Social emotions and social functioning in Chinese deaf and hard-of-hearing and hearing preschoolers

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Chapter 1

GENERAL INTRODUCTION

Emotions can serve survival needs and social functioning. Basic emotions such as anger, fear, disgust, happiness, from an evolutionary perspective, are related to the motivations and behavioral reactions that provide individuals with generalized solutions to survival-relevant challenges (e.g., de Waal, 2008; Levenson, 2011). Neuroscientific research has further identified distinguishable neuro-circuitry and pathways for some basic emotions, indicating that basic emotions are innate, hardwire attributes rooted in the human nature (e.g., Bernhardt & Singer, 2012; LeDoux, 2000; 2009). Comparatively, social emotions, such as shame, guilt, pride, and empathy, are a spectrum of emotions serving primarily social functioning, as these emotions regulate one's social behaviors in accordance with the social expectations (Tangney et al., 2007). In other words, social emotions can only be acquired through social experiences, as individuals must understand the social norms before experiencing the corresponding social awareness and emotions (Tracy & Robins et al., 2004).

Social emotions may also be distinguished from basic emotions by their neural mechanisms: social emotions may involve complex social/cognitive functioning, which arise from the coordination and coupling of different brain regions (e.g., Decety, 2015; Lamm et al., 2011; Singer & Lamm, 2009). As social norms vary from culture to culture, social emotions can manifest as different social behaviors and psychological processes in different cultural contexts, therefore, latent cultural impact should always be taken into account when studying social emotions (Li et al., 2023; Takamatsu et al., 2021). In especially child psychology, social emotions are considered a series of key predictors of children's social-emotional development: children's acquisition of social emotions relies on socialization and social learning; and their manifestations of social emotions further contribute to predicting their social competence, internalizing and externalizing behaviors (e.g., Li et al., 2020; Rieffe et al., 2010; Tsou et al., 2021).

Despite the great amount of research on social emotions among adolescents and adults, empirical findings on the development of social emotions of preschool children are scarce (Broekhof et al., 2021; Da Silva et al., 2022; Netten et al., 2015). Furthermore, the development trajectories of social emotions are largely unexplored in non-Western cultures and among preschool children with limited social learning opportunities. This knowledge is crucial so that early interventions, education, and support can be provided to children at the earliest stage. To this end, our research focused on Chinese deaf and hard-of-hearing (DHH) preschoolers and aimed to examine how children's hearing loss may impact their developmental trajectories of social emotions - specifically for moral emotions (shame, guilt, pride; **Chapter 3**) and empathy (**Chapter 5**) - during preschool years. Considering the restricted access to social interactions due to hearing loss, DHH children could encounter more difficulties in their early development of social emotions, which may further affect their psychosocial functioning (Calderon & Greenberg, 2011; Tsou et al., 2021). Moreover, given the lack of measurement tools for social emotions in China, validation studies were conducted first to pave the way for our longitudinal exploration (**Chapter 2** and **4**). Below we introduce our topics in greater detail.

PART I – Deaf and Hard-of-Hearing Children; the Situation in China

Hearing loss (HL) usually refers to a hearing threshold higher than 26 decibels (dB). More specifically, moderate hearing loss is often defined as a threshold between 40 dB and 70 dB in one's better ear, while a hearing threshold of 26-40 dB is deemed mild hearing loss. Typically, a hearing threshold higher than 70 dB is considered severe or profound hearing loss; and the most extreme example of hearing loss is total deafness

(Misurelli & Litovsky, 2015). Hearing loss(es) can occur in one ear (unilateral hearing loss), or both ears (bilateral hearing loss). In general, an individual with certain degrees of hearing loss will be recognized as deaf and hard-of-hearing (DHH) individuals.

Notably, a large proportion of DHH children worldwide have received hearing rehabilitation or intervention such as a hearing aid (HA) and/or a cochlear implant (CI), as assistance tools (Brahdham & Jones, 2008; De Raeve & Lichtert, 2012). The hearing aid is a portable device installed inside the auditory canal, which amplifies the volume of sounds in natural environments; and a CI electrically stimulates the auditory nerve, bypassing the damaged part of the ear. Importantly, hearing loss may negatively affect children's social participation. Challenges to participating with peers and others cannot be solved completely with the assistance of HAs or CIs (Calderon & Greenberg, 2011; Korver et al., 2010). Research showed that DHH children might still experience extra difficulties following verbal speeches and conversations, especially in circumstances where loud background noises or interferences are present (Misurelli & Litovsky, 2015). Especially in busy social environments, children using CIs can miss out on verbal cues when their attention is not highly focused on the speakers, or when multiple people are speaking. The auditory information that DHH children acquire is often partial/distorted, for example, due to poor acoustic conditions in the places where they are (Calderon & Greenberg, 2011; Leibold & Buss, 2013).

One of the consequences of these factors negatively influencing DHH children's social participation is children's challenges with incidental learning. Through observing others' social behaviors, overhearing conversations, watching films, reading books, and other means by which a culture conveys its messages, children pick up different social behaviors to replicate or practice them, gradually becoming aware of social standards and others' perspectives (Tangney et al., 2007). Moreover, through incidental learning

children also acquire knowledge and understanding of often implicit cultural norms and values, important for the subsequent development of social emotions (Dirks et al., 2020; Eisenberg et al., 1998; Hintermair, 2006).

The prevalence of hearing loss in China and the governmental policy

On a global scale, the prevalence of hearing loss among children is around 34 million (WHO, 2024). China, as a populous country with a population of 1.4 billion, faces great challenges regarding the prevalence of hearing loss and deafness especially among its younger generation. To date, out of the 220 million children in China, approximately 4.6 million children have experienced some sort of hearing loss (2.11%) (Yun et al., 2017). Annually, approximately 150 thousand Chinese infants are born with moderate to severe hearing loss, taking up 1.5% of the national newborn population (Gong et al., 2018). Given the prevalence of hearing loss caused by pervasive sensory impairment, detection, diagnosis (e.g., genetic tests, hearing screening tests), and early rehabilitation and intervention are crucial to lowering the disability rate in children, and safeguarding the social-emotional development of DHH children (Chen et al., 2013; Lü et al., 2011).

A policy supporting the national screening program on newborn infants' hearing was implemented in China in June 2009 (Wen & Huang, 2023). This initiative allows newborns to be screened for hearing abnormalities within 48 hours after their birth. In most cases, Chinese infants are born in local hospitals where they take screening tests instantly. In some special cases, infants are not eligible to receive the screening tests immediately after birth, then they are required to take the tests within 42 days. If infants do not pass the initial screening, they receive another round of screening checks within 42 days. For children who do not finally pass the screening tests, they receive diagnoses

of hearing loss from specialists. All these tests must be carried out by professionals who are eligible to work in public hospitals or hearing rehabilitation centers. Therefore, the hearing screening program enables early identification and treatment of hearing loss for DHH children, and as a result, in recent years a large proportion of DHH children have access to early interventions.

When children are diagnosed with hearing loss, they will then be introduced to suitable treatments, such as a hearing aid (HA) trial, or a pre-cochlear implant (CI) test. A team of medical doctors, therapists, audiologists, and psychologists conduct a series of examinations to evaluate what type of assistance may be needed for each child (Ding et al., 2009). The parents and teachers of the DHH children are also included in making the final decisions: life quality and school performance will be taken into consideration in determining the type of treatment that their child receives. For cochlear implantation, preoperative assessment and postoperative rehabilitation are planned before operations (Deep et al., 2019).

According to governmental reports, in most of the Chinese provinces, the costs for HA or CI treatment are fully covered by public health insurance. In other provinces, the expenses of HA or CI treatment are compensated to varying degrees, depending on the financial status of the local governments (Jiang et al., 2019). Currently, more than 80% of Chinese children aged under six years who have moderate-to-severe hearing loss are equipped with HA/CI. In addition to medical treatment, hearing rehabilitation has been extensively developed in recent years: over 800 hearing rehabilitation centers were established in China, offering comprehensive aural-verbal rehabilitation programs for DHH children. The governmental and societal support greatly improved the hearing status and language development of DHH children in China (e.g., Chen et al., 2019; Wen & Huang, 2023).

The China Rehabilitation Research Center for Hearing and Speech Impairment

The longitudinal data of this thesis (**Chapter 3** and **5**) were collected on both DHH and typically hearing (TH) preschoolers recruited from the China Rehabilitation Research Center for Hearing and Speech Impairment (CRRCHSI). The CRRCHSI is a national-level research center that offers rehabilitation programs and early interventions, aimed at helping children with hearing loss develop and improve listening and speaking skills to communicate effectively via spoken language.

In CRRCHSI, there are different classes for preschool children with different hearing conditions. The CRRCHSI has an affiliated kindergarten hosting both TH and DHH preschool children. TH children receive regular preschool education in the center. As for DHH children, depending on their hearing abilities, they are assigned to different classes consist of DHH children who receive rehabilitation/early interventions. In some of these classes, children have mild-moderate hearing loss and their language develops relatively well. For these children, the center aims to prepare them for further study in mainstream elementary schools. In some other classes, DHH children have more severe hearing loss, hence the teachers devote more time/efforts to one-on-one interactions to safeguard their language development, and to adjust to each child's different learning paces. These arrangements aim at establishing clear goals for children's rehabilitation and creating an inclusive environment to encourage DHH children to interact with their peers, which social participation is crucial to their socialization.

During one-on-one interaction with children, teachers focus on training DHH children's listening skills to allow them to capture information in verbal communication.

At a relatively later stage, teachers assist children in developing their verbal expression skills. During the rehabilitation program, sign language is not a part of the instructional language while spoken language is the only focus (Li et al., 2017).

Additionally, DHH children attend regular lessons and speech therapy sessions. Group activities are an important part of their daily routines: peer interactions could facilitate both children's language development and socialization, and thus creating an inclusive environment is greatly emphasized in the teachers' course designs. Teachers encourage DHH children to actively participate in various social activities, where DHH children can practice their communication skills and learn social knowledge during the interaction with their peers. Parents are also highly involved in rehabilitation programs, where they learn how to communicate with their children at home by involving them in family activities such as story-telling or chatting.

In general, DHH children spend one year on average in CRRCHSI. After one year, the teachers evaluate on children's hearing conditions and language abilities, thus providing suggestions about whether the DHH child can be admitted to the mainstream schools, or that the DHH child needs special education.

PART II – Social Emotions and Their Development in Preschool Children with and without Hearing Loss

Moral Emotions

Moral emotions are elicited when an individual evaluates his/her personal attributes and behaviors in light of the social norms or anticipation of others' perspectives (Tangney et al., 2007; Tracy & Robins, 2004). Shame and guilt are moral emotions with negative

emotional valence, which arise when an individual focuses on the self and views his/her personal attributes and self-related behaviors in a negative way. The attribution of the cause of an event (antecedent) differentiates between shame and guilt, and these causal attributions differ on three major dimensions: globality (global/specific), controllability (controllable/uncontrollable), and stability (stable/unstable) (Tangney & Dearing, 2002; Tracy et al., 2007; **Figure 1** illustrates the self-evaluative process).

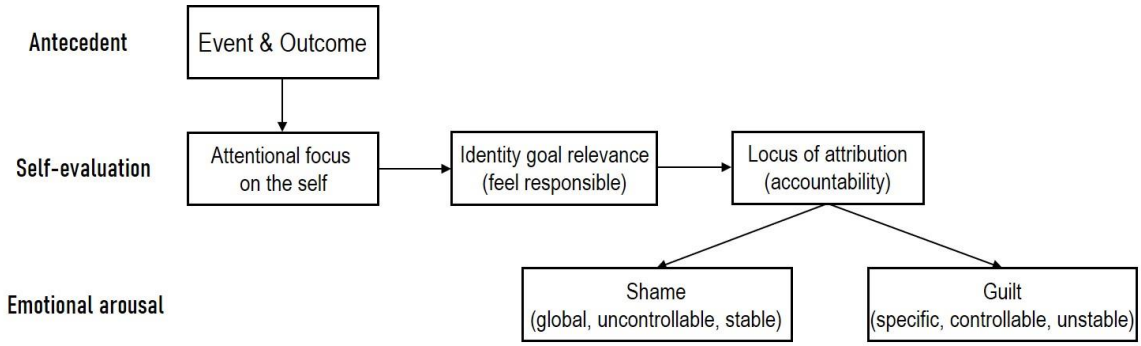

Figure 1. The self-evaluation and attribution that lead to shame/guilt

Global, uncontrollable, and stable attributions will likely lead to shame, whilst specific, controllable, and unstable attributions may elicit guilt (Tracy et al., 2007). For instance, when a student fails an exam, the failure on the exam serves as an antecedent that triggers a negative evaluation. If the student attributes the failure to the global self (e.g., "I am a bad student"), he/she would feel ashamed. In this case, the student blames one's core self (global); also, a person's personality and ability cannot be improved in a short duration (stable), he/she can also feel helpless in the situation (uncontrollable). However, if the student attributes the failure to a more specific cause (e.g., "I was not prepared for the exam"), he/she would feel guilty. Due to that misbehaviors are specific, and amendable (temporary), he/she may be motivated to apologize and compensate for his/her inappropriate behaviors (controllable).

Corresponding to the different attributions, shame and guilt may be associated

with different reaction tendencies. Shame feelings are often painful, as one's global self is depreciated. Individuals may also feel helpless when feeling shame, as the causes of shame are stable and uncontrollable (e.g., personality traits). Therefore, individuals tend to withdraw and escape from social environments, and avoid further social contact by feeling ashamed (Tangney et al., 2007). Prior findings show that the frustration and social avoidance caused by shame contribute to low self-esteem, negative ruminations depression and anxiety (e.g., Fergus et al., 2010; Gruenewald et al., 2004). Furthermore, in some cases, the undeniable pain and humiliation experienced in shame feelings can antagonize individuals, driving them to externalize the blame and anger toward others. This so-called "shame-rage" often results in hostility and aggression, which can disrupt these individuals' social relationships, making them more susceptible and vulnerable to bullying (Bennett et al., 2005; Malti & Krettenauer, 2013; Stuewig et al., 2010).

Guilt is often deemed as more socially and emotionally adaptive. As guilt arises from the regret/remorse for misbehaviors, it is less devastating to the global self and is more controllable. Individuals would feel urged to apologize and compensate for their wrongdoings when feeling guilty (Tangney et al., 2007). Thus, guilt serves the function of regulating social behaviors and rectifying conduct problems. Prior research shows that the proneness of experiencing guilt is related to fewer aggressive behaviors, more prosocial behaviors, and higher relationship qualities (Da Silva et al., 2022; Mazzone et al., 2016). Notably, especially in Western societies, shame often leads to much more negative behavioral outcomes than guilt, which can be a cultural variance (Broekhof et al., 2018; Da Silva et al., 2022).

Pride is another moral emotion that is relevant to one's psychosocial functioning. Unlike shame and guilt, pride arises from a positive evaluation of one's self-image and self-related behaviors. For instance, when an individual achieves a goal, he/she could

experience a proud feeling, as an accomplishment positively contributes to a good self-image. The positive feelings of pride therefore increase the individual's self-esteem and facilitate his/her prosocial behaviors. Empirical research indicates that pride is related to better social competence and more prosocial behaviors in children (Da Silva et al., 2022; Ross, 2017).

The Development of Moral Emotions in Preschool Years

Moral emotions develop in the social context (Tangney et al., 2007). Children may need to acquire several cognitive abilities before experiencing moral emotions: (1) a (basic) sense of self-awareness, as a prerequisite of self-evaluation; (2) internalized knowledge of moral norms and prevailing social values; (3) a perspective-taking ability that enables children to anticipate how one's personal attributes are viewed in others' eyes (Tracy et al., 2007).

Firstly, children's self-awareness emerges during their second year of life, when they start to recognize themselves in a mirror, becoming able to display self-referential facial expressions and verbal statements (Thompson, 2006). Such a basic sense of self-awareness allows children to feel responsible for their social behaviors so that their self-evaluations can be elicited in certain social situations. Secondly, children learn social knowledge and internalize social norms throughout their childhood, which allows them to understand which behaviors are accepted as socially appropriate and which behaviors are viewed by society as undesirable so that they can evaluate their social behaviors in light of the social expectations. From the age of one, children begin to switch their attention from "the inner world" to "the outer world". Via observing others' expressions and overhearing conversations, they learn about how behaviors and personal attributes

are evaluated and judged in a social context (Lagattuta & Thompson, 2006). At the age of three, children develop an ability to reflect on their own behaviors, which prepares them for moral attributions and judgments (Daniel et al., 2014). Thirdly, to experience moral emotions, children must also anticipate how their personal attributes are viewed in others' eyes. For example, shame and guilt involve negative emotional reactions (e.g., fear, embarrassment) as one's personal traits or behaviors are viewed negatively, and negative self-evaluations are highly dependent on the anticipation of others' (implicit) perspectives. Thus perspective-taking abilities, known also as Theory of Mind (ToM), is also one prerequisite for experiencing moral emotions (Tangney et al., 2007). Children's perspective-taking abilities emerge when they start to realize that individuals' behaviors are driven by certain intentions, and their perspective-taking skills continue developing during their childhood and adolescence, corresponding to their socialization process (Broekhof et al., 2015).

Empirical evidence on children's moral development is in line with the findings for the abovementioned factors. As children's socialization and cognitive development go on, they become increasingly capable of moral reasoning and attribution: children will become able to evaluate a certain situation as morally right or wrong and attribute corresponding moral emotion to the target person (Chaparro et al, 2013; Daniel et al., 2014). Children's moral development is also evident in the increasing accuracy of their moral judgments. For example, at five years of age, children no longer attach positive emotions to the victimizers in a "happy victimizing task", and instead show sympathy to the victims (e.g., Gummerum, et al., 2010; Gummerum et al., 2016). In other words, children's reactions to moral situations become more and more similar to those of adults after acquiring the necessary cognitive skills. Several studies showed that preschoolers manifested more frequent and intense shame and guilt as they grew older, which might

be a concomitant phenomenon of children's socialization and cognitive development (Gummerum et al., 2010; Mazzone et al., 2018). Children also manifest more pride in the form of self-referential statements, facial expressions, or body gestures as they grow older (Ketelaar et al., 2015; Tangney et al., 2007).

DHH children encounter many obstacles in their socialization due to restricted access to social learning (Tangney et al., 2007), which places them at a disadvantage in acquiring knowledge and understanding of social norms and values at the same level as their hearing peers (de Villiers & de Villiers, 2014). Empirical research shows that DHH children display lower levels of perspective-taking abilities, compared to their TH peers (Broekhof et al., 2015; González et al., 2007; Ketelaar et al., 2012). These difficulties may further affect the development of moral emotions. Prior findings indicate that DHH children manifest lower levels of shame, guilt, and pride as compared to their TH peers (Ketelaar et al., 2015). These differences could be observed as early as the preschool years and seem to be maintained throughout childhood (Broekhof et al., 2018; 2020; 2021). However, to date, longitudinal research following the changes in moral emotions among DHH children over the preschool years is still lacking.

Empathy

Empathy is another type of social emotion that guides individuals to navigate through their daily routines, as it facilitates social interactions and promotes prosocial behaviors (Decety & Jackson, 2006). Empathy, in general, refers to the capability to vicariously experience others' feelings and to react altruistically to others' emotional expressions (Rieffe et al., 2010). Empirical research shows that, overall, empathy is associated with various aspects of children's psychosocial functioning, such as better social competence

and emotion regulation, fewer internalizing and externalizing behaviors (e.g., Neumann, et al., 2016; Rieffe et al, 2010). Empathy is, accordingly, deemed as "a social glue" for stimulating and strengthening interpersonal interactions (De Waal, 2008).

Although some prior studies conceptualized and operationalized empathy as a unidimensional construct, an increasing number of recent studies show that empathy is a complex construct that comprises distinct dimensions (Baron-Cohen & Wheelwright, 2004; Rieffe et al., 2010). Supporting evidence may come from validation studies: some widely-used questionnaires, such as the "Interpersonal Reactivity Index" (Davis, 1980), and the "Jefferson Scale of Empathy" (Hojat et al., 2018), show that empathy comprises at least affective and cognitive components.

To date, limited research has examined the empathic development in preschool years. The questionnaires typically used to measure empathy in adults are not suitable for young children, because the life experiences explored in adult questionnaires do not apply to young children. Furthermore, the theoretical model/framework of many of the current in-use empathy questionnaires does not capture the development of empathy in early childhood. Hoffman's (1987) *empathy model* is amongst the first to describe how empathy develops in the preschool years, which establishes a theoretical foundation for developing instruments to assess empathy in young children. In theory, three levels of empathy are distinguished in the early stages of development (these "levels" described by Hoffman are more like different "components" or "dimensions") (Hoffman, 1987).

Emotion Contagion

"Emotion Contagion" (or "affective empathy") is the basic level of empathy. It refers to the extent to which an individual could be affected by other's emotional expressions.

Emotion contagion originates from the process where the newborns generate emotional arousal as an innate/instinctive response to others' emotional expressions, which may consist of non/sub-conscious mimicries of others' facial, vocal, and bodily expressions (Bernhardt & Singer, 2012). Neuropsychological findings have suggested a possibility that such an emotional mimicking is equivalent to the activation of the "Mirror Neuron System (MNS)" (Decety & Lamm, 2009; Bernhardt & Singer, 2012). Meanwhile, it is demonstrated by observational studies that already in infancy, we can observe that when a child cries in a room, other nearby children will also be affected and thus follow crying. Based on the findings from multiple research fields, de Waal (2008) thus concluded that emotion contagion is the foundation of empathy, which initializes and induces empathic reactions towards the emotional person.

