers to get attuned to their infants' signals, anticipate and prevent distress as well as facilitate infants' social attentiveness towards others. Immigrant West African mothers, on the other hand, were observed to combine motor stimulation with affectionate verbal responses to infant gaze, an interactional style characteristic of a hybrid cultural model (Lavelli et al., 2019). Finally, Palestinian-Arab mothers displayed high arousal and highly positive affect when their infants were distressed, as a strategy to guide infants' attention to their mothers (Abu-Salih et al., 2023). In summary, these studies reveal that co-regulation is part of all caregivers' parenting repertoire but challenge the idea that attuned co-regulation occurs universally through face-to-face affective exchanges.

2.3. Evidence for the cultural pathways to SR in toddlerhood

Most studies measured SR in toddlerhood as compliance or waiting in a delay task based on behavioral observations. Chen et al. (2003) found that compared to the Canadian toddlers, urban Chinese toddlers, when asked to clean up toys, were more likely to show committed compliance (i.e., wholehearted, eager cooperation without external prompting). Canadian toddlers, on the other hand, displayed situational compliance more often, operationalized as the child's externally-driven cooperation via frequent maternal prompts in moments of distraction or low motivation (i.e., adult guided co-regulation). Additionally, rural Nso Cameroonian toddlers demonstrated higher compliance than Costa Rican and Greek toddlers in daily interactions (Keller et al., 2004), and Arab-Palestinians were more compliant to prohibitions at childcare than their Israeli counterparts (Feldman, Masalha, & Alony, 2006). These findings lend support to the premise that a cultural model emphasizing relatedness and its associated socialization goals (i.e., role obligations, obedience, social harmony) acts to foster greater self-restraint. However, when measured through EF tasks, urban Chinese toddlers at 14 months exhibited poorer inhibition than Dutch toddlers, raising questions as to whether the wait paradigm for a toy reward (i.e., glitter wand) carries the same meaning and valence for young toddlers as in the study of Li et al. (2023). When comparing wait paradigms cross-culturally, Yanaoka, Foster, Michaelson, Saito, and Munakata (2024) draw attention to the culturally relevant habits such as everyday experiences of waiting for rewards that could ease the effort required for inhibition in delay or prohibition tasks, creating a bias for meaningful group comparisons.

Cross-sectional and longitudinal relations between parenting and SR also show cultural differences. In the previously mentioned study by Chen et al. (2003), self-reported maternal warmth (e.g., hugs, kisses, holding) and reasoning were associated with Chinese toddlers' committed compliance, whereas reasoning was related to Canadian toddlers' situational compliance. Chen et al. argued that this finding suggests differing beliefs about toddlers' autonomy, i.e., Canadian mothers may view toddlers as needing external support during the transition from a lack of control to internalized control, whereas Chinese mothers value self-initiated control beginning in the earliest years of life (Chao, 1995). In a longitudinal study analyzing Cameroonian, Greek, and Costa Rican dyads together, Keller et al. (2004) found that body contact in infancy—characteristic of proximal parenting and providing warmth—predicted compliance in toddlerhood. Similarly, Feldman et al.'s longitudinal study (2006) documented greater body contact between Palestinian parents and infants (holding them on their lap or in their arms), low levels of infant fussing and crying, and parental problem-solving support at 33 months as predictors of toddler compliance. Yet, among Israeli parents, face-to-face interactions and affectionate or object-mediated touch and an indirect teaching style (i.e., using suggestions, praise) fostered toddler compliance (Feldman et al., 2006). These findings show that warmth is a key predictor of compliance, though expressed differently across cultures. On the other hand, concrete guidance reflects the cultural expectation that children should follow the caregiver's lead for Palestinians, whereas indirect guidance stresses mental agency for Israelis.

There are only a few studies on maternal directives and child compliance across cultures. Reddy, Liebal, Hicks, Jonnalagadda, and Chintalapuri (2013) observed urban, middle-class Indian and UK mother-infant dyads at home from infancy to toddlerhood across five time points. The study found that Indian mothers gave more directives at all timepoints, and infant compliance emerged earlier than in the UK sample. Across both groups, more directives correlated with higher compliance, and directive frequency changed more over time than infant compliance, indicating a focus on training infant responses. These findings suggest that maternal directives speed up the compliance for Indians, aligning with the urban Indian caregivers' emphasis on cooperation and harmonious close-knit relations (Raval et al., 2012). On the other hand, in middle-class, urban, educated Costa Rican and Mexican dyads, mothers' preference for relational goals and low directiveness during free play predicted higher compliance in toddlers, suggesting that mothers in a hybrid cultural model may respect child autonomy outside the discipline context in return for toddlers' compliance with their requests (Kärtner, Borke, Maasmeier, Keller, & Kleis, 2011).

