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Linking Affective Processes and Parents' Beliefs about Emotion Controllability to Children's Socioemotional Functioning

By

Ozge Ugurlu

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Psychology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Ozlem Ayduk, Chair
Professor Dacher Keltner
Professor Iris B. Mauss

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Abstract

Linking Affective Processes and Parents' Beliefs about Emotion Controllability to Children's Socioemotional Functioning

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Ozge Ugurlu

Doctor of Philosophy in Psychology

University of California, Berkeley

Professor Özlem Ayduk, Chair

This dissertation examined two distinct affective processes as antecedents of healthy socioemotional functioning: emotion recognition in vocal bursts and controllability beliefs about emotions. This investigation, consisting of two sections, utilized a longitudinal study spanning from early childhood through pre-adolescence (N_{T1} = 168, N_{T2} = 98). The first section explored children's ability to recognize emotions in vocal bursts and its socioemotional correlates. Results revealed that gender differentially predicted the developmental trajectories of recognition accuracy in this modality. Specifically, while younger girls (vs. boys) were better at recognizing emotions in vocal bursts, this difference disappeared by age eight. In addition, higher competence in this ability predicted a lower likelihood of parent-reported conduct problems and a higher tendency toward prosocial behavior concurrently, with the latter effect staying significant longitudinally. The second section investigated parents' beliefs about children's capacity to control their emotions ("emotion controllability") as another antecedent for socioemotional development. Results indicated that parents' beliefs about children's emotion controllability predicted children's own emotion controllability beliefs. These beliefs of children, in turn, predicted their use of cognitive change strategies and, subsequently, better socioemotional functioning. These findings contribute to our growing understanding of how both emotion recognition and emotion controllability beliefs are important factors in predicting children's adaptive functioning.

Keywords: emotion recognition, emotion regulation, emotion controllability beliefs, socioemotional functioning.

Dedication

This dissertation is dedicated to my family—Muhterem Emine Uğurlu, Mehmet Uğurlu, and Orkun Uğurlu—for their unwavering support and boundless love, and most importantly, for their invaluable guidance in teaching me to be a good person.

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and the way you create such a positive and supportive team environment. I am beyond grateful that I learned from you and became a part of your team. Finally, I must express my gratitude to Frank Sulloway. Simply sharing the same space with such a brilliant mind is an honor. Thank you for your selfless moral support and professional guidance on this dissertation.

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General Introduction

Emotions play a crucial role in shaping and maintaining intra- and interpersonal relationships (Ekman, 1992; Keltner & Haidt, 1999; van Kleef & Côté, 2022). Specifically, expressions of emotions provide information about the intentions of expressors. Therefore, being able to appropriately recognize one's own and others' emotions facilitates appropriate responses, thereby helping to coordinate social interactions (Keltner & Buswell, 1997; Keltner & Kring, 1998; Schultz et al., 2004). For example, accurately perceiving someone's sadness and distress might elicit compassionate responses, which can enhance affiliative tendencies (Campos et al., 1989; Keltner & Bonanno, 1997). Relatedly, love promotes bonding, fear alerts people against potential threats, seeing embarrassment in others enhances forgiving behaviors, and awe induces connection (Anderson et al., 2018; Bai et al., 2017; Bowlby, 1969; Feinberg et al., 2012; Goetz et al., 2010; Gonzaga et al., 2006; Keltner & Haidt, 2003). On the other hand, disturbances in regulating emotions can lead to emotion-related impulsivity and abrupt aggressions, harming relationships and resulting in downstream psychopathological outcomes (Joorman & Gotlib, 2010; Johnson et al., 2013). These highlight the need to better understand ways in which emotions support healthy social interactions.

Researchers have examined the dynamic relationship between emotions and social interactions within the broader concept of socioemotional functioning (Rothbart & Bates, 2006; Chen, 2010). The term of socioemotional functioning has been operationalized in multiple ways. One of the most comprehensive definitions describes it as individuals' capacity to recognize, experience, regulate, and express emotions; form close and secure interpersonal connections; and respond appropriately in social interactions (Parlakian et al., 2003). The roots of differences in socioemotional functioning can be traced to early childhood, with empirical evidence indicating that children progressively develop the capacity to understand their own and others' emotions, engage in meaningful conversations, and share readily with others during their first two years (Thompson, 2010; Tomasello et al., 2007).

Developmental studies provide robust evidence that adaptive socioemotional functioning correlates positively with increased wellbeing, positive affect, academic self-efficacy, and academic achievement (Briggs-Gowan & Carter, 2008; Duckworth & Seligman, 2005; Jones et al., 2015; Ladd, Kochenderfer, & Coleman, 1996; Van Os et al., 2010), as well as likability and peer acceptance (Kochenderfer-Ladd & Ladd, 2019; Rydell et al., 2003). However, problems with adaptive socioemotional functioning, shown by behaviors like anger, being rejected by peers, and heightened anxiety in stressful situations, can hurt relationships and raise the risk of dropping out of school and developing psychopathology (Lemerise & Dodge, 2000; Selten & Cantor-Graae, 2005; Selten et al., 2013; Van Os et al., 2010). Therefore, it is crucial to understand what might predict children's adaptive socioemotional functioning, thereby supporting their healthy development. To address this, current dissertation investigated two distinct affective processes, each potentially playing a crucial role in predicting children's socioemotional functioning. Specifically, utilizing a longitudinal study of parent-child dyads from early childhood to pre-adolescence, I examined whether children's emotion recognition in vocal bursts and parents' beliefs about children's capacity to control their emotions ("emotion controllability") predict children's socioemotional functioning.

Section 1 of this dissertation examined the role of emotion recognition in adaptive socioemotional functioning. Emotions are dynamic and expressed through various modalities (Keltner, 2019). One such modality is vocal bursts—non-linguistic sounds occurring between or

in the absence of speech (Hawk et al., 2009). However, much developmental research has focused on facial emotion recognition assessed using static pictures (Hall, 2004; Hampson et al., 2006; Thayer et al., 2000; Vassallo et al., 2009). This hinders our understanding of the developmental trajectories of reliably recognizing emotions in vocal bursts and their correlations with young children's socioemotional functioning (Ruba & Pollack, 2020). Therefore, Section 1 of this dissertation had three primary goals: examining (1) the developmental trajectories of emotion recognition in vocal bursts in children aged five to eight years, (2) the role of gender as a moderator, and (3) the concurrent and prospective associations between emotion recognition in vocal bursts and socioemotional functioning.

Section 2 examined another affective process as a predictor of children's socioemotional functioning: parents' beliefs about children's emotion controllability. Previous research provides evidence that individuals who believe emotions are controllable are more likely to engage in emotion regulation strategies to modulate negative emotions, which in turn predicts higher subjective wellbeing and lower levels of depression (De Castella et al., 2013; Ford et al., 2018; Kneeland et al., 2016a,b,c; Kneeland & Dovidio, 2020; Schroder et al., 2015; Tamir et al., 2007; Tamir & Mauss, 2011; Zerwas et al., 2022). Guided by this evidence, I first examined whether parents' beliefs about children's emotion controllability would predict children's own emotion controllability beliefs. Then, using a serial path model, I examined whether parents' beliefs about children's emotion controllability would predict children's adaptive socioemotional functioning through shifts in children's emotion controllability beliefs, and subsequently, their use of cognitive change strategies.

SECTION 1

Developmental Trajectories of Emotion Recognition in Vocal Bursts and Its Socioemotional Correlates in Early Childhood[1]

Emotion reasoning, a suite of abilities that involve recognizing, inferring, and predicting others' emotions (Ruba & Pollack, 2020), is vital for navigating social interactions both in childhood (Denham et al., 2003; Denham et al., 2007) and throughout development (Parker & Gottman, 1989). One key skill that falls under this broad construct is *emotion recognition*, the narrower capacity to decipher others' emotional cues in various expressive modalities such as the face, voice, and posture (Keltner, 2019). This ability improves throughout infancy and early childhood (Ruba & Pollack, 2020) and is a crucial aspect of children's socioemotional development (Schultz et al., 2004). It facilitates the navigation of social situations, plays a pivotal role in interpersonal communication, and enhances comprehension of others' behavior (Saarni, 1999; Scharfe, 2000). Despite the importance of emotional recognition in day-to-day life, most empirical research on this topic in childhood has focused on a single expressive modality: the face (Denham et al., 2003; Widen & Russell, 2008). However, emotions are reliably expressed across a range of modalities, including touch, posture, and voice (Keltner, 2019), suggesting that the current understanding of how emotion recognition develops in other modalities during childhood is relatively limited and lacks the nuance involved in real social encounters (see Ruba & Pollack,

[1] Section 1 was submitted as a manuscript in a peer-reviewed journal authored by Özge Ugurlu, Anna Luerssen, Joseph Ocampo, Oliver John, & Özlem Ayduk.

2020). To address this gap, the current study investigated another important modality—the expression of emotion through vocal bursts (e.g., laughs, sighs).

Emotion Recognition in Facial Cues

Most scholarship establishing the developmental trajectories and importance of emotion recognition ability centers around the face as the expressive modality (Hall, 2004; Hampson et al., 2006; Keltner, 2019; Thayer et al., 2000; Vassallo et al., 2009). This visual recognition commences within the first year of life (Morgan et al., 2011; Oakes & Rakinson, 2019), during which children begin to discriminate facial expressions based broadly on valence (i.e., positive vs. negative) (Widen & Russell, 2010; Widen, 2013). By age three, children become more able to distinguish expressions of distinct emotions (e.g., happiness, sadness, anger, fear) (Székely et al., 2011), with some research suggesting that improvements continue to occur through adolescence (Batty & Taylor, 2006; Herba et al., 2006; Thomas et al., 2007). Although findings on which distinct emotions are recognized earlier vs. later in development are mixed (Bruce et al., 2000), it is widely accepted that children accurately recognize faces expressing happiness earlier than those depicting distinct negative emotions such as anger or disgust (Boyatzis et al., 1993; Camras & Allison, 1985; Gosselin & Larocque, 2000; Herba & Phillips, 2008; Maassarni et al., 2014; Montirosso et al., 2010; Widen & Russell, 2003).

The role of gender in the development of children's emotion recognition abilities has also been examined. Meta-analytic findings suggest a small but reliable female advantage in the overall ability to recognize and interpret emotions from static facial expressions (McClure, 2000). This effect tends to be larger in infancy but gradually disappears in later childhood as boys catch up with girls. More recent studies focusing on gender and distinct emotions have yielded results consistent with these meta-analytic findings, demonstrating a female advantage for a number of emotions, including anger, disgust, and sadness, that have persisted through adolescence (Lawrence et al., 2015; Montirosso et al., 2010).

The ability to decode others' emotions is crucial for social interactions throughout life (Keltner & Haidt, 1999). Proficiency in emotion recognition during childhood, measured using static facial pictures, is associated with better socioemotional functioning (Field et al., 1982), including higher levels of perspective taking and empathy (Carr & Lutjemeier, 2005), and lower levels of problematic social behaviors and hyperactivity (Chronaki et al., 2013; Izard et al., 2001). The fact that the ability to recognize emotions facilitates positive relationships underscores the importance of better understanding the predictors and consequences of emotion recognition skills in children.

Recognition of Emotion in Vocal Bursts

Despite the insights the existing literature provides on the development of emotion recognition ability in children, one critique of this literature is that it focuses almost exclusively on emotion recognition in a single modality, the face. Moreover, these studies largely use static images portraying exaggerated facial expressions that are uncommon in everyday life, leading to an overestimation of children's accuracy.

Emotions are expressed through multiple modalities, including body posture, gestures, words, and pitch (de Gelder & Vroomen, 2000; Hampson et al., 2006; Keltner, 2019; Thayer et al., 2000; Vassallo et al., 2009). One such modality is vocalization. Emotional vocal cues include inflections in speech, known as emotional prosody (e.g., rhythm, stress, and intonation), and purely non-verbal emotional vocalizations, such as sighs, laughter, screams, or cries, often called vocal bursts (Cowen et al., 2019; Trinh et al., 2022; Scherer & Wallbott, 1994; Cordaro et al., 2016). Vocal bursts are described as the auditory equivalent of facial expressions (Grandjean et al., 2021)

and are also rich sources of emotion signaling (Keltner & Haidt, 2001). Like facial expressions, they provide insights into the internal state of others even though they do not rely on words (Kraus, 2017). Thus, they are essential to social interactions and influence the hearer's reactions to their environment. For example, toddlers are less likely to play with a toy when their parents vocalize yuck— a burst expressing disgust (Hertenstein & Campos, 2004). Studies have also found that individuals can reliably discern emotions through vocalizations across cultures even when the person producing the vocal burst cannot be seen (Cordaro et al., 2016; Sauter et al., 2010; Simon-Thomas et al., 2009). Therefore, vocal bursts may carry unique and important information about other people's emotional states that is missed when research focuses solely on the face.

Like facial emotion recognition, infants can discriminate across different emotional vocal bursts soon after birth (Grossman et al., 2010; Soderstrom et al., 2017; Wu at el., 2017). Recognition accuracy in this modality develops with age, with greater gains in early childhood, followed by the slowing of improvement and eventual plateau. Some research indicates that children reach adult level competency around age 15 (Grosbras et al., 2018), while other studies suggest this plateau occurs earlier, possibly by age nine (Tonks et al., 2007). Some studies also suggest that developmental trajectories vary across distinct emotions (e.g., Matsumo & Kishimoto, 1983). For example, Sauter et al. (2013) found that recognition of surprise conveyed through vocal bursts improved from ages five to ten, whereas no such improvement was found for other distinct emotions assessed, including anger, disgust, fear, sadness, achievement, amusement, contentment, and relief. Similar to facial recognition, girls tend to be more accurate in identifying emotional nuances conveyed through vocal bursts during childhood (Allgood & Heaton, 2015; Chronaki et al., 2014; Grosbras et al., 2018). However, minimal research has evaluated gender differences in emotion recognition in this modality during early childhood for distinct emotions.

The potential implications of emotion recognition in vocal cues for socioemotional outcomes have been addressed by limited research focusing primarily on emotional prosody. Specifically, preschoolers' ability to recognize emotional prosody has been associated with increased peer-rated popularity and decreased emotional and behavioral problems (Nowicki et al., 1998), as well as lower levels of hyperactivity and conduct issues (Chronaki et al., 2015). Similarly, school-age children's ability to recognize emotional prosody has been linked to enhanced social competence, peer-rated popularity (Leppänen et al., 2001), and reduced emotional and behavioral difficulties (Nowicki et al., 2019). However, a study specifically focusing on emotional vocal bursts showed no significant associations between recognition accuracy and socioemotional functioning in 6–8-year-old children (Neves et al., 2021). The scarcity of research on this topic, combined with the limited scope and inconsistencies across findings, collectively underscore the need for further examination of whether recognition accuracy in the vocal modality relates to important outcomes in childhood.

The Current Research

This study aimed to address several of the knowledge gaps described in the preceding sections. First, given that most emotion recognition tasks for children rely heavily on visual stimuli, it is important to examine the recognition of emotions expressed through other modalities (Ruba & Pollack, 2020). This includes vocal bursts, which also convey important information about the internal states of others (Kraus et al., 2017). Second, while children's ability to recognize emotional vocal bursts improves with age (Herba & Phillips, 2004; Sauter et al., 2013), there is a lack of well-powered research on the developmental trajectories of distinct emotions and how these trajectories vary across genders. Third, understanding the relationship between an individual's ability to reliably recognize vocal bursts and their socioemotional functioning is also relatively

limited. Beyond broadening our understanding of emotion recognition in childhood, addressing these gaps could inform whether the ability to recognize emotions in vocal bursts is associated with the development of socioemotional functioning later in life, thus offering insights for both early assessment and interventions.

To address these gaps, a modestly large sample of children aged five to eight years completed a computer task in which they heard a series of vocal bursts emitted by different voices and were asked to identify the emotion conveyed (Sauter et al., 2013). The task included well-studied distinct emotions (Ekman & Friesen, 1976), including happiness, anger, fear, surprise, disgust, and sadness. Additionally, caregivers completed a well-validated and widely used questionnaire (Strengths and Difficulties; Goodman, 2001) assessing their child's socioemotional functioning in various domains, including emotional symptoms, conduct problems, hyperactivity/inattention, and prosocial behavior, at the time of the laboratory assessment at Time 1 (T1) and again approximately 3 years later at Time 2 (T2).

I evaluated the role of age and gender (along with their interaction) in predicting overall recognition accuracy (collapsed across emotions) and recognition accuracy for each of the distinct emotions. I hypothesized that children's overall recognition accuracy would increase with age (H1) and that girls would recognize emotions more reliably than boys (H2). While I expected recognition to improve with age across distinct emotions, I did not have specific hypotheses about which emotions might show the largest (vs. smallest) improvements with age or for which emotions there would additionally be interactions with gender.

In a final set of analyses, I assessed whether the ability to recognize emotions in vocal bursts is associated with functioning in the aforementioned socioemotional domains: emotional symptoms, peer relationships, conduct problems, prosocial behavior, hyperactivity, and inattention. Based on the prior literature linking other forms of emotion recognition (e.g., facial cues, emotional prosody) to socioemotional functioning, I generally expected a positive association (H3). That said, of the latter domains, I expected the weakest association with hyperactivity/inattention since that it is not directly related to social communication or understanding.

Methods

Participants

The initial sample at T1 consisted of 171 children aged five to eight years, recruited from nearby elementary schools, museums, or family events. Parents and children visited the laboratory accompanied by one caregiver (81.01% mothers, 18.35% fathers, 0.63% others). The first five children were pilot subjects and were excluded from the sample on an a priori basis. Additionally, four participants were excluded because they were either not in the right age range or not typically developing. After these exclusions, 162 children remained in the final sample. As reported by caregivers, 47.53% of the children were girls, and 52.47% were boys (see Table 1 for the full list of demographics). Age and gender (boy = -1; girl = 1) were not correlated in this sample, $r(160) = .02$, $p = 0.79$.