Emotion contagion is essential to inhibiting children's aggression (Rieffe et al., 2010; Tampke, et al., 2019). When a child feels others' pain and discomfort, he/she is unlikely to continue acting aggressively. Contrarily, if the child is insensitive to others' emotional expressions, he/she could act aggressively and callously, as often observed in children with conduct disorders (e.g., Broekhof et al., 2018; Waller et al., 2020). However, too much emotion contagion may be a psychological burden for children. As children are constantly exposed to various emotional stimuli in their daily routines, they need to develop regulation abilities/strategies to avoid being emotionally overwhelmed. Manifesting excessive emotion contagion can be a sign of children lacking regulation abilities, which puts them at high risk of developing internalizing symptoms, such as anxiety and depression (Rieffe et al., 2010). Accordingly, the development trajectory of emotion contagion should in principle, decrease by age. As children acquire higher cognitive abilities when they grow older, they will be more capable of regulating their emotional arousal to mitigate the negative effects caused by contagious emotions (Li et

al., 2023; Rieffe et al., 2010).

According to existing findings, no group difference between DHH and TH children has been found regarding their manifestations of emotion contagion. Emotion contagion decreases in DHH and TH preschoolers alike, as they grow older and become more capable of regulating emotional arousal (Ketelaar et al., 2015; Tsou et al., 2021).

Attention to Others' Feelings

"Attention to Others' Feelings", as the second level of empathy, emerges in children's second year of life (Hoffman, 1987). As shown by past studies, toddlers develop a sense of self-awareness at the age of one, which allows them to distinguish others' emotional arousal from their own. This self-other distinction is in fact a developmental milestone for young children because when children realize that the arousal they experience is an emotional reaction triggered by others' emotions, they could temporarily suppress their own idiosyncratic desires and re-allocate their attentional resources to the social world (Rieffe et al, 2010). Such a switch of attention and perspective views from "self-focus" to "outward focus" may alleviate children's emotional distress caused by the contagious emotions of others, and it also motivates children to engage in social interactions which provides them more opportunities for incidental/social learning (Broekhof et al., 2018).

Longitudinal studies reveal that children's attention to others' feelings increases throughout the preschool years, accompanied by their socialization process (Tsou et al., 2021). Moreover, preschoolers who pay more attention to others' feelings are perceived by parents and teachers as more socially competitive (Bandstra et al., 2011; Da Silva et al., 2022). Presumably, the attentional switch from the self to the outer world speeds up the pace for children to understand the intrinsic causes of others' implicit perspectives,

allowing the cognitive components of empathy to develop, which in turn facilitates their development of social competence (Netten et al., 2015).

Attention to others' feelings is also affected by children's socialization, and thus DHH children may have disadvantages in this regard due to limited social participation and fewer opportunities of incidental learning (Caldwell & Nittrouer, 2013). To the best of our knowledge, only one longitudinal study has explored this topic, finding that DHH preschoolers showed a greater increase in attention to others' feelings compared to their TH peers (Tsou et al., 2021). Possibly, DHH children experience delays in earlier stages but catch up with their TH peers later in the preschool period (Tsou et al., 2021). Current research does not especially examine the attentional component of children's empathy development, leaving this topic largely unexplored.

Prosocial Behaviors

The shift of "inward attention" to the "outer and social world" would pave the way for preschoolers to act altruistically in a social context to relieve other's distress. "Prosocial behaviors" therefore, forms the third level of empathy. To initiate prosocial motivations, children have to attend to others' emotions and perspectives instead of focusing on their own thoughts or feelings. On top of that, children need to understand others' intentions, desires, or beliefs (i.e., theory of mind, ToM) to take action to relieve others' distress. However, although young children start to acquire an awareness to act pro-socially, they are often (cognitively) confused in social situations and cannot always distinguish their desires from the desires and needs of others (Hoffman, 1987). In other words, preschool children may still struggle to effectively respond to others' emotions, and their prosocial attempts do not always meet the criterion for "altruistic behaviors" (Rieffe et al., 2010).

Yet, when children grow older, their prosocial behaviors increase in quality and quantity, which is a direct consequence of their development of cognitive abilities (Li et al., 2020; Tsou et al., 2021). Indeed, prior research observed spontaneous prosocial behaviors in preschoolers, which took the forms of sharing, helping, or comforting attempts (Beeler-Duden et al., 2022; Zahn-Waxler et al., 1992). This means that already in the preschool years, children's altruistic motives can be embodied in concrete behaviors (Flook et al., 2019). More recent studies show that preschoolers' prosocial behaviors also contribute to better social competence, fewer internalizing and externalizing behaviors (Donohue et al., 2019; Salerni & Caprin, 2022; Tsou et al., 2021).

"Prosocial behaviors" is another empathic level largely affected by socialization and social learning. According to recent empirical research, DHH children show fewer prosocial behaviors than their TH peers (Netten et al., 2015; Tsou et al., 2021). Tsou et al., (2021) argued that the delay manifested by DHH children upon prosocial behaviors can be attributed to inadequate perspective-taking and a lack of empowerment to take actions in social contexts. Note, however, although the group difference persists over the preschool period, TH and DHH children show the same development trajectory by manifesting more prosocial behaviors as their age increases (e.g., Netten et al., 2015; Takamatsu et al., 2021; Tsou et al., 2021). Moreover, the associations between prosocial behaviors and psychosocial functioning are similar in TH and DHH children: prosocial behaviors contribute to better social competence, fewer internalizing and externalizing behaviors in both TH and DHH preschoolers (Chao et al., 2015; Netten et al., 2015). Yet, longitudinal findings on young children's empathic development are still scarce, and future studies are needed to deepen our understanding of this topic.

PART III - Research of Social Emotions in China: Across Cultural Contexts

It should be noted that most studies on social emotions have focused on children living in Western countries. Yet, culture may affect children's social-emotional development. Cultures shape how children understand moral norms and influence how they interact with others. The Hofstede (1980) theory for cross-cultural studies suggests that typical Western cultures are deemed as individualistic-oriented, whilst typical Eastern cultures are deemed as collectivistic-oriented. The different cultural orientations/norms lead to different psychological effects: Western individuals tend to be more independent from each other, prioritizing personal success over group interests; and Eastern individuals tend to be more interdependent and value group cohesion over personal goals (Tsai et al., 2006). Hence, the expressions of pride may be considered more positive in Western cultures as pride reinforces one's self-confidence and highlights one's individual value, whereas shame is deemed more negative in Western societies than in Eastern societies because shame depreciates/devalues the global self and leads to feelings of frustration and humiliation (Broekhof et al., 2018). However, shame may not be as maladaptive in Eastern societies as in Western societies, as in the Eastern cultural contexts, shame can facilitate the reflection on one's own behaviors and suppress his/her personal desires to focus more on others' needs, which benefits group harmony and cohesion (Wang et al., 2020; Wong & Tsai, 2007).

As our current knowledge of moral emotions is primarily derived from research on Western samples, it is widely acknowledged that experiencing emotions of pride and guilt is socially adaptive, whereas the proneness to experiencing shame is related with more internalizing and externalizing symptoms (e.g., Broekhof et al., 2020; Drummond

et al., 2017; Stuewig et al., 2015). However, research based on East-Asian individuals suggests otherwise. For example, research on South-Eastern Asians reveals that shame contributes to self-improvement during a negative self-evaluation (e.g., Bagozzi, et al., 2003; Cole et al., 2006; Heine, 2002). It is also found in Chinese individuals that shame can contribute to prosocial behaviors in certain social contexts (Wang et al., 2020). Note, however, aside from the few studies suggesting adaptive functions of shame in Eastern societies, most studies on Chinese samples show similar findings to prior studies based on Western individuals, indicating that shame is related to more internalizing behaviors (e.g., Lee et al., 2016; Shao et al., 2020; Wu et al., 2021; Zhong et al., 2008). These inconsistencies in empirical findings suggest that more attention should be paid to the moral development of Chinese children.

Cross-cultural research demonstrates cultural variances in experiencing and expressing empathy as well. East-Asian individuals are shown to be more affected by contagious emotions: they experience more personal distress by witnessing someone in distress, as compared to their Western counterparts (Atkins et al., 2016). Possibly, such variance could be attributed to the variances in cultural norms and values: East Asians tend to be more interdependent and focus more on others' feelings; also, group harmony is greatly emphasized in East-Asian cultures, thus expressing negative emotions is often viewed as disruptive in these cultures (Matsumoto et al., 2008). As a result, East Asian individuals are sensitive to others' negative emotional expressions, and these negative expressions often lead to high personal distress in them (Markus & Kitayama, 1991).

Taken together, prior research suggests that the development of social emotions in Chinese children differs from what is typically observed in children from Western societies. Conducting research on social-emotional development in a sample of Chinese children can contribute new insights, which can enhance our understanding of potential

cultural variances.

Another important issue to consider is that current studies about social emotions are mostly conducted in Western social/cultural contexts, using questionnaires or other methods developed in these countries. Yet, fewer studies have been focusing on Chinese children, and this disparity in research could be partially attributed to the lack of valid assessment tools specifically designed for Chinese children. Validating questionnaires used in Western preschoolers within Chinese contexts is the promising first step toward studying the developmental trajectories of social emotions in Chinese (DHH) preschool children.

The Aim and Structure of this Dissertation

This thesis examines the impact of hearing conditions (DHH/TH) on the development of social emotions in preschool children within the Chinese social context. It starts with two studies on moral emotions, where a parent-report questionnaire designed to assess moral emotions for preschoolers was first validated in Chinese preschoolers (**Chapter 2**) and then used to examine the developmental trajectories of moral emotions in DHH and TH preschool children in China (**Chapter 3**). Next, two studies were conducted to explore the development of empathy. Similarly, a parent-report questionnaire for the assessment of empathy was validated beforehand in Chinese preschoolers (**Chapter 4**) and then applied to Chinese DHH and TH preschool children to study the development of empathy over the preschool years (**Chapter 5**).

In particular, **Chapter 2** presents our validation research on the Moral Emotion Questionnaire (MEQ). The MEQ is a parent-report questionnaire originally designed to measure shame, guilt, and pride in Dutch preschoolers. In this chapter, our study tested the psychometric properties of the MEQ when applied to Chinese preschool children,

and examined the associations between shame, guilt, pride, and children's psychosocial functioning. **In Chapter 3**, using the Chinese version of MEQ validated in **Chapter 2**, we further investigated the development trajectories of shame, guilt, and pride over the preschool years. By collecting two waves of longitudinal data in Chinese DHH and TH preschool children, we investigated the impact of children's hearing impairment on the developmental trajectories of shame, guilt, and pride, and assessed the contribution of these developmental trajectories to (predicting) children's psychosocial functioning. **Chapter 4** introduces our validation research on the Empathy Questionnaire (EmQue), which is a parent report for measuring three distinct empathic levels for preschoolers (i.e., Emotion Contagion, Attention to Others' Feelings, and Prosocial Behaviors). This validation research tested the psychometric properties of the Chinese version of EmQue and also examined the concurrent relations between empathic levels and children's psychosocial functioning. In **Chapter 5**, we investigated the developmental trajectories of the three distinct empathic levels (as measured by the EmQue) across the preschool years. Two waves of data were collected on both Chinese DHH and TH preschoolers to evaluate how hearing loss affected preschool children's development of empathy. The over-time effects of empathic development on children's psychosocial functioning were also examined. **Chapter 6** summarizes, and discusses our key findings and limitations, and also talks about the implications of these findings, providing suggestions for future research.

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Chapter 2

Moral emotions in early childhood: Validation of the Chinese Moral Emotion Questionnaire

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Abstract

Moral emotions such as pride, guilt, and shame play an important role in the social-emotional development of preschool children. However, there are not many instruments available for measuring moral emotions in the preschool age. Moreover, relatively few research have examined the cross-cultural validity of measures for moral emotions. The present study tested the Chinese version of the Moral Emotion Questionnaire (MEQ) on a group of (N=182) Chinese preschool children aged from 2 to 6 years. The Chinese MEQ is a parent report translated from Dutch, assessing behavioural responses of pride, guilt, and shame in preschool children. Confirmatory factor analysis showed satisfactory goodness-of-fit indexes for a three-factor structure (Pride, Guilt, Shame) with 15 loading items. For concurrent relations, the results suggested an adaptive role of pride and guilt and a maladaptive role of shame in the social-emotional development of preschool children. We could conclude that the 15-item Chinese MEQ is a valid and reliable instrument for measuring pride, guilt, and shame in 2-to-6-year-old children in the Chinese context.

Keywords Chinese culture; Moral emotions; Preschool age; Validation

INTRODUCTION

Moral emotions such as pride, guilt, and shame serve important social functions. They regulate social behaviours and motivate people to act in accordance to moral standards (Tangney et al., 2007). Children start to internalize prevailing social norms and moral values since the early years of life, manifesting signs of shame and guilt for misconduct, and pride for achievements (Izard, 2009; Lewis, 1992). To date, relatively few studies have investigated moral emotions in young children (Lotze et al., 2010; Olthof, 2012). This can be, at least partly, due to the difficulties in measurement, as most children aged 6 years and younger are not yet fully capable of reflecting upon and reporting their own moral and emotional experiences. A parent report, the Moral Emotion Questionnaire (MEQ), designed for assessing pride, guilt, and shame among preschoolers was recently validated in Dutch children aged 2.5 to 6.5 years (Da Silva et al., 2022), provides a new tool for the assessment of moral emotions in this population. However, the extent to which this Dutch version can be applied to the assessment of moral emotions in non-Western children is yet unknown. A validation of the MEQ on Chinese preschool children can inform us of its cross-cultural consistency and validity.

Moral emotions are a spectrum of emotions that arise when a person evaluates his/her own attributes or behaviours in light of the dominant social norms and moral values (Tangney et al., 2007; Tracy & Robins, 2004). Pride arises when a person has a positive evaluation of his/her personal attributes or behaviours (Li et al., 2021). For example, if the prevailing social norm views “helping others” as a good deed, one may feel proud of him/herself (“I am a good person”), or of his/her prosocial behaviours (“I did a good thing”) after performing a helping behaviour.

Contrarily, shame and guilt arise when an individual has a negative evaluation on the self or self-related behaviours. Particularly, shame and guilt differ in the self-

attribution process: Guilt is felt when a person attributes the cause of a negative event to his/her misbehaviour, e.g. “I did something bad to others”; but when one attributes the negative event to the global self, e.g. “I am a terrible person in others’ eyes”, shame becomes the dominant emotion (Li et al., 2021; Tracy & Robins, 2004). Shame is often perceived as more maladaptive than guilt, as it is accompanied by a devaluation of one’s inherent personalities. Shameful feelings can be very hurtful, driving a person to withdraw and avoid social interactions, or triggering hostility (i.e. “Shame-rage”) in that person for repairing damaged self-image and reinstating the threatened social status (Lewis, 1971; Scheff, 1987). Compared to shame, the experience of guilt is often less overwhelming, as one’s core self is not threatened. This leaves space for introspection or anticipation of the negative consequences and motivates apologizing or amending behaviours (Tangney & Dearing, 2002).

Given the nature of moral emotions, it is not surprising that different moral emotions are associated with different behavioural outcomes. Past research examining pride, shame, and guilt in children found that a high proneness to feeling pride was related to high self-confidence and good social competence (Tracy et al., 2007). A high proneness of feeling guilt was related to low frequencies of bullying and aggression, strong motivations of prosocial behaviours, and positive qualities of peer relations (Broekhof et al., 2018; Mazzone et al., 2016). As for shame, a high proneness to shame is a risk factor for developing internalizing behaviours, such as low self-esteem, victimization, depression, or anxiety (Fergus et al., 2010; Gruenewald et al., 2004); and externalizing behaviours such as other-blaming, reactive or passive aggression (Bennett et al., 2005; Stuewig et al., 2010). However, it is important to note that these studies are based mostly on the findings of school-aged children and adolescents from Western societies.

For the development of moral emotions, the abovementioned self-evaluation is an essential component, which involves a complex cognitive process and requires higher-order cognitive abilities. This explains why, unlike basic emotions which are already present in a-few-month-old infants, moral emotions emerge later in life (Tracy & Robins, 2004). First, children need to have a sense of self as separate from others (Stipek et al., 1998). An indication of the emergence of the sense of self is when children start to use self-referential language around the age of two (Thompson, 2006). Additionally, children need to learn what their caregivers expect from them and need to develop an understanding of what behaviours are deemed socially appropriate or inappropriate (Kagan, 2005). Toddlers were observed to show distress or avoidant behaviours when they realized they misbehaved, yet a positive response with an accomplishment (Emde et al., 1991; Izard, 2009; Kochanska, 2002). These kinds of reactions can be seen as children's first manifestations of guilt, shame, and pride (Lagattuta & Thompson, 2007; Lewis, 1992; Li, et al., 2021; Stipek, 1998). Although these manifestations increase with age and across situations, it is not until the age of six years that children start to acquire a relatively mature understanding of moral emotions. Compared to toddlers, school-aged children are more aware of social norms, but can also attribute responsibility to an actor regarding certain outcomes, i.e. pride can only be attributed when the actor themselves is responsible for that positive outcome, but not when one wins the lottery (Graham & Weiner, 1991; Kornilaki & Chlouverakis, 2004).

To study moral emotions, many studies rely on self-report questionnaires, such as the "Test of Self-Conscious Affect for Children" (Tangney, 1990) and the "Brief Shame and Guilt Questionnaire for Children" (Novin & Rieffe, 2015). For obvious reasons, self-reports are unsuitable at the preschool age, because preschoolers are not

fully capable of reflecting on and reporting their feelings (Broekhof et al., 2015). Therefore, research on moral emotions in preschoolers mostly used observational tasks, where "rigged" situations were created to provoke pride, shame, and/or guilt in children. Typically developing children aged 2 to 6 years already showed remorse and regret when they failed a task or damaged the property of others, and pride when making an achievement (e.g., Alessandri & Lewis, 1996; Barrett et al., 1993; Belsky et al., 1997; Ketelaar et al., 2015; Lewis & Ramsay, 2002; Li et al., 2021; Ross, 2017). In addition to measuring moral emotions at the global level by the emotional valence (e.g., Ketelaar et al., 2015; Li et al., 2021), some behavioural studies examined discrete moral emotions within the same valence, e.g., distinguishing between shame and guilt by observing whether children showed avoidance or reparative behaviours (Barrett et al., 1993; Ross, 2017). While these behavioural studies provided valuable information on preschoolers' shame/guilt-related responses to specific situations, parent questionnaires can further inform us about children's dispositional tendencies to experience moral emotions across contexts. Parents as the ones who watch over their children and interact with them on a daily basis, are excellent informants for evaluating their children's dispositional reactions of moral emotions based on long-term and close observations (Fung et al, 2003). The MEQ (Da Silva et al, 2022) is such a parent-report designed especially for preschool children. Not only has it shown robust psychometric properties, importantly, but it also makes a distinction between shame and guilt by asking parents what are the behavioural tendencies of their children's emotional experiences. While shame is related with the action tendency of avoiding others and hiding oneself, guilt is often expressed through approaching the other person, seeking forgiveness, and compensating for another's loss.

In spite of the merits of the MEQ, since it was validated originally in a Western sample, it is unclear to what extent it can be applied to non-Western preschoolers. Culture shapes the social environment in which children develop emotional competence. The well-known cultural dimensions are individualism and collectivism (Hoefstede, 1980). The general observation is that Eastern cultures, such as the Chinese culture, are more collectivistic-oriented than Western cultures (Tsai et al., 2006). Regarding the cultural influences on moral emotions, empirical research found that pride and guilt functioned similarly across Chinese to Western (e.g., North American or Dutch) cultures: pride was positively related to social competence (e.g. Han et al., 2021; Hooge et al., 2011; Kluwin et al., 2002; Tracy et al., 2007), and guilt was negatively associated with aggression and positively related with prosocial motives in both Chinese and Western cultures (e.g. Broekhof et al., 2018; Ding et al., 2016; Frijda & Mesquita, et al., 1994; Lutwak et al., 2001).

However, shame has been reported to show some degrees of cross-cultural variations. As mentioned, shame arises with a negative evaluation of the core attributes of the self. This goes against the individualistic value which emphasizes self-value. It is repeatedly reported by Western research that a high proneness to shame is related to only maladaptive psychosocial outcomes (e.g. the Dutch sample in Broekhof et al., 2018). In Eastern cultures, however, a “big ego” is discouraged because it may be against the collectivistic value that puts the group above the self (Hofstede, 1980). Therefore, shame is viewed more adaptively in Eastern cultures than in Western cultures, as it prevents the developing of a bigger ego and stimulates conformity within the group. This might explain why in addition to its associations with maladaptive behavioural outcomes such as internalizing and externalizing behaviours in Chinese children and adolescents (Lee et al., 2016; Li et al, 2004; Wang et al., 2017; Wong et

al., 2014; Wu et al., 2021; Zhong et al., 2008), shame can also be related to adaptive psychosocial outcomes such as prosocial and self-improvement behaviours in individuals from China, Japan and other Southern Asian countries (e.g. Bagozzi, et al., 2003; Heine, 2002; Wang et al., 2020).