Finally, referring back to the study conducted by Li et al. (2023), behavioral observations revealed that autonomy support (e.g., following the child's lead, assisting when appropriate) was linked to cognitive flexibility and inhibition, only in the Dutch sample, not in the Chinese sample. This finding aligns with the autonomous cultural model's priorities for early adaptability to technological and societal changes promoted by Dutch parents. Autonomy support may become more relevant for Chinese children's EF at preschool age (Cheng, Lu, Archer, & Wang, 2018; Sun & Tang, 2019). It is also possible that other parenting behaviors such as warmth may predict EF for Chinese toddlers at this young age. Taken together, although families from urban India, China, Costa Rica, and Mexico can be taken as representatives of a hybrid autonomous-relational cultural model, these studies show maternal directiveness or autonomy may function differently in these samples, suggesting intracultural variations in the parenting precursors of SR.

Few cross-cultural studies have explored toddlers' emotion regulation (ER) strategies in relation to specific maternal responses. For example, Bozicevic et al. (2021) found that UK mothers more often responded positively (e.g., mirroring, smiling) to infant

vocalizations, while Italian mothers did so to their infants' smiles. By 22 months, the Lab-TAB Barrier Task was used with both UK and Italian dyads. This paradigm involves seating the child in a highchair, allowing 30 s of play with an attractive toy, which was then placed out of reach behind a transparent screen for 1 min. Mothers are asked to remain neutral and not to interact during the task. UK toddlers used more verbal and nonverbal bids, whereas Italian toddlers relied more on distraction during this wait paradigm. Positive maternal responses to infant pre-speech and smiles predicted toddlers' use of bidding and distraction in this toy wait paradigm, respectively. Maternal responses to infant pre-speech also explained UK toddlers' greater bidding than their Italian peers, demonstrating that mothers' predominant responses in infancy align with their respective cultural socialization goals, and those responses act to shape the type of culturally desirable ER strategies in toddlerhood.

In another longitudinal study by Bozicevic et al. (2016), maternal sensitivity at 3 months—measured through affectionate and attuned responses in face-to-face interactions—was similar across UK and South African (urban and peri-urban) samples, but predicted different ER strategies at 24 months in the toy wait paradigm of the Lab-TAB Barrier Task. Higher sensitivity predicted more distraction and less avoidance for UK toddlers, more distraction, self-soothing, and fewer attempts at the toy for urban South African toddlers, yet less distraction and self-soothing for peri-urban toddlers. This finding reinforces the idea that caregiver responses help shape the culturally preferred ER strategies in toddlerhood.

Finally, Friedlmeier, Corapci, Susa-Erdogan, and Benga (2019) formed profiles to better understand different combinations of maternal responses that help toddlers wait for a treat. European-American and Israeli-Jewish mothers were mainly in a profile marked by distraction, gentle control (e.g., moving the reward away), and warmth. Romanian mothers were primarily in the pure distraction profile, while Turkish mothers mostly fit the profile of control and verbal reassurance. The profile with an emphasis on mothers' use of distraction was related to less frequent toddler anger and sadness. This effect was partly due to the fact that toddlers applied strategies like distraction and self-soothing, similar to their mothers' regulatory style. In sum, the US and Israeli mothers' profile reflected an autonomy emphasis, while Turkish and Romanian mothers with an autonomous-related emphasis showed distinct ways of negotiating the emphasis on autonomy and relatedness in emotional socialization.

2.4. Evidence for the cultural pathways to SR using emic approach

A series of ethnographic studies conducted in understudied countries revealed that parents instill distinct emotions in their children (e.g., fear, shame) to facilitate the internalization of cultural values and norms towards self-regulated conduct such as respect. Yet, the key socializing emotion differed depending on its adaptive value in its ecosocial context, for example fear in Madagascar, but anxiety and embarrassment in Taiwan, and shame in Indonesia (Röttger et al., 2013; 2015). Another line of qualitative research with in-depth interviews have revealed cross-cultural differences in response to disharmonious (e.g., anger) rather than submissive emotions (e.g., fear) that may challenge the cohesion of the social relations. Specifically, mothers with a stronger emphasis on relatedness (e.g., Romania, Türkiye) were more likely to restrain their toddlers' anger by relying on close affectionate ties (e.g., comforting) and reasoning (e.g., explaining social norms for proper conduct) than mothers with a stronger emphasis on autonomy (e.g., US), who were more likely to expect self-regulation of anger by issuing a time-out to calm down. Mothers from the US, Romania, and Türkiye all predominantly preferred comforting and reassuring responses to toddlers' sadness and fear (Corapci et al., 2018).