The results reported here are part of a broader caregiver-child study investigating the links between self-control, emotion recognition, regulation, and family dynamics (also see Luerssen et al., 2023). Using a rule of thumb, I aimed to recruit 20 boys and 20 girls for each age group. This approach ensured equal gender representation within each age category, resulting in a total sample size of 160. In anticipation of attrition, I initially oversampled. Data collection for T1 occurred between January 2018 and January 2020 (right before the declaration of the global pandemic), forcing me to cease data collection before reaching the targeted sample size for girls at age 8.

Table 1
Participants' Demographics at T1 and T2

T1 (N = 162)		T2 (N = 98)	
Child Variables			
Age at T1		**Age at T1**	
5 (23 boys, 21 girls)	44 (27.2%)	5 (14 boys, 12 girls)	26 (26.5%)
6 (22 boys, 20 girls)	42 (25.9%)	6 (15 boys, 13 girls)	28 (28.6%)
7 (20 boys, 21 girls)	41 (25.3%)	7 (11 boys, 12 girls)	23 (23.5%)
8 (20 boys, 15 girls)	35 (21.6%)	8 (11 boys, 10 girls)	21 (21.4%)
Gender		**Gender**	
Girl	77 (47.5%)	Girl	47 (48.0%)
Boy	85 (52.5%)	Boy	51 (52.0%)
Race		**Race**	
Asian American	20 (12.3%)	Asian American	9 (9.2%)
Black/African American	6 (3.7%)	Black/African American	4 (4.1%)
Native Hawaiian or Pacific Islander	1 (0.6%)	Native Hawaiian or Pacific Islander	0 (0%)
White	76 (46.9%)	White	48 (49.0%)
Other	10 (6.2%)	Other	5 (5.1%)
Multiracial	42 (25.9%)	Multiracial	29 (29.6%)
Missing	7 (4.3%)	Missing	3 (3.1%)
Ethnicity		**Ethnicity**	
Hispanic/Latinx	25 (15.4%)	Hispanic/Latinx	12 (12.2%)
Other	128 (79.0%)	Other	82 (83.7%)
Missing	9 (5.6%)	Missing	4 (4.1%)
Caregiver Variables			
Age		**Age**	
Mean (SD)	40.1 (4.73)	Mean (SD)	40.2 (4.62)

Gender		**Gender**	
Female	122 (75.3%)	Female	73 (74.5%)
Male	30 (18.5%)	Male	17 (17.3%)
Other	1 (0.6%)	Other	1 (1.0%)
Missing	9 (5.6%)	Missing	7 (7.1%)
Race		**Race**	
Asian American	42 (25.9%)	Asian American	24 (24.5%)
Black/African American	9 (5.6%)	Black/African American	6 (6.1%)
Native Hawaiian or Pacific Islander	1 (0.6%)	Native Hawaiian or Pacific Islander	0 (0%)
White	62 (38.3%)	White	43 (43.9%)
Other	10 (6.2%)	Other	5 (5.1%)
Multiracial	21 (13.0%)	Multiracial	12 (12.2%)
Missing	17 (10.5%)	Missing	8 (8.2%)
Highest Degree Earned		**Highest Degree Earned**	
High school diploma or equivalency	10 (6.2%)	High school diploma or equivalency	4 (4.1%)
Associate degree (junior college)	12 (7.4%)	Associate degree (junior college)	2 (2.0%)
Bachelor's degree	64 (39.5%)	Bachelor's degree	42 (42.9%)
Master's degree	44 (27.2%)	Master's degree	27 (27.6%)
Doctorate	16 (9.9%)	Doctorate	13 (13.3%)
Professional (MD, JD, DDS, etc.)	10 (6.2%)	Professional (MD, JD, DDS, etc.)	7 (7.1%)
Missing	6 (3.7%)	Missing	3 (3.1%)
Income		**Income**	
$5,000 through $11,999	2 (1.2%)	$5,000 through $11,999	1 (1.0%)
$12,000 through $24,999	1 (0.6%)	$12,000 through $24,999	0 (0%)
$25,000 through $34,999	5 (3.1%)	$25,000 through $34,999	1 (1.0%)
$35,000 through $49,999	6 (3.7%)	$35,000 through $49,999	2 (2.0%)
$50,000 through $74,999	14 (8.6%)	$50,000 through $74,999	8 (8.2%)
$75,000 through $99,999	16 (9.9%)	$75,000 through $99,999	6 (6.1%)
$100,000 and greater	99 (61.1%)	$100,000 and greater	68 (69.4%)
Missing	19 (11.7%)	Missing	12 (12.2%)

Procedure

Sections 1 and 2 of this dissertation employed the same procedure, all of which were approved by the Institutional Review Board. The full study comprised two assessment phases. At T1, caregiver-child dyads participated in a laboratory session lasting approximately 60 to 90 minutes. Children received small toys as compensation for their participation. Upon arrival, an experimenter obtained consent and parental permission from the accompanying caregiver and informed assent from the child. Subsequently, children were taken to a separate procedure room to complete a series of questionnaires and behavioral measures, including the recognition of emotions from the vocal bursts task. Meanwhile, caregivers remained in a control room with a second experimenter to complete the caregiver survey. Caregivers were taken to a separate room to complete a Qualtrics survey about themselves, their children, and their interactions with their children. Measures relevant to the current assessment are described below.

Approximately 2.5 – 3 years later (M = 2.9 years, SD = .37), all caregivers who participated in the initial laboratory session were sent personalized links to a second survey on Qualtrics as part of a larger follow-up study at T2. Of the 162 caregivers included in the final analysis at T1, 98 completed the T2 survey. Attrition was 39.51 %, likely influenced by the COVID-19 pandemic.

Nevertheless, the T2 sample was not significantly different from the T1 sample in terms of caregivers' age ($M_{dif\ f}$ = 0.49, $t(124.6) = 0.61$, $p = 0.53$), gender ($X^2(2) = 0.78$, $p = 0.68$), or race/ethnicity (X^2 (6) = 4.51, $p = 0.60$). Similarly, there were no differences in child participants' age at T1 (M_{diff} = 0.02, $t(205) = 0.11$, $p = 0.91$), gender ($X^2(1) = 0.05$, $p = 0.81$), race ($X^2(5) = 5.60$, $p = 0.34$), or performance on the vocal burst recognition task (M_{diff} = -0.03, $t(134.77) = -1.43$, $p = 0.15$). However, the T2 sample had a significantly higher household income than the T1 sample (M_{diff} = 0.64, $t(91.50) = 2.63$, $p = 0.01$).

Measures

Emotion Recognition from the Vocal Bursts Task. Children completed a forced-choice categorization task consisting of 24 emotional sounds presented on an IBM tablet (Sauter, 2007; Sauter et al., 2010). The stimuli were a shortened subset of a validated set of emotional, non-verbal vocalizations of adult encoders, including laughs, sighs, and grunts (Sauter et al., 2010). Four vocalizations (two boys, two girls) were presented for each of the following distinct emotions: anger (irrgghh), surprise (woo), happy (laugh), sad (whine), fear (scream), and disgust (eww)

For each burst, children were shown four emojis as response options chosen from a larger pool, each corresponding to one of the distinct emotions listed above. Before the task began, children were familiarized with all emojis to ensure they knew what emotion each emoji represented. Of the four emojis presented as response options during a trial, one matched the category of the sound and constituted the target, and the other three response options were randomly drawn from the larger pool of emojis. One emoji response option appeared in each corner of the screen. The location of the correct response on the screen was randomized across trials. Each emoji appeared an equal number of times across the entire task.

Children's response to each vocal burst was coded as correct (1) or incorrect (0). Recognition accuracy was computed as the percent of correct answers. If a child did not respond to at least 50% of trials, their data were not included in the analysis (n = 2). Otherwise, trials that were skipped (1.6% of all trials) were treated as incorrect. I removed one observation as an outlier that was greater than 3.5 times the SD away from the mean.

Socioemotional Functioning at T1 and T2. To assess children's socioemotional functioning at T1 and T2, caregivers completed the Strengths and Difficulties Questionnaire (Goodman, 2001). The original measure included five subscales, each consisting of five items that

assess 1) emotional symptoms (e.g., "many fears, easily scared"), 2) conduct problems (e.g., "often fights with other children"), 3) hyperactivity/inattention (e.g., "restless, overactive"), 4) peer problems (e.g., "picked on or bullied"), and 5) prosocial behavior (e.g., "shared readily with other children"). Caregivers rated their agreement with each item on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). As part of our team's effort to reduce the length of the caregiver survey, I omitted one item from the emotional symptoms subscale ("often complains of headaches") given that I deemed its relevance to the respective subscale ambiguous. Caregivers' ratings were averaged to create a summary score for each subscale. The peer problems subscale, consisting of four items, had low reliability at T1 ($\alpha = .29$) and at T2 ($\alpha = .50$) and, therefore, was dropped from the analyses.

Data Analytic Plan

Table 2 displays descriptive statistics for all the variables. Tables 3 and 4 display their intercorrelations. I began the analysis with a comparison of emotional vocal burst recognition accuracy across distinct emotions. This was followed by examining changes in overall recognition accuracy and accuracy for specific emotions with age. The interaction between age and gender on overall recognition accuracy and recognition accuracy for distinct emotions were also analyzed. Finally, I explored the relationship between recognition accuracy and the various domains of socioemotional functioning.

Table 2

Descriptive Statistics

	T1			T2		
	M	*SD*	α	*M*	*SD*	α
Emotion Accuracy	0.82	0.11	-	-	-	-
Emotional Symptoms	2.18	0.88	.71	2.35	0.88	.79
Conduct Problems	1.74	0.65	.70	1.70	0.57	.76
Hyperactivity	2.74	0.86	.76	2.58	0.77	.78
Prosocial Behavior	4.09	0.69	.82	4.03	0.62	.80

Notes. Emotion accuracy scores ranged from 0 to 1, while socioemotional functioning scores ranged from 1 to 5. *M* and *SD* denote the mean and standard deviation, respectively; α represents estimates of reliability.

Table 3

Zero-Order Correlations for Study Variables at T1

Variable	*M*	*SD*	1	2	3	4
1. Recognition Accuracy	0.82	0.11				
2. T1 Emotional Symptoms	2.18	0.88	-.01 [-.16, .15]			
3. T1 Conduct Problems	1.74	0.65	-.20* [-.35, -.05]	.24** [.08, .38]		
4. T1 Hyperactivity	2.74	0.86	-.11 [-.26, .05]	.13 [-.03, .28]	.36** [.21, .49]	
5. T1 Prosociality	4.09	0.69	.28** [.13, .42]	-.15 [-.30, .01]	-.40** [-.53, -.26]	-.18* [-.33, -.02]

Notes. M and *SD* are used to represent the mean and standard deviation, respectively. The values in square brackets indicate the 95% confidence interval for each correlation. * indicates $p < .05$; ** indicates $p < .01$.

Table 4

T2 Sample - Descriptive Statistics and Zero-Order Correlations between Recognition Accuracy and Socioemotional Functioning

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Recognition Accuracy	0.83	0.11								
2. T1 Emotional Symptoms	2.07	0.88	.02							
			[-.18, .22]							
3. T1 Conduct Problem	1.74	0.63	-.28**	.23*						
			[-.45, -.08]	[.03, .41]						
4. T1 Hyperactivity	2.67	0.85	-.11	.07	.32**					
			[-.30, .10]	[-.13, .27]	[.13, .49]					
5. T1 Prosociality	4.12	0.69	.26*	-.18	-.57**	-.19				
			[.07, .44]	[-.37, .02]	[-.69, -.41]	[-.38, .01]				
6. T2 Emotional Symptoms	2.35	0.88	.04	.50**	.19	.07	-.13			
			[-.16, .24]	[.34, .64]	[-.01, .38]	[-.13, .27]	[-.32, .08]			
7. T2 Conduct Problem	1.70	0.57	.00	.16	.52**	.17	-.20	.47**		
			[-.20, .20]	[-.05, .35]	[.36, .65]	[-.04, .36]	[-.38, .00]	[.30, .61]		
8. T2 Hyperactivity	2.58	0.77	-.21*	.08	.37**	.62**	-.18	.32**	.38**	
			[-.40, -.01]	[-.13, .28]	[.19, .54]	[.48, .73]	[-.37, .02]	[.13, .49]	[.20, .54]	
9. T2 Prosociality	4.03	0.62	.19	-.15	-.41**	-.21*	.55**	-.17	-.43**	-.30**
			[-.01, .38]	[-.34, .06]	[-.56, -.22]	[-.40, -.01]	[.40, .68]	[-.36, .03]	[-.58, -.26]	[-.47, -.11]

Notes. M and *SD* are used to represent the mean and standard deviation, respectively. The values in square brackets indicate the 95% confidence intervals for each correlation. * indicates $p < .05$; ** indicates $p < .01$. The correlations were assessed only among participants who participated at both T1 and T2.

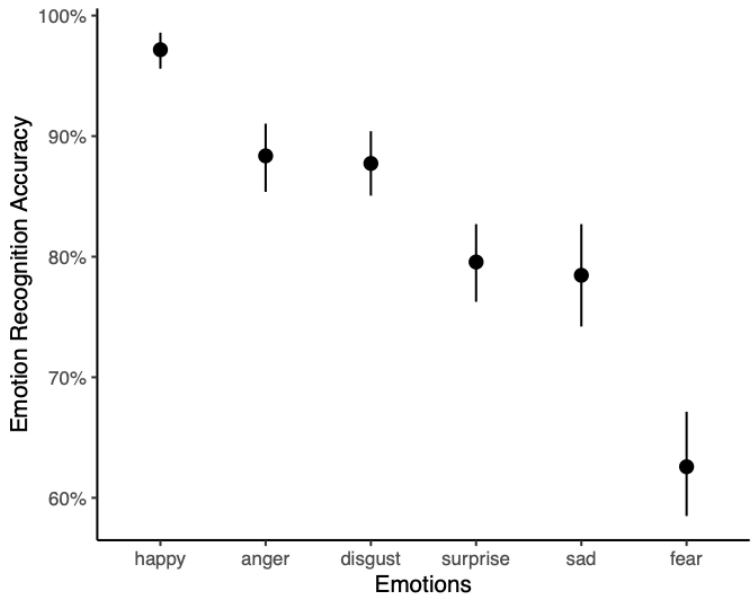
Results

Recognition Accuracy

Overall recognition accuracy (% correct collapsed across distinct emotions) in the sample was 82.3%, which was significantly above chance (see Table 5). Accuracy rates for all distinct emotions were also above chance (>25% correct for all emotions), with children showing the highest accuracy for happiness, followed by anger and disgust, and then surprise and sadness. Accuracy was lowest for fear (see Figure 1).

Figure 1

Recognition Accuracy Across Distinct Emotions



Notes. Recognition accuracy was operationalized as the percent of trials correct for each distinct emotion. The figure includes 95% confidence intervals.

Holm p-value pairwise comparisons showed that accuracy for happiness (highest) and fear (lowest) was significantly different from accuracy for all other emotions. Recognition levels for anger and disgust did not differ significantly from one another, nor did those for surprise and sadness.

Table 5

Recognition Accuracy Against Chance

	Accuracy by Emotion		
Emotion	% Correct	*t*	*p*
Total	82.3	64.87	< .001
Happy	97.2_a	93.47	< .001
Anger	88.4_b	43.95	< .001
Disgust	87.7_b	43.99	< .001
Surprise	79.6_c	32.16	< .001
Sad	78.5_c	25.77	< .001
Fear	62.6_d	17.77	< .001

Notes. The percentage correct was tested against chance (25%). Different subscripts for distinct emotions indicate that accuracy rates are significantly different from each other at Holm-adjusted $p < .05$.

Recognition Accuracy Across Age

I first regressed overall recognition accuracy on age (in months). Then, I repeated this analysis separately for each distinct emotion. Age had a significant positive effect on all accuracy indices aside from happiness, which was positively associated with age at a marginal level (see Table 6 and Figure 2).

Table 6

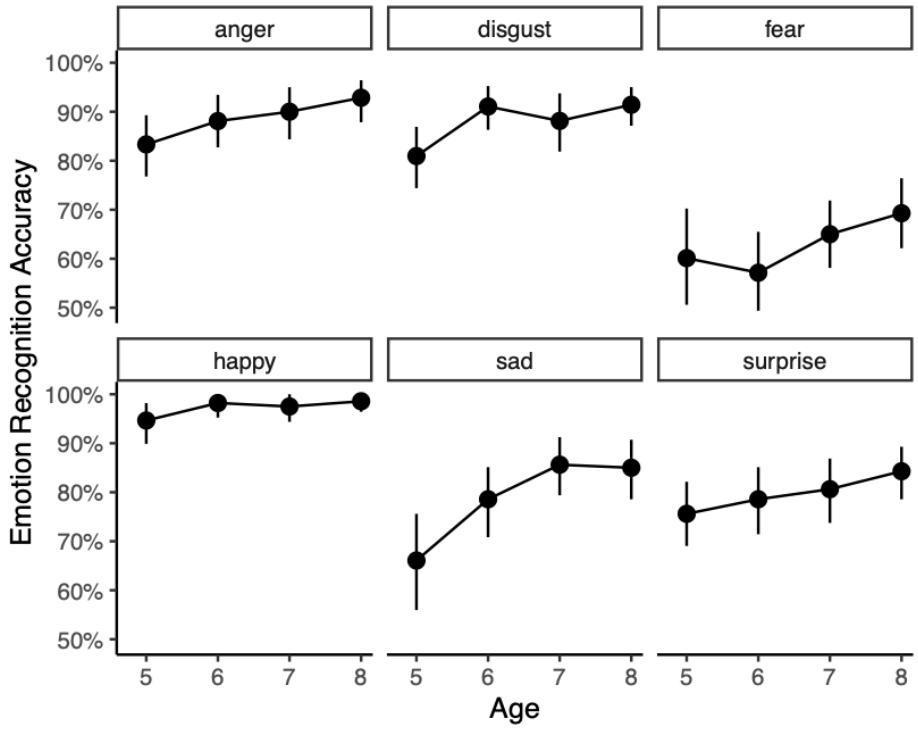
Age Regressed on Recognition Accuracy

Emotion	*B* *[CI]*	*Std. Beta* *[Std. CI]*	*t*	*df*	*p*
Overall	0.03 [0.02 – 0.05]	0.34 [0.19 – 0.49]	4.50	157	< .001
Anger	0.03 [0.00 – 0.05]	0.16 [0.00 – 0.31]	1.99	157	.048
Disgust	0.03 [0.01 – 0.06]	0.20 [0.04 – 0.35]	2.51	157	.013
Fear	0.04 [0.01 – 0.08]	0.18 [0.03 – 0.34]	2.31	157	.022
Happy	0.01 [-0.00 – 0.03]	0.15 [-0.01 – 0.30]	1.86	157	.065
Sad	0.06 [0.02 – 0.10]	0.25 [0.10 – 0.40]	3.23	157	.001
Surprise	0.03 [0.00 – 0.06]	0.16 [0.00 – 0.31]	2.02	157	.045

Notes. Age was scored in months.