This study aimed to validate the Chinese version of the MEQ by examining its factor structure, internal validity and construct validity using a Chinese preschool sample. The MEQ assesses pride, shame and guilt in preschool children through parental evaluations of children's behavioural responses (Da Silva et al, 2022). It asks parents what happens when their child has misbehaved or made achievements. For validation of the measure, we assessed the construct validity by examining the fit of the intended three-factor structure (pride, guilt, shame) on the sample. Cronbach's alpha, inter-item correlation and composite reliability were examined for each scale to test the internal validity. For concurrent validity, we expected pride to relate positively with social competence (Broekhof et al., 2018; Stuewig et al., 2010); and guilt to relate positively to social competence and negatively with externalizing behaviours (Broekhof et al., 2018; Ding et al., 2016). As for shame, we expected shame to relate positively with internalizing and externalizing behaviours (Wang et al., 2020; Wang & Sang, 2020; Wu et al., 2021), and positively with social competence (Bagozzi et al., 2003; Heine, 2002).

METHODS

Participants and Procedure

A total of 182 children aged between 2 and 6 years old (range: 24-72 months, M = 52.23 months, SD = 12.2 months; 48.9% boys) and their caregivers participated in this study. Caregivers were mothers (74.7%), fathers (20.9%) and grandparents (4.4%). The

socioeconomic status of this sample (the means of indices, e.g. household income, parental/maternal education level, ratio of single-parent families) was basically in line with the general population in China (Bulletin of the Seventh Population Census, 2021; Akimov et al., 2021). Table 1 shows the information on the characteristics of the participants, including for boys and girls respectively. Appendix Table B shows the age distribution.

Table 1. Demographic Characteristics of the Participants

	Boys (89)	Girls (93)	All (182)
Age (in months), M (SD)	44.82 (12.40)	56.88 (11.42)	52.15 (12.29)
Respondent, n (%)			
Mother	67 (75.2%)	69 (74.2%)	136 (74.7%)
Father	16 (18.0%)	22 (23.7%)	38 (20.9%)
Grandparent	5 (5.6%)	3 (3.2%)	8 (4.4%)
Family composition, n (%)			
Two-parent families	81 (91.0 %)	87 (93.5%)	168 (92.3%)
Single parent families	8 (9.0%)	6 (6.5%)	14 (7.7%)
Family members in house, n (SD)	2.7 (1.11)	2.6 (.92)	2.6 (.97)
Socio-Economic Status, M (SD)			
Maternal education level [a]	3.87 (.62)	3.93 (.43)	3.90 (.54)
Paternal education level [a]	3.93 (.67)	3.88 (.53)	3.91 (.61)
Annual household income [b]	3.28 (2.33)	3.06 (2.18)	3.17 (2.27)

Note: No differences were noted between girls and boys in all the variables included in this table.
[a] Mean (SD) for each condition. Values: 1 = "Primary school & below", 2 = "Junior high", 3 = "High school", 4 = "University or College", 5 = "Postgraduate & above".
[b] Mean (SD) for each condition. Values: 1 = "<€3,000"; 2 = "€3,000-€15,000"; 3 = "€15,000-€20,000"; 4 = "€20,000-€25,000"; 5 = "€25,000-€40,000"; 6 = "€40,000-€65,000"; 7 = "€65,000-€130,000"; 8 = "> €130,000".

The children were recruited from two public kindergartens in JiangSu province, which are located in Eastern China. The kindergartens each had three preschool classes (one class per grade, with a total of three grades in Chinese kindergartens). All children of three grades in the two kindergartens were included, except for children with

apparent developmental delays and mental health disorders, such as attention-deficit hyperactivity disorder and autism spectrum disorder. After approvals were authorized by the headmasters of the local kindergartens, the teachers of each class were then contacted about this study of its purpose, execution and privacy policy. The teachers agreed with our requirements and understood the confidentiality of the data, who later informed the children and caregivers of the study, and delivered to them the informed consent. The goals, execution, data management, privacy policy, as well as voluntary nature of the participation, were stated clearly in the informed consent, which the caregivers were requested to sign prior to the later test procedures. The questionnaires (which were covered with a front page to preserve the privacy of participants) were also distributed by the teachers to the children, brought home by the children to their caregivers, and collected by the teachers upon completion and delivered to the researchers. The approval for this study was obtained from both the local kindergartens and the Ethical Committee of Leiden University.

Measures

Moral Emotions Questionnaire. The MEQ (see Appendix Table A) aims to assess behavioural responses that are associated with three distinct moral emotions: pride, guilt and shame. The initial 25-item MEQ was developed by a team of developmental psychologists, based on a pilot sample of 106 caregivers. It was later validated by Da Silva et al, (2022) on a sample of 377 caregivers of children aged 2.5 to 6.5 years, and modified into a 17-item version. This 17-item MEQ served as the starting point of the present study, encompassing: “Pride” scale (7 items), “Guilt” scale (6 items), and “Shame” scale (4 items) (Table A). The caregivers were instructed to rate the degree to which each item represented their child’s behaviour in the past two months on a 3-point scale (0 = never, 1= sometimes, 2 = often). A higher score may indicate a higher

frequency and intensity that their child experienced for each emotion, except for Item 16, which was contra-indicative formulated and reversely coded for computing scale scores. Caregivers were encouraged to answer to all items, including those that are seemingly inapplicable to their children.

Internalizing and Externalizing Behaviours. To examine the severity of the internalizing and externalizing problems, the Early Childhood Inventory 4th edition (ECI-4; Sprafkin et al., 2002) parent checklist was administered. The ECI-4 consists of 9 subscales and 108 items that screen for 15 emotional and behavioural disorders in young children. Caregivers were required to rate as much as they could about how their child demonstrated each behaviour on a 4-point scale (0 = never, 1 = sometimes, 2 = often, 3 = very often), based on how their child manifested each symptom. Higher scores indicate more severe behavioural problems. Following the method of Ketelaar et al., (2017), we combined several scales of ECI-4 as indicators to assess internalizing problems and externalizing problems:

To assess internalizing behavioural problems, the "Major Depressive Disorder" scale (10 items, e.g. "Talks about death or suicide", "Sad for most of the day"), the "Separation Anxiety" scale (8 items, e.g. "Afraid to sleep unless near parents", "Gets very upset when child expects to be separated from home or parents"), the "Social Phobia" scale (3 items, e.g. "When put in uncomfortable social situations, the child cries, freezes, or withdraws from interacting"), and the "Generalized Anxiety" scale (4 items, e.g. "Is overly fearful of, or tries to avoid, specific objects or situations") were combined as the indicator for "Internalizing Behaviours";

For the assessment of externalizing behavioural problems, the "Oppositional Defiant Disorder" scale (8 items, e.g., "Loses temper", "Is touchy or easily annoyed by others"), and the "Conduct Disorder" scale (10 items, e.g. "Serious lying", "Is

physically cruel to people") were combined as the indicator for "Externalizing Behaviours". Internal consistencies of these two indices were adequate (Table 2).

Table 2. The Descriptive Statistics, Internal Consistencies of the study variables

	Number of items	Mean (SD)	Cronbach's alpha	Inter-item correlation
Moral Emotions				
Pride	7	2.62 (.34)	.74	.30
Guilt	4	2.34 (.42)	.63	.30
Shame	4	1.70 (.43)	.67	.34
Social Emotional Functioning				
Internalizing Behaviors	25	1.63 (.21)	.73	.27
Externalizing Behaviors	18	1.32 (.25)	.87	.31
Social Competence	10	2.37 (.38)	.69	.22

Social Competence. To measure social competence, the Chinese version of the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; Lai et al., 2010) was adopted. The Chinese SDQ consists of 5 subscales and 25 items that screen for 5 emotional, social and behavioural aspects. Caregivers were required to rate as much as they could about how their child manifested each behaviour in the past two months on a 3-point scale (0 = not true, 1= somewhat true, 2 = certainly true). Following the method of Ketelaar et al. (2017), we selected two scales of SDQ: the "Peer Relation" scale (5 items, e.g. "Generally liked by other children", "Has at least one good friend") and the "Prosocial Behaviour" scale (5 items, e.g. "Considerate of other people's feelings", "Kind to younger children") to form an indicator as "Social Competence". The internal consistencies of this index was adequate (Table 2).

Translation procedure. Due to there being no existing Chinese versions of the MEQ and the ECI-4, we thus followed a back-translation procedure to translate the

questionnaires (Brislin, et al., 1973). The MEQ was translated from Dutch to Chinese, while the ECI-4 was translated from English to Chinese, by senior psychologists from our lab who are fluent in Dutch/English and Chinese. Afterwards, back-translations from Chinese to Dutch (MEQ) and English (ECI-4), were performed by other bilingual colleagues of ours. The translated scripts were checked for language consistency by comparing them with the original version. Inconsistencies were resolved by discussions within our research team.

Statistical Analyses

First, the construct validity of the Chinese MEQ was assessed through the confirmatory factor analysis (CFA) and reported following the guidelines by Jackson et al., (2009). We designated the Dutch MEQ with 17 items (Da Silva, et al., 2022) as our baseline model. Considering that the 3-point scale of the MEQ was of an ordinal (ordered-category) nature, we used the weighted least-squares means and variance adjusted (WLSMV) as the estimator for (multi-group) CFAs (Brown, 2006; Ruppert & Wand, 1994). To evaluate model fits, a set of absolute and relative fit indices were used: A model was preferred when the normed chi square (χ^2) < 3.0, also $\chi^2/df < 2.0$ (Bollen, 1989); the Comparative Fit Index (CFI) > .90 (an acceptable level), or > .95 (a good fit; Hu & Bentler, 1999; Li, 2016), the Tucker-Lewis Index (TLI) > .95 (Lucas-Molina et al., 2018); the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) < .08, while the null model RMSEA > .158 (Kenny et al., 2015; Little, 2013). Considering that WLSMV might be prone to overestimate the CFIs compared to maximum likelihood (ML) estimations, a cut-off criterion of .95 for CFIs was preferred (e.g., Bandalos, 2014; Li, 2016). Also, Modification Indexes (MI), Standardized Expected Parameter Changes (SEPC), Inter-factor Correlations were computed for evaluating the diversity of items and scales, MI

> 10 or SEPC absolute value > .30 indicates loadings of an item on unexpected scales (Whittaker, 2012).

Second, for internal consistencies, Cronbach's alphas and inter-item correlations were examined. A Cronbach's alpha coefficient of .70 or higher was considered adequate (Ponterotto & Ruckdeschel, 2007). An inter-item correlation ranged .30 to .50 may indicate a consistency of the items within a scale, however, an inter-item correlation higher than .50 may indicate a tendency for the items (of the same scale) to be overly repetitive.

Third, we examined the concurrent validity of the three MEQ scales by examining their correlations with Internalizing Behaviours, Externalizing Behaviours, and Social Competence. Partial Spearman's correlation analyses were performed, controlling for age. If one MEQ scale was also correlated with the other MEQ scales and/or gender, then they were controlled for as well (e.g., controlling for age, gender, Guilt when examining correlations of Pride; Appendix Table C for the correlations between all study variables). Bonferroni correction was applied to adjust for multiple testing.

In addition, for exploratory purposes, we evaluated whether measurement properties of the MEQ were invariant across gender and age groups (i.e., < 54 months [median age] vs. ≥ 54 months), via multigroup CFAs. Given the relatively small sample size, this part of the results should be interpreted with caution. Following the standard procedure (Brown, 2014; Milfont & Fischer, 2010), three levels of measurement invariance hypotheses were tested sequentially: configural, metric, and scalar. The examination of configural invariance assessed whether the model structure was equivalent across the target groups. The examination of metric invariance was to confirm if the factor loadings of the scales were invariant across the groups. Testing the

scalar invariance allowed us to confirm whether the item intercepts were equivalent across the groups. Partial invariance was tested when full metric/scalar invariance was not met, by freeing the invariant items (Byrne et al., 1989). The criteria for the metric, scalar invariance were: the decrease in the CFI value (ΔCFI) < .01; the change in RMSEA (ΔRMSEA) < .015; and the change in SRMR (ΔSRMR) < .030 (Chen, 2007). The selection of the items to be freed was based on their univariate MI, and the Lagrange multiplier test, which shows the effect of releasing an equality constraint simultaneously between groups (e.g. Martín-Puga et al., 2022; Rosseel, 2012). The group differences were assessed when at least 50% of the items within one factor were invariant (Steenkamp & Baumgartner, 1998).

The (multigroup) CFAs were conducted in R (R Core Team, 2022, version 4.0.5), using *Lavaan* package version 0.6-9 (Rosseel, 2012). The examination for internal consistencies and Spearman's rank-order correlations for concurrent validity were conducted in SPSS version 24 (IBM Corp., 2016).

Missing Data Analysis

186 out of 210 participants sent responses back to the researcher, among which 4 were not fully completed (< 90% completion). For the remaining data, a few missing values existed (< 0.5%). Little's MCAR test suggested these values were missing at random ($p > .05$). Listwise deletion was used for the cases with missing values.

RESULTS

Construct Validity

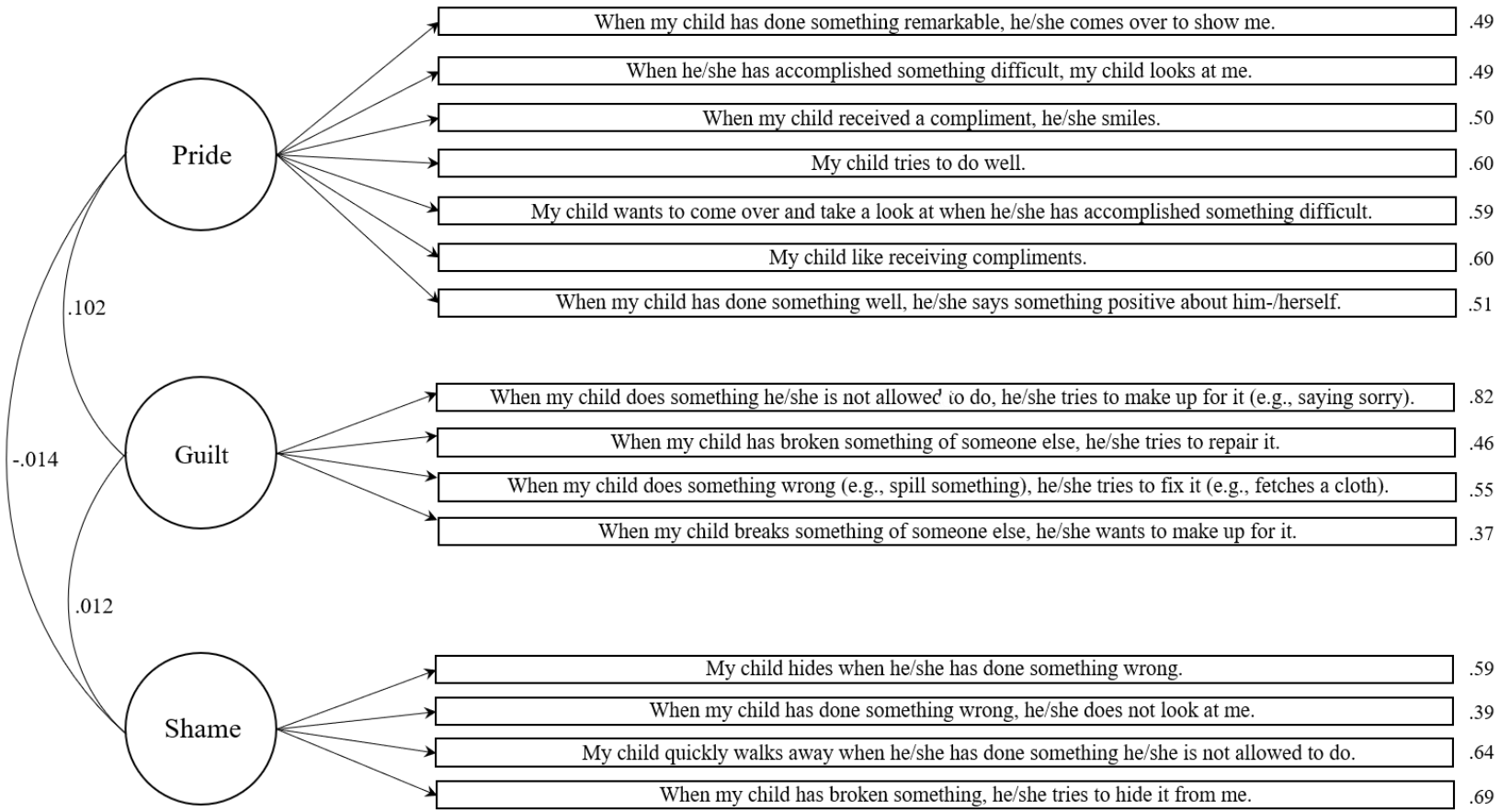
Table 3 shows the fit measures of three sequentially tested models in the present study. Model 1 presented the original Dutch model developed by Da Silva et al. (2022), which was regarded as the starting point of our analysis. The fit measures suggested that the

original model required improvement for this Chinese sample (CFI= .892, TFL= .873, RMSEA= .065). We firstly removed the item with the lowest factor loading (λ = .11, item 11 from Guilt), leading to Model 2. Although Model 2 revealed an acceptable model fit (χ^2 = 167.37, df =107, RMSEA = .061, CFI= .915, TFL= .90), item 5 from Guilt had a high MI (>30) and SEPC (> 0.35) on Shame. Hence, we removed item 5, leading to Model 3. Model 3 revealed very good fit measures (χ^2 = 127.76, χ^2/df= 1.72, RMSEA= .43, null model RMSEA= .198, CFI= .96, TFL= . 95) and variance parameters. Furthermore, we checked the content of each item in Model 3, and confirmed that all are appropriate under the Chinese cultural context. Therefore, we accepted Model 3 as the final model for the Chinese MEQ. Figure 1 shows the structure and items of the final model.

Table 3. Fit indices for the model testing of the MEQ

Model	χ2	df	RMSEA [90% CI]	Null RMSEA	CFI	TFL	SRMR
Model1	203.65	116	.065 [.050, .080]	.183	.892	.873	.089
Model2	167.37	101	.061 [.044, .077]	.191	.915	.900	.086
Model3	127.16	74	.043 [.017, .062]	.196	.96	.952	.077

Note: Model 1 = the original Dutch model (17 items, Da Silva et al., 2022);
Model 2 (16 items) = a revised model where 1item were deleted from Model 1 (Item 11 from Guilt);
Model 3 = the final model with 1 more item deleted based on Model 2 (item 5 from Guilt).



Note: The three numbers to the left are partial correlation coefficients between Pride, Guilt and Shame, which are non-significant ($p>.05$);
The numbers to the right are standardized factor loadings of each of the items on the corresponding scales, all higher than the cutoff point ($\lambda>.35$).

Figure 1. The CFA result: A Three-Factor Construct of the MEQ

Measurement Invariance Across Gender. The hypothesis of invariance of the model across gender was tested based on the final model (see Table 4). First, the fit measures obtained from the configural model showed an adequate fit, χ^2 (174, N = 182) = 167.08, p < .01; CFI = .999; RMSEA = .001; SRMR = .084. In the next step, testing metric invariance revealed a significant change in the fit indices (ΔCFI= −.036; ΔRMSEA = .039; ΔSRMR = .013), suggesting that metric invariance could not be assumed. Thus, partial metric invariance was tested by freeing the equivalence constraint on Item 14 (from Pride) and 16 (from Guilt), and a nonsignificant change in the model fit was obtained (ΔCFI = -.009; ΔRMSEA = .013; ΔSRMR = .008). This implied that the item loadings besides Item 14 and 16 were invariant across gender, hence the hypothesis of partial metric invariance was tenable. Afterwards, testing scalar invariance yielded an insignificant change in the fit indices (ΔCFI = .005; ΔRMSEA = -.001; ΔSRMR = .002), confirming equivalent intercepts across gender.

Since the majority (≥ 50%) of the items for each factor were invariant, the MEQ scores were comparable across genders. Independent t-tests showed that there existed only a gender difference in Pride: $\text{Pride}_{\text{boys}} = 2.55 < \text{Pride}_{\text{girls}} = 2.67$, t(179) = -2.52, p = .013, but not in Guilt, t(179) = .047, p = .963, or Shame, t(179) = -.413, p = .680. Due to that item 14 and 16 did not meet invariance in the metric/scalar tests, we further checked the group difference across gender by removing the two items in the comparison and no significant effect was observed (Appendix Table D).

Measurement Invariance Across Age. We first divided the sample into two equal age groups, one (n = 91) < 54 months, and the other (n = 91) ≥ 54 months (Table 4). The configural model showed an adequate fit, χ^2 (174, N = 182) = 162.49, p < .01; CFI = .999; RMSEA = .001; SRMR = .085. Next, testing metric invariance revealed a significant change in the fit indices (ΔCFI = −.011; ΔRMSEA = .024; ΔSRMR = .007).

Thus, partial metric invariance was tested by freeing the equivalence constraint on Item 4 (from Shame), and a nonsignificant change was obtained (ΔCFI = 0; ΔRMSEA = 0; ΔSRMR = .005), indicating that the item loadings besides Item 4 were invariant across age. Afterwards, testing scalar invariance yielded a significant change (ΔCFI = -.021; ΔRMSEA =.031; ΔSRMR = .006). Partial scalar invariance was thus conducted. After freeing the equality constraints on the intercepts of Item 9 (from Shame) and 17 (from Pride), partial scalar invariance was achieved (ΔCFI = -.004; ΔRMSEA = .014; ΔSRMR = .003).