In a related fashion, Denham, Caal, Bassett, Benga, and Geangu (2004) have shown that young children's reactions to their mothers' anger expression showed cultural differences, with US children matching anger, whereas Japanese and Romanian children showing compliance. Yet, all children responded with comforting when their mothers expressed sadness (Denham et al., 2004). This body of qualitative research is important for two reasons. It reveals that socialization pathways towards SR development are also shaped by distinct emotions in different cultures. Secondly, the potential of the emic approach is highlighted in this qualitative research to avoid ethnocentric biases and inform culturally sensitive assessments in non-WEIRD societies, also known as the Majority World (e.g., Asian, South American, African countries) where approximately 85 % of the world's population lives amid rapid globalization (Draper et al., 2023).

2.5. Evidence for cross-cultural differences in effortful control

Since SR in infancy and toddlerhood is linked to temperamental EC, we summarize cross-cultural data on EC, with its components in infancy that include orienting, low-intensity pleasure, soothability, and cuddliness (Rothbart & Ahadi, 1994). Firstly, at child ages 3, 6, 9, 12, and 18 months, US mothers rated their infants and toddlers higher in EC than Japanese mothers, who in return rated their children higher in fear, suggesting that the Japanese cultural model promotes the development of a reactive, fear-based inhibitory control system (Nakagawa & Sukigara, 2014; Slobodskaya, Gartstein, Nakagawa, & Putnam, 2013). This finding aligns with prior research (Ujiie et al., 2000) that documented Japanese infants' greater reliance on their mothers for ER at 11 months of age. Furthermore, compared to US children, EC ratings were higher among South Korean children at ages 16 through 30 months (Krassner et al., 2017), and among Chinese children at 3, 6, and 9 months (Gartstein et al., 2006), as well as at 6 and 26 months (Jones et al., 2021). Findings from the Joint Effort Toddler Temperament Consortium (Gartstein & Putman, 2019; Putman et al., 2024) also showed that 18- to 36-month-old South Korean toddlers had the highest EC scores among 14 countries. In sum, this body of research suggests that, among Asian samples, South Korean children exhibited greater regulation—as indicated by temperament ratings—compared to their US counterparts. This pattern is consistent with an expected cultural emphasis on respect for authority and obedience (Choi, Kim, Kim, & Park, 2013), and South Korea is low in masculinity (i.e., value on assertiveness over care) and intermediate in power distance (i.e., acceptance of unequal power) (Hofstede, 2001). These cultural factors, highlighted in a review conducted by Putnam and Gartstein (2017), also emerged as key predictors of EC.

The available evidence also suggests that Italian mothers rated cuddliness as a component of EC higher during infancy (Montirosso, Cozzi, Putnam, Gartstein, & Borgatti, 2011) and soothability higher during toddlerhood (Cozzi et al., 2013), compared to US mothers. This difference was attributed to Italian mothers' greater emphasis on promoting affiliativeness and connectedness as a socialization goal (Bornstein et al., 2012; Montirosso et al., 2011). On the other hand, U.S. children exhibit better overall regulation than Russian (Gartstein, Slobodskaya, & Kinsht, 2003) and Italian children (Cozzi et al., 2013; Montirosso et al., 2011). However, Russian infants in Israel had higher regulatory abilities than those in the U.S. (Gartstein, Slobodskaya, Putnam, & Kinsht, 2009), suggesting the crucial role of quick distress recovery for coping with the daily stressors in the Israeli environment.

3. Conclusions

We summarize the key conclusions derived from the available body of research. First, cross-cultural studies using the FFSF have shown that infants universally show similar responses when social interaction is disrupted. However, the intensity of these responses varies across cultures as predicted by the cultural models (e.g., greater emotion suppression among Chinese and Bolivian infants than US and European infants). Furthermore, behavioral indices of SR based on observational compliance converge with mother ratings of EC such that children show better regulation in cultures/communities with an emphasis on role-based obligations and social harmony.

Secondly, as the field is advancing to nuanced ways of capturing caregiver-child dyadic experiences in dynamic ways, multiple time-scale approaches provide a unique opportunity to uncover intriguing cultural subtleties. This research shows that caregivers universally strive to keep their infants engaged and regulated, yet the ways those co-regulation strategies are manifested vary cross-culturally (e.g., face to face synchronization versus maternal motor stimulation characterized by rhythmic vocalizations), deemed as adaptive to caregivers' distinct ecosocial contexts.