Figure 2

Age Regressed on Recognition Accuracy for Each Discrete Emotion



Visual inspection of these trajectories suggested that there might be a non-linear association between age and recognition accuracy for some emotions (e.g., disgust, sadness), which I explored in two ways. First, I tested the significance of the change in accuracy from ages five to six. This did not reveal a consistent pattern across emotions, with growth significant for disgust (β = .56, 95% CI [0.14, 0.99], $t(155) = 2.63$, $p = .009$) and sadness (β = .48, 95% CI [0.06, 0.89], $t(155) = 2.28$, $p = .024$), but no significant change for happy, surprise, anger, or fear ($|t|$s < 1.78). Second, I fit a curvilinear effect of age in the regression analyses reported above. The quadratic term was not statistically significant for any of the emotions, $|t|$s < 0.97. Overall, these analyses indicated that the relationship between age and recognition accuracy was best captured by the linear term.

Age X Gender Interactions in Recognition Accuracy

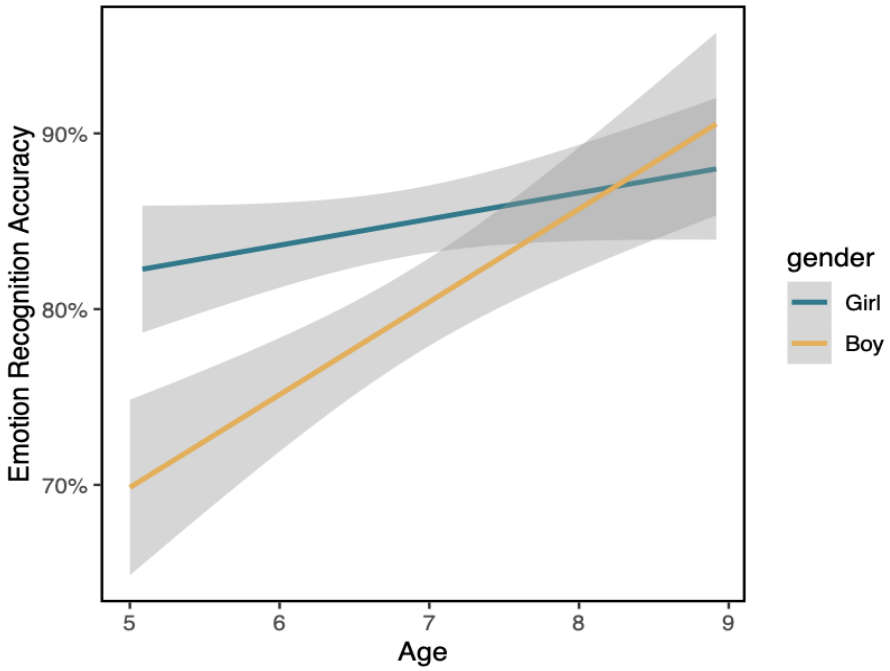
To examine whether gender moderated the effect of age, I regressed overall recognition accuracy on age (months; group mean centered), gender (boy = -1; girl = 1), and the interaction between age and gender. There was a main effect of age (β = .34, $t(155) = 4.66$, 95% CI [0.19, 0.48], $p < .001$) and a main effect of gender (β = .23, $t(155) = 3.28$, 95% CI [0.09, 0.38], $p = .001$). However, these main effects were qualified by a significant age X gender interaction (β = -.19, $t(155) = -2.61$, 95% CI [-0.33, -0.05], $p = .010$).

As illustrated in Figure 3, simple slopes analysis (Aiken & West, 1991) showed that for boys, recognition accuracy improved significantly from ages five to eight (β = .52, $t(155) = 5.25$,

$p < .001$). In contrast, for girls, recognition accuracy did not change across the same developmental period (β = .15, $t(155) = 1.42$, $p = .158$). Furthermore, at age five, girls were better at recognizing emotions than boys (β = 1.10, $t(155) = 3.88$, $p = .001$), but this difference was no longer significant at age eight (β = .08, $t(155) = 0.41$, $p = .686$).

Figure 3

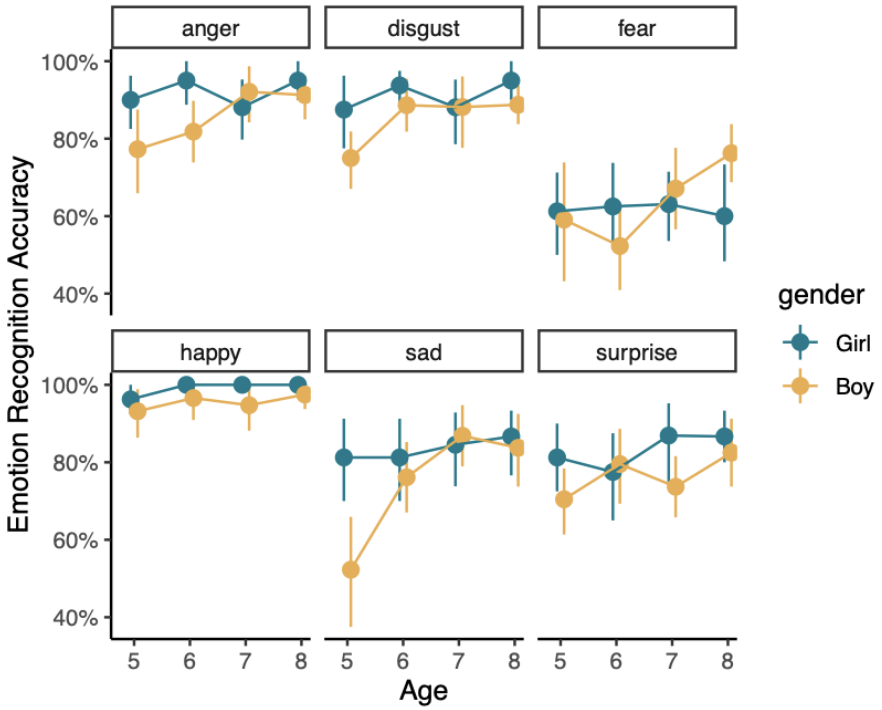
Age X Gender Interaction in Overall Recognition Accuracy



Using the same approach outlined above, I next examined age X gender interaction in predicting recognition accuracy at the level of distinct emotions. The interaction term was only significant for sadness (β = -0.17, $t(155) = -2.26$, $p = .025$) and anger (β = -0.16, $t(155) = -2.06$, $p = .041$) (see Figure 4), ($p > .099$ for all other emotions). Simple slopes analysis showed that for boys, recognition accuracy for sadness improved significantly (β = .42, $t(155) = 4.00$, $p < .001$). In contrast, for girls, recognition accuracy for sadness did not change across the same developmental period (β = .08, $t(155) = 0.70$, $p = .484$). For anger, boys also showed significant improvement in recognition accuracy (β = .31, $t(155) = 2.93$, $p = .004$), while girls did not (β = -0.01, $t(155) = -0.05$, $p = .963$). Full results for all distinct emotions can be found in SOM Table S1.1.

Figure 4

Age X Gender Interactions in Recognition Accuracy Across Discrete Emotions



Notes. Girls and boys are plotted at the same age, but for better visual presentation, their means and confidence intervals are slightly offset on the x-axis.

Recognition Accuracy Predicting Socioemotional Functioning

In my final analyses, I explored the associations between accuracy in recognizing emotions in vocal bursts and children's socioemotional functioning as reported by their caregivers. I predicted ratings on each socioemotional subscale (emotional symptoms, conduct problems, hyperactivity/inattention, prosocial behavior) from overall recognition accuracy since I did not have specific hypotheses about recognition ability at the level of distinct emotions and because I aimed to avoid inflating Type 1 errors from multiple comparisons when predicting five socioemotional domains at the distinct emotion level (see SOM Table S1.2 for this analysis).

Results at T1 showed that recognition accuracy positively predicted child prosociality (β = .28, $t(151) = 3.60$, $p < .001$) and negatively predicted conduct problems (β = -.20, $t(151) = -2.56$, $p < .01$). Associations with the other subscales were non-significant ($|t|s < 1.36$). A second step in the regression controlled for the child's age and gender. The effect of recognition accuracy on prosociality remained significant (β = .25, $t(149) = 3.02$, $p < .001$), while the effect on conduct problems became marginal (β = -.17, $t(149) = -1.95$, $p = .05$). Once again, no other effects were significant ($|t|s < 1.02$) (see Table 7).

For T2 outcomes, recognition accuracy (from T1) positively and prospectively predicted child prosociality (β = .19, $t(94) = 1.91$, $p = .05$) and negatively predicted hyperactivity (β = -.21, $t(94) = -2.11$, $p = 0.03$). Associations with emotional symptoms and conduct problems were not

significant (|*t*|s < .38). A second step in the regression controlled for the child's age, gender, and time lag between T1 and T2 assessments (see Table 8). [2]

These analyses showed that the effect for prosociality (β = .26, *t*(91) = 2.33, *p* = .02) and hyperactivity (β = -.24, *t*(94) = -2.06, *p* = .04) remained significant. Associations with emotional symptoms and conduct problems were not significant (|*t*|s < .98). In the third step, I controlled for T1 assessments of each subdomain of socioemotional functioning. When accounting for socioemotional functioning at T1, the results showed that the effects of prosociality (β = .17, *t*(88) = 1.76, *p* = .08) and hyperactivity (β = -.17, *t*(88) = -1.86, *p* = .06) became marginal (see Table 8). Associations with emotional symptoms and conduct problems were not significant (|*t*|s < .24).

[2] I opted to control for the latter because the lag between T1 and T2 assessments varied substantially (range: 2.4 years - 4.05 years), potentially impacting the child's age and subsequently the key outcomes I measured.

Table 7

Recognition Accuracy Predicting Socioemotional Functioning at T1

		Socioemotional Functioning at T1			
		Emotional Symptoms	**Conduct Problems**	**Hyperactivity**	**Prosociality**
	Predictor	*β (std SE)*	*β (std SE)*	*β (std SE)*	*β (std SE)*
Step 1	Recognition Accuracy	-0.01 (.08)	-0.20 (.08)*	-0.11 (.08)	0.28 (.08)**
Step 2	Recognition Accuracy	-0.09 (.09)	-0.17 (.09)†	-0.09 (.09)	0.25 (.08)**
	Gender	0.06 (.08)	-0.14 (.08)	-0.18 (.08)*	0.22 (.08)**
	Age	0.20 (.09)*	-0.01 (.09)	0.04 (.09)	-0.06 (.08)

Notes. Separate regressions were run for emotion accuracy as a predictor; for gender boy = -1, girl = 1. † $p < .10$, *$p < .05$, ** $p < .01$.

Table 8

Recognition Accuracy Predicting Socioemotional Functioning at T2

		Socioemotional Functioning at T2			
		Emotional Symptoms	Conduct Problems	Hyperactivity	Prosociality
	Predictor	*β (std SE)*	*β (std SE)*	*β (std SE)*	*β (std SE)*
Step 1	Recognition Accuracy (T1)	0.04 (.10)	0.00 (.10)	-0.21 (.10)*	0.19 (.10)*
Step 2	Recognition Accuracy (T1)	-0.00 (.12)	-0.11 (.11)	-0.24 (.11)*	0.26 (.11)*
	Age (T1)	0.15 (.11)	0.21 (.11)†	0.13 (.11)	-0.18 (.11)
	Gender	-0.09 (.11)	0.07 (.11)	-0.09 (.11)	0.06 (.10)
	Time Lag between T1 & T2 Assessments	-0.06 (.11)	-0.21 (.10) †	0.00 (.10)	0.24 (.10)*
Step 3	Recognition Accuracy (T1)	0.02 (.10)	0.02 (.10)	-0.17 (.09)†	0.17 (.10)†
	Age (T1)	0.06 (.10)	0.19 (.10)*	0.05 (.09)	-0.21 (.09)*
	Gender	-0.05 (.09)	0.12 (.09)	0.02 (.09)	-0.07 (.09)
	Time Lag between T1 & T2 Assessments	0.11 (.10)	-0.17 (.09)	0.03 (.08)	0.18 (.09)
	Socioemotional Functioning (T1)	0.53 (.10)**	0.54 (.09)**	0.62 (.08)**	0.56 (.09)**

Notes. Separate regressions were run for recognition accuracy as a predictor; for gender - boy = -1, girl = 1. † $p < .10$, *$p < .05$, ** $p < .01$.

Discussion

The ability to recognize expressions of emotion, an aspect of emotion reasoning (Ruba & Pollack, 2020), is one linchpin of effective social interactions (Denham et al., 2003; Denham et al., 2007; Keltner & Haidt, 1999; Keltner & Kring, 1998; van Kleef & Côté, 2022) and is predictive of socioemotional functioning in childhood (Parker &Gottman, 1998). Although extensive research has explored the maturation of emotion recognition over the course of development in boys and girls (Kok et al., 2014; Williams et al., 2009), this research has primarily focused on facial cues (Denham et al., 2003; Widen & Russell, 2008). This raises the question of when and which children can recognize emotions in other modalities, such as those conveyed via vocal bursts, and whether this ability is also connected to socioemotional functioning (for review, Kilford et al., 2016). To address this gap, I assessed 1) five- to eight-year-old children's developmental trajectories of emotion recognition of well-studied emotions in vocal bursts at both overall and distinct emotion levels, 2) the role of gender in moderating these developmental trajectories, and 3) the socioemotional correlates of this emotion recognition.

The results showed that all the distinct emotions were recognized above the chance level in this age group. These results converge with the findings on the recognition of emotion from the voice (Cordaro et al., 2016; Sauter et al., 2013; Simon-Thomas et al., 2009). Happiness was the most accurately recognized emotion. This is consistent with prior research that has shown that happiness in facial expressions tends to be recognized earlier in development than distinct negative emotions (e.g., Boyatzis et al., 1993; Camras & Allison, 1985; Gosselin & Larocque, 2000; Herba & Phillips, 2008; Maassarni et al., 2014; Montirosso et al., 2010; Widen & Russell, 2003). After happiness, recognition accuracy was highest for anger and disgust, which were recognized equally well. Accuracy for surprise and sadness came next. Finally, among the well-studied emotions studied here, fear was the least well recognized. One possible explanation for this finding is that the relatively privileged children in my sample may have had limited exposure to emotive screams compared to other emotion vocalizations such as ewws and laughs. The lower recognition accuracy for fear aligns with some studies on facial cues (e.g., Boyatzis et al., 1993; Camras & Allison, 1985; Gosselin & Larocque, 2000) but not others (e.g., Montirosso et al., 2010; Maasarni et al., 2014). Given these mixed findings, more research is needed to determine whether this effect is indeed unique to the emotion conveyed in the vocal domain.

Next, I investigated the developmental trajectories of emotion recognition in vocal bursts. Consistent with previous findings (Chronaki et al., 2015; Grosbras et al., 2018; Sauter et al., 2013) and my hypotheses (H1), overall recognition accuracy improved between ages five and eight for all emotions except happiness. Recognition for happiness trended in the expected direction but remained marginal, likely due to the ceiling effect. A more granular analysis revealed that the largest improvement in accuracy occurred between ages five and six, with a slowdown thereafter. This might be related to the onset of schooling, including more exposure to others' emotions or even lessons about emotion in the kindergarten curriculum. Consequently, ages five to six might be a pivotal period for caregivers and educators to actively engage in discussions about emotions through various means, such as playbooks or games. However, my data did not provide a timeframe to pinpoint when the development of emotion recognition in vocal bursts starts to plateau or reach adult-level proficiency. Among the oldest participants, accuracy was relatively high for happiness, anger, and disgust (around 85–95%), indicating near-proficiency by age eight. In contrast, accuracy for surprise, sadness, and particularly fear remained lower (around 60–80%), suggesting the possibility of more protracted development. Future research (particularly longitudinal) should include older samples to explore this further.

I also investigated the moderating role of gender in recognition accuracy. Consistent with some research on vocal bursts (Allgood & Heaton, 2015; Chronaki et al., 2014; Grosbras et al., 2018), I hypothesized that girls would be more accurate than boys (H2), which was supported albeit in a nuanced manner. Specifically, girls were more accurate than boys at recognizing emotions in vocal bursts at the age of five (confirming H2); this difference disappeared by age eight. Girls' accuracy did not change significantly across this developmental period, suggesting early honing of this skill. In contrast, boys showed marked improvement across this developmental period, eventually catching up with their female peers. The same pattern was observed for sadness and anger at the level of distinct emotions. These findings are consistent with a small body of research demonstrating that girls tend to be more proficient than boys at recognizing both sadness (Mancini et al., 2013) and anger (Lawrence et al., 2015; Montirosso et al., 2010) in facial expressions. Overall, the gender effects I observed in this study are consistent with the continuing presence of gender norms surrounding the experience and understanding of emotions, including the meta-analysis by McClure (2000), which found that girls develop emotion recognition abilities earlier than boys.