Since the majority of (≥ 50%) items for each factor were invariant, the scores of MEQ were comparable across age. Independent t-tests revealed no differences in the MEQ scales between the two age groups, *t*s < 1.84, *p*s > .069. The three items (item 4, 9, and 17) that were variant and freed in the metric/scalar tests appeared to have no large impact on the comparison between different age groups (Appendix Table D).

Internal Consistencies

Table 2 shows the internal consistencies of the Pride, Guilt and Shame scales. The Cronbach's alpha varied from 0.63 to 0.74. The inter-item correlations ranged from 0.30 to 0.34, which were good and did not exceed the suggested range.

Table 4. Fit Indices of the Invariance Across Gender and Age Groups (half of participants <54 months; the other half ⩾54 month)

Parameters	Model Fit Indices						Model Fit Change values		
	χ2	df	CFI	RMSEA [90% CI]	Null RMSEA	SRMR	ΔCFI	ΔRMSEA	ΔSRMR
Gender									
Configural	167.08	174	.999	0.001 [0, 0.042]	.198	.084			
Metric	212.83	186	.963	0.04 [0, 0.064]	.198	.097	-.036	.039	.013
Partial Metric [a]	191.69	184	.990	0.014 [0, 0.052]	.198	.092	-.009	.013	.008
Scalar	199.38	196	.995	0.013 [0, 0.048]	.198	.094	.005	-.001	.002
Age group									
Configural	162.49	174	.999	0.001 [0, 0.037]	.207	.085			
Metric	195.39	185	.987	0.025 [0, 0.054]	.207	.092	-.011	.024	.007
Partial Metric [b]	183.42	184	.999	0.001 [0, 0.046]	.207	.090	0	0	.005
Scalar	213.51	196	.978	0.032 [0, 0.057]	.207	.096	-.021	.031	.006
Partial Scalar [c]	198.34	194	.995	0.015 [0, 0.049]	.207	.093	-.004	.014	.003

Note: CFI: comparative fit index; RMSEA: root mean square error of approximation;
CI: confidence interval; SRMR: standardized root mean square residual. N=182. *p<0.05

[a.] Equality constraints on the factor loadings of Item 14 and 16 were freed from the model.

[b.] Equality constraint on the factor loadings of Items 4 was freed from the model.

[c.] Equality constraints on the intercepts of Items 9 and 17 were freed from the model.

Concurrent Validity

Table 5 presents the Spearman rank-order correlation coefficients of the MEQ scales with the indices of social-emotional functioning, age, and gender. Results showed that after controlling for age, gender, and Guilt, Pride was positively correlated to Social Competence. After controlling for age and Pride, Guilt was found to be negatively correlated with Externalizing Behaviours, and positively with Social Competence. Shame, on the contrary, was positively correlated with Internalizing and Externalizing Behaviours.

Table 5. Spearman's correlations between the MEQ scales and the concurrent indices

	Concurrent Indices: Social-Emotional Functioning		
	Internalizing Behaviors	Externalizing Behaviors	Social Competence
Pride	.13	.11	.36***
Guilt	-.09	-.15	.16*
Shame	.17**	.24***	-.15

Note. Significance level is adjusted with Bonferroni correction to $p \leq \alpha/3 = .017$.

* p (one-tailed) ≤ .017. ** p (one-tailed) ≤ .010. *** p (one-tailed) ≤ .001.

DISCUSSION

This study provided supporting evidence for a 15-item Chinese MEQ, which was developed based on the original 17-item Dutch version (Da Silva et al, 2022). The psychometric results of the Chinese MEQ indicated a good construct validity, thus confirming a three-factor model distinguishing between the indicated moral emotions (shame, guilt, and pride) in a sample of Chinese preschool children. This model was tenable across age and gender according to measurement invariance analyses, and no

correlations were noted between age and the three different MEQ factors. The internal validity (Cronbach's alphas and inter-item correlations) was adequate for all three scales. The results also demonstrated a pattern for concurrent validity that was by and large in line with previous studies based on Western samples: pride and guilt were positively related to social competence, whereas shame was positively related to internalizing and externalizing behaviours. Below we discuss these outcomes in greater detail.

A total of two items were deleted due to low factor loadings on their intended scale (Guilt), while both items showed also considerable factor loadings on another scale (Shame): item 5 ("My child shows that he/she regrets something") and item 11 ("My child cries when he/she has accidentally hurt someone"). Note that both the deleted items refer to children's negative emotional expressions, whereas the remaining items all refer to children's behaviours that are aimed at amending (anticipated) transgressions. This may reflect cultural differences. Whilst in Western (e.g., North American, Western Europe) cultures it is acceptable to express negative emotions when well-justified, such as showing a guilty look after misbehaving, in the Chinese culture the expression of negative emotions is overall less welcomed and requires greater caution (e.g., Novin & Rieffe, 2015). For Chinese children, an adaptive reaction in guilt-provoking situations might involve not only the initiation of reparative behaviours but also the suppression of negative emotions. In addition, although in Western cultures guilt often triggers self-evaluation and self-scrutinization (Tangney & Dearing, 2002), the function of guilt in the Chinese culture might be more other-oriented, namely, the concern is mainly about how the other person would feel and how the relationship with another could be jeopardized (e.g. Huang et al., 2018). This may explain why in our Chinese sample, guilt had only a positive relation with social competence whereas no

negative relation with externalizing problems. Future cross-cultural research on moral emotions in young children is thus needed to replicate our findings and unveil possible cultural influences.

For the concurrent validity of pride and shame, our findings were by and large in line with the previous literature on Western and Eastern samples (e.g. Broekhof et al., 2018; Ding et al., 2016; Lee et al., 2016; Tracy et al., 2007; Wang et al., 2017; Wu et al., 2021): That is, pride was positively correlated with social competence, and shame was positively related with internalizing and externalizing behaviours in our sample. The results, therefore, suggested no notable cultural variance between the current Chinese preschool children sample and previous Western samples in regard to the concurrent validity of pride and shame. This cross-cultural consistency could imply that the moral(ity)-mechanism is deeply embedded in early social-emotional development, although the existing research is seemingly lacking in the exploration of this mechanism in young children. Hence, this study highlights the necessity of validating new instruments for different cultures and age groups, as it may be the first step for extending our horizons on this topic.

Contrary to our expectations, for shame, we did not find it to be related to any adaptive aspects of social functioning in Chinese preschoolers. This result is consistent with previous Western findings, but contradictory to several studies that were based on Eastern samples. For example, Bagozzi et al. (2003), Breugelmans & Poortinga (2006), Heine (2002), and Wang et al. (2020) reported that shame was positively correlated to prosocial behaviours, self-improving motives, or positive interpersonal relationships among Chinese, Japanese, Indian, and Filipino participants, respectively. Notably, the participants of the above studies were from school-age children to adults, yet our sample consists of preschool children with a mean age of four years. Presumably, we

could attribute the cause to the ongoing yet unfinished socialization processes of preschool children in this special stage - theories suggested that children would first develop a relatively "pure" form of self-awareness before they can adjust their self-identity to conform to the group identities and cultural expectations (Lagattuta & Thompson, 2007). Accordingly, they might have not fully internalized the collectivistic values that are required to suppress their idiosyncratic desires and act under societal expectations. Moreover, children of this age are still under-developed in understanding societal expectations, the existing studies concluded that they are not fully aware of others' desires, motives, or beliefs (e.g. Broekhof et al., 2015; Olthof, et al., 2010). In this case, the presence of shameful feelings might not trigger a strong internal motivation in preschool children in shame-eliciting scenarios to defend or remedy their impaired social and self-image.

As for the relationship between the levels of moral emotions and age within this preschool period: is consistent with the cross-sectional studies (e.g., Cole et al., 2006; Konchanska et al., 1995) and the longitudinal studies focusing on Western preschoolers (e.g., Li et al., 2021), our results revealed no age difference in our Chinese sample either, indicating that the levels of pride, guilt, and shame remained relatively static in the preschool stage. The comparisons of scores between groups were based on the premise that measurement invariance was achieved for (the majority of) the items used. However, it is noteworthy that only partial invariance was assumed in this study, while several items were variant on the cross-group assessment, which may influence our evaluation of group differences. Yet, a series of post-hoc t-tests showed that including and excluding the variant items in the analysis did not change the results of the group comparisons, implying that the group differences were not sensitive to these variant items. Accordingly, our result may indeed suggest that children's development of pride,

guilt, and shame, as manifested by their daily behaviors, is relatively slow and not significant in preschool years (Etxebarria et al., 2019). By contrast, the development of moral emotions seems to accelerate at later stages, evidence from Western children showed that the experience of moral emotions peaked in early adolescence, which is probably related to the rapid growth of social awareness and social desires for belongingness in adolescence (e.g., Broekhof et al., 2021). Yet, despite the crucial role of moral emotions in social development, our knowledge of the developmental trajectories and mechanisms is rather limited. This of course highlights the importance of validating measuring tools as the first step, but also calls for future studies to enrich our understandings on this topic.

Limitations of This Study and Future Directions

Validating a new parent questionnaire for measuring moral emotions in Chinese preschoolers makes a promising first step toward understanding the early moral development among non-Western children. However, limitations should also be noted. First, the sample size in this study was relatively small (N=182). Small-sized data of ordinal nature, especially with asymmetrical distributions, could be problematic and biased in the estimations of parameter estimates (e.g., RMSEAs, CFIs), Chi-squares, or standard errors (of factor loadings, inter-factor correlations, or structural paths) in confirmatory factor analyses (Bandalos, 2014; DiStefano & Morgan, 2014; Li, 2016). Specifically, Li (2016) suggested that although DWLS/WLSMV estimations with small samples can provide relatively robust parameter estimates, the standard errors can be more biased or inaccurate (5% - 8%) compared to estimations with large samples. Bandalos, (2014) and DiStefano & Morgan (2014) suggested when sample sizes were notably small (N=100) with highly asymmetric distributions, both the parameter estimates and standard errors acquired from DWLS/WLSMV estimations could be

more biased. Although in our case, skewness of the main factors and most of the items were within [-1, 1], i.e., close to normal distributions, the parameter estimates and the standard errors could still be slightly more biased (< 5% for parameters; 5% - 10% for standard errors) comparing to estimations of large samples. Hence, we recommend future validation studies to use a larger sample size (N>500), to minimize the biases in estimations. Second, the participants of the present study were recruited solely in the Jiangsu province. Although the socioeconomic status of our participants was largely in line with the general population in China (Bulletin of the Seventh Population Census, 2021), we cannot neglect that the majority (>99.7%) of the population in Jiangsu are ethnically Han. Although the Han-Chinese culture has always been the mainstream culture of China, it is different from some other subcultures (e.g., Mongolian, Tibetan) in certain aspects. In fact, we did not directly measure any cultural-related variables in this study, which may have limited our understanding of the exact role of cultures (and subcultures) in moral development, as well as how they may interact with age in the process. Hence, caution is warranted when using the current version of MEQ to assess moral emotions in children from the ethnic minority groups of China, and future studies are suggested to further explore such culture-morality dynamics in preschool children. Third, we think it might be necessary to point out that the responses of the caregivers can be to some extent biased, as the caregivers might be prone to overestimate their children's morality, either intentionally or unconsciously. This may be especially the case when participants sensed that they were or would be evaluated: in this study, the anticipation that the teachers would finally collect the responses can increase the likelihood of biases in caregivers' responses, as some caregivers care much about teachers' evaluation of their children. Although the paper questionnaires were stapled with front covers (with only logos, the project title, and affiliations), confidentiality was

not fully guaranteed. In this case, envelopes that can be sealed up (upon completion) may be ideal to contain paper questionnaires and to protect privacy, they are recommended for future studies. Lastly, the correlational nature of the validation studies does not allow for interpretations of the causality and mechanisms of the concurrent relations we found. Longitudinal designs may be needed to study the developmental trajectories of moral emotions in the preschool years.

CONCLUSION

This validation study showed that the modified 15-item Chinese version of the MEQ is suitable for assessing pride, guilt, and shame in Chinese preschool children. Considering the significant role of moral emotions in guiding children's social behaviours, we hope that the Chinese MEQ provides a valid tool for assessing moral emotions in preschool children and will complement research on the function and early development of moral emotions across cultures.

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Chapter 3

A longitudinal study on moral emotions and psychosocial functioning among preschool children with and without hearing loss

Li, Z., Li, B., Tsou, Y. T., Wang, L., Liang, W., & Rieffe, R. (2024). A longitudinal study on moral emotions and psychosocial functioning among preschool children with and without hearing loss. *Development and Psychopathology,* 1-12. https://doi.org/10.1017/S0954579424001408

Abstract

Moral emotions such as shame, guilt, and pride are crucial to young children's social-emotional development. Due to the restrictions caused by hearing loss in accessing the social world, deaf and hard-of-hearing (DHH) children may encounter extra difficulties in their development of moral emotions. However, little research so far has investigated the development trajectory of moral emotions during preschool years in DHH children. The present study used a longitudinal design to explore the development trajectories of shame, guilt, and pride, in a sample of 259 Chinese DHH and TH preschoolers aged 2 to 6 years old. The results indicated that according to parent reports, DHH children manifested lower levels of guilt and pride compared to their TH peers, yet the manifested levels of shame, guilt, and pride increased throughout preschool time at a similar pace in all children. Moreover, whilst guilt and pride contributed to increasing levels of psychosocial functioning over the preschool years, shame contributed to lower social competence and more externalizing behaviors in DHH and TH preschoolers. The outcomes imply that early interventions and adjustment to hearing loss could be useful to safeguard the social development of children with severe hearing loss, and cultural variances shall be taken into consideration when studying moral emotions in Chinese cultural background.

Key words

Moral emotions; Development trajectory; Deaf and hard-of-hearing; Preschool children

INTRODUCTION

Moral emotions such as shame, guilt, and pride serve crucial social functions. Shameful and guilty feelings could function as emotional punishments, reminding individuals that some particular personalities or behaviors are undesirable within their society; whilst proud feelings reinforce similar behaviors in the future. Accordingly, moral emotions regulate individuals' behaviors, and motivate them to act in accordance to social norms (Tangney et al., 2007). Children's development of moral emotions relies on their social learning (Muris & Meesters, 2014). For children of preschool age, this process takes place primarily in parent-child interactions, and also in various social situations where children observe others' behaviors and overhear conversations. Social learning is the primary way for children to learn social norms and understand how social behaviors may be evaluated in different perspectives (Eisenberg et al., 1998). Nevertheless, access to the predominantly hearing social world can be difficult for "deaf and hard-of-hearing" (DHH) children (Rieffe et al., 2015), and such difficulties may negatively affect their social learning and development of moral emotions. To date, studies exploring the development of shame, guilt, and pride in DHH preschoolers are scarce, whereas these emotions are important to children's further development in many areas of psychosocial functioning (Broekhof et al., 2020). To fill the gap, our study examined the development of shame, guilt, and pride in the preschool years in DHH children, as compared to their typically hearing (TH) peers, and explored how this may be related to their psychosocial functioning, using a longitudinal design.

Moral emotions and their developmental trajectory

Moral emotions are elicited by self-evaluations of one's personal attributes or behaviors in light of the prevailing social norms (Tracy et al., 2007). In particular, pride arises from positive self-evaluations, whilst shame from negative self-images on one's

personal attributes, and guilt from negative arousal on having inflicted harm on others (Tangney et al., 2007). Consequently, experiences of pride may benefit children's social skills and facilitate prosocial behaviors (Da Silva et al., 2022; Ross, 2017); shameful feelings depreciate one's core self and could result in internalizing behaviors, such as withdrawal, avoiding social situations, and showing anxious symptoms and/or worrying (Li et al., 2023; Mills et al., 2015), or externalizing behaviors, such as acting out, throwing fits, disruptive, or aggressive behaviors (Heaven et al., 2009; Peng et al., 2018); whereas guilty feelings can often lead to an urge to amend for wrongdoings, and inhibition of aggression (Ding et al., 2016; Drummond et al., 2017). Accordingly, moral emotions play a crucial role in children's early social-emotional development (Calderon et al., 2011; Chao et al., 2015).

The capability of self-evaluation requires certain cognitive skills (Tracy et al., 2007): children ought to have awareness of the self, of the social norms, and the ability to take others' perspectives, in order to carry out self-evaluations. Research showed that children can show self-awareness from the age of two (Bulgarelli et al., 2019), and have basic understanding of social norms or values already in toddlerhood (Hardecker et al., 2016). With increasing perspective-taking capabilities (Broekhof et al., 2015), children start to manifest moral judgmental expressions around three years of age (Krettenauer et al., 2013; Gummerum et al., 2016; Pluta et al., 2023), showing early signs of shame, guilt, pride (Da Silva et al., 2022; Li et al., 2023). Prior research found that behaviorally manifested levels of guilt and pride increase rapidly during the preschool age (Bafunno & Camodeca, 2013; Da Silva et al., 2022; Ketelaar et al., 2015; Lapan & Boseovski, 2017; Ongley & Malti, 2014), whereas manifestation of shame remains static in early childhood (Ross, 2017; Sette et al., 2019; Li et al., 2021). Notably, the abovementioned developmental trajectories were concluded from studies focused on TH children,

whereas the situation may be different when moral development is affected by hearing loss.

Social learning and moral emotions in DHH children

Most DHH children are born to hearing parents who have no prior experience in interacting with individuals with hearing loss (Mitchell & Karchmer, 2004), whereby the lack of proficiency in fine-tuning the communication with their DHH child could negatively affect their parent-child interactions. For example, obstacles may exist in the processes when DHH children try to follow their parents' instructions or to understand verbal feedback on their recent behaviors and performances (Ketelaar et al., 2015). Accordingly, it is usually more difficult for parents to share or to bond with their DHH child because they must rely on short and simple verbal language or rudimentary sign language for communication (Calderon & Greenberg, 2011). As a consequence, the parent-child interaction for DHH children involves less in-depth communication on understanding others' emotions or taking others' perspectives, which may negatively impact the psychosocial functioning of DHH children (Morgan et al. 2014; Dirks et al. 2020).

The challenges in social communication and interaction cannot be solved completely even if DHH children's hearing abilities are assisted by hearing equipment. DHH children may still experience difficulties in following verbal conversations even with the help of a hearing aid (HA) or a cochlear implant (CI), especially in situations where loud background noises, interference cues, or multiple sound sources are present, or when the speaker is not facing (right to) them (Caldwell & Nittrouer, 2013; Misurelli & Litovsky, 2015). Furthermore, during interactions with peers, DHH children can easily miss verbal cues when their attention is not fully focused on the speakers (Calderon & Greenberg, 2011). Even when their attention is focused, they may receive

only partial information due to interferential background noise (Leibold & Buss, 2013). As most of their cognitive resources might be allocated to verbal cues, in combination with limited access to daily social interaction as described above, DHH children may also miss or misinterpret nonverbal cues during communication, which are similarly crucial for successfully navigating social situations (Rudner & Holmer, 2016; Tsou et al., 2021). The difficulties in receiving information during interpersonal interactions can limit the opportunities for social learning: DHH youths may struggle to acquire social knowledge or practice cognitive skills through social learning, unlike their TH peers who do so as part of their daily routines (Calderon & Greenberg, 2011; de Villiers & de Villiers, 2014; Netten et al, 2015).

Restricted access to social learning can affect the early development of moral emotions in DHH children (Tracy et al., 2007). Cross-sectional research showed that DHH children displayed lower levels of shame, guilt, and pride compared to their TH peers, with these differences apparent as early as preschool age (Ketelaar et al., 2015). This pattern seems to maintain throughout childhood as shown by studies on shame and guilt among DHH adolescents (Broekhof et al., 2018; 2020; 2021). Despite the atypical development of moral emotions among DHH children, similar associations between moral emotions and psychosocial functioning were found in DHH and TH children. Specifically, higher levels of shame were found to contribute to predicting more internalizing or externalizing behaviors in both DHH and TH children, whereas higher levels of guilt contributed to predicting fewer externalizing symptoms (Broekhof et al., 2018; 2020). Furthermore, positive associations between pride/guilt and social competence were found in DHH and TH preschoolers (Ketelaar et al., 2015; Li et al., 2023), although such results were not consistently found in elder children or adolescents (e.g., Roos et al., 2014; Stuewig & McCloskey, 2005). These findings thus highlight

the importance of moral emotions to children's psychosocial functioning.

Present Study

To date, most research on moral emotions in DHH and TH children used cross-sectional designs examining group differences of moral emotions between DHH and TH children. However, little is known about how shame, guilt, and pride develop in preschool years in DHH children. To the best of our knowledge, only two longitudinal studies examined this in school-aged children and adolescents, using self-reports (Broekhof et al., 2021; Mazzone et al., 2016). They found that the levels of shame and guilt increased during late childhood and early adolescence in both TH and DHH youth. The present study planned to use a longitudinal design to investigate the development of shame, guilt, and pride among DHH and TH preschoolers, based on parent reports. Prior research has shown that expressions of moral emotions can be observed in the behaviors of children from the age of two years (e.g., Krettenauer et al., 2013; Gummerum et al., 2016; Pluta et al., 2023) and that these observed behaviors can be reliably reported by parents (Kochanska et al., 1995).