Third, available studies reveal that both culture-common and culture-specific socialization processes predict SR, even as early as within the first few months. Our review revealed that maternal affection, contingent interactions, and socially engaging nonverbal communication (e.g., playful touch) were identified across cultures as key predictors of infants' distress modulation, whereas caregiver distraction served a similar goal of toddlers' distress modulation. On the other hand, supporting the cultural pathways hypothesis, different parenting behaviors/styles may play a similar function in different cultural contexts to foster SR. One notable example is warmth, displayed through body contact in societies with a relational cultural model, but through face-to-face and positively affectionate interactions in an autonomous cultural model.

Finally, as reviewed above, distinct socialization pathways towards children's SR were documented in different cultural models, yet there is some variability within each cultural model (e.g. Italian and British mothers, Bozicevic et al., 2021; Turkish and Romanian mothers, Friedlmeier et al., 2019), shaped by factors such as unique cultural practices, access to resource availability, emotion norms, or the society's hierarchical social structure (Halberstadt & Lozada, 2011). The variations within the autonomous-relational model is inevitable as societies in the Majority World experience significant demographic, economic, political, and technological transformations at varying levels. Yet, our knowledge is scant concerning the multiple potential combinations of autonomy- and relatedness-oriented worldviews among non-Western, urban, middle-class caregivers as new environmental demands emerge.

4. Recommendations for future research directions

Based on the limitations and gaps in the existing research, we outline the following research recommendations. First, as reviewed above, there is accumulating evidence for culturally-grounded parenting behaviors, with an assumption that parents are guided by their cultural beliefs and socialization goals, ultimately shaping SR development. Yet, this central assumption often lacks direct evaluation. Therefore, it is important to assess parents' goals, beliefs, and even their self-construals to examine the unfolding links from cognitions to parenting behaviors, and eventually to child SR. In that regard, not only standardized measures such as the Parenting Ethnotheories scales and the Socialization Goals Questionnaire (Keller et al., 2006), Parents' Beliefs About Children's Emotions Questionnaire (Halberstadt et al., 2013), and/or the Self-Construal Scale-38 (Vignoles et al., 2016), but also qualitative/emic approach can be very informative. This type of assessment can reflect varying degrees of autonomous and relational orientations, rather than classifying caregivers into discrete categories. The knowledge gained from such comprehensive assessment has the potential to elaborate the ecocultural model's framework on the hybrid cultural models.

Secondly, we know little how caregivers interpret the instructions of the FFSF paradigm and which beliefs they hold regarding baseline and/or reunion. Furthermore, the extent to which caregivers adjust or maintain their practices and goals in response to children's self-regulatory capacity (including temperamental EC), and whether child self-regulatory capacities also shape parenting are important future research agendas to move the field forward.

Third, innovative and unobtrusive ways of data collections such as wearable digital technologies attached to infants and caregivers (Geangu et al., 2023; Wass et al., 2019) can be integrated to cross-cultural research to collect physiological measures during the daily activities to better track the co-regulation of autonomic arousal in the caregiver-child dyad.

Fourth, expanding the diversity of non-Western samples and their assessment over multiple developmental periods with larger samples is warranted to better delineate how distinct early interaction patterns contribute to children's acquisition of SR. Our review was restricted to cross-cultural studies that shared common methodology to assess both caregiving and SR to more accurately evaluate the cultural pathways hypothesis. Yet, even in the absence of a comparison sample, single culture studies would allow for a deeper and nuanced understanding of SR development within a given culture, and can help generate or refine theories as well as measurement methods, rather than imposing Western models or assessment tools.

Finally, greater interdisciplinary collaboration between cultural psychologists, developmental scientists, and anthropologists is

warranted to better contextualize parenting. Such collaboration would also help develop ecologically valid, standardized measures for unbiased comparisons across societies (Amir & McAuliffe, 2020). Our review also highlights the need to culturally adapt evidence-based parenting intervention programs—mostly developed with WEIRD samples—for diverse contexts. This again requires stronger collaboration among cultural, developmental, and clinical scientists.

To conclude, sociocultural study of SR development remains at the periphery of developmental science, with a small number of cross-cultural studies from diverse communities around the globe. Although the number of such studies may grow gradually due to the time-intensive nature of collaboration, qualitative coding, and other methodological challenges, gaining deeper insight into how early parenting shapes diverse trajectories of SR across cultures remains a crucial objective.

CRediT authorship contribution statement

Oana Benga: Writing – review & editing. **Georgiana Susa-Erdogan:** Writing – review & editing, Writing – original draft, Conceptualization. **Çorapçı Feyza:** Writing – review & editing, Writing – original draft, Conceptualization.

Declaration of Competing Interest

The authors have no conflict of interest to declare.

Data availability

No data was used for the research described in the article.

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