Lastly, I examined the socioemotional correlates of emotion recognition of vocal bursts cross-sectionally and longitudinally and generally expected positive associations (H3). My results showed that the ability to recognize emotions in vocal bursts did not correlate with caregivers' perception of children's emotional symptoms (e.g., often worried, depressed, nervous, having fears) both cross-sectionally and prospectively. This ability only marginally predicted conduct problems (e.g., fighting with other children, lying, cheating, losing temper) cross-sectionally, but not prospectively, when children's age and gender were constant. In addition, emotion recognition in vocal bursts correlated with hyperactivity (e.g., being restless or overactive) prospectively, but not cross-sectionally. This relationship became statistically marginal when T1 levels and other relevant covariates were also included as predictors. Nevertheless, the effect sizes for emotion recognition at T2 were similar with (.17) and without covariates (.19) in the model. Therefore, I believe the reduction in statistical significance may, in part, be due to low power (i.e., losing degrees of freedom).

Most importantly, emotion recognition ability in vocal bursts at T1 predicted higher levels of prosociality (e.g., considering others' feelings, assisting those experiencing distress, consistently displaying kindness) both cross-sectionally and prospectively, even when controlling for age and gender. However, this link became marginal when T1 prosociality was controlled in assessing the change scores. These findings align well with previous research demonstrating that reliable emotion recognition promotes appropriate social responses, underscoring the robust association between emotion recognition in vocal bursts and prosociality. For instance, individuals, including children, adept at discerning emotions from affective cues in others are more likely to recognize sadness in a peer, understand their needs, and respond with comforting behaviors (Eisenberg & Fabes, 1995; Izard, 2002). Therefore, reliable emotion recognition facilitates the appropriate utilization of emotions, fostering prosocial behaviors such as sharing and helping, all aimed at benefiting others (de Waal, 2008; Dovidio, 2001; Izard et al., 2000; Penner et al., 2005). Relatedly, these findings support previous evidence showing that the ability to recognize emotions in others strongly correlates with the capacity for empathy (Mayer, DiPaolo, & Salovey, 1990), which in turn plays a crucial affiliative role in social interactions, aiding in the formation and maintenance of healthy relationships (Anderson & Keltner, 2003; Ringwald & Wright, 2021).

Limitations and Future Directions

Although the current research enriches our understanding of emotion recognition in childhood, there were several limitations. First, while my stimuli were well-studied emotions (Ekman, 1992), recent research indicates there is a much greater range of emotions that are experienced and expressed (Cordaro et al., 2016; Cowen et al., 2019). As such, future research should explore when, how, and by whom other distinct emotions are recognized in vocal bursts. Second, although contextual information is instrumental in identifying emotions in natural settings (Barret et al., 2011), my stimuli were presented in isolation. On the other hand, identifying emotions in vocal bursts without a broader context may be more challenging for young children, potentially making it a more diagnostic task for their skills and a better predictor of socioemotional outcomes. Nevertheless, future research should compare and contrast the accuracy of recognizing emotion in vocal bursts with and without contextual information.

Lastly, I suggested that vocal recognition performance may be particularly indicative of socioemotional abilities. However, the data in this study do not directly compare emotion recognition accuracy in faces vs. voices to determine whether one is a stronger predictor of socioemotional competencies than the other. Future studies should directly compare these modalities in young children and evaluate their relative association with children's socioemotional outcomes.

Conclusion

These limitations aside, the current research contributes to the broader emotion reasoning literature by examining the developmental trajectories, gender interactions, and socioemotional correlates of an understudied aspect of recognition: emotions conveyed through vocal bursts. The insights gained from this research have the potential to identify critical periods for targeted interventions, educational strategies, and caregiver practices aimed at fostering emotional literacy and socioemotional competence in children.

SECTION 2

Parents' Beliefs about Children's Emotion Controllability and Their Socioemotional Correlates[3]

"Your beliefs become your thoughts, your thoughts become your words, your words become your actions, your actions become your habits, your habits become your values, and your values become your destiny."

Mahatma Gandhi

This quote illustrates the interconnectedness of beliefs, thoughts, and actions, highlighting the importance of beliefs guiding behaviors and ultimately influencing well-being. Researchers have long argued that people hold strong beliefs about emotions, with one particularly important one being whether people believe emotions are more controllable or more uncontrollable (De Castella et al., 2013; Tamir, John, Srivastava, & Gross, 2007; Ford & Gross, 2019). These beliefs not only shape how people view emotions in general—as good or bad, helpful or harmful (Ford & Mauss, 2014; Harmon-Jones et al., 2011; Tamir, 2009; Tsai, 2007)—but also profoundly influence individuals' mental health and well-being (De Castella et al., 2013; De Castella et al., 2015; Kneeland et al., 2016a, b, c).

While the critical relationship between beliefs about emotion controllability and well-being is becoming clearer, little is known what might give rise to these beliefs. In addressing this, recent research has begun to examine youths' beliefs about emotion controllability. However, our understanding of how the parent-child relationship is associated with these patterns is still very limited. Therefore, Section 2 of this dissertation aimed to examine the role of parents' beliefs about children's emotion controllability in predicting children's own beliefs, as well as the pathways through which these beliefs predict children's adaptive socioemotional functioning.

Emotion Controllability Beliefs, Well-being, and Cognitive Reappraisal

The notion of emotion controllability belief is grounded in research on implicit theories that have been studied in relation to people's conceptions of intelligence, social skills, and personality traits (Blackwell, Trzesniewski & Dweck, 2007; Molden & Dweck, 2006). Tamir and colleagues (2007) extended this line of research to the domain of emotions. They provided evidence that people hold distinct implicit beliefs about emotions, with 40% of their sample believing that emotions are controllable (incremental emotion beliefs), while the rest viewing emotions as fixed and unchangeable, even if people try to change them (entity emotion beliefs). Although different terms have been used to refer to these beliefs, I will use the term 'emotion controllability beliefs' throughout, directly asking whether people believe they can change their emotions, as utilized in prior work (Halberstadt et al., 2013). This approach emphasizes the aspect of one's perceived ability to control emotions, which is central to my research questions.

Recent research provides a robust direct link between emotion controllability beliefs and well-being (De Castella et al., 2013; Ford et al., 2018; Ford, Mauss, & Gruber, 2015; Kneeland et al., 2016a, b, c). For example, research on college students showed that holding the belief that

[3] This section is being prepared for submission as a manuscript to a peer-reviewed journal, authored by Ozge Ugurlu, Anna Luerssen, Iris Mauss, & Ozlem Ayduk.

emotions are uncontrollable as opposed to the belief that emotions are controllable correlates with lower well-being, greater psychopathology (e.g., anxiety, depression), and higher stress levels (De Castella et al., 2013; Schroder et al., 2015; Veilleux, Salomaa, Shaver, Zielinski, & Pollert, 2015). Along those same lines, an experimental study showed that after a negative mood induction, adults with stronger entity beliefs about emotion controllability experienced worse moods than those with weaker beliefs (Kappes & Schikowski, 2013).

Recent work suggests that the beliefs individuals hold about the controllability of emotions predict adaptive outcomes through the use of emotion regulation strategies, specifically cognitive reappraisal, which is defined as a strategy that involves reframing the meaning of an emotionally evocative stimulus to alter its emotional impact (Gross & John, 2003; De Castella et al., 2013; Ford et al., 2018; Ford & Gross, 2019; Kneeland et al., 2016a, b, c; Kneeland & Dovidio, 2020; Schroder et al., 2015; Tamir et al., 2007; Tamir & Mauss, 2011). One rationale explaining this pathway is that emotion controllability beliefs pertain to whether individuals perceive their emotional experiences as changeable. Cognitive reappraisal, as an antecedent-focused emotion regulation strategy, directly targets reframing these emotional experiences (Zerwas et al., 2022). Therefore, individuals who believe they can control their emotions are more likely to implement strategies that modify their emotional reactivity as it unfolds, whereas those who believe that they have little control over their emotions may be less likely to put effort into utilizing these strategies (Tamir et al., 2007; Ford and Gross, 2019). Given that cognitive reappraisal is one of the most widely studied emotion regulation strategies, with substantial evidence supporting its impact on psychological health and better interpersonal functioning, it is evident that individuals who believe they can control their emotions and engage in these strategies could consequently benefit from the adaptive outcomes associated with it (Aldao et al., 2010; Garnefski & Kraaij, 2006; Gross & John, 2003; Tamir, John, Srivastava, & Gross, 2007; Troy et al., 2010; Troy & Mauss, 2011).

Supporting this, empirical evidence on adult samples shows that stronger uncontrollability beliefs are linked with less frequent use of reappraisal (De Castella et al., 2013; Schroder et al., 2015). Relatedly, experimental studies manipulating adults' emotion controllability beliefs have also shown that being induced to hold stronger (vs. weaker) controllability beliefs about emotions leads to less effort in regulating emotions after anxiety-inducing tasks (Kneeland et al., 2016a, b, c). Complementing these findings, an experience sampling study examining reappraisal as a mediator of the link between emotion controllability beliefs and adaptive functioning showed that students' beliefs of emotion controllability at the beginning of the semester predicted less depression at the end of the semester through greater use of cognitive reappraisal and less use of rumination (Kneeland & Dovidio, 2020).

The Effect of Emotion Controllability Beliefs on Youths' Cognitive Reappraisal and Well-being

Researchers have also explored the role of cognitive reappraisal in explaining the link between emotion controllability beliefs and their downstream effects on health and well-being in youth. Notably, Tamir et al. (2007) reported that college students with stronger controllability beliefs at the start of the school year experienced fewer positive emotions, more negative emotions, and higher levels of depression, loneliness, and isolation by the end of the year. Furthermore, students who believed emotions were more controllable at the start of college were more likely to use cognitive reappraisal strategies over time. In a younger cohort, Ford et al. (2018) reported that adolescents (aged 14–18) with stronger uncontrollability beliefs exhibited more pronounced depressive symptoms. Building on these correlational findings between cognitive reappraisal and well-being, Ford and colleagues provided evidence of directionality, showing that the link between

emotion controllability beliefs and depressive symptoms was mediated by lower cognitive reappraisal, leading to a maladaptive trajectory. They also extended and replicated this finding with a longitudinal design. They found that youths' uncontrollability beliefs about emotions (aged 10–18) represented a risk factor for depression, which was mediated through cognitive reappraisal strategies. Additionally, a randomized controlled trial showed that adolescents who were taught that people can modify their emotions used more cognitive reappraisal and, in turn, experienced enhanced emotional well-being (Smith et al., 2018). Supporting these findings, a recent systematic review revealed robust correlations between emotion controllability beliefs and symptoms of anxiety and depression in youth (aged 14–24), with effect sizes ranging from small to medium. This was partly attributable to the more frequent use of cognitive reappraisal (Somerville et al., 2024).

Evidently, the controllability beliefs that adults and youth hold about emotions significantly predict their adaptive well-being and mental health. Yet, one question remains relatively unanswered: How do people, especially youth, form those beliefs? Ford and colleagues (2018; also see Halberstadt et al., 2013) postulated that there might be a top-down process where youth might adopt those beliefs by mirroring other adults' beliefs, attitudes, and behaviors through observations, socialization, or direct communication. To start addressing this critical issue more directly, Section 2 of this dissertation examined whether parents' beliefs about children's emotion controllability predict children's own emotion controllability beliefs over time.

Parent-Child Interactions and Children's Outcomes

Most evidence regarding the impact of parents on children's outcomes has focused on areas related to parental behaviors (parent responsiveness vs. overcontrol) and parenting styles (permissive, authoritative, neglectful, and authoritarian). For example, parents' punitive or minimizing reactions can lead to greater externalizing problems and lower social competence in children. In contrast, parents' supportive reactions, such as focusing on problem-solving strategies, can help children develop effective emotion regulation strategies and contribute to their social and emotional functioning (Eisenberg et al., 1996; Fabes et al., 2001; McElwain et al., 2007).

Researchers have also examined parent-child relationships in relation to emotion-related socialization behaviors. Specifically, empirical evidence shows that parents can shape children's emotional development (e.g., emotion experience, expression, and regulation of emotion) through the expression and communication of emotions and reactions to children's emotion-related behaviors (Denham et al., 2007; Eisenberg et al., 1998; Eisenberg et al., 2020). Children receiving these messages can incorporate them into their own beliefs and behavioral systems (Morris et al., 2007). For example, when a child faces a stressor, be it academic failure or peer and parental conflict, parents' emotional and motivational responses could predict the child's emotion regulation mechanisms. Relatedly, research also shows that maternal supportive emotion socialization can moderate the link between maternal emotion regulation and child negative affect, potentially fostering the development of healthy emotion regulation in children (Lee et al., 2023).

Researchers have proposed that one factor that might predict parents' emotion-related behaviors and attitudes toward their children might be parents' emotion-related beliefs (Dix, 1991, 1992, 1993; John & Gross, 2004). The evidence examining parents' emotion-related beliefs mainly comes from the framework of meta-emotion theory, which is defined as a combination of accepting (valuing) or non-accepting (dismissing) beliefs about emotions. For example, parents who view emotions as dangerous or problematic tend to minimize their children's emotions (Gottman et al., 1996; Halberstadt et al., 2013). Similarly, parents who believe that children's positive emotions are harmful respond more negatively to their children's positive emotions (Halberstadt et al.,

2013). On the other hand, parents who view emotions as valuable tend to have more supportive reactions to their children's emotional experiences (Wong et al., 2009). Specifically, they may be able to provide opportunities to discuss emotions and encourage the emotional expression of both positive and negative emotions (Lozada et al., 2016; Perez-Rivera & Dunsmore, 2011). In addition, they tend to be more responsive to children's emotions and assist them in navigating emotionally intense events (Halberstadt et al., 2008). These beliefs are linked to higher emotional competencies, such as better emotion recognition (Castro et al., 2015), as well as more adaptive coping skills, including problem-solving, emotion-oriented coping, and seeking support (Halberstadt et al., 2008). Relatedly, Meyer and colleagues (2014) found that acceptance of children's emotional reactions is associated with children's self-regulation. Taken together, parents' valuing and accepting children's emotions can contribute to adaptive outcomes in children, such as well-being, improved peer relationships, and academic achievement, directly or indirectly (Katz & Windecker-Nelson, 2004; Ramsden & Hubbard, 2002).

To my knowledge, none of the aforementioned studies directly examined parents' beliefs about children's capacity to control their emotions, with the exception of Halberstadt et al (2013). They developed a comprehensive scale to assess parents' beliefs about their children's emotions, comprising several subscales, including one that directly asks whether parents believe children can control their emotions. This leaves room to explore how parents' emotion controllability beliefs might be associated with children's own beliefs. Building on those findings, the current study examined whether parents' beliefs about children's emotion controllability would predict children's own emotion controllability beliefs, their subsequent emotion regulation strategies, and, ultimately, their socioemotional functioning.

The Current Research

The current study addressed several gaps identified in the preceding sections. First, previous research on youths' beliefs about emotion controllability has often focused on adolescents (Ford et al., 2018; Romero et al., 2014; Smith et al., 2017; Somerville et al., 2024; Tamir et al., 2007), a critical period for developing these beliefs. I aimed to extend this research to pre-adolescents, a transitional period also marked by numerous emotion-related challenges (Young et al., 2019; Larson et al., 2002), to see if the same patterns hold. Second, extending previous studies that examined parents' emotion-related beliefs through the lens of meta-emotion theory, I directly asked whether parents beliefs about children's capacity to control their emotions predict children's own emotion controllability beliefs over time. Third, studies on youths' beliefs about emotion controllability have predominantly focused on outcomes related to subjective well-being and psychopathology (De Castella et al., 2013; Schroder et al., 2015; Veilleux et al., 2015). I aimed to build on these findings by examining parents' reports on their children's socioemotional functioning, providing a valuable external perspective on children's emotional adjustment. I assessed socioemotional functioning at two levels. First, I examined it as a latent factor comprised of children's internalizing and externalizing problems, impulsivity, and prosocial behaviors to understand its overall associations with parents' and children's emotion controllability. Second, I examined each subscale separately to disambiguate whether emotion controllability beliefs and cognitive change strategies are differentially associated with specific facets of socioemotional functioning.

Lastly, research examining the link between emotion controllability beliefs and cognitive reappraisal has often relied on a single indicator to assess reappraisal (De Castella et al., 2013; Ford et al., 2018; Kneeland et al., 2016b; Schroder et al., 2015; Tamir et al., 2007). In addition to cognitive reappraisal measurement, I incorporated multiple theoretically relevant assessments,

including putting things into a broader perspective and temporal distancing, conceptualizing them as indicators of a broader strategy called 'cognitive change.' Temporal distancing involves the act of mentally projecting oneself into the future (Bruehlman-Senecal & Ayduk, 2015) and imagining how one will perceive and feel about a current negative experience in the far future (e.g., 5–10 years). This perspective shift has been shown to lead people to recognize the temporary nature of their emotions, and re-evaluate the significance of the event, resulting in the attenuation of their current emotional responses (Ayduk & Kross, 2018; Bruehlman-Senecal & Ayduk, 2015; Bruehlman-Senecal, Ayduk, John, 2016). Similarly, putting things into a broader perspective involves reframing the current negative experience within a broader context or from a different viewpoint, enabling individuals to see the bigger picture (Schartau et al., 2009). This might involve reminding oneself that there are worse things in the world or that the current situation is not as dire as other things that could have happened. Like temporal distancing, both adults and adolescents who adopt a perspective-broadening strategy report fewer symptoms of depression and anxiety than those who use this strategy less frequently (Garnefski et al., 2001; Garnefski et al., 2002). Taken together, both temporal distancing and perspective-broadening are recognized as forms of cognitive change, as they involve reconstructing the meaning of an emotion-eliciting situation to alter its emotional impact (Bruehlman-Senecal et al., 2016; Gross & John, 2003). This comprehensive assessment of cognitive change strategies allowed me to test both their overall and differential associations with pre-adolescents' emotion controllability beliefs and subsequent socioemotional functioning.