Our first goal was to compare the levels of behavioral manifestations of shame, guilt, pride in both DHH and TH children, examining if there was any group difference. According to prior research, we expected lower manifestation of shame, guilt, and pride in DHH preschoolers than TH peers (e.g., Broekhof et al., 2020; Ketelaar et al., 2015).

The second goal was to investigate the development of shame, guilt, and pride during the preschool years in both DHH and TH preschoolers. For TH preschoolers, we expected stable levels of shame over time, but increased levels of guilt and pride (e.g., Li et al., 2021; Ongley & Malti, 2014). As for DHH preschoolers, due to a lack of empirical evidence, we could only infer from research on older DHH children

(Broekhof et al., 2021; Mazzone et al., 2016) and assumed that DHH preschoolers might have a similar developmental trend as their TH peers.

Our third goal was to investigate the longitudinal associations of shame, guilt, and pride with psychosocial functioning (i.e., internalizing and externalizing behaviors, social competence) in DHH and TH preschoolers. Based on prior correlational research on TH children (e.g., Ding et al., 2016; Mills et al., 2015; Ross, 2017), we expected that for TH preschoolers, their manifested shame levels would contribute to more internalizing behaviors (e.g., social withdrawal, worrying, and anxious behaviors) and more externalizing behaviors (e.g., acting out, disruptive, and/or aggressive behaviors) (e.g., Heaven et al., 2009; Peng et al., 2018; Gadow et al., 2001; Sprafkin et al., 2002); their levels of guilt contributed to better social competence and fewer externalizing behaviors; and their manifestations of pride, contributed to better social competence over time. For the DHH group, we assumed that the abovementioned associations might be similar in DHH preschoolers as in their TH peers (Broekhof et al., 2018; Ketelaar et al., 2015).

METHOD

Participants

A total of 259 Chinese DHH and TH children (DHH: 123; TH: 136) aged from 21 to 84 months (M=49.22 months, SD=12.65 months, at the first wave) participated in this study. Two waves of longitudinal data were collected on this sample with an interval of 14.61 months (SD=4.31 months).

The participants were recruited via the China Rehabilitation Research Center for Hearing and Speech Impairment (CRRCHSI) from 2019 to 2020. CRRCHSI is a national research institution providing early interventions for children with hearing loss

in China. CRRCHSI has a center-affiliated kindergarten, which hosts both DHH and TH children. DHH children first attend classes that are specially designed for DHH children. After one to two years, depending on the DHH children's language and cognitive development, DHH children are allocated to mixed classes where they have classes and interactions with TH peers. During their stay in the center, the DHH children received early interventions and special education to promote their language and social development. CRRCHSI emphasizes the development of spoken language, and thus signed language is not used as a language of instruction.

The DHH participants recruited from CRRCHSI had severe hearing losses, with average unaided hearing thresholds of 77.73 dB at the better-hearing ear and 86.75 dB at the worse-hearing ear. 86.9% of the children used a hearing aid (HA) or cochlear implant (CI) (mean aided hearing thresholds: 23.10 dB at the better hearing ear; 33.44 dB at the worse hearing ear). The demographic characteristics of both the DHH and TH participants and the hearing status of the DHH participants are shown in Table 1. When comparing between groups, no difference was found in terms of mean age, mean IQ scores, or the means of the socioeconomic variables.

The inclusion criteria for DHH preschoolers were: (1) pre-lingual (younger than three years of age) hearing loss with a minimum hearing threshold of 40 dB in the better ear (calculated by averaging unaided hearing thresholds at 500, 1000, 2000, 4000 Hz); (2) adequate cognitive development (i.e., non-verbal IQ > 80); (3) no other disabilities or developmental disorders. The inclusion criteria for TH preschoolers were: (1) with no delays in their cognitive development (i.e., non-verbal IQ > 80); (2) without any disability or developmental disorder.

Table 1 Characteristics of the participants

	Time 1		Time 2	
	DHH (*n*=123)	**TH (*n*=136)**	**DHH (n=64)**	**TH(n=66)**
Personal Characteristics				
Age, months, mean (*SD*)	49.88 (15.69)	51.00 (10.05)	63.23 (15.78)	63.32 (8.02)
Gender, *n* (%)				
Male	72 (58.5%)	71 (52.2%)	36 (53.7%)	33 (52.4%)
Female	51 (41.5%)	65 (47.8%)	31 (46.3%)	30 (47.6%)
Non-verbal intelligence score [a]**,** mean (*SD*)	100.23 (16.10)	106.21 (10.60)	98.28 (14.41)	104.32 (13.52)
Socioeconomic Status, mean (SD)				
Maternal Education [b]	3.63 (0.89)	4.07 (0.93)	3.59 (0.93)	3.89 (1.08)
Parental Education [b]	3.61 (0.86)	4.11 (0.85)	3.63 (0.84)	3.91 (1.03)
Annual household income [c]	4.11 (0.85)	3.71 (0.86)	3.12 (1.79)	5.00 (1.97)
Hearing Characteristics				
Age of Identification, months, mean (*SD*)	14.78 (14.87)		16.66 (14.98)	
Hearing device, *n* (%)				
CI (unilateral / bilateral)	22 (17.89%)		8 (13.56)	
HA (unilateral / bilateral)	27 (21.95%)		10 (16.95%)	
Using both CI + HA	58 (47.15%)		39 (66.10%)	
Others/Unknown	16 (13.01%)		7 (11.86%)	
HA use, months, mean (*SD*)	22.53 (13.09)		21.36 (12.47)	
CI use, months, mean (*SD*)	18.32 (11.78)		17.05 (10.79)	
Unaided Hearing threshold, better ear, mean (SD) [d]	77.73 (29.72)		81.98 (27.89)	
Unaided Hearing threshold, worse ear, mean (SD) [d]	86.75 (28.02)		89.61 (28.53)	
Aided Hearing threshold, better ear, mean (SD) [d]	23.10 (14.48)		31.87 (18.52)	
Aided Hearing threshold, worse ear, mean (*SD*) [d]	33.44 (21.55)		40.22 (20.61)	

Note: [a] IQ scores were evaluated using the final scores of the Griffiths Mental Development Scales.
[b] Mean (SD) for each condition. Values: 1 = "Primary school & below", 2 = "Junior high", 3 = "High school", 4 = "University or College", 5 = "Postgraduate & above".
[c] Mean (SD) for each condition. Values: 1 = "<CNY20,000"; 2 = "CNY20,000-100,000"; 3 = "CNY110,000-150,000"; 4 = "CNY160,000-200,000"; 5 = "CNY210,000-300,000"; 6 = "CNY310,000-500,000"; 7 = "CNY500,000-1,000,000"; 8 = "> CNY1,000,000".
[d] Values referred to the hearing threshold of either the left or right ear, of different degrees of hearing loss. ** p<.001, *p<.05 between DHH and TH children.

The non-verbal intelligence (IQ) of the participants was tested by teachers and researchers at CRRCHSI, using the Griffiths Development Scales for China (GDS-C) (original version: Griffiths & Huntley, 1996; Chinese version: Tso et al., 2018), which is a validated instrument with standardized norm scores widely used in China. We retrieved participants' IQ scores from CRRCHSI, under the permission of the children's parents and the teachers.

Procedure

Prior to the data collection, the research protocol of the present study was approved by the ethics committee of Leiden University and CRRCHSI. The two waves of data collection were conducted with the help of the teachers from the center-affiliated kindergarten. Before data collection, the researchers offered the teachers instructions on data collection to ensure that the procedure could be carried out correctly.

Before the data collection, the parents/caregivers of the children were provided detailed information on the goals, execution, data management, privacy policy of this study, as well as the voluntary nature of participation, and they were requested to sign an informed consent. After receiving the informed consent from the parents/caregivers, the teachers distributed the paper-form questionnaires to the children, who brought the questionnaires home to their parents/caregivers. After the parents/caregivers completed all the questionnaires, they gave the questionnaires to their children to bring them back to the center-affiliated kindergarten. The teachers collected the questionnaires and gave them to the researchers. For those caregivers who preferred to fill in the questionnaires online, a link was sent to them by email.

Measures

Moral Emotions (Shame, Guilt, Pride). To assess shame, guilt, and pride, the Chinese

version of Moral Emotion Questionnaire MEQ (Li et al., 2023) was administered. This questionnaire was translated from the Dutch MEQ (Da Silva et al., 2022), and validated in a sample of Chinese children with satisfactory factorial validity and reliability across sex and age groups from 2 to 6 years. This MEQ is a parent-report questionnaire that assesses behavioral responses to three distinct moral emotions shame, guilt, and pride, in children aged 2 to 6 years. It has 15 items, encompassing: "Shame" scale (4 items), "Guilt" scale (4 items), and "Pride" scale (7 items). The respondents were instructed to rate how each item represented their child's behaviors in the past two months, on a 3-point scale (0 = never, 1= sometimes, 2 = often). A higher score indicated a higher behavioral tendency of their child to experience each described emotion. The respondents were encouraged to answer all the items, even when some items may be considered as not applicable to their child.

Internalizing and Externalizing Behaviors. To evaluate the severity of internalizing and externalizing behaviors, the Early Childhood Inventory 4th edition (ECI-4, Sprafkin et al., 2002) parent checklist was used. Since no Chinese version of the ECI-4 was available, we applied a back-translation procedure to the translation (Brislin et al., 1973): First, the questionnaire was translated from English to Chinese by a researcher who was proficient in both languages. A back-translation, from Chinese to English, was conducted later by another bilingual researcher. The translation scripts were examined for language consistency by the research team. Any inconsistencies (of languages) were resolved by discussions with the research team.

The ECI-4 consists of 9 subscales and 108 items screening for 15 emotional and behavioral disorders in preschoolers or children. The caregivers of the participants were instructed to rate how their child manifested each described symptom on a 4-point scale (0 = never, 1 = sometimes, 2 = often, 3 = very often), based on their child's behavioral

manifestations in the past two months. A higher score indicated a more severe behavioral symptom.

Following the method of Ketelaar et al., (2017), we used four scales of the ECI-4 to assess children's "Internalizing Behaviors", which include: the "Major Depressive Disorder" scale (10 items, e.g. "Being too shy in front of their peers"); the "Separation Anxiety" scale (8 items, e.g. "Cannot fall asleep without parents staying around"); the "Social Phobia" scale (3 items, e.g. "When put in uncomfortable social situations, the child cries, freezes, or withdraws from interacting"); the "Generalized Anxiety" scale (4 items, e.g. "Cannot get rid of worrying thoughts"). We calculated the grand mean of the scores that the caregivers gave on the items from the four scales and used this mean score as the indicator of broadband internalizing behaviors.

Two scales of the ECI-4 were selected and combined, to assess "Externalizing Behaviors" (Ketelaar et al., 2017): "Oppositional Defiant Disorder" scale (8 items, e.g., "blame others when making mistakes") and the "Conduct Disorder" scale (10 items, e.g. "Is physically cruel to people"). We calculated the grand mean of the scores that the caregivers gave on these items from the two scales and used this mean score as the indicator of broadband externalizing behaviors.

Social Competence. To assess social competence, the Chinese version of the Strengths and Difficulties Questionnaire (SDQ; Lai et al., 2010) was employed. The Chinese SDQ consists of 5 subscales with 25 items, screening for (young) children's social, emotional, and behavioral symptoms. Caregivers of the participants were instructed to rate on how their child showed each symptom/behavior in the past two months on a 3-point scale (0 = not true, 1= somewhat true, 2 = certainly true). A higher score indicates higher social competence of a child.

Following Ketelaar et al. (2017), we used two subscales to assess children's "Social Competence": the "Peer Relation" scale (5 items, e.g. "Picked on or bullied by other children"), and the "Prosocial Behavior" scale (5 items, e.g. "Helpful if someone is hurt, upset or feeling ill"). Three items of the "Peer Relation" scale were reversely formulated and thus were reversely coded in the later analytic process. The grand means of the scores that the caregivers gave on the items from the two scales were calculated and used as the indicator of children's social competence.

Table 2 provides the descriptive statistics of the measurements used in this study. McDonald Omega's revealed that the internal consistencies of the questionnaires used in the present study ranged from 0.76 to 0.89 at Time 1, and from 0.73 to 0.90 at Time 2, indicating satisfactory to good internal consistencies of the measurements.

Statistical Analyses

Statistical analyses were conducted using R version 3.6.2 (R Core Team, 2021). Figures were made using the package "Ggplot2" (Wickham, 2009). Multi-level analysis (LMM) was conducted using the "lme4" package (Bates et al., 2015).

Linear Mixed Models (LMMs) were used to analyze the longitudinal data which had a two-level structure (i.e., two time points nested within participants). The stepwise method was applied to enter variables into the models. Simpler models with better fit indices were preferred over more complex models. When evaluating the fit indices, the preferred model showed lower deviance (i.e., smaller −2 Log likelihood [−2LL] values) in a likelihood ratio test (Wood et al., 2008). Both unstandardized (B) and standardized (Beta) estimates were reported. Standardized estimates are considered good indicators for the effect sizes of the predicting variables (Gelman & Hill, 2006; Lorah, 2018).

Table 2 Psychometric properties of all study variables at each time point

	NO. Items	Range of Scores	McDonald's omega	DHH		TH	
				mean	SD	mean	SD
Time1							
Shame	4	0-2	.76	.62	.47	.57	.43
Guilt	4	0-2	.81	1.13	.44	1.27	.38
Pride	7	0-2	.85	1.56	.35	1.68	.34
Social Competence	10	0-2	.80	1.29	.34	1.43	.31
Internalizing Behaviors	25	0-3	.88	.74	.32	.85	.14
Externalizing Behaviors	18	0-3	.89	.86	.37	.82	.38
Time2							
Shame	4	0-2	.74	.68	.46	.66	.45
Guilt	4	0-2	.82	1.28	.35	1.38	.39
Pride	7	0-2	.84	1.66	.32	1.75	.28
Social Competence	10	0-2	.73	1.46	.28	1.50	.27
Internalizing Behaviors	25	0-3	.91	.88	.14	.84	.14
Externalizing Behaviors	18	0-3	.90	.78	.35	.78	.36

First, to examine the changes in shame, guilt, and pride across time in DHH and TH children, we started with an unconditional means model that included only a fixed and a random intercept. Next, age was entered into the model, to examine whether and how the levels of moral emotions changed across the two time points. Thereafter, group (0 = TH, 1 = DHH) was added to the models to examine whether the TH and DHH children differed on the levels of moral emotions. Lastly, the interaction between age and group was added to examine if the developmental trends of moral emotions varied across groups.

Second, to investigate the contribution of the three moral emotions to predicting the psychosocial functioning of DHH and TH preschoolers, first, a mean variable and a change variable were created for each moral emotion. The value of the mean variable was the mean score of children's score at time 1 and at time 2. The value of the change variable was computed by subtracting participants' score at time 1 from that of time 2. Specifically, these mean variables were created to examine the between-subject effects,

which informed us to what extent the levels of participants' moral emotions contributed to predicting their psychosocial functioning over time; whereas the change variables were created to examine within-subject effects, which could inform us how participants' increase or decrease of moral emotions contributed to predicting their psychosocial functioning (Li et al., 2021).

After we created the mean and change variables of moral emotions, we started with the baseline model which included only a fixed and a random intercept. Next, we entered age and group as fixed factors in the model. The interaction of age and group were also tested. Thereafter, we entered the mean and change variables of shame, guilt, and pride step by step into the models. Lastly, we entered the interactions of the group and the mean and change variables, to further examine if the effects varied across TH to DHH preschool children.

Missing Data Analyses

At time one, caregivers of 259 children filled in all the questionnaires. However, due to the COVID-19 pandemic, the research team lost contact with some of these participants at the second wave of data collection. As a consequence, only 130 participants had data on both time points. The attrition rate of this longitudinal data is thus 49%. LMMs were often considered robust in handling data with attrition (Twisk et al., 2013). Simulation studies suggested that when the attrition of longitudinal data was lower than 50%, the results can be considered as not significantly biased (Gustavson et al., 2012; Pan & Zhan, 2020).

Furthermore, children who dropped out did not differ from those who had two waves of data in most variables at time 1 (i.e., age, nonverbal IQ, socio-economic status, gender distribution, shame, pride, and externalizing behaviors), except for showing

higher levels of guilt, fewer internalizing behaviors, and lower social competence than those who stayed (ts > 2.13, p < .017). Notably, the LMMs used in this study are known to be robust in handling data with attrition, especially on the condition that the (overall) data is missing at random (a MAR condition) (Ibrahim & Molenberghs, 2009; Twisk et al., 2013). Accordingly, we performed Little's MCAR test to evaluate the missing patterns of missing values. At time one, the data was missing completely at random χ^2 = 3671.87, *df* = 5643, $p > 0.05$, and less than 2% missing values existed in the data of time 1. At time 2, less than 0.5% of missing data existed in the available data, which was also randomly distributed: χ^2 = 1311.69, *df* =1347, $p > 0.05$. Therefore, listwise deletion was applied to the missing data at time 1, whereas LMMs accounted for the missing follow-up points at time 2 (Twisk et al., 2013).

Table 3 Fixed and random effects of the best models for predicting moral emotions over time

	Shame			**Guilt**			**Pride**		
	B (SE)	Beta (SE)	CI [low, high]	B (SE)	Beta (SE)	CI [low, high]	B (SE)	Beta (SE)	CI [low, high]
Fixed effects									
Intercept	**.44 (.08)**	**.61 (.03)**	[.27, .61]	**.81 (.10)**	**1.25 (.02)**	[.65, .96]	**1.43 (.07)**	**1.65 (.02)**	[1.30, 1.56]
Age (linear)	**.003 (.001)**	**.09 (.04)**	[.001, .006]	**.01 (.001)**	**.26 (.04)**	[.006, .012]	**.005 (.001)**	**.14 (.03)**	[.003, .007]
Group	-	-	-	**-.10 (.04)**	**-.10 (.04)**	[-.19, -.02]	**-.09 (.04)**	**-.09 (.04)**	[-.16, -.01]
Random effects									
Residual	**.08 (.28)**	**.08 (.28)**	[.25, .32]	**.09 (.29)**	**.09 (.29)**	[.26, .33]	**.06 (.24)**	**.06 (.01)**	[.06, .24]
Intercept	**.12 (.35)**	**.13 (.35)**	[.30, .40]	**.05 (.23)**	**.05 (.23)**	[.17, .28]	**.05 (.21)**	**.05 (.01)**	[.05, .21]

Note: B = Unstandardized/Raw estimates of fixed effects; Beta = Standardized Estimates of fixed effects; SE = standard error. CI = 95% confidence interval; Significant effects are marked as bolded.

RESULTS

The development of shame, guilt, and pride

Table 3 shows the estimations of the fixed and random effects of the best-fitting models for predicting the longitudinal changes in the levels of shame, guilt, and pride.

Regarding the development of shame, adding the effect of age (b = 0.003, beta = 0.09, t = 2.01, p = 0.03, 95% CI: [0.0001, 0.006]) improved the model fit to the largest extent, showing the lowest -2LL value (408.7). Entering the effect of the group did not improve the model fit. The best-fitting model showed that the levels of shame increased during preschool years among all children. Additionally, DHH and TH preschoolers did not differ in the level of shame (Figure 1).

Regarding the development of guilt, the model with the fixed effects of age (b = 0.01, beta = 0.26, t = 6.70, p < 0.001, 95% CI: [0.006, 0.012]) and group (b = -0.10, beta = -0.10, t = -2.40, p = 0.017, 95% CI: [-0.19, -0.02]) had the lowest -2LL (327.9). The results suggested that the levels of guilt increased in both groups during preschool years, whereas DHH preschoolers expressed overall less guilt than TH peers (Figure 1).

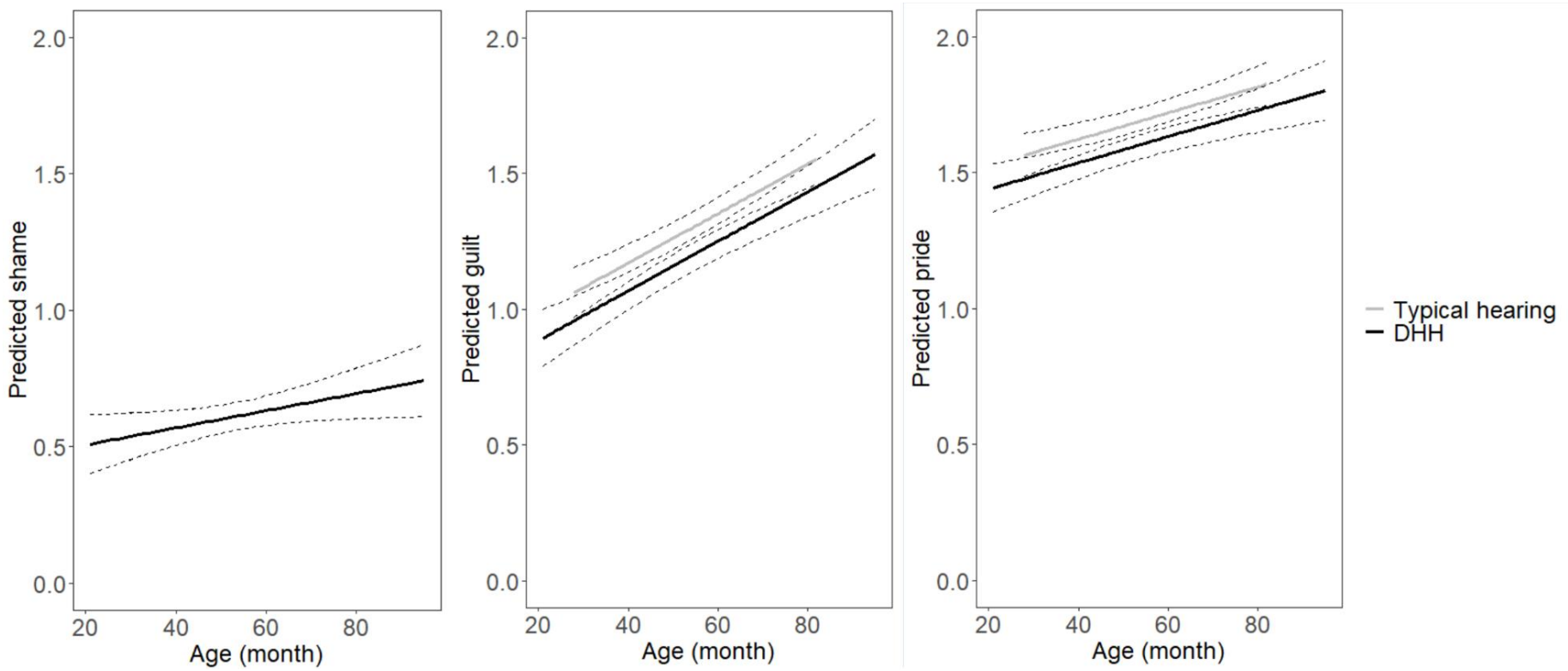
As for the development of pride, the model with the fixed effects of age (b = 0.005, beta = 0.14, t = 4.21, p < 0.001, 95% CI: [0.003, 0.007]) and group (b = -0.09, beta = -0.09, t = -2.35, p = 0.019, 95% CI: [-0.16, -0.01]) improved the model fit to the largest extent: -2LL (195.3). The results suggested that pride increased in both groups during preschool years; DHH preschoolers showed less pride than TH peers (Figure 1).

Table 4 Fixed and random effects of the best-predicting models for children's psychosocial functioning over time.

	Social Competence				Internalizing Behaviors				Externalizing Behaviors			
	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]
Fixed effects												
Intercept	**.60 (.10)**	[.36, .76]	**1.41 (.15)**	[1.38, 1.44]	**.97 (.04)**	[.89, 1.05]	**.82 (.01)**	[.80, .84]	**1.07 (.09)**	[.89, 1.26]	**.82 (.02)**	[.78, .86]
Age (linear)	**.004 (.001)**	[.002, .006]	**.12 (.03)**	[.06, .17]	-	-	-	-	**-.005 (.001)**	[-.007, -.002]	**-.15 (.04)**	[-.22, -.08]
Group	**-.16 (.05)**	[-.27, -.05]	-.05 (.03)	[-.11, .05]	**-.07 (.02)**	[-.10, -.02]	**-.07 (.02)**	[-.11, -.02]	**-**	-	**-**	-
Shame-mean	**-.17 (.05)**	[-.27, -.07]	**-.07 (.03)**	[-.13, -.02]	-	-	-	-	**.30 (.05)**	[.20, .39]	**25 (.04)**	[.17, .32]
Guilt-mean	**.32 (.05)**	[.23, .41]	**.24 (.03)**	[.17, .31]	**-.09 (.03)**	[-.16, -.04]	**-.07 (.02)**	[-.11, -.03]	**-.12 (.05)**	[-.23, -.01]	**-.09 (.04)**	[-.17, -.01]
Pride-mean	**.20 (.05)**	[.10, .31]	**.13 (.03)**	[.06, .19]	-	-	-	-	-	-	-	-
Shame-change	**-**	-	**-**	-	**-**	-	**-**	-	**.16 (.07)**	[.04, .29]	**.08 (.03)**	[.02, .14]
Guilt-change	**.19 (.05)**	[.09, .28]	**.10 (.03)**	[.04, .14]	-	-	-	-	**-**	-	**-**	-
Pride-change	**.23 (.06)**	[.10, .35]	**.09 (.03)**	[.04, .14]	-	-	-	-	-	-	-	-
Group * Shame-mean	**.18 (.07)**	[.04, .32]	**.15 (.06)**	[.03, .26]	-	-	-	-	**-**	-	**-**	-
Random effects												
Residual	**.04 (.19)**	[.17, .23]	**.05 (.22)**	[.20, .25]	**.04 (.20)**	[0.19, .22]	**.04 (.20)**	[.19, .22]	**.06 (.23)**	[.21, .27]	**.06 (.23)**	[.21, .27]
Intercept	**.03 (.17)**	[.14, .24]	**.02 (.13)**	[.07, .17]	**.001 (.001)**	[.001, .005]	**.001 (.001)**	[.001, .005]	**.06 (.24)**	[.20, .28]	**.06 (.24)**	[.20, .28]

Note: B = Unstandardized/Raw estimates of fixed effects; Beta = Standardized Estimates of fixed effects; SE = standard error. CI = 95% confidence interval; Significant effects are marked as using bolded font.

Figure 1: Longitudinal graphic representation of the predicted values based on the optimal fitting models: Shame, Guilt, and Pride.



Note: Grey solid lines represent the predicted mean values of TH children. Black solid lines represent the predicted mean values of DHH children. Dotted lines represent the upper and lower ends of the 95% confidence interval. When there is no group difference, the solid line represents the developmental trajectory of both groups (i.e., the case on predicted shame).

Longitudinal associations between moral emotions and psychosocial functioning

Table 4 shows the fixed and random effects of the best-fitting models for predicting the longitudinal changes in the psychosocial functioning of DHH and TH children.

For the development of internalizing behaviors, the best-fitting model that had the lowest -2LL (-111.2) was with the fixed effects of group (b = -0.07, beta = -0.07, t = -3.10, p = 0.002) and guilt-mean (b = -0.09, beta = -0.07, t = -3.19, p = 0.002). This result indicated that internalizing problems remained stable over time. Overall, DHH preschoolers displayed lower levels of internalizing problems than TH peers; more guilt contributed to predicting fewer internalizing behaviors over time in both DHH and TH preschoolers.

As for the development of externalizing behaviors, the best-fitting model which had the lowest -2LL (213.9) was with fixed effects of age (b = -0.005, beta = -0.15, t = -4.05, p < 0.001), shame-mean (b = 0.30, beta = 0.25, t = 6.20, p < 0.001), guilt-mean (b = -0.12, beta = -0.09, t = -2.23, p = 0.03), and shame-change (b = 0.16, beta = 0.08, t = 2.50, p = 0.01). This result showed that externalizing behaviors decreased over time in both DHH and TH preschoolers; more shame, less guilt, or an increase of shame, can contribute to predicting more externalizing behaviors over time in both TH and DHH preschoolers.

For the development of social competence, the best-fitting model which had the lowest -2LL (10.4) included the fixed effects of age (b = 0.004, beta = 0.12, t = 4.23, p < 0.001), group (b = -0.16, beta = -0.05, t = -1.77, p = 0.07), shame-mean (b = -0.17, beta = -0.07, t = -2.40, p = 0.02), guilt-mean (b = 0.32, beta = 0.24, t = 6.94, p < 0.001), pride-mean (b = 0.20, beta= 0.13, t = 3.77, p < 0.001), guilt-change (b = 0.19, beta = 0.10, t = 3.75, p < 0.001), pride-change (b = 0.23, beta = 0.09, t = 3.60, p < 0.001), and

the interaction between group and shame-mean (b = 0.18, beta = 0.15, t = 2.48, p = 0.02). The result indicated that children's social competence increased during preschool years; more guilt and more pride contributed to predicting better social competence over time in DHH and TH children; an increase of guilt and pride contributed to predicting better social competence among TH and DHH preschool children. As for the interaction effect of shame-mean and group, post-hoc analyses revealed that the level of shame was negatively associated with social competence over time in only TH preschoolers (b = -0.17, beta = -0.13, t = -3.35, p = 0.001), whereas the effect was not significant in DHH preschoolers (b = 0.01, beta = 0.01, t = 0.22, p = 0.82).

DISCUSSION

Moral emotions are crucial to children's social-emotional development. However, the development of moral emotions is under-studied for young children with hearing loss. This longitudinal research is amongst the first to investigate the development of shame, guilt, pride, and their associations with psychosocial functioning in DHH preschoolers, based on parent evaluations. Overall, our findings of guilt and pride are in line with the literature, whereas there were some unexpected findings of shame. First, as expected, DHH children exhibited lower levels of guilt and pride than TH children, and the two groups did not differ in the pace of development of guilt and pride, which increased over time in all children. Furthermore, as expected, the manifestations of guilt and pride were associated with better development of psychosocial functioning in all preschool children. Regarding shame, although the literature showed less manifestation of shame in DHH children than in TH children, we did not find any group difference. Whereas prior studies indicated that shame remained stable in early childhood (Ross, 2017; Sette et al., 2019; Li et al., 2021), we found an increase in shame over time in both DHH and TH preschoolers. In addition, although shame was negatively associated with children's

social competence, this association was found in only TH children. Below we discuss our findings in detail.

Firstly, our study contributes supporting evidence for the socially adaptive role of guilt and pride in fostering children's psychosocial development (e.g., Broekhof et al., 2018; Ketelaar et al., 2015). Importantly, our findings highlight that guilt and pride held equal significance for TH and DHH children regarding their psychosocial functioning. However, our study also confirmed previous findings that DHH children may encounter greater challenges in developing these moral emotions. Taken together, our findings underscore the importance of creating an inclusive environment for DHH children that supports their development of moral emotions.

Secondly, prior studies suggested that DHH children exhibited less shame than their TH peers (Broekhof et al., 2020; Ketelaar et al., 2015) and that shame remained relatively stable in early childhood (Li et al., 2021; Ongley & Malti, 2014). However, our study found similar levels of shame in DHH and TH children, with shame increasing over time in both groups. This seems to indicate a more prominent development of shame in our sample. It is important to note that our sample consists of Chinese children, whereas the abovementioned studies on children's development of moral emotions were conducted in Western societies. In many Western cultures, shame is considered as detrimental to an individual's self-image (e.g., Gruenewald et al., 2004; Tracy & Robins, 2004). However, in typical East-Asian cultures including the Chinese culture, shame is considered to serve an adaptive function in certain contexts, including inducing self-reflection and keeping one's behaviors aligned with the social norms (e.g., Bagozzi et al., 2003; Heine, 2002; Wang et al., 2020). Collectivistic cultural values in East Asia more strongly prioritize group values over personal desires and interests (Hofstede, 1980; Triandis, 1993), hence potentially leading individuals to experience

higher social pressure or motivation to feel shame for inappropriate social behaviors, as compared to Western individuals (Stadter & Jun, 2020; Tracy et al., 2007). Moreover, parents in East-Asian societies often use shaming as a parenting strategy to regulate children's behaviors. This could contribute to a high proneness to shame in East-Asian children at a young age (Tsai, 2007). The relatively more positive view on shame in East-Asian cultures might explain the increasing trend of shame observed in our sample. Noteworthily, our findings suggest that Chinese DHH preschoolers might have learned this cultural norm to a similar extent as their TH peers, thus showing no difference in the level or the developmental trend of shame from their TH peers. Future research could further examine these assumptions by conducting comparative studies across different cultures.

Thirdly, another unexpected finding regarding shame is that more manifestations of shame contributed to lower levels of social competence in TH preschoolers, whereas no such association was found in DHH preschoolers. Although feeling shame at an appropriate level can help children regulate their behaviors, experiencing it frequently and intensively may disrupt and jeopardize their interpersonal interactions, because a high propensity to feel shame typically implies that the ashamed individual encounters obstacles in fitting into the social world and exhibits low social adaptability (Ferguson et al., 1999; Tracy & Robins, 2004). This negative impact could be more salient for TH children compared to DHH children because TH children generally have more opportunities to participate in social interactions. In contrast, DHH children might have fewer opportunities for social interactions, and thus the influence of shame experience and manifestations might be less pronounced in shaping their social images or defining their social relationships (Calderon & Greenberg, 2011; Netten et al, 2015).

Limitations and Future Directions

The present study provided new insights into the early development of moral emotions among DHH preschool children and broadened our horizon by providing information on a non-Western (Eastern Asian) sample. Nonetheless, the limitations should be noted. Firstly, the attrition rate of our sample was higher than expected. As mentioned, whereas data with a 50% attrition rate are generally considered as acceptable for analysis, lower attrition rates, ideally below 30%, are preferable for LMM estimations (Gustavson et al., 2012; Pan & Zhan, 2020). Although LMMs are recommended for handling data with attrition, it is important to acknowledge that biases in the estimation could still exist, as children who dropped out at the second time point differed from those who stayed in guilt, internalizing behaviors, and social competence. Conducting future replication studies with a lower attrition rate could provide insights into the potential impact of the data loss on the study outcomes. Second, we solely relied on parent questionnaires as the measurement tool. This may elevate the risk of common method bias (Podsakoff et al., 2003). Future studies could apply a multi-method/multi-informant design, for example using behavioral tasks, field observations, or neuroscientific approaches, to deepen our understanding of young children's moral development. Examining the extent to which parent reports correspond to children's actual behaviors could also help us understand how to reliably measure moral emotions among young children. Third, our sample comprised DHH preschoolers who utilized hearing intervention devices and were receiving early intervention at a rehabilitation center (CRRCHSI) in Beijing. Although the average socioeconomic status of our sample (e.g., the parental education level, annual household income) was comparable to the national average level of China (Akimov et al., 2021), it is important to recognize that our sample may not represent the entire population of Chinese DHH preschoolers

due to China's vast geographic and socioeconomic diversity. Thus, caution is warranted when generalizing our findings to other groups of DHH children. Future studies are recommended to use larger samples involving participants recruited in different regions, to improve their external validity. Especially, the majority of the DHH children in this study had severe-to-profound hearing loss and received a cochlear implant. More attention shall be paid to children with mild-to-moderate hearing loss, and those who do not receive a cochlear implant, as the needs of these children are even less understood and may encounter more problems in accessing the social world.

CONCLUSION

This longitudinal study revealed that similar to TH children, moral emotions play an equally crucial role in influencing the psychosocial development of DHH children. However, consistent with previous research, our findings indicate that DHH children face greater challenges in developing moral emotions, particularly guilt and pride, which play an adaptive role in fostering positive psychosocial development. These challenges were already present in the preschool age and persistent over time. This underscores the importance of establishing an inclusive social learning environment where DHH children can receive the same level of support as their TH peers for developing their moral emotions. Additionally, our study suggests that culture could influence children's experiences and development of shame. Future research should adopt a more nuanced approach to explore the potential impact of culture and its interaction with children's hearing status in shaping their development of moral emotions.

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Chapter 4

Validation of the Chinese Empathy Questionnaire for Pre-School Children

Li, Z., Li, B., Tsou, Y. T., & Rieffe, C. (2024). Validation of the Chinese Empathy Questionnaire for Pre-school Children. *Early Education and Development,* 1-16. https://doi.org/10.1080/10409289.2024.2372938

Abstract

Research Findings: Empathy plays an important role in children's early social-emotional development. However, there are not many instruments available for measuring the different aspects/levels of empathy in preschool children. Moreover, few studies examined the validity of the existing measures for empathy in Chinese children. The present study tested the Chinese version of the Empathy Questionnaire (EmQue) on a group of Chinese preschool children (N = 182) aged from 2 to 6 years. The Chinese EmQue is a parent report translated from Dutch that assesses the behavioral manifestations of three distinct levels of empathy: emotion contagion, attention to others' feelings, and prosocial behaviors among preschool children. Confirmatory factor analysis showed satisfactory goodness-of-fit indexes for a three-level structure with 19 loading items. The results of concurrent validity showed that the three levels of empathy were functioning differently in early social-emotional development. *Practice or Policy:* We could conclude that the 19-item Chinese EmQue is a valid, reliable instrument for measuring empathy in 2- to 6-year-old children in the Chinese context.

Key Words Empathy; Preschool age; Validation; Chinese children

INTRODUCTION

Empathy serves an important function in navigating daily social life, as it plays a key role in guiding interpersonal interactions, facilitating in-group behaviors, strengthening social bonds. Importantly, empathy, i.e., feeling and caring for another person's emotional response in a given situation, motivates people to care for one another and to focus on another person's needs, thereby temporarily overcoming one's own idiosyncratic needs and desires (De Waal, 2008; Decety & Jackson, 2006). The earliest signs of empathy can be already witnessed in infants, emphasizing that the capacity for empathy is innate and can be observed in children across different cultures (De Waal, 2008; Tong et al., 2012).

However, to date, research measuring empathy is mostly based on Western samples, and with participants of older ages (e.g., late childhood, adolescence, and adulthood), while this topic has rarely been discussed among young children from East-Asian countries. Moreover, current research conducted in East-Asian countries mostly operationalized empathy as a unidimensional construct, whereas empathy is perceived as a complex construct consisting of several distinct levels (i.e. emotional contagion, attention to others' emotions, understanding others' emotions, and prosocial behaviors; e.g., Hoffman, 1987; Rieffe et al, 2010).

It is important to identify these levels separately in young Chinese children, as these levels may mature differently through development (see explanation below), and the development of these distinct levels of empathy has been shown to relate to various

domains of social-emotional functioning, such as better developed social competence, and lower risks of developing externalizing behaviors (e.g., Neumann, et al., 2016; Noten et al., 2019), according to Western studies. Recent studies among Chinese preschool children showed similar results of empathy (as a unidimensional construct): higher levels were associated positively with children's sociability, emotion regulation, whereas negatively with their peer problems, internalizing or externalizing behavioral symptoms (e.g. Lin et al., 2023; Qian et al., 2021; Wu et al., 2018). Yet, how separate levels of empathy are related to social-emotional functioning in Chinese preschoolers remains unknown.

To fill these gaps, the present study aims to translate and validate a parent report that was specially designed for assessing three different levels of empathy in preschool children, the Empathy Questionnaire (EmQue, Rieffe et al., 2010; Dutch in origin), in a sample of Chinese preschool children aged 2 to 6 years. This questionnaire has already been translated and validated in four other languages, and the validation studies confirmed its factor structure and showed good psychometric properties for the separate (sub-)scales (Grazzani et al., 2017; Takamatsu et al., 2021; Lucas-Monlina et al., 2018; Da Silva, et al., 2022). The theoretical as well as practical meanings of validating the EmQue will be discussed below.

Empathy in Preschool Children

Hoffman (1987) proposed a multilevel model of how empathy develops during early childhood, where each of the levels builds upon the former. "Emotion contagion",

referred to also as "affective empathy" (Rieffe et al., 2010), is the first level, representing the extent to which an individual can be emotionally affected via perceiving others' emotional expressions or behaviors (e.g., Noten et al., 2019; Pouw et al., 2013). For instance, when one infant bursts out crying, other nearby infants may follow spontaneously. Emotion contagion was described by De Waal (2008) as an innate, hard-wired, core mechanism of empathy. It is supposed to be the trigger for "feeling what the other feels", to create an emotional bond between two individuals, stimulating interpersonal closeness, and thus feeding into social competence over time (Eisenberg et al., 2010). Yet, excessive levels of emotion contagion may lead to more internalizing behaviors, such as anxiety and depression (Geng et al., 2012; Rieffe et al., 2010; Yan, et al., 2021), as empathizing with others' negative emotions can also be overwhelming and disturbing for young children.

The second level of empathy, "attention to others' feelings", emerges at around the second year. Hoffman (1987) argued that when toddlers have acquired a basic sense of self-awareness, they undergo the "separation-individuation" process through which they identify their core self as separated from others. The awareness that the arousal they experience when they empathize with others is but a reflection of the arousal in someone else, helps them to be less overwhelmed by the intensity caused by others' emotions and enables them to pay more attention to interpersonal interactions in social life (Decety, 2011). Besides, children need to have a basic level of self-control/emotion regulation to temporarily overrule their instinctive, idiosyncratic desires to focus on others' internal states and to serve others' needs (Rodríguez et al., 2020). The change

of perspective to locate the source of emotional arousal is such a developmental milestone: it marks the shift of attention from the self and inner feelings to the social world, allowing further social learning and socialization processes to take place.

The shift in attention from self-focused to other-focused is an important step towards acting prosocially to relieve other's distress (i.e., "prosocial behaviors"), which is the third level of empathy. To initiate prosocial behaviors, first, children need to attend to the person in distress rather than being immersed in their own emotional arousal. Second, understanding another person's emotional states and needs is crucial for initiating prosocial behaviors. As argued by Hoffman (1987), although toddlers have the motivation to subside the impact of negative emotions on others, they often confuse their own needs with other people's needs, and thus, for example, offering candies to a crying adult. As children grow older, along with enhanced emotion regulation and perspective-taking abilities, children's prosocial actions increase in both quality and quantity (Flook et al., 2019, Li et al., 2020; Tsou et al., 2021).