To test those ideas, I employed a within-subject longitudinal design with parent-child participants. Parents reported on their children's socioemotional functioning at two time points: Time 1 (T1), when children were five to eight years old, and Time 2 (T2), approximately 3 years later, during children's pre-adolescent period (ages 8 to 12). At T1, parents also reported their beliefs about children's emotion controllability. At T2, children reported their beliefs about emotion controllability, as well as their use of cognitive change strategies. The timing of children's assessments was informed by the previous research. For example, while previous research indicates that children as young as five may begin to utilize cognitive change strategies (Waters & Thompson, 2014), the ability to reliably self-report on these skills typically emerges around age eight (Zimmerman & Iwanski, 2014). Similarly, Ford et al. (2018) demonstrated that children as young as nine can reliably report their beliefs about intelligence malleability (Erdley & Dweck, 1993). In addition, Crawford et al. (2021) successfully assessed emotion controllability beliefs in children as young as seven, supporting the feasibility of obtaining self-report measures from pre-adolescents. I hypothesized that (H1) parents' beliefs about children's emotion controllability would predict children's own beliefs about emotion controllability over time. Further, in two separate models, I predicted that children's emotion controllability beliefs would, in turn, predict (H2a) children's higher use of cognitive change strategies and (H2b) adaptive socioemotional functioning. Lastly, I predicted that (H3) parents' beliefs about children's emotion controllability would predict better socioemotional functioning in children through shifts in children's beliefs about emotion controllability and their subsequent use of cognitive change strategies.

Methods

Procedure

The procedure was described in Section 1. In this section, I focused exclusively on the additional measures and materials specific to Section 2.

Measures

T1 Assessments

Parents' Beliefs about Children's Emotion Controllability. For the purpose of the current study, I adapted The Implicit Theories of Emotion Scale by replacing the word "people" with "children" in each statement ("*No matter how hard they try, children cannot really change the emotions that they have; If they want to, children can change the emotions that they have; The truth is, children have very little control over their emotions").* Responses were rated on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) and averaged across to create a composite ($M = 2.55$, $SD = 1.1$, $\alpha = .81$). The first and second items were reverse scored, so higher numbers meant higher controllability beliefs.

T2 Assessments

Children's Controllability Beliefs about Emotion. Children reported on their controllability beliefs about emotions via The Implicit Theories of Emotion Scale (Tamir et al., 2007). The scale included two items ("*People can learn to control their feelings; If they want to, people can change the emotions that they have"*). Responses were rated on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) and averaged together to create a composite ($M = 3.77$, $SD = .81$, $\alpha = .56$).

Children's Cognitive Change. Children reported on their use of a series of different reappraisal strategies. These questions tapped into three well-established strategies that are thought to reflect different forms of reappraisal (Bruehlman-Senecal, Ayduk, & John, 2016; Gross & John, 2003).

Positive Reappraisal. Children reported on their habitual positive reappraisal strategy usage via the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski & Kraaij, 2006). This scale included three items targeting positive reappraisal of children when something unpleasant happened (*I think to myself that I can learn from what has happened; I tell myself that having this experience will help me become more grown up; I think to myself that there are good sides to it as well"*). Responses were rated on a scale of 1 (*never*) to 5 (*always*) and averaged to create a composite ($M = 2.97$, $SD = 0.76$; $\alpha = .50$).

Putting into Perspective. Children reported on their habitual ability to put things into perspective in the face of challenges by using the child version of the Cognitive Emotion Regulation Questionnaire (CERQ, Garnefski & Kraaij, 2006). This scale had two items ("*I think that it's not as bad as other things that could happen; I think there are worse things in the world").* Responses were rated on a scale of 1 (*never*) to 5 (*always*) and averaged to create a composite ($M = 3.12$, $SD = 1.00$; $\alpha = .62$).

Temporal Distancing. Children reported on their habitual temporal distancing strategy usage via adapted items from the Temporal Distancing Questionnaire (Bruehlman-Senecal, Ayduk, & John., 2016). This scale had three items ("*I think about how my feelings may get better in a few months; I tell myself that I may feel better about this as time goes on; I tell myself that in a month or two I may start to feel that what happened wasn't so bad after all")*. Responses were

rated on a scale of 1 (*never*) to 5 (*always*) and averaged to create a composite (M = 3.00, SD = 0.86; α = .55).[4]

Children's Socioemotional Functioning at T1 and T2. I assessed children's socioemotional functioning both at T1 and T2. Caregivers completed the Strengths and Difficulties Questionnaire (Goodman, 2001) and rated their agreement with each item on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The original measure includes five subscales, each consisting of five items that assess 1) emotional symptoms (e.g., "*many fears, easily scared*"; M_{T1} = 2.18, SD_{T1} = .88; α_{T1}= .71; M_{T2} = 2.38, SD_{T2}= .88; α_{T2} = .79), 2) conduct problems (e.g., "*often fights with other children*"; M_{T1} = 1.74, SD_{T1} = .65; α_{T1} = .70; M_{T2} = 1.72, SD_{T2} = .59; α_{T2} = .76), 3) hyperactivity/inattention (e.g., "*restless, overactive*"; M_{T1} = 2.74, SD_{T1} = .86; α_{T1} = .76; M_{T2} = 2.60, SD_{T2} = .79; α_{T2} = .78), 4) peer problems (e.g., "*picked on or bullied*"; M_{T1} = 2.09, SD_{T1} = .66; α_{T1} = .29; M_{T2} = 2.13, SD_{T2} = .52; α_{T2} = .50), and 5) prosocial behavior (e.g., "*shared readily with other children*"; M_{T1} = 4.08, SD_{T1} = .68; α_{T1} = .82; M_{T2} = 4.02, SD_{T2} = .64; α_{T2} = .80). As part of our team's effort to reduce the length of the caregiver survey, I omitted one item from the emotional symptoms subscale ("*often complains of headaches*"), given that I deemed its relevance to the respective subscale ambiguous. Caregivers' ratings were averaged to create a summary score for each subscale. The peer problems subscale, consisting of four items, had low reliability at T1 (α = 0.29) and T2 (α = .50); therefore, it was dropped from the analyses. When creating the latent factor of socioemotional functioning, items related to emotional symptoms, conduct problems, and hyperactivity were reverse-scored and aggregated so that higher numbers indicate better overall socioemotional functioning.

Data Analytic Plan

I first examined the zero-order correlations between parents' beliefs about children's emotion controllability, children's emotion controllability beliefs and cognitive change strategies, as well as their socioemotional outcomes both at T1 and T2 (see Table 9). Next, I tested whether parents' beliefs about children's emotion controllability at T1 would predict children's controllability beliefs at T2 (see Table 10). I then fit two separate path models to examine whether children's emotion controllability beliefs would account for the variance between the relationship of parents' beliefs about children's emotion controllability and (a) children's cognitive change strategies and (b) children's socioemotional outcomes (see Figures 5 and 6) Lastly, using a serial path model, I tested whether parents' beliefs about children's emotion controllability would predict better socioemotional functioning in children through shifts in children's beliefs about emotion controllability and their subsequent use of cognitive change strategies.

Results

Preliminary Analysis

I first tested whether demographics at two time points were significantly different from each other. The T2 sample was not significantly different from the T1 sample in terms of parents' age (M_{diff} = 0.49, t(124.6) = 0.61, p = .53), gender (χ^2(2) = 0.78, p = .68), race/ethnicity (χ^2(6) = 4.51, p = .60), or beliefs about children's emotion controllability (M_{diff} = 19, t(131.35) = 1.06, p = .28). T2 sample was also not significantly different from the T1 sample in terms of child

[4] Low alpha levels in the children's cognitive change scale and their emotion controllability beliefs scale could be attributed to the measures comprising only two items.

participants' age (M_{diff} = 0.02, $t(205) = 0.11$, $p = .91$), gender ($\chi^2(1) = 0.05$, $p = .81$), or race ($\chi^2(5) = 5.60$, $p = .34$). However, the T2 sample was significantly higher in household income than the T1 sample (M_{diff} = 0.64, $t(91.50) = 2.63$, $p = .01$).

Given the changes in income levels between the T1 and T2 samples, income was assessed as a covariate in the main models. Its inclusion or exclusion did not significantly alter the results. Therefore, it was not included in the final models. In addition, preliminary analysis tested age and gender interaction term in the main models. The results did not reveal a statistically significant interaction between age and gender; therefore, it was not discussed in the following sections.

Table 9

Means, Standard Deviations, and Zero-Order Correlations Between Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. T1 Parents' Beliefs	2.55	1.1												
2. T2 Child's Beliefs	3.77	0.81	.24* [.04, .42]											
T2 Child Cognitive Change														
3. Positive Reappraisal	2.97	0.76	0.16 [-.04, .35]	.29** [.10, .46]										
4. Putting into Perspective	3.12	1.00	0.11 [-.09, .31]	0.05 [-.15, .24]	.33** [.15, .50]									
5. Temporal Distancing	3.00	0.86	0.17 [-.03, .36]	.25* [.06, .43]	.54** [.39, .67]	.40** [.22, .55]								
T1 Child Socioemotional Functioning														
6. Emotional Symptoms	2.18	0.88	-0.1 [-.25, .06]	0.09 [-.12, .28]	0.16 [-.04, .35]	0.19 [-.02, .37]	0.03 [-.17, .23]							
7. Conduct Problems	1.74	0.65	0 [-.16, .16]	0.08 [-.12, .28]	0.04 [-.16, .24]	0.06 [-.15, .26]	0.1 [-.10, .30]	.24** [.08, .38]						
8. Hyperactivity	2.74	0.86	-.17* [-.32, -.01]	-0.01 [-.21, .20]	0.05 [-.16, .24]	-0.14 [-.34, .06]	0.08 [-.12, .28]	0.13 [-.03, .28]	.36** [.21, .49]					
9. Prosociality	4.08	0.68	0.05 [-.11, .21]	0.08 [-.13, .28]	-0.03 [-.23, .17]	0.1 [-.11, .29]	0.06 [-.15, .26]	-.16* [-.31, -.01]	-.42** [-.54, -.28]	-.16* [-.31, -.01]				
T2 Child Socioemotional Functioning														
10. Emotional Symptoms	2.38	0.88	0.1 [-.11, .30]	-0.06 [-.26, .13]	0.01 [-.19, .20]	0.07 [-.13, .26]	-0.19 [-.37, .01]	.50** [.34, .64]	0.19 [-.01, .38]	0.07 [-.13, .27]	-0.11 [-.30, .09]			
11. Conduct Problems	1.72	0.59	0.09 [-.12, .29]	-0.12 [-.31, .08]	0.02 [-.18, .22]	0.16 [-.04, .35]	-0.07 [-.26, .13]	0.16 [-.05, .35]	.52** [.36, .65]	0.17 [-.04, .36]	-0.2 [-.39, -.00]	.49** [.32, .63]		
12. Hyperactivity	2.6	0.79	-0.14 [-.33, .07]	-0.08 [-.27, .12]	-0.03 [-.22, .17]	-0.13 [-.32, .07]	-0.09 [-.28, .11]	0.08 [-.13, .28]	.37** [.19, .54]	.62** [.48, .73]	-.21* [-.39, -.01]	.34** [.15, .50]	.41** [.23, .56]	
13. Prosociality	4.02	0.64	-0.04 [-.24, .16]	0.04 [-.16, .24]	0 [-.19, .20]	0.03 [-.17, .23]	0.04 [-.16, .23]	-0.15 [-.34, .06]	-.41** [-.56, -.22]	-.21* [-.40, -.01]	.57** [.42, .69]	-0.18 [-.37, .01]	-.44** [-.59, -.27]	-.34** [-.51, -.16]

Notes. M and *SD* are used to represent the mean and standard deviation, respectively. The values in square brackets indicate the 95% confidence interval for each correlation. * indicates $p < .05$. ** indicates $p < .001$.

The Link Between Parents' and Children's Emotion Controllability Beliefs

I first tested whether parents' beliefs about children's emotion controllability would predict children's own emotion controllability beliefs (H1). Using hierarchical regression models and reporting standardized beta coefficients as an estimate of effect sizes (see Table 10), I regressed parents' beliefs about children's emotion controllability on children's beliefs as a first step and found a significant positive association. In the second step, I included children's age at T1 as a covariate, and the positive association remained significant. Furthermore, the addition of child's gender as a covariate in the third step maintained the significance of the relationship. Overall, consistent with my hypothesis (H1), parents' beliefs about children's emotion controllability assessed at T1 predicted children's own emotion controllability beliefs assessed at T2.

Table 10

Regression Results Using T2 Children's Emotion Controllability Beliefs as the Criteria

Predictor	*b*	95% C	β	*Std 95% CI*	*t*	*df*	Model Fit	Difference
Intercept	3.32**	[2.91, 3.74]						
T1 Parents' Beliefs	0.18*	[0.03, 0.33]	0.24*	[0.04, 0.44]	2.34	91		
							R^2 = .057*	
							95% CI[.00,.17]	
Intercept	3.29**	[2.87, 3.71]			15.70	90		
T1 Parents' Beliefs	0.19*	[0.04, 0.35]	0.26*	[0.05, 0.46]	2.48	90		
T1 Child Age	-0.08	[-0.23, 0.08]	-0.10	[-0.31, 0.10]	-0.99	90		
							R^2 = .067*	ΔR^2 = .010
							95% CI[.00,.17]	95% CI[-.03, .05]
Intercept	3.29**	[2.87, 3.70]			15.66	89		
T1 Parents' Beliefs	0.19*	[0.04, 0.35]	0.26*	[0.05, 0.46]	2.49	89		
T1 Child Age	-0.07	[-0.22, 0.08]	-0.10	[-0.30, 0.11]	-0.95	89		
T1 Child Gender	-0.07	[-0.24, 0.09]	-0.09	[-0.29, 0.11]	-0.88	89		
							R^2 = .075	ΔR^2 = .008
							95% CI[.00,.17]	95% CI[-.03, .04]

Notes. Parents' Beliefs = Parents' beliefs about children's emotion controllability. * indicates $p < .05$; ** indicates $p < .01$, *b* = unstandardized regression coefficients, β = standardized regression coefficients.

Paths Linking Parents' Emotion Controllability Beliefs to Children's Cognitive Change Strategies and Socioemotional Functioning

Next, I tested whether children's beliefs about emotion controllability accounts for the shared variance between parents' beliefs about emotion controllability and children's cognitive change strategy, as well as children's socioemotional functioning, respectively. As shown in Figures 5 and 6, two separate models of indirect effects were utilized.

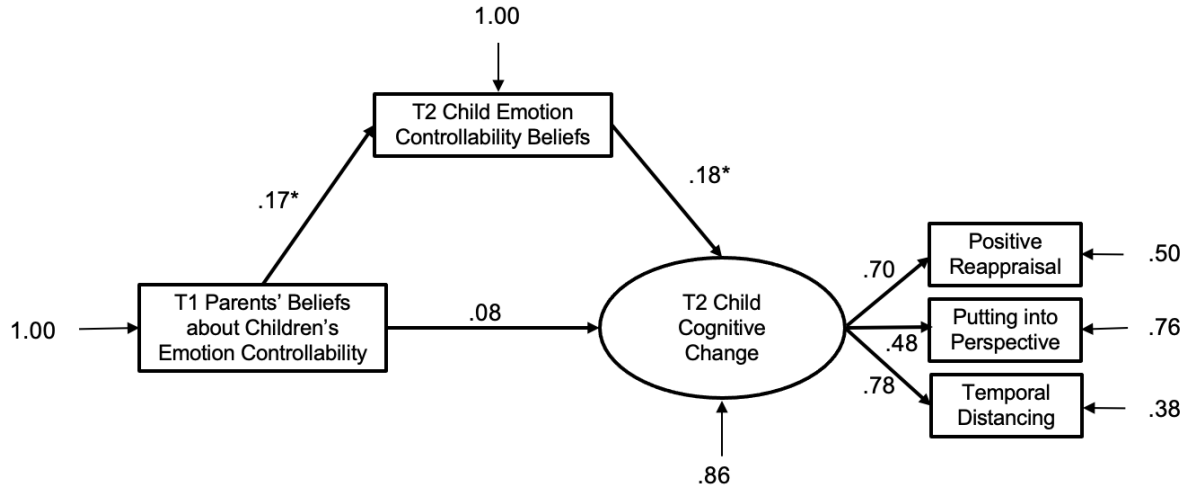
For this, I used structural equation modeling (SEM) through the lavaan package in R Studio Version 1.2.1335 (Rosseel, 2012). The analysis was conducted using full information maximum likelihood (FIML) to handle missing data and bootstrap resampling with 5000 iterations to estimate standard errors. To evaluate model fit in SEM, I inspected the $\chi 2$ test of model fit as an absolute fit index, as well as the comparative fit index (CFI), standardized root-mean-squared residual (SRMR), root mean square error of approximation (RMSEA), and Tucker-Lewis index (TLI) as relative fit indices, following established guidelines (Hu & Bentler, 1999). Nonsignificant $\chi 2$ values ($p > .05$), CFI values greater than 0.95, SRMR values less than 0.08, RMSEA values less than 0.06, and TLI values greater than 0.95 were used to indicate satisfactory model fit.

As shown in Figures 5 and 6, two latent variables were specified in the model: children's cognitive change strategy use at T2 and children's socioemotional functioning at T2. First, children's cognitive change was measured using three observed indicators: positive reappraisal, putting into perspective, and temporal distancing. Factor loadings for all observed indicators on the latent variable were significant (ps < .001), with standardized loadings ranging from .48 to .78. Second, children's socioemotional functioning at T2 was measured using four observed indicators: the conduct behavior subscale, hyperactivity subscale, emotional symptoms subscale, and prosociality subscale from the Strengths and Difficulties Questionnaire (Goodman, 2001). Factor loadings for all observed indicators on the latent variables were significant (ps < .001), with standardized loadings ranging from .94 to .29 for children's socioemotional functioning at T2 and T1.

First, I tested the indirect path model where T1 parents' beliefs about children's emotion controllability predicted children's use of cognitive change at T2 through shifts in children's emotion controllability beliefs. The model showed an excellent fit ($\chi 2(4) = 2.90$, $p = .52$, RMSEA = .00, SRMR = .02, CFI = 1.00, TLI = 1.04). As Figure 5 illustrated, the indirect path that goes from T1 parents' beliefs about children's emotion controllability to T2 children's cognitive change strategy use through T2 children's emotion control beliefs was significant ($\text{indirect}_{a*b} = .033$, 95% bootstrapped CI = [0.001, 0.087]). When I fit each cognitive change strategy as a single indicator outcome, I found an indirect significant effect for reappraisal ($\chi 2(3) = 14.22$, $p = .003$, RMSEA = .00, SRMR = .006, CFI = 1.00, TLI = 1.45; $\text{indirect}_{a*b} = .04$, 95% bootstrapped CI = [0.003, 0.094]) and temporal distancing ($\chi 2(3) = 12.50$, $p = .006$, RMSEA = .00, SRMR = .006, CFI = 1.00, TLI = 1.45; $\text{indirect}_{a*b} = .039$, 95% bootstrapped CI = [0.001, 0.096]) but not for putting into perspective ($\chi 2(3) = 6.63$, p = .08, RMSEA = .00, SRMR = .000, CFI = 1.00, TLI = 1.00; $\text{indirect}_{a*b} = 0.002$, 95% bootstrapped CI = [-0.049, 0.061]). After respecifying the model to exclude 'putting into perspective' from the latent factor of cognitive change, the indirect effect remained statistically significant (see SOM Figure S2.1 for the model specifics).

Figure 5

Path Model Showing Results for Children's Cognitive Change at T2



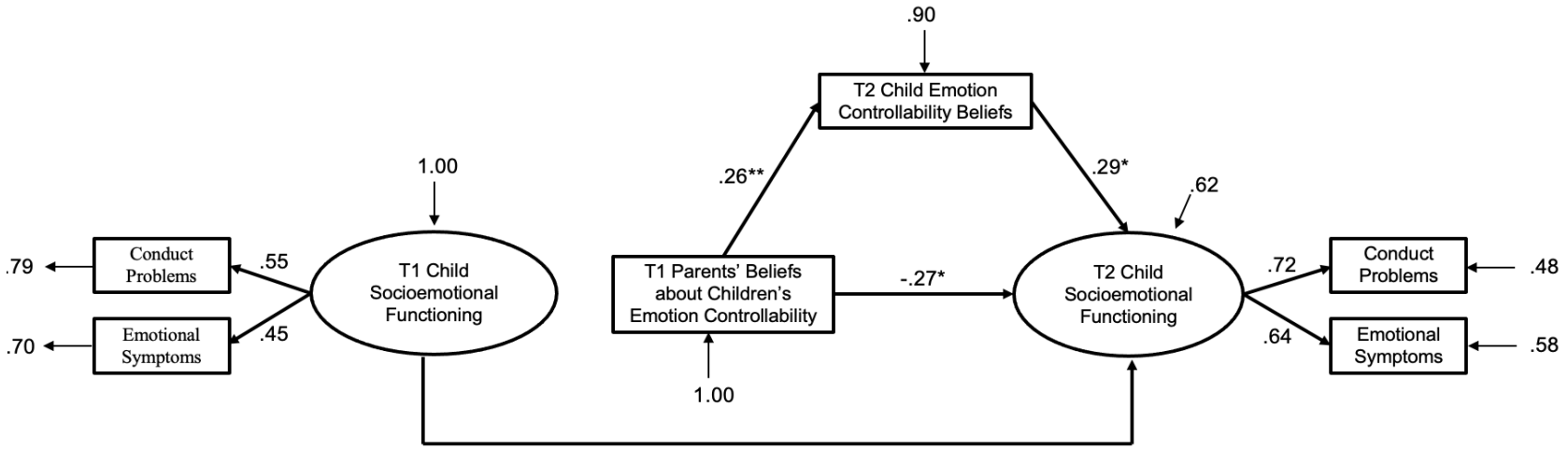
Notes. The observed variables constituting T2 child cognitive change were allowed to covary with one another, but they were omitted from the display for simplicity. * indicates $p < .05$; ** indicates $p < .01$. The total effect was not significant, (ab)+c = 0.11, 95% bootstrapped CI [-0.005, 0.265].

Next, I tested whether parents' beliefs about children's emotion controllability at T1 would predict children's socioemotional functioning at T2 through shifts in children's emotion controllability beliefs at T2. I included T1 children's socioemotional functioning in the model and added the covariations of each observed subscale of socioemotional functioning from T1 to T2 assessments. For model parsimony, the measurement model was respecified by removing the prosociality indicator from the latent construct of children's socioemotional functioning. This resulted in more theoretically and statistically consistent factor loadings. While this modification led to a negligible improvement in global fit indices (CFI increased from .98 to .99, TLI increased from .94 to .97, RMSEA stayed the same at .04, and SRMR stayed the same at .06), it substantially enhanced the coherence of the latent factor structure of socioemotional functioning (see SOM Table S2.1 for factor loadings before and after the respecification). The model showed an excellent fit ($\chi2(13) = 15.45$, $p = .28$, RMSEA = .04, SRMR = .06, CFI = .99, and TLI = .97). As Figure 6 illustrated, the indirect path linking parents' beliefs about children's emotion controllability to adaptive socioemotional functioning through children's own emotion controllability beliefs was significant ($\text{indirect}_{a*b} = .055$, 95% bootstrapped CI = [0.005, 0.123]).

Due to the low factor loading of the hyperactivity indicator on the latent construct of children's socioemotional functioning at T1, this indicator was excluded from the final model specification. Respecification improved the model fit even further ($\chi2(3) = 1.41$, $p = .70$, RMSEA = .00, SRMR = .02, CFI = 1.00, TLI = 1.00; $\text{indirect}_{a*b} = .045$, 95% bootstrapped CI = [0.001, 0.132]). The initial model specification, which included hyperactivity as an observed indicator, was presented in SOM Figure S2.2 for reference.

Figure 6

Path Model Showing Results for Children's Socioemotional Functioning at T2



Notes. * indicates $p < .05$; ** indicates $p < .01$; *** indicates $p < .001$. The observed variables constituting children's socioemotional functioning were allowed to covary with one another separately at T1 and T2, but they were omitted from the display for simplicity. T1 child socioemotional functioning and T1 parents' beliefs about children's emotion controllability were allowed to covary (p= .43). The total effect was not significant, (ab) + c = -.12, 95% bootstrapped CI = [-0.306, 0.015].

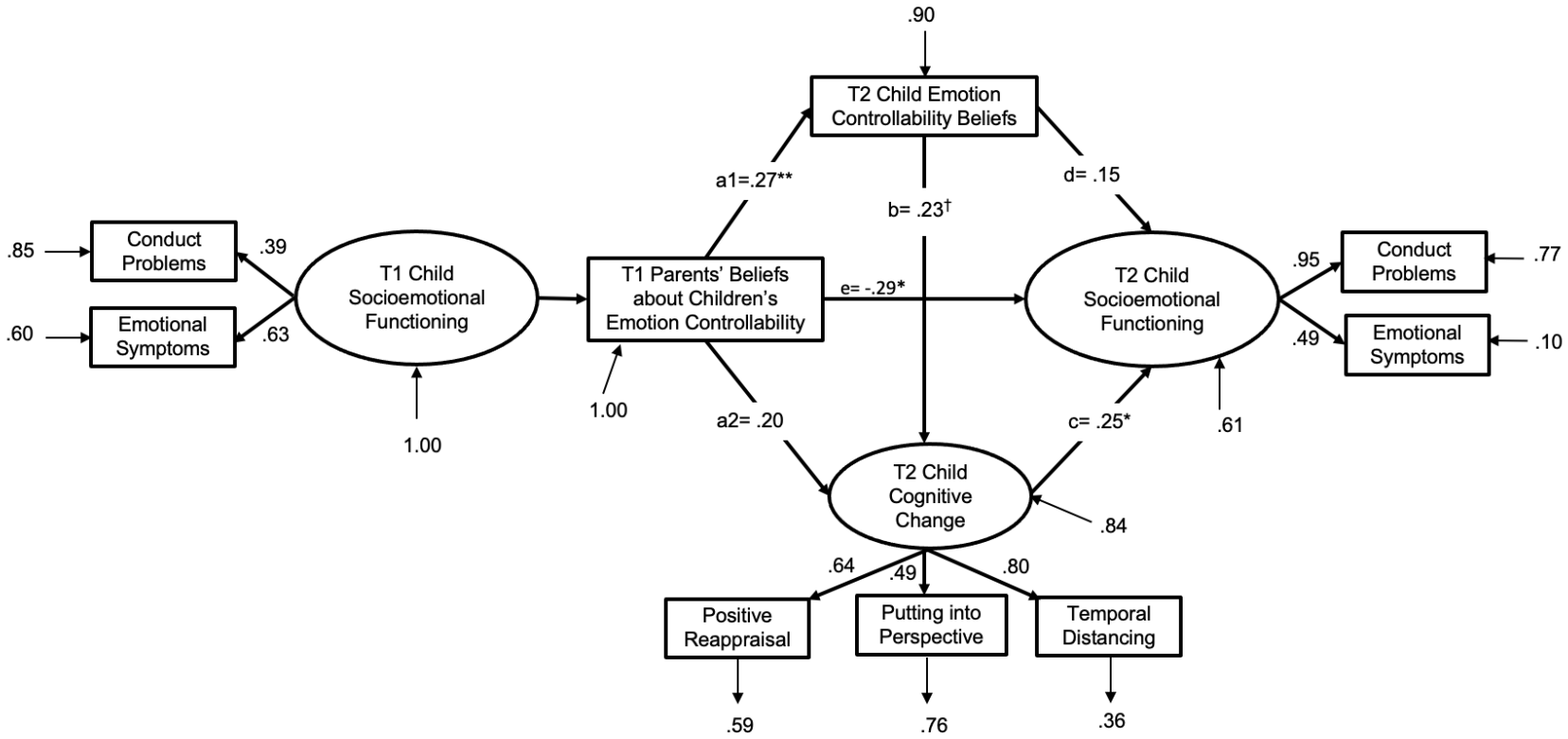
Parents' Emotion Controllability Beliefs and Children's Socioemotional Functioning: A Serial Path Model Testing the Role of Cognitive Change Strategies

Previous research provides evidence supporting that cognitive reappraisal explains the positive shared variance between emotion controllability beliefs and well-being (Ford et al., 2018; Kneeland & Dovidio, 2020; Smith et al., 2017; Somerville et al., 2024; Tamir et al., 2007). Therefore, I utilized a path model using SEM wherein children's emotion controllability beliefs and cognitive change strategies were tested in sequential paths to examine whether they account for the shared variance between parental beliefs and children's socioemotional functioning. Specifically, parents' beliefs about children's emotion controllability at T1, children's own emotion controllability beliefs at T2, and children's use of cognitive change strategies at T2 were serially entered in the model to predict children's socioemotional functioning as reported by their caregivers at T2 while controlling for their T1 socioemotional functioning scores. I followed the same proposed cut-off criteria that I used in the preceding models. Additionally, the model incorporated direct paths from parents' T1 beliefs about children's emotion controllability to both children's T2 socioemotional functioning and their use of cognitive change strategies.

Guided by the previous path analyses in this study, the measurement model for children's socioemotional functioning was specified as a latent construct with two observed indicators: conduct problems and emotional symptoms. Similarly, the latent factor of children's cognitive change was operationalized using two observed indicators: positive reappraisal and temporal distancing. Building upon the aforementioned model specifications enabled me to test a more parsimonious model, allowing me to evaluate the associations between children's cognitive change strategies and emotion-related outcomes. The model showed an excellent fit ($\chi2(17) = 23.85$, $p = .12$; RMSEA = .07; SRMR = .06; CFI = .96; TLI = .91). As Figure 7 illustrated, parents' beliefs about children's emotion controllability at T1 significantly predicted children's emotion controllability beliefs at T2 ($\beta = .27$, $SE = .07$, $p = .006$). Children's emotion controllability beliefs at T2 were marginally associated with their cognitive change at T2 ($\beta = .23$, $SE = .10$, $p = 0.06$). Lastly, children's cognitive change at T2 predicted their socioemotional functioning at T2 ($\beta = .27$, $SE = .17$, $p = .03$). Although the individual path coefficients trended in the hypothesized direction, the indirect path of parental beliefs about children's emotion controllability in predicting children's socioemotional functioning through both children's own emotion controllability beliefs and their use of cognitive change strategies was not statistically significant ($\text{indirect}_{a1*b*c} = .012$, 95% bootstrapped CI [-0.013, 0.049]). To further examine this relationship, the same model was tested separately for each specific indicator of children's socioemotional functioning at T2 (i.e., conduct problems and emotional symptoms). The indirect effects for both indicators were also not significant ($\text{indirect}_{a1*b*c\ (\text{conduct problems})} = -.002$, 95% bootstrapped CI [-0.017, 0.007]; $\text{indirect}_{a1*b*c\ (\text{emotional symptoms})} = .01$, bootstrapped 95% CI [-0.006, 0,033]).

Figure 7

Testing the Role of Children's Emotion Controllability Beliefs and Their Cognitive Change Strategies in a Serial Path Model



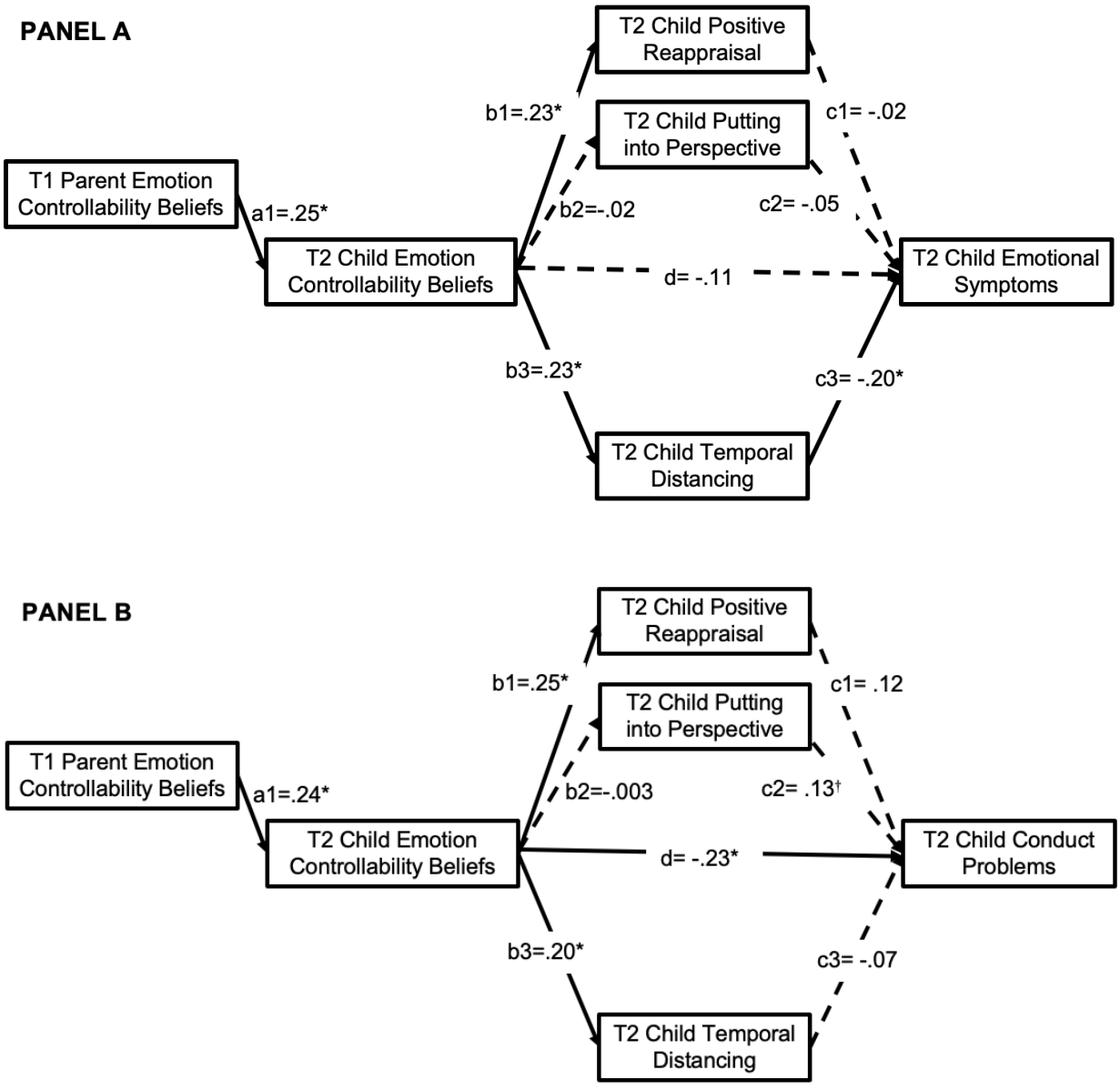
Notes. †indicates $p < .07$; * indicates $p < .05$; **indicates $p < .01$. The observed variables constituting children's socioemotional functioning were allowed to covary with one another separately at T1 and T2, but they were omitted from the display for simplicity. Child socioemotional functioning and parents' beliefs about children's emotion controllability at T1 were allowed to covary (p= .36).