Empathy Measurement in China

To the best of our knowledge, there is currently no parent questionnaire designed to measure the multi-component nature of empathy in Chinese preschool-aged children. Although some widely used self-report questionnaires have been validated to assess empathy in Chinese school-aged children, including the "Interpersonal Reactivity Index" (IRI, Siu & Shek, 2005), the "Jefferson Scale of Empathy" (JSE, Yi et al., 2020; Huang et al., 2019), the "Basic Empathy Scale" (BES, Geng et al., 2012),

and the "Empathy Quotient" (EQ, Guan, et al., 2012; Zhao et al., 2018), the inclusion of a scale focused on understanding others' emotions (perspective taking) makes them unsuitable for toddlers and preschoolers, who cannot yet acknowledge others' perspectives due to the different stages in their Theory-of-Mind development (Broekhof et al., 2015).

To date, parent reports used in Chinese preschoolers measured empathy as a one-dimensional construct (e.g., Lin et al., 2023; Qian et al., 2021; Wu et al., 2018). In other studies, observational tasks were employed (e.g., Huang et al., 2017; Roberts & Strayer, 1996). Both methodologies cannot capture the nuanced developmental characteristics of distinct empathy components in preschoolers. Drawing on prior research conducted with Western children, it has been observed that emotion contagion tends to decrease over time in early childhood, while attention to another's emotions and prosocial behaviors tends to increase with age (e.g., Rieffe et al., 2010; Tsou et al., 2021). By validating the EmQue, a parent report that gauges the three essential components of empathy in toddlers and preschoolers, we provide a valuable instrument for understanding the intricate development of empathy among Chinese preschool-aged children.

Furthermore, our understanding of empathy in preschool years has stemmed primarily from observations of Western children. Yet, cross-cultural studies on empathy in adults have revealed distinctions in the experience and expression of empathy between Western and East-Asian individuals: East-Asian individuals experience higher levels of personal distress when witnessing someone in distress, as compared to their

Western counterparts (Atkins et al., 2016). This variance can be attributed to the cultural emphasis on group harmony in many East-Asian societies, where expressions of negative emotions are viewed as disruptive or socially inappropriate – thus East-Asian children might have fewer opportunities to practice coping with negative emotions, in responding to others' negative emotions or in regulating their own (Matsumoto et al., 2008). Consequently, East-Asian individuals can be more alerted to and be more heavily affected by others' expressions of negative emotions (Markus & Kitayama, 1991).

In fact, at the social level, individuals in collectivistic cultures (common in East-Asian societies) might exhibit a higher frequency/intensity of attention to interpersonal relationships, which increases distress levels; whereas those in individualistic cultures (common in Western societies) would focus more on their feelings and needs, lowering the risk of developing emotional disorders (Hofstede, 1980; Markus & Kitayama, 1991). Validating the EmQue in Chinese preschoolers may provide a useful tool for conducting cross-cultural investigations, and contribute to new insights on the cultural variance of empathy development.

Present Study

The present study aimed to validate a Chinese version of the Empathy Questionnaire (EmQue; Rieffe et al., 2010, Appendix Table A) in a sample of Chinese preschool children. The EmQue is a Dutch-originated parent report comprising three scales: "Emotion Contagion", "Attention to Others' Feelings", and "Prosocial Behaviors" that

correspond to the first three levels of Hoffman's (1987) model. It has been used in cross-sectional and longitudinal research on social-emotional functioning and development, and in preschoolers who are autistic or deaf and hard-of-hearing (Li et al., 2023; Netten et al., 2015). Thus far, the EmQue has been translated and validated in four other languages in Italian, Japanese, Spanish, and Portuguese preschoolers (respectively, Grazzani et al., 2016; Takamatsu et al., 2021; Lucas-Monlina et al., 2018; Da Silva, et al., 2022). The studies demonstrated robust psychometric properties of the three levels of empathy across different languages and cultures, although slightly different numbers of items were removed from the original version (20 items) to form a shorter version of the EmQue (the 13-item version was validated in Italian, Japanese, and Spanish; the 15-item version was validated in Portuguese; see Appendix Table A for an overview). Validating a Chinese EmQue would further our understanding of the nuances in empathy development and facilitate cross-cultural investigation.

First, we assessed the construct validity by examining the model fit of the 3-factor structure in the confirmatory factor analysis (CFA) (i.e., Emotion Contagion, Attention to Others' Feelings, Prosocial Behavior). Additionally, we also tested the fit of the short version EmQue (13 items) previously validated in different languages (i.e., Italian,, Japanese, and Spanish; Grazzani et al., 2017; Takamatsu et al., 2021; Lucas-Molina et al., 2018), and compared it to our final model derived from the CFA. Second, we examined the internal consistencies of the three scales. Third, we investigated concurrent validity by examining the correlations between the EmQue scales and the variables of social-emotional functioning (internalizing behaviors, externalizing

behaviors, and social competence). Based on prior studies, we expected Emotion Contagion to correlate positively to internalizing behaviors and social competence (Noten et al., 2019; Pouw, et al, 2013; Yan et al., 2021), while negatively to externalizing behaviors (Tampke, et al., 2019; Yan et al., 2021). We expected Attention to Others' Feelings and Prosocial Behaviors to correlate positively to social competence, whereas negatively to externalizing behaviors (Bandstra et al., 2011; Da Silva et al., 2022). Prosocial Behaviors were expected to also correlate negatively to internalizing behaviors (Donohue et al., 2020; Huber et al., 2019; Salerni & Caprin, 2022).

METHOD

Participants

This study is part of a larger-scaled longitudinal research project on the moral development of preschoolers in China. 182 preschoolers (age range: from 24 to 72 months, mean age = 52.3 months, SD_{age} = 12.2 months) along with their caregivers participated in the research. This validation study is part of a larger project containing two validation studies, and to date, one study has been published using data from this sample. Further information on the demographic characteristics of our sample is provided in that publication (Li et al., 2023).

Participants were recruited from two public kindergartens in Jiangsu province, China. Each kindergarten had three classes from three different grades, thus in total six classes. Both kindergartens and their six classes agreed to participate in this research. First, we explained to the teachers the inclusion criterion of participants: participants

should not have any clinical diagnoses, such as autism spectrum disorder or attention-deficit hyperactivity disorder. Furthermore, we explained in detail the aim of our study, the execution plan, the privacy policy, and the voluntary nature of participation. Before the data collection, caregivers received information about the project and an informed consent form on which they could indicate if they approved for their child to participate. After our researchers verified the informed consent, the questionnaires were distributed by the teachers to the children included in the study, delivered to the caregivers, and brought back upon completion. Formal approval of this study was acquired from both the kindergartens and the Ethical Committee of Leiden University.

Measures

Sum scores for all scales involve the mean score based on the total number of items per scale. Internal consistencies of the scales were adequate to good (Table 1).

Table 1. The Descriptive Statistics, Internal consistencies of the study variables

Factors	Number of items	Mean (SD)	Cronbach alpha	Inter-item correlation	Composite reliability
EmQue Scales					
Emotional Contagion	6	1.49 (.41)	.70	.28	.72
Attention to Others' Feelings	7	2.34 (.36)	.67	.23	.63
Prosocial Behaviors	6	2.14 (.46)	.76	.35	.83
Social-Emotional Indexes					
Internalizing Behaviors	25	1.46 (.27)	.73	.27	.94
Externalizing Behaviors	18	1.31 (.25)	.87	.31	.83
Social Competence	10	2.37 (.38)	.69	.22	.76

The Empathy Questionnaire (EmQue, Appendix Table A). EmQue is a parental report

that aims at assessing empathetic behaviors in young children. The original EmQue was designed by Rieffe et al., (2010) in Dutch language consisting of 20 items. According to the validation of Rieffe et al., (2010), one item (item 19, Appendix Table A) was removed, leading to a 19-item Dutch version of EmQue. The 20-item version was also validated in Italian (Grazzani et al., 2017), Japanese (Takamatsu et al., 2021), and Spanish (Lucas-Monlina et al., 2018) and that have formed a new, 13-item version. It was also validated in Portuguese recently suggesting a new 15-item version (Da Silva, et al., 2022). Notably, all of the existing versions of EmQue had the same 3-factor structure, measuring Emotional Contagion, Attention to Others' Feelings, and Prosocial Behaviors for empathy. In the scales, respondents were asked to rate the degree to which each item represents their child's behaviors over the past two months on a 3-point scale (0 = never, 1 = sometimes, 2 = often). Higher scores indicate a higher tendency for their children to perform the behaviors described by the items. Respondents were recommended to answer to all items, even if the items did not apply to them.

Internalizing and Externalizing Behaviors. The Early Childhood Inventory 4th edition parent checklist (ECI-4; Sprafkin et al., 2002) was deployed to evaluate the severity of internalizing and externalizing behavioral problems. This questionnaire consists of 9 scales and 108 items, screening for 15 distinct emotional/behavioral disorders of preschoolers. The caregivers were asked to rate how each item represented their child's behaviors in the last two months on a 4-point scale (0 = never, 1 = sometimes, 2 = often, 3 = very often), with higher scores indicating more severe behavioral problems.

To embody the purpose of this study, we merged scales within the domain of

internalizing and externalizing symptoms to measure the two broadband categories of behavioral problems (Ketelaar et al., 2017; Li et al., 2020). For the assessment of "Internalizing Behaviors", we combined four scales: "Major Depressive Disorder" (10 items, e.g., "Always feeling tired for no particular reason", "Being too shy in front of their peers"), "Separation Anxiety" scale (8 items, e.g., "Having nightmares about being separated from parents", "Cannot fall asleep without parents staying around"), "Social Phobia" (3 items, e.g., "Wet the bed at night"), and "Generalized Anxiety" (4 items, e.g., "Cannot get rid of worrying thoughts"). A higher score indicates more internalizing symptoms.

For the assessment of "Externalizing Behaviors", we combined the two scales "Conduct Disorder" (10 items, e.g., "steal from others", "physically hurting others"), and "Oppositional Defiant Disorder" (8 items, e.g., "arguing with adults", "blame others when making mistakes"). A higher score indicates more externalizing symptoms.

Social Competence. The Chinese version of the Strengths and Difficulties Questionnaire (Chinese SDQ; Lai et al., 2010) was used to assess social competence. The questionnaire consists of five scales (each scale has five items), evaluating five aspects of children's social-emotional functioning. The caregivers were asked to rate to what extent their child manifested each behavior/symptom in the past two months on a 3-point scale (0 = not true, 1= somewhat true, 2 = certainly true). Following Ketelaar et al. (2017), we merged two scales to assess children's social competence: the "Peer Relation" scale (e.g., "Rather solitary, tends to play alone", "Picked on or bullied by other children"), and the "Prosocial Behavior" scale (e.g., "Kind to younger children",

"Helpful if someone is hurt, upset or feeling ill"). Negatively formulated items were reversedly coded. A higher score indicates a higher level of social competence.

Translation and Task Procedures

As there were no Chinese versions of the EmQue and the ECI-4, a back-translation procedure was performed to translate the two questionnaires (Brislin et al., 1973). First, the EmQue and ECI-4 were translated from English to Chinese by two researchers in our lab who are fluent in English/Chinese. Next, other researchers translated the two questionnaires from Chinese back to English. The back-translations were checked for language consistency as compared to the original questionnaires. Disagreement was resolved through discussion. Finally, the research team checked and approved the translations.

Statistical analyses

The construct validity of the Chinese EmQue was evaluated via confirmatory factor analysis[1] (CFA) (Jackson et al., 2009). We started with the 20-item Dutch EmQue (Rieffe, et al., 2010). Several models were sequentially tested, on the three-factor construct (Emotional Contagion, Attention to Others' Feelings, Prosocial Behaviors). Given the ordinal nature of three-point scales, we used the Weighted Least-Squares

[1] An exploratory factor analysis (EFA) was initially conducted in a pilot trial, and the 3-factor model was shown as appropriate according to the eigenvalue and scree-plot. Given that our aim was to confirm the 3-factor model in a Chinese sample, and that conducting EFA and CFA on the same sample could increase the risk of overfitting (Fokkema & Greiff, 2017; Whittaker & Worthington, 2016), in this study we only conducted the CFA as the formal analysis.

Means and Variance adjusted (WLSMV), which was considered a more adaptable estimator (Bandalos, 2014) to examine construct validity and measurement invariance. A set of absolute and relative fit indices were used to evaluate if our model fit was sufficient: the normed chi-square ($\chi 2$) < 3.0 and $\chi 2/df$ < 2.0 (Brown, 2014), the comparative fit index (CFI) > .90, the Root-Mean-Square Error of Approximation (RMSEA) < .08, the standardized root mean square residual (SRMR) < .08 (Hu & Bentler, 1999), on condition with the null model RMSEA > .158 (Kenny et al., 2015). Besides, the modification indices (MI) > 10 were used as the criterion to evaluate if any item was loaded on a non-target scale (Whittaker, 2012).

For internal consistencies, we assessed Cronbach's alphas, inter-item correlations, and composite reliabilities. A Cronbach's alpha value above .70 was deemed adequate (Ponterotto & Ruckdeschel, 2007). Inter-item correlations ranged [.30, .50] indicate consistency of the items within one scale. A scale could be too homogenous when this value was higher than .50. For composite reliabilities, a value higher than .70 was deemed sufficient; however, a value higher than .95 may indicate high homogeneity of items within a scale (Bacon et al., 1995).

Moreover, we assessed the concurrent validity of the three EmQue scales by checking their correlations with three social-emotional indices: Externalizing Behaviors, Internalizing Behaviors, and Social Competence. Given the ordinal nature of our data, partial Spearman's rank-order correlations were preferred over Pearson's correlations, and the age factor was controlled for. Also, when the EmQue scales were inter-correlated, they were controlled for too. Bonferroni corrections were used as our

adjustment method in the multiple testing.

Additionally, we assessed measurement invariance of the EmQue scales across gender and age groups (as 54 months was the median age, we compared two groups: < 54 months vs. ≥ 54 months) through multigroup CFAs. Following Brown's (2014) standard procedure, three measurement invariance hypotheses: configural, metric, and scalar, were tested sequentially. Equivalence of item factor loadings and intercepts were examined across the target groups. Partial invariance was achieved by freeing invariant items on the condition that full metric or scalar invariance was not achieved (Byrne et al., 1989). The criteria for the invariance were: the change value of CFI (ΔCFI) < .01; the change value of RMSEA (ΔRMSEA) < .015; and the change value of SRMR (ΔSRMR) < .030 (Chen, 2007). Items can be freed based on the univariate MI and the Lagrange multiplier test. Group differences were checked if > 50% of the items of one scale were invariant (Martín-Puga et al., 2022).

The CFAs and measurement invariance tests were carried out using the *Lavaan* package (Rosseel, 2012) on the platform of R version 4.0.5 (R Core Team, 2022). The calculations of Cronbach's alphas, inter-item correlations, and partial Spearman's correlations were performed in SPSS 24.0 (IBM, 2016). Composite reliabilities were computed by using the values of factor loadings acquired in the CFAs.

Missing Data Analysis

Out of the 186 responses we received, four had missing values larger than 10% and thus were removed from further analyses. The remaining responses had less than 0.5%

missing values and were included in the final analyses. The MCAR test suggested the missing pattern was random (Little, 2013). Listwise deletion was used to remove the missing values.

RESULTS

Construct validity

Table 2 shows the fit indices of the models tested successively. Model 1 was the original 20-item Dutch model (Rieffe et al., 2010), the starting point of the analysis. This baseline model showed an acceptable model fit. Yet, item 19 had a low factor loading of .18 (< .30) on its target scale (Emotion Contagion) and thus was removed from the analysis, leading to Model 2. The fit indices of Model 2 revealed an improvement: χ^2 = 167.37, df =107, CFI = .926, TLI = .910, RMSEA = .53, while the null model RMSEA = .173 (>.158). Furthermore, we examined the factor loadings, MI, SEPC, and inter-factor correlations, and no significant unfitness was observed. Hence, Model 2 was accepted as the final model. Additionally, we tested also the 13-item version, as suggested by the Italian, Japanese, and Spanish versions (Grazzani et al., 2017; Takamatsu et al., 2021; Lucas-Molina et al., 2018). The results showed an adequate model fit (Table 2).

Table 2. Fit indices for the model testing of the EmQue

Model	χ2	df	RMSEA [90% CI]	Null RMSEA	CFI	TLI	SRMR
Model1	248.82	167	.052 [.038, .065]	.161	.921	.910	.083
Model2	224.81	149	.053 [.038, .067]	.173	.926	.915	.083
13-item	79.83	62	.040 [.013, .063]	.205	.970	.962	.070

Notes: RMSEA [90% CI] = root-mean-square error of approximation [lower, upper limits, 90% Confidence Interval]; Null RMSEA = the baseline model RMSEA; CFI = comparative fit index; TFI = Tucker-Lewis Index; SRMR = standardized root mean square residual.
Model 1 = original design of the questionnaire which consists of 20 items (our starting point);
Model 2 = the final model, item 19 (from Emotional Contagion) was deleted based on Model 1;
Model 3 = the Italian model of 13 items tested additionally as a comparison to the final 19-item model.

Measurement Invariance Across Gender

Based on our final model, first, the configural model showed an adequate fit (see Table 3). The metric invariance examination revealed a significant change in the fit indices (ΔCFI= −.030; ΔRMSEA = .022; ΔSRMR = .007). Partial metric invariance was thus tested by freeing the equivalence constraint of item 14 (from Prosocial Behavior) and item 16 (from Emotional Contagion) and was found tenable (ΔCFI = -.009; ΔRMSEA = .010; ΔSRMR = .004), so the item loadings except for items 14 and 16 were invariant across gender groups. Later, testing scalar invariance revealed an insignificant change of the fit indices (ΔCFI = .004; ΔRMSEA = -.005; ΔSRMR = .002), confirming the scalar invariance hypothesis of equivalent intercepts. Given ≥ 50% of the items of each scale being invariant, the EmQue scores were comparable across genders. Independent t-tests revealed no gender differences in the three EmQue factors, ts < 1.42, ps > .157.

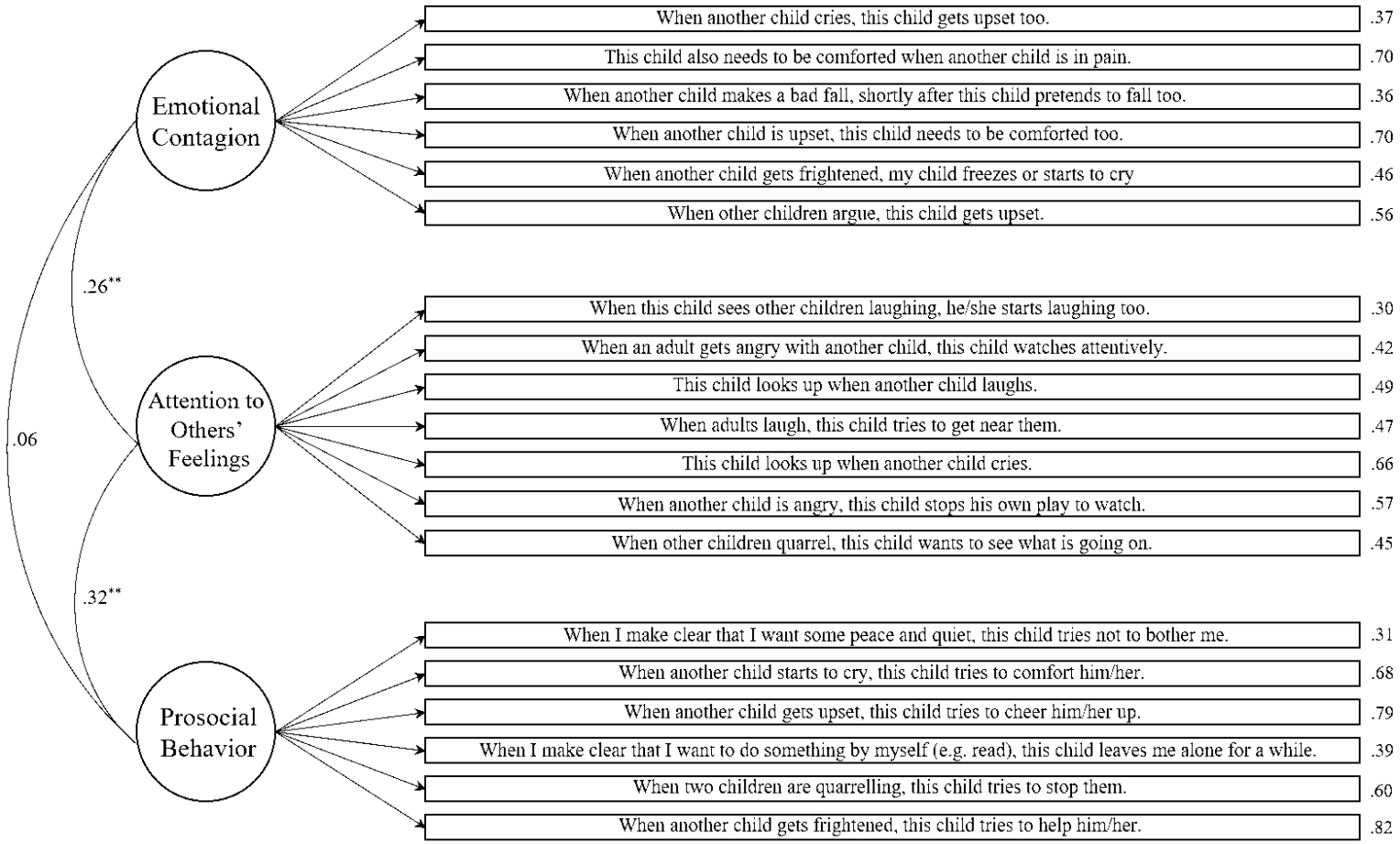

Figure 1. CFA of the three-factor structure of the Chinese EmQue

Table 3. Fit Indices of the Invariance Examinations Across Gender, Age Groups (half of participants <54 months; the other half ⩾54 month).