Subsequent analyses were conducted to test whether single indicators of cognitive change strategies would explain the shared variance between emotion controllability beliefs and children's socioemotional functioning. The role of each indicator was assessed in relation to the latent factor of socioemotional functioning, as well as the single indicators for conduct problems and emotional symptoms in three separate models. While no significant indirect effects emerged for the overall socioemotional functioning as a latent factor (see SOM Table S2.2 for detailed path coefficients and indirect effects), nuanced relationships were observed between each cognitive change strategy and the specific indicators of socioemotional functioning.

As Figure 8 illustrated, neither positive reappraisal nor putting into perspective accounted for the shared variance in the relationship between T1 parents' beliefs about children's emotion controllability, T2 children's beliefs about emotion controllability, and their T2 emotional symptoms or conduct problems. Conversely, temporal distancing accounted for the shared variance between parents' and children's beliefs about emotion controllability and children's emotional symptoms (but not their conduct problems). Precisely, parents' beliefs about children's emotion controllability at T1 significantly predicted children's emotion controllability beliefs at T2 (β = .25, *SE* = .06, *p* = .004). Children's emotion controllability beliefs at T2 significantly predicted their temporal distancing strategy use at T2 (β = .23, *SE* = 0.08, *p* = .02). Lastly, children's temporal distancing strategy use at T2 significantly predicted lower emotional symptoms (β = .20, *SE* = .09, *p* = .01). The indirect effect of parents' beliefs about children's emotion controllability on emotional symptoms through children's beliefs about emotion controllability and their temporal distancing strategy use was also significant ($indirect_{a1*b3*c3}$ = -.009, 95% bootstrapped CI [-0.028, - 0.001]. All estimated indirect effects for other models are reported in SOM Table S2.3.

Figure 8

Testing Single Indicators of Cognitive Change Strategies and Socioemotional Functioning in Separate Path Models



Notes. Panel A illustrates the model predicting T2 child emotional symptoms. Panel B illustrates the model predicting T2 child conduct problems. The models in Panel A and Panel B controlled for children's emotional symptoms and conduct problems at T1, respectively. † indicates $p < .07$; * indicates $p < .05$; ** indicates $p < .001$.

Discussion

A growing body of research has begun to investigate the variability in individuals' beliefs about emotion controllability, their impact on the use of cognitive reappraisal strategies to regulate emotions, and the downstream consequences for well-being and mental health in both adult and youth populations (De Castella et al., 2013; De Castella et al., 2015; Ford et al., 2018; Ford & Gross, 2019; Harmon-Jones, Harmon-Jones, Amodio, & Gable, 2011; Kneeland et al., 2016a; Tamir, John, Srivastava, & Gross, 2007). The current study expanded upon those empirical findings by directly examining whether parents' beliefs about children's emotion controllability predict pre-adolescents' own emotion controllability beliefs and whether these beliefs, in turn, predict their broader use of cognitive change strategies, ultimately influencing their subsequent socioemotional functioning.

To my knowledge, only Halberstadt et al. (2013) directly asked parents' beliefs about children's capacity to control their emotions. They examined how those beliefs are associated with parents' supportive versus unsupportive responses to their children's negative affective states, leaving room to explore how those controllability beliefs might be associated with children's own beliefs. Therefore, I first examined this direct link. Specifically, I assessed parents' beliefs about children's emotion controllability at T1, when children were between five and eight years old, and then assessed children's own emotion controllability beliefs 3 years later, during their pre-adolescent years (ages 8 to 12). This timing of children's emotion controllability beliefs assessment was guided by previous research indicating that pre-adolescents can reliably report their beliefs about emotions (Crawford et al., 2021; Zimmerman & Iwanski, 2014).

Supporting my hypothesis (H1), I found that parents' beliefs about children's emotion controllability assessed in early childhood predicted children's own beliefs about emotion controllability 3 years later when the children reached their pre-adolescent period. This effect held regardless of children's age or gender. This finding aligns with the previous research proposing that children might learn and internalize beliefs about emotion controllability through explicitly hearing messages about emotion controllability or observing how parents handle their emotions (Ford et al., 2018; Halberstadt et al., 2013; Morris et al., 2007). Overall, this study provides preliminary evidence supporting the notion that children who receive messages (directly or indirectly) about the controllability of emotions in early childhood may adopt these beliefs themselves through the pre-adolescent period. Therefore, future research should further investigate the relationship between parents' beliefs about children's emotion controllability, the extent to which they communicate emotion-related concepts, and the implications for children's socioemotional functioning.

Next, I examined whether parents' beliefs about children's emotion controllability would predict children's greater use of cognitive change strategies through shifts in children's own emotion controllability beliefs. Unlike previous studies that predominantly used single indicators of cognitive reappraisal, I used multiple indicators (e.g., positive reappraisal, putting into perspective, and temporal distancing) under the broader term "cognitive change." Supporting my hypothesis (H2a) and aligning with previous research, the results showed that children's emotion controllability beliefs accounted for the shared variance in the relationship between parents' beliefs about children's emotion controllability and their children's greater use of cognitive change strategies. The structural equation model showed that putting into perspective's loading on the broader term cognitive change variable was lower compared to positive reappraisal and temporal distancing. Even though testing the model with and without this indicator did not change the

overall effect, this suggests that pre-adolescents may not yet fully develop their capacity to utilize putting into perspective as a cognitive change strategy.

Next, I tested a separate path model using the same predictors, but this time with the goal of predicting children's socioemotional functioning. Previous research examining the link between emotion controllability beliefs and psychological outcomes often focused on psychopathology (e.g., depression and anxiety) or subjective well-being (Tamir et al., 2007; Ford et al., 2018; Smith et al., 2017; Somerville et al., 2024). Expanding on this evidence, I tested whether the same pattern would hold for children's overall socioemotional functioning. I initially included subscales of conduct problems (e.g., fighting with other children, lying, cheating, losing temper), emotional symptoms (e.g., frequent worry, depression, nervousness, fears), hyperactivity (e.g., impulsivity, restless, not being able to stay still for long), and prosociality (being helpful if someone is hurt, considerate of other people's feelings). The final model suggested that removing prosociality would enable a more coherent assessment of socioemotional functioning. Further, removing hyperactivity improved the model fit. This suggests that while prosociality is an important component of socioemotional functioning, it may not be directly related to beliefs about emotion controllability. Similarly, although it is plausible that believing emotions can be controlled might be related to the impulsivity aspect of hyperactivity, this aspect may be more associated with cognitive components of attention span rather than the affective aspects influenced by emotion-related beliefs.

The final model showed that children's emotion controllability beliefs accounted for the shared variance in the relationship between parents' beliefs about children's emotion controllability and children's emotion-related socioemotional functioning. This finding, consistent with my initial hypothesis (H2b), suggests that parents who believe in young children's capacity for emotion control are more likely to have children who adopt analogous beliefs in their pre-adolescence period. These beliefs, in turn, predict the adaptive emotion-related aspects of socioemotional functioning. Overall, these findings extend previous evidence focused on adolescents (Ford et al., 2018; Romero et al., 2014; Smith et al., 2017; Somerville et al., 2024; Tamir et al., 2007), demonstrating that similar patterns regarding emotion controllability beliefs and adaptive outcomes are evident in pre-adolescent age groups. However, the path on which emotion controllability beliefs predict socioemotional functioning remains unexplored. Specifically, as previous evidence suggests, do parents' and children's emotion controllability beliefs foster the use of cognitive change strategies in children, which then predicts improved socioemotional functioning?

To examine this, I utilized a serial path model to assess whether parents' beliefs about children's emotion controllability would predict adaptive socioemotional functioning in children through shifts in children's emotion controllability beliefs and their subsequent use of cognitive change strategies. Informed by the previous path models in the study, this model only included conduct problems and emotional symptoms as indicators of socioemotional functioning. The results offered partial support for my prediction (H3). Children's emotion controllability beliefs, significantly predicted by parents' beliefs, only marginally predicted their use of cognitive change strategies, despite trending in the expected direction. The use of these strategies, however, did predict improved socioemotional functioning. The overall indirect path (parents' emotion controllability beliefs → children's emotion controllability beliefs → children's cognitive change strategies → children's change in socioemotional functioning) was not significant. However, a more granular analysis, wherein every single indicator of cognitive change strategies was tested in relation to the latent factor of socioemotional functioning as well as conduct problems and

emotional symptoms in separate models, revealed nuanced relationships. Specifically, temporal distancing significantly accounted for more of the shared variance between parents' and children's emotion controllability beliefs and children's emotional symptoms but not conduct problems. However, indirect paths were not observed when examining positive reappraisal and putting into perspective as individual cognitive change strategy indicators on emotional symptoms and conduct problems.

This suggests that pre-adolescents may gravitate towards and benefit more from temporal distancing strategies, a tendency that may be related to their developmental stage. While children in this age group are developing more complex reasoning abilities, they may still struggle with abstract concepts. Temporal distancing, which involves projecting oneself into the future and imagining how one might feel about a current situation later, might be more concrete and easier to grasp for pre-adolescents compared to the more abstract processes of positive reappraisal (e.g., they can learn from what happened or there might be good sides to it as well) and putting into perspective (e.g., thinking there are worse things in the world). Another reason that we might not have seen a consistent pattern could be that children's socioemotional functioning was parents' reports on their children. While this provides valuable external insight, there might be discrepancies between children's self-reported experiences and their parents' observations. Therefore, future studies could benefit from comparing children's outcomes reported by both children and their parents.

Practical Implications

The findings of this study have several implications, particularly highlighting the importance of parent-child interactions. First, the study provides preliminary evidence showing that parents' beliefs about children's emotion controllability predict children's own emotion controllability beliefs. Previous evidence suggests that those beliefs might be foundational in paving the way for more effective cognitive change mechanisms and overall well-being over time (Kneeland, Nolen-Hoeksema, Dovido, & Gruber, 2016a, b, c). Therefore, I propose that targeting parents' emotion beliefs—endorsing the idea that children can control their emotions— could address the root of the problem, thereby providing a more foundational solution for improving children's healthy development. Although this hypothesis warrants empirical evidence and direct comparison, I propose that targeting beliefs, which seem to influence behaviors, might be more effective than attempting to change behavior directly (e.g., through training on emotion regulation strategies).

Another benefit of targeting parents' beliefs about children's emotion controllability relates to the timing of the intervention. While the existing literature does not precisely pinpoint when beliefs about emotion controllability begin to form, shaping these beliefs as early as possible through socialization may help children internalize them and, therefore, develop effective emotion regulation from an early age. This approach could serve as a protective factor against potential psychological health problems that may become more difficult to address once fully developed. Additionally, internalizing the belief that emotions are controllable may not only enhance children's cognitive reappraisal skills but also other theoretically relevant cognitive change strategies, thereby expanding their emotion regulation repertoire—a crucial predictor of psychological health and well-being (Ford, Gross, & Gruber, 2019).

Limitations and Future Directions

This study, employing a longitudinal design and focusing on an understudied age group, offers significant insights into how parental beliefs about children's emotion controllability predict children's socioemotional functioning and the paths through which these beliefs predict adaptive

outcomes in children. Despite its strengths, there are several limitations that highlight key future directions.

First, the second wave of data collection coincided with the COVID-19 pandemic—a period marked by unprecedented instability. This may have contributed to the attrition rate in Wave 2, limiting the power of complex statistical models. It is also plausible that unique stressors and disruptions due to preventive measures during that anomaly may have influenced the findings. For instance, parents who were confined at home with their children might have amplified their responses to various aspects of their children's socioemotional functioning, such as emotional symptoms, conduct problems, and hyperactivity. Therefore, it is crucial that future studies should test the same hypothesis with larger samples and under naturalistic observation to ensure the robustness of the results.

Second, while the two-time-point longitudinal design allowed for examining the directionality of effects and changes in children's socioemotional functioning, it did not permit causal inferences, particularly regarding relationships between variables measured at T2. Longitudinal studies with more assessment points would provide a more nuanced understanding of children's developmental trajectories of emotion-related beliefs and their socioemotional correlates. This approach could also allow researchers to track the trajectories of these beliefs over time, providing opportunities to identify an optimal time window for interventions. Additionally, for a more robust causal interpretation, future studies should directly investigate how shifting parents' beliefs about children's emotion controllability influences subsequent changes in children's beliefs and behaviors. It is also important to note that the relationship between parental beliefs and children's behavior may be bidirectional. For example, children's pre-existing behavioral tendencies (e.g., constantly fidgeting or often throwing tantrums) may influence parental beliefs about children's emotion controllability. Future research would also benefit from exploring these complex dynamics.

Third, even though this study provided preliminary evidence that parents' beliefs about children's emotion controllability predict children's own beliefs, there is room to explore what might explain this link. Therefore, future research should delve deeper into the theoretically relevant moderators and underlying mechanisms influencing this relationship in greater depth. For example, researchers should examine the ways in which parental empathy, warmth, communication styles, and overprotection influence the relationship between parents' beliefs about children's emotion controllability and children's emotion controllability beliefs.

Lastly, current research used both child- and parent-reported variables; therefore, it was not solely based on parental perceptions. However, it is worth noting that the assessment of children's socioemotional functioning relied on parents' self-reports. As previously mentioned, these reports might be biased and influenced by specific contexts, such as COVID-19. In addition, children's emotional symptoms or behaviors occurring outside of the family context might not be fully captured by parents (Karnilowicz, Mauss, & Zhou, 2022). Therefore, future studies should incorporate behavioral assessments and child reports to provide a more comprehensive and accurate evaluation of child outcomes.

Conclusion

While much work remains to understand how parents' emotion-related beliefs predict children's well-being, the current research contributes to the growing body of research by providing evidence that parents' beliefs in children's ability to control their emotions can predict analogous beliefs in children, contributing to their use of adaptive emotion regulation strategies and, therefore, better socioemotional functioning.

General Discussion

Emotions play a pivotal role in shaping daily experiences, influencing relationships and overall well-being from childhood (Ekman, 1992; Ekman & Cordaro, 2011; Keltner & Haidt, 1999; Schultz et al., 2004). This highlights the need to better understand the role of affective processes in predicting children's healthy development. Therefore, the overarching goal of this dissertation was to investigate two related affective processes and their socioemotional correlates. To address this, I presented two studies using data from a longitudinal sample, integrating perspectives from affective and developmental science.

First, I investigated the developmental trajectories of young children (ages five to eight) in their capacity to recognize emotions in vocal bursts, a specific facet of emotion reasoning (Ruba & Pollack, 2020), and whether gender moderates these trajectories. Following this, I examined both concurrent and prospective socioemotional correlates associated with young children's proficiency in reliably recognizing emotions in this particular modality. However, healthy socioemotional functioning does not occur in isolation. Therefore, in Section 2, I shifted the focus to a more extrinsic and environmental factor—parenting. Specifically, I examined whether parents' beliefs about children's emotion controllability were associated with children's socioemotional functioning over time through shifts in children's own beliefs about emotion controllability and, subsequently, their use of cognitive change strategies.

In Section 1, I found that each distinct emotion was recognized above the chance level within this age group, and overall accuracy improved with age (except for happiness, likely due to the ceiling effect). A finer-grained analysis indicated that the most substantial gains in accuracy occurred between the ages five and six, with a slower progression thereafter. Building upon those findings, I found that gender moderated that relationship in a nuanced way. Specifically, although girls at the age of five outperformed boys in recognizing emotions in vocal bursts, this gender difference was no longer evident by age eight. Girls' accuracy stayed stable over time, suggesting early mastery of recognition in this emotion modality. Conversely, boys experienced significant growth in their ability to recognize emotions throughout this period, ultimately closing the gap with their female peers. In addition, the results showed that the ability to recognize emotions in vocal bursts predicted specific aspects of socioemotional functioning, with these associations varying both concurrently and prospectively. Specifically, children who were better at recognizing emotions in vocal bursts were rated as having fewer externalizing problems and more prosocial concurrently, with prosociality remaining significant in the prospective analysis.

Section 2 of this dissertation examined whether parents' beliefs about children's emotion controllability would predict children's own emotion controllability beliefs, which would subsequently predict children's higher use of cognitive change strategies and, ultimately, higher socioemotional functioning. The results were presented in 3 steps. First, parents' beliefs about children's emotion controllability, assessed when children were five to eight years of age at T1, predicted children's own emotion controllability beliefs when they reached pre-adolescence at T2. Second, two separate path models revealed that children's beliefs about emotion controllability at T2, in turn, predicted their greater use of cognitive change strategies and adaptive socioemotional functioning, both of which were also assessed at T2. Third, the serial path model revealed that children's temporal distancing as a cognitive change strategy (but not positive reappraisal and putting into perspective) significantly accounted for the shared variance between parents' and children's emotion controllability beliefs and children's lower levels of emotional symptoms.

By assessing two related yet distinct affective processes in predicting children's adaptive socioemotional functioning with a longitudinal study, this dissertation offers significant theoretical

and practical insights. First, its multifaceted approach highlighting the interconnected nature of emotions contributes to our growing body of knowledge at the intersection of affective and developmental science. Second, by providing information about potentially critical periods in the developmental trajectories of emotion recognition ability in vocal bursts and drawing attention to the importance of parents' beliefs about children's capacity to control their emotions, it opens promising avenues for future research and potential interventions.

Contributions to Affective Science

Contributions to the Science of Emotion Recognition and Future Directions

Section 1 contributed to the knowledge of affective science by providing evidence that the development of emotion recognition in vocal bursts may follow distinct trajectories based on gender. While this investigation opens a promising avenue for future research, it is critical to note that emotion recognition science has moved beyond simply assessing well-studied emotions (Cowen et al., 2017, 2019; Keltner et al., 2016; Keltner et al., 2019). Although an initial focus on a narrower set of distinct emotions was necessary for the feasibility and simplicity of assessment in young children, future research should investigate the nuanced developmental trajectories of young children's emotion recognition abilities. Specifically, future studies should explore how they recognize and differentiate a wider range of emotions across various modalities, as well as whether these trajectories vary by gender.

Cowen et al. (2019) found that adults can recognize up to 24 different emotions in vocal bursts, including but not limited to admiration, awe, disappointment, and compassion. Some of these emotions are conceptualized as self-conscious emotions (e.g., shame, pride, embarrassment), and some might be related to cognitive states, such as boredom and confusion (Elfenbein et al., 2007; Keltner, 1995). Reliable emotion recognition for those certain emotion categories might depend on children's developmental stages. For example, one can reason that those self-conscious emotions might be more likely to emerge during pre-adolescence or adolescence periods. Moving forward, it would be important to know whether these different categories of emotions are perceived above chance levels for different age groups (early childhood, pre-adolescence, adolescence, and emerging adulthood) and genders. It would be equally important to know their developmental trajectories and when the recognition accuracy of these emotions in vocal bursts might plateau. This would provide crucial information for determining the optimal time window for targeted interventions aimed at enhancing emotion recognition skills.

Contributions to the Science of Emotion Controllability Beliefs and Future Directions

As discussed previously, Section 2 of this dissertation contributed to the burgeoning research on emotion controllability beliefs in several significant ways. First, it assessed a direct association between parents' beliefs about children's emotion controllability and children's own beliefs over time. Second, it provided evidence that cognitive change strategies might account for the shared variance between parents' beliefs and children's socioemotional functioning, even in pre-adolescents.

Moving forward, a fruitful avenue for future research would be to examine the link between emotion controllability beliefs and self-control, defined as the ability to act in accordance with long-term goals despite short-term temptations (Baumeister et al., 2007; Tangney et al., 2004). For instance, while individuals who have high self-control might adhere to a diet or meet deadlines, others might easily indulge in unhealthy snacks or procrastinate. To date, researchers have predominantly focused on the cognitive underpinnings of self-control abilities to explain what might give rise to these individual differences. In particular, a large body of research showed that executive functioning and cognitive control are important mechanisms (Casey et al., 2011;

Eigsti et al., 2006). However, little is known about the affective processes involved. Assuming that self-control dilemmas are emotion-eliciting states that also involve motivational states, it is plausible to think that individuals who believe they can control their emotions may be more likely to employ cognitive change strategies (e.g., temporal distancing) to modulate the emotions that might arise during self-control dilemmas, whether appetitive (e.g., desire) or aversive (e.g., frustration).

Similar to emotion regulation strategies, self-control abilities are also associated with adaptive functioning, including stress resilience, long-term health outcomes, and interpersonal functioning (Moffitt et al., 2011; Mischel & Ayduk, 2011; Ayduk et al., 2000). Therefore, future studies could examine self-control as a potential underpinning to determine whether emotion controllability beliefs predict higher dispositional self-control abilities, which, in turn, may predict adaptive functioning in both children and adults.

Bridging Affective and Developmental Science and Future Directions

Today**,** an increasing number of adults and children experience emotion dysregulation in various aspects of their lives, often putting them on maladaptive trajectories in well-being and health outcomes. This has led to a surge in demand for therapy and a rise in the number of mental health apps. Therefore, in this dissertation, I examined the affective roots of children's adaptive functioning, aiming to gain insight into preventing potential psychological and health problems that might arise later in life. In essence, this dissertation took a crucial step towards a more comprehensive understanding of healthy emotional development in childhood and its implications for lifelong health and well-being.

Despite its observational nature, this dissertation has the potential to inform multiple avenues for interventions. In Section 1, I proposed that children who were adept at recognizing affective cues in vocal bursts, such as laughter, sighs, and cries, might have a heightened sensitivity to the emotional state of others. This skill lays the foundation for empathy, enhancing social interactions, boosting likeability, and ultimately fostering deeper social bonds (Anderson & Keltner, 2002; Mayer, DiPaolo, & Salovey, 1990). Thus, educators, curriculum planners, and parents may consider targeting the development of emotion recognition skills to equip children with tools for more adaptive functioning, potentially buffering against future health problems (e.g., peer rejection, loneliness, degraded relationships due to uncontrolled aggression).

Additionally, this section provided preliminary evidence about the potentially optimal timing for interventions targeting vocal bursts across different genders. The results indicated that recognition accuracy might show accelerated development between ages five and six, which might provide an optimal window for intervention timing. For a more accurate estimate, future studies should replicate this finding across a wider range of emotions with larger samples. Future research should also expand the scope of the investigation to encompass diverse cultural contexts, as the frequency of emotion expressions can vary across cultures (Keltner & Haidt, 1999; Matsumoto et al., 2008; Tsai et al., 2006). Being exposed to certain emotions can ultimately influence children's capacity to reliably recognize them. Therefore, assessments of emotion recognition should be culturally sensitive, accounting for these potential variations in emotional expression and experience.

Regarding Section 2, future experimental research could examine the causal impact of both parents' and children's beliefs about emotion controllability. Given the theoretical proposition that beliefs can shape behavior, manipulating those beliefs could provide compelling evidence for their causal role in fostering adaptive outcomes in children. Additionally, future studies should delve deeper into the comparative efficacy of different cognitive change strategies,

employing experimental designs to elucidate their differential impact on emotion regulation. Such investigations could inform the development of evidence-based interventions, curricula, and training programs aimed at enhancing children's emotion regulation skills, ultimately contributing to their overall well-being.

Concluding Comments

This dissertation explored two key affective processes—emotion recognition in vocal bursts and emotion controllability beliefs—and their correlates with children's socioemotional development. The findings suggested that the ability to recognize emotions in vocal bursts predict adaptive socioemotional functioning. Additionally, the research highlights the potential role of parental beliefs about children's emotion controllability on children's own beliefs and cognitive change strategies, which may also predict their adaptive socioemotional functioning. By shedding light on these dynamic processes, this work contributes to the understanding of affective processes in healthy development and provides potential directions for future research aimed at promoting children's emotional and social health.

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Supplements

SECTION 1

I. Supplemental Tables and Figures (I-II)

SECTION 2

I. Supplemental Tables and Figures (I-V)

I. Age X Gender Interactions

Table S1.1

Age X Gender Interactions in Recognition Accuracy Across Distinct Emotions

		β	*95 % CI std*		*t*	*p*
			Lower Bound	Upper Bound		
Happy						
	Age	0.15	-0.01	0.30	1.91	.058
	Gender	0.18	0.03	0.34	2.37	.019
	Age*Gender	-0.03	-0.19	0.12	-0.42	.671
Anger						
	Age	0.15	0.00	0.31	2.00	.048
	Gender	0.18	0.03	0.33	2.42	.017
	Age*Gender	-0.16	-0.31	-0.01	-2.06	.041
Disgust						
	Age	0.20	0.04	0.35	2.53	.003
	Gender	0.17	0.01	0.32	2.18	.015
	Age*Gender	-0.09	-0.24	0.06	-1.19	.236
Surprise						
	Age	0.16	0.01	0.32	2.08	.040
	Gender	0.15	-0.00	0.31	1.95	.053
	Age*Gender	0.01	-0.14	0.17	0.15	.882
Sad						
	Age	0.25	0.10	0.39	3.27	.001
	Gender	0.18	0.03	0.33	2.43	.016
	Age*Gender	-0.17	-0.32	-0.02	-2.26	.025
Fear						
	Age	0.18	0.02	0.33	2.24	.026
	Gender	-0.02	-0.18	0.13	-0.26	.793
	Age*Gender	-0.13	-0.28	0.02	-1.66	.100

II. Predicting Children's Socioemotional Functioning at T1 and T2

Table S1.2

Children's Socioemotional Functioning at T1 And T2 Across Emotions

	T1 Outcome Value				T2 Outcome Value			
	Emotional Symptoms	Conduct Problems	Hyperactivity	Prosocial	Emotional Symptoms	Conduct Problems	Hyperactivity	Prosocial
	β (std SE)	β (std SE)	β (std SE)	β (std SE)	β (std SE)	β (std SE)	β (std SE)	β (std SE)
Recognition Accuracy								
Anger	-0.07 (0.08)	-0.04 (0.08)	-0.02 (0.08)	0.24 (0.08)**	0.14 (0.09)	-0.05 (0.09)	-0.04 (0.09)	0.21 (0.09)*
Disgust	0.04 (0.08)	-0.13 (0.08)	-0.06 (0.08)	0.11 (0.08)	-0.14 (0.10)	0.00 (0.09)	-0.09 (0.09)	0.11 (0.09)
Fear	-0.02 (0.08)	-0.19 (0.08)*	0.04 (0.08)	0.09 (0.08)	0.12 (0.09)	0.17 (0.09)†	-0.14 (0.08)	0.04 (0.09)
Happy	-0.08 (0.08)	-0.05 (0.08)	-0.07 (0.08)	0.03 (0.08)	-0.22 (0.09)*	-0.12 (0.09)	-0.06 (0.08)	0.07 (0.09)
Sad	-0.09 (0.08)	-0.13 (0.08)	-0.11 (0.08)	0.21 (0.08)**	-0.04 (0.10)	-0.15 (0.09)	-0.03 (0.09)	0.13 (0.09)

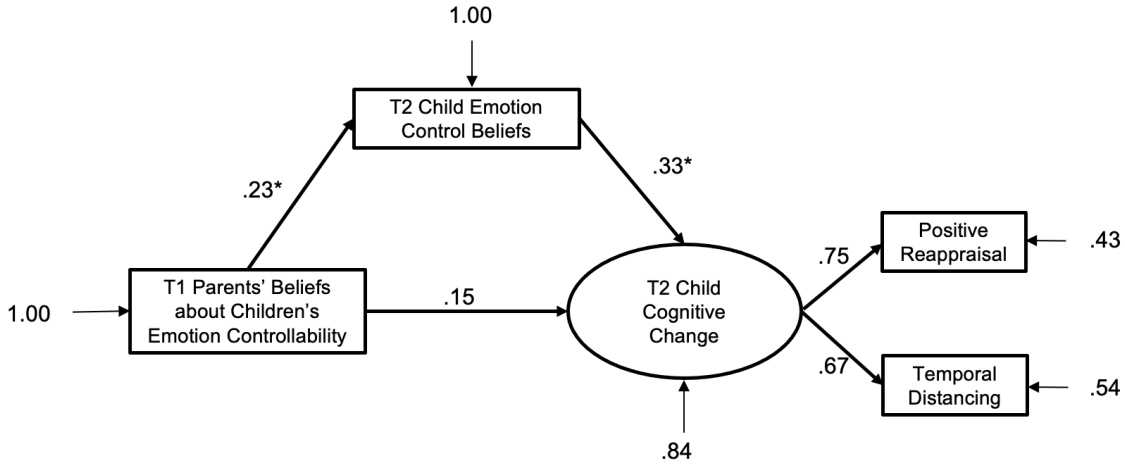
Note. Each emotion was individually assessed as predictors in separate models. T1 models control for age and gender. T2 models control for age, gender, time lag, and T1 measurement of socioemotional functioning.

SECTION 2

I. Path Model Respecifications for T2 Child Cognitive Change

Figure S2.1

Path Model When Putting into Perspective was Removed.



Note. Indirect effect = .004, bootstrapped 95% CI = [0.003, 0.093]; total effect = 0.127, 95% bootstrapped CI = [-0.018, 0.273]; $\chi 2(1) = 0.08$, p = .76, RMSEA = .00, SRMR = .006, CFI = 1.00, TLI = 1.45.

II. Factor Loadings for Children's Socioemotional Functioning at T1 and T2

Table S2.1

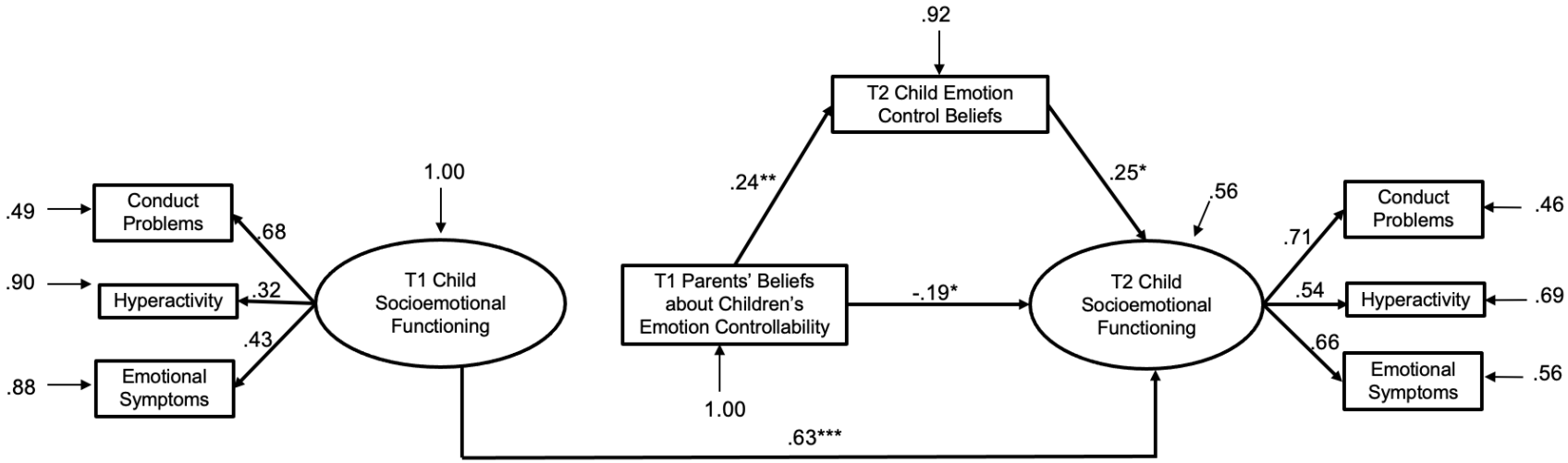
Factor Loadings for Children's Socioemotional Functioning at T1 and T2 with and without Prosociality

	Factor Loadings			
Predictor	**With Prosociality**		**Without Prosociality**	
T1 Child Socioemotional Functioning	Std. Loadings	*p*	Std. Loadings	*p*
1. Emotional Symptoms	.29	.008	.41	.01
2. Hyperactivity	.25	.000	.32	.00
3. Conduct Problems	1.06	.005	.71	.01
4. Prosociality	.53	.005	-	-
T2 Child Socioemotional Functioning				
5. Emotional Symptoms	.52	.000	.65	.00
6. Hyperactivity	.51	.000	.55	.00
7. Conduct Problems	.82	.000	.73	.00
8. Prosociality	.50	.001	-	-

III. Path Specifications with Hyperactivity Subscale

Figure S2.2

Respecified Path Model of Socioemotional Functioning with the Hyperactivity Subscale



Notes. * indicates $p < .05$; ** indicates $p < .01$; *** indicates $p < .001$. T1 child socioemotional functioning and T1 parents' beliefs about children's emotion controllability were allowed to covary (p= .48). The total effect was not significant (ab)+c = -.07, 95% bootstrapped CI [-0.22, 0.02].

IV. Indirect Paths of Single Cognitive Change Strategies Assessing Children's Socioemotional Functioning

Table S2.2

Single Indicators of Cognitive Change Strategies Predicting Children's Socioemotional Functioning as a Latent Factor at T1

	a1 path	b path	c path	indirect effect (a1*b*c)
	T1 parent beliefs predicting T2 children's beliefs	T2 children's beliefs predicting children's cognitive change strategy	T2 Children's cognitive change strategy predicting children's socio-emotional functioning	Statistics 95% bootstrapped CIs
Single Predictors of Cognitive Change				
T2 Children's Positive Reappraisal	**β = .27*, SE = .07, p = .006**	**β = .21*, SE = .09, p = .04**	β = .09, SE = .09, p = .47	indirect=0.003, CI [-0.018, 0,015]
T2 Children's Putting into Perspective	**β = .27*, SE = .07, p = .006**	β = -.05, SE = .16, p = .70	β = .12, SE = .06, p = .40	indirect= -0.001, CI [-0.010, 0,013]
T2 Children's Temporal Distancing	**β = .27*, SE = .07, p = .006**	**β = .19†, SE = .10, p = .05**	**β = .25*, SE = .09, p = .007**	indirect=0.009, CI [-0.011, 0,029]

Notes. Bolded text indicates significant paths. † indicates p = 0.05; * indicates p = 0.01

V. Indirect Paths Assessing Children's Socioemotional Functioning

Table S2.3

Multi-Group Analysis Testing Single Indicators of Cognitive Change Strategy on Each Observed Indicators of Children's Socioemotional Functioning

	indirect effect (a1*b*c) 95% bootstrapped CIs
T2 Cognitive Change Strategy	
	I. T2 Children's Emotional Symptoms
Positive Reappraisal	indirect= -0.001, CI [-0.015, 0.010]
Putting into Perspective	indirect= 0.000, CI [-0.006, 0.007]
Temporal Distancing	**indirect= -0.009, CI [-0.028, -0.001]**
	II. T2 Children's Conduct Problems
Positive Reappraisal	indirect= 0.004, CI [-0.001, 0.015]
Putting into Perspective	indirect= 0.000, CI [-0.005, 0.006]
Temporal Distancing	indirect=-0.002, CI [-0.008, 0.003]

Note. Path a1 examines the direct link of parents' beliefs about children's emotion controllability at T1 predicting children's own emotion controllability beliefs at T2. Path b examines the direct link of children's own emotion controllability beliefs at T2 predicting their use of cognitive change strategies. Finally, path c examines the direct link of children's cognitive change strategy at T2 predicting their emotional symptoms and conduct problems at T2 separately. Bolded text indicates significant paths.