	χ2	df	CFI	RMSEA [90% CI]	SRMR	ΔCFI	ΔRMSEA	ΔSRMR
Gender								
Configural	303.97	298	.994	.015 [0, .044]	.091			
Metric	351.46	314	.964	.037 [0, .056]	.098	-.030	.022	.007
Partial Metric	328.89	312	.985	.025 [0, .048]	.095	-.009	.010	.004
Scalar	339.26	328	.989	.020 [0, .045]	.097	.004	-.005	.002
Age group								
Configural	343.50	298	.956	.041 [.012, .060]	.096			
Metric	389.03	314	.928	.052 [.032, .068]	.102	-.028	.011	.006
Partial Metric	367.52	311	.946	.045 [.021, .063]	.099	-.010	-.007	.003
Scalar	384.03	327	.945	.044 [.021, .061]	.101	-.001	-.001	.002

Note: CFI: comparative fit index; RMSEA: root mean square error of approximation; CI: confidence interval; SRMR: standardized root mean square residual. N=182. *p<0.05

[a] An equality constraint on the factor loadings of Item 14 and item 16 was freed from the model;

[b] Equality constraints on the factor loadings of Items 12, item 16 and 20 were freed from the model.

Measurement Invariance Across Age

We first divided our sample (by medium age) into two equal groups: one < 54 months, and the other ≥ 54 months. The configural model showed a good fit (see Table 3). The test of the metric invariance revealed a significant change in the fit indices (ΔCFI = −.028; ΔRMSEA = .011; ΔSRMR = .006). Thus, partial metric invariance was tested by freeing the equivalence constraint on items 12 and 20 (both from Attention to Others' Feelings) and item 16 (from Emotional Contagion), then a nonsignificant change was observed (ΔCFI = -.010; ΔRMSEA = -.007; ΔSRMR = .003), indicating that the factor loadings besides items 12, 16 and 20 were invariant across age groups. Next, testing scalar invariance revealed a nonsignificant change (ΔCFI = -.001; ΔRMSEA =-.001; ΔSRMR = .002), indicating equivalent intercepts across age groups. Independent t-

tests showed an age difference for Prosocial Behavior: Prosocial $_{elder}$ = 2.28 > Prosocial $_{younger}$ = 2.00, t(179) = 4.807, p < .001, but not for Emotional Contagion or Attention to Others' Feelings, ts < -.50, p > .453.

Internal Consistency

Internal consistencies were from acceptable to good. For the three EmQue scales, Cronbach Alpha's varied from 0.67 to 0.76; inter-item correlations varied from 0.23 to 0.35; composite reliabilities varied from 0.63 to 0.83, respectively (Table 1).

Table 4. Spearman's correlations between the MEQ scales and the concurrent indices

	Concurrent Indices: Social-Emotional Functioning		
	Internalizing Behaviors	Externalizing Behaviors	Social Competence
Emotion Contagion	.20**	.01	-.39***
Attention to Others'Feelings	.29***	.09	.22**
Prosocial Behaviors	-.25**	-.17***	.39***

Note. The significance level is adjusted with Bonferroni correction to $p \leq \alpha/3 = .017$. * p (one-tailed) ≤ .017. ** p (one-tailed) ≤ .010. *** p (one-tailed) ≤ .001.

Concurrent Validity

Table 4 presents the Spearman correlation coefficients of the EmQue scales with the indices of social-emotional functioning, age, and gender. After controlling for age and Attention to Others' Feelings, higher levels of Emotion Contagion were correlated with more Internalizing Behaviors and lower Social Competence; more Prosocial Behaviors were correlated with fewer Internalizing Behaviors and Externalizing Behaviors, and higher Social Competence. When controlling for age, Emotional Contagion, and Prosocial Behaviors, Attention to Others' Feelings were positively correlated to Internalizing Behaviors and Social Competence.

DISCUSSION

The present validation study provided support for a 19-item Chinese version of EmQue, thus replicating the results of the original Dutch EmQue (Rieffe, et al., 2010). The results of psychometric properties suggested a good construct validity, distinguishing between the three levels of empathy, i.e., Emotion Contagion, Attention to Others' Feelings, and Prosocial Behaviors in a sample of Chinese preschool children. Consistent with the Dutch EmQue, one item was removed from the 20-item version due to a low factor loading on its intended scale (item 19, "When another child cries, this child looks away"). The internal consistency within each scale was adequate. Also, partial measurement invariance was achieved when comparing across gender or age groups, meaning that the majority of the items of each scale were equivalent for young children of different ages and genders. Hence, the 19-item version of EmQue is reliable for measuring (multi-levels of) empathy in young boys and girls aged from 2 to 6 years old.

In addition, we assessed the 13-item model used in the Italian, Japanese, and Spanish versions of EmQue (Grazzani et al., 2017; Takamatsu et al., 2021; Lucas-Monlina et al., 2018). A comparable, yet not significantly higher, level of fit indices than the 19-item model was revealed. Thus in our case, we considered that the 19-item and 13-item models fit equally adequate in terms of the construct validity, while the 19-item version has the advantage of its breadth of valid items, and therefore is regarded as more informative, comprehensive, and capable of offering a good view for the topic.

Regarding concurrent validity, our hypotheses were partly confirmed by the results: as expected, the scale of Emotion Contagion was related to more internalizing behaviors; the scale of Attention to Others' Feelings was related to better social competence; and the scale of Prosocial Behaviors was related to fewer internalizing, externalizing behaviors, and better social competence. Yet, unexpected relations were also found for these scales: Emotion Contagion was related to lower social competence and Attention to Others' Feelings was related to more internalizing behaviors. Besides, the expected negative associations for Contagion and Attention to Others' Feelings with externalizing behaviors were not confirmed. Below we discuss the outcomes in greater detail.

As expected, emotion contagion was associated with more internalizing behaviors in Chinese preschool children (Rieffe et al., 2010). However, unexpectedly, it was associated also with lower levels of social competence. This finding may be explained by the cultural norm in East-Asian societies, which stresses that the expression of negative emotions is unwelcome (Tsai & Levenson, 1997). For Chinese children,, displaying personal distress and negative emotions in social settings may induce discomfort in others and disrupt interpersonal interactions, thus children manifesting too much emotion contagion can be perceived as being socially less competent and emotionally immature (Ip et al, 2021; Markus & Kitayama, 1991). Being overwhelmed by one's own arousal further hinders children from reacting empathically and socially adaptively toward others, which in the long run might compromise their development of social competence (Hamaidi et al., 2021; MacCormack et al., 2019;

Spinrad et al., 2006). In contrast, many Western cultures allow for more open expression of feelings, including negative emotions (Tsai & Levenson, 1997). In such a cultural context, expressing personal distress in an empathy-provoking situation may be viewed as showing an understanding of another person's plight, thereby enhancing social relationships.

Attention to others' feelings was related to better social competence, as expected. As suggested by Hoffman (1987), children switching their focus of attention from the self to others facilitates children's socialization. However, unexpectedly, attention to others' feelings was also associated with more internalizing behaviors. Possibly, cultural variance should be taken into account: for Western children, attending to others' emotions might yield social benefits by enhancing the understanding of someone else's inner mental state. Yet, this may have relatively little impact on their own inner feelings, given the prevalent independent self-image in Western cultures. In contrast, in an interdependent cultural context, such as in the Chinese context, where individuals prioritize collective values and group harmony, children may be more alerted by others' distress, which could bring social benefits (e.g., strengthens social bonds), but simultaneously impose costs to the self (Tsai et al., 2006). Prior research suggested that elevated attention to others' negative emotions may increase emotional arousal in preschool children (Tsotsi et al., 2021). Attending to another person's distress thus could induce high emotional arousal in Chinese children, potentially leading to anxiety and depressive mood (Atkins et al., 2016).

Whereas emotion contagion and attention to another's emotion showed a negative association with externalizing behaviors in Western children, such associations were not observed in Chinese preschoolers. This discrepancy might stem from the different coping mechanisms between Western and East-Asian children: even when they experience similar levels of emotional arousal in empathy-provoking situations, the resulting action tendencies can manifest in distinct ways. In the absence of good emotion regulation and a matured form of emotional understanding, Western preschool children tend to externalize their distress and frustration by venting out negative emotions, whereas Chinese preschool children internalize negative feelings and express their distress and frustration through manifestations of anxiety and depression (Atkins et al., 2016). This inclination is probably shaped by the internalization of cultural values of collectivism, as prioritizing group harmony is emphasized over personal expressions (Hofstede, 1980).

Overall, our study supports that the tri-dimensional construct of empathy exists cross-culturally, yet our findings also indicated nuanced distinctions in the specific functions of each empathy level, which may be shaped by the cultural contexts in which children are socialized. This underscores the need for validated instruments to measure empathy in children from diverse cultural backgrounds, which would enable researchers to further validate these assumptions made in this study.

Limitations and Future Directions

Validating a parent report to assess empathy in Chinese preschoolers is an important first step to studying empathy development in cross-cultural contexts. Yet limitations should be addressed. First, it is noteworthy that our sample size was relatively small, which could cause inaccuracy in our estimations of the psychometric properties of EmQue. For example, although our data distribution was close to symmetric (skewness was between -1 to 1), the standard errors can still be biased - approximately 10% larger than the standard error estimates of large samples (Bandalos, 2014; DiStefano & Morgan, 2014). The smaller sample size also prevented us from splitting the sample and respectively conducting an EFA and a CFA. Hence we highly recommend future validation studies to use larger-size (N > 500) samples to minimize the biases in estimations. With larger sample sizes, future studies could also conduct exploratory analyses and cross-validate the data to further understand how empathy can be assessed in preschool children. Second, our results of concurrent validity of empathy may indicate some degrees of cultural variances, yet we did not directly measure cultural identity or cultural cognition of participants in this study, thus cannot examine the latent culture effects on children's perception of empathy. Third, our participants were recruited from two public kindergartens in the Jiangsu province. Given that China is a large country with a diverse multiethnic, multi-subcultural composition, caution is warranted when applying the EmQue to assessing Chinese children of different demographic backgrounds. Nevertheless, we would like to mention that the social-economic characteristics of participants (e.g., parents' education level, net household income) was comparable to that of the general population in China (Akimov et al.,

2021). Fourth, another limitation of this study is that only parent questionnaires were included, which could create a response bias and contain the possibility of shared method variance. Future studies could apply a multi-method and multi-informant design, for example using tasks or playground observations, to further validate this questionnaire. Lastly, the correlational nature of this study does not allow for interpretations on the causality of concurrent relations we found. Longitudinal research may have an advantage in deepening our understanding of the developmental trajectories of empathy in young Chinese children.

Researchers and practitioners can assess preschool children's dispositional proneness to experience empathy by using this parent report. Notably, our findings revealed that greater empathic responses such as feeling and attending to others' emotions could induce more personal emotional arousal in Chinese preschoolers, which could further lead to lower social competence and increased internalizing behaviors. To better support these children, parents, teachers, and practitioners are recommended to provide these children with opportunities to learn how to cope with and communicate negative emotions. Yet, for the results to be informative to parents and teachers, a standardized norm needs to be established among Chinese children for this EmQue.

CONCLUSION

The outcomes of this validation study suggest that the 19-item Chinese version of the EmQue is suitable for assessing "the multilevel empathy" in Chinese preschool children utilizing a parent report. Our results on the construct validity indicated that as early as

the preschool years, empathy already develops into a multi-level construct consisting of distinct emotional, attentional, and social facets, which entail different social-emotional functioning. We hope that this questionnaire provides a useful tool for assessing empathy in Chinese preschool children, and could promote cross-cultural research to look into whether and how the development and the function of empathy may vary in different cultural contexts.

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Chapter 5

The Development of Empathy and Its Association with Social-Emotional Functioning in Pre-schoolers with Hearing Loss and Typical Hearing

Li, Z., Li, B., Tsou, Y. T., Frijns, J. H. M., Meng, Q., Yuen, S., Wang, L., Liang, W., & Rieffe, C. (2014). The Development of empathy and its association with social-emotional functioning in preschoolers with hearing loss and typical hearing. *Research on Child and Adolescent Psychopathology,* 1-14. https://doi.org/10.1007/s10802-024-01271-0

Abstract

Empathy plays a crucial role in children's social-emotional development. There is an increasing trend in recent studies to recognize empathy as a multi-dimensional construct, consisting of three distinct hierarchical levels: emotion contagion, attention to others' feelings, and prosocial behaviors (Hoffman, 1987). The present study is amongst the first to use a longitudinal approach to examine the development trajectories of the distinct empathic levels, based on a sample of Chinese preschoolers aged 2 to 6 years, half of the sample being deaf and hard-of-hearing (DHH). Our results showed that according to the parental observation, DHH preschoolers manifested a similar extent of all three empathic levels as their typically hearing (TH) peers did over the preschool years. As for the longitudinal associations over time, emotion contagion contributed to more internalizing and externalizing behaviors in both groups; whilst attention to others' feelings contributed to fewer internalizing behaviors in only DHH children. Prosocial behaviors contributed to better social competence, and fewer internalizing and externalizing behaviors in both DHH and TH children just as expected. These outcomes imply that early intervention or special education may be useful to safeguard children's empathic development, shrinking the gaps between DHH and TH children; but meanwhile, cultural factors might cause latent effects on children's understandings of empathy and impact on how empathy "regulates" children's social-emotional functioning, in a Chinese cultural context.

Key words

Empathy; Development Trajectory; Preschoolers; Social-Emotional Functioning

INTRODUCTION

Empathy, the ability to vicariously experience and understand others' emotions and to alleviate their emotional stress, is essential for navigating social interactions as well as fostering interpersonal bonds (e.g., Decety & Jackson, 2006; Hoffman, 1987; Rieffe et al., 2010). It is also crucial for children's early social-emotional development. Higher levels of empathy are associated with better social competence, and fewer internalizing and externalizing behaviors (e.g., Neumann, et al., 2016; Noten et al., 2019; Tully & Donohue, 2017). However, the development of empathy among deaf or hard-of-hearing (DHH) children may pose more challenges compared to typically hearing (TH) children, as they encounter additional obstacles in accessing their social environment when raised in predominantly hearing environments (Morgan et al. 2014; Dirks et al. 2020). For instance, when loud background noises are present during conversations, DHH children may receive only partial or distorted information (Calderon & Greenberg, 2011; Rieffe et al., 2015). The problems of missing out on social learning opportunities cannot be solved completely with hearing-aid (HA) devices or a cochlear implant (CI), which work best in one-to-one interactions/communications in relatively quiet environments (Caldwell & Nittrouer, 2013; Misurelli & Litovsky, 2015). These restrictions on social participation that DHH children often experience may have a profound negative impact on their emotional socialization. DHH children are reported to show lower levels of sharing and understanding emotions, including empathy (e.g., Moeller, 2007; Netten et al., 2015; Rieffe et al, 2015). To date, only a few studies have explored the empathic development of young DHH children, and notably, they operationalized empathy as a general, unidimensional concept (e.g., Dirks et al., 2017; Peterson, 2016). However, increasing numbers of recent studies indicated empathy to be multi-dimensional in both adults and children (e.g., Da Silva et al., 2022; Hojat et al., 2018; Rieffe et al., 2010).

Considering the importance of understanding early developmental stages in hearing and DHH children to ensure timely intervention, the present study aimed to explore how different components of empathy develop over the preschool years among DHH and TH children, and how these empathic components affect children's social-emotional development.

Hoffman (1987) proposed a multi-level model of empathy where three distinct levels develop sequentially in the early years of life. "Emotion Contagion", also known as "affective empathy", is the first and basic level of empathy, referring to the extent to which a person can be affected by others' emotional expressions or behaviors. Newborn infants can already be affected by the emotional expressions of others: at their first year of life, they start to mirror/mimic others' verbal statements, facial expressions and body gestures, which presumably triggers similar arousal in themselves (Bernhardt & Singer, 2012). Therefore, when one infant bursts out crying in a room, other nearby infants may follow spontaneously. Prior research showed that this capacity, which is supposed to be innate (De Waal, 2008), is observable in both TH and DHH preschoolers. According to parental reports, DHH preschoolers using CIs manifested similar levels of emotion contagion as their hearing peers (Ketelaar et al., 2015; Tsou et al., 2021).

Although emotion contagion was related to more prosocial behaviors in DHH and TH preschool children (Ashori & Aghaziarati, 2023; Da Silva et al., 2022; Fink & de Rosnay, 2023), too much emotion contagion can result in high personal distress and internalizing behaviors (e.g., Geng et al., 2012; Rieffe et al., 2010; Tsou et al., 2021). Possibly, empathizing with others' (negative) emotions can be overwhelming for young children who have not yet developed sufficient emotion regulation abilities (Rieffe et al., 2010). As children grow older and become more and more capable of regulating their own emotional arousal, emotion contagion tends to decrease slightly, which was

observed during the preschool years in both DHH and TH children (Tsou et al., 2021). This implies that emotion contagion is largely innate and is influenced little by hearing loss.

The second level of empathy, "Attention to Others' Feelings", emerges around the second year of life (Hoffman, 1987). "Attention to Others' Feelings" represents the abilities of children to suppress their own idiosyncratic desires and to switch their focus of attention to others' needs and feelings, which is a developmental marker of children's socialization process. From a developmental perspective, as daily environments are full of information and emotional stimuli, toddlers develop a basic sense of self-awareness at around the age of one that allows them to distinguish others' emotional arousal from their own feelings. Upon realizing that their contagious arousal is triggered by others' emotions, children could be less overwhelmed by contagious emotions and temporarily suppress their idiosyncratic desires, which help them to shift the attention toward other individuals who are in need (Rieffe et al, 2010). Such a shift of attention from the "self-focusing perspective" to the "other-focusing perspective" relies on the input from social environments and prepares children for further social interactions, such as caring about others' desires/needs and performing prosocial behaviors.

For DHH children, it may be more difficult to be aware of the emotions of others when their attention is not directed to the source. Yet, even when they do shift their attention to others' emotional displays, DHH children may still struggle to understand the situation and to interpret verbal feedback about their social behaviors (Ketelaar et al., 2015). During communication with peers, DHH children may often take in partial or distorted information (e.g., Calderon & Greenberg, 2011). These obstacles may limit DHH children's opportunities of social/incidental learning, making it more challenging for them to develop an understanding of others' emotions and perspectives (Morgan et

al. 2014). Longitudinal research showed similar levels of attention to others' feelings in DHH preschoolers and their TH peers, but these DHH children manifested a higher increase over time (Tsou et al., 2021).

Notably, while attention to others' feelings is related to better social competence in DHH and TH preschoolers (Ashori & Aghaziarati, 2023; Bandstra et al., 2011; Da Silva et al., 2022; Li et al., 2023; Rieffe et al., 2010), DHH and TH preschool children who showed larger/faster increases in their attention over time were at greater risks of exhibiting internalizing behaviors (Tsou et al., 2021). Presumably, focusing attention on others' negative emotions increases young children's personal distress who do not yet have sufficient emotion regulation abilities (Eisenberg, 2006).

"Prosocial behaviors" form the third level of empathy, emerging as children's abilities to feel, understand, and respond to others' emotions increase. The initiation of prosocial acts may need a full understanding of others' intentions, desires, and beliefs, however, preschool children do not understand the intrinsic causes of others' emotional expressions due to their still-developing cognitive abilities (Broekhof et al., 2015). Yet, despite not understanding others' perspectives, preschoolers still manifest the motives and action tendencies to alleviate the influence of negative feelings on others, and such altruistic motives often take the form of concrete behaviors, such as helping, sharing, or comforting (Beeler-Duden et al., 2022; Zahn-Waxler et al., 1992). As a matter of fact, spontaneous prosocial behaviors are already observable in preschoolers, and the quality and quantity of these behaviors improve as their emotion regulation and perspective-taking abilities develop (Flook et al., 2019; Tsou et al., 2021). Furthermore, higher levels of prosocial behaviors may be related to better-developed social competence and fewer internalizing and externalizing behaviors among TH preschoolers (Caputi et al., 2012; Da Silva et al., 2022; Rieffe et al.. 2010; Salerni & Caprin, 2022).

DHH children manifest lower prosocial motives and fewer prosocial behaviors than their TH peers do (e.g., Netten et al., 2015; Tsou et al., 2021). Although the group differences persist during the preschool years, both TH and DHH children were found to display increasing levels of prosocial behaviors during the period (Netten et al., 2015; Rieffe et al., 2010; Takamatsu et al., 2021; Tsou et al., 2021). These findings suggest that although DHH children feel and attend to others' emotions, they do not demonstrate prosocial actions towards distressed others to the same extent as their TH peers do. These findings can be attributed to their difficulties in understanding complex social situations and social knowledge to support them to react in these situations, as well as a lack of empowerment to take action (Tsou et al., 2021). Considering the essential role of prosocial acts in facilitating various kinds of interpersonal relationships, these group differences observed in prior studies might account for the lower social competence and higher frequencies of behavioral problems of DHH preschoolers (e.g., Chao et al., 2015; Netten et al., 2015). Cross-sectional research also found that prosocial behaviors were related to better social competence and fewer behavioral problems in DHH preschoolers (Ashori & Aghaziarati, 2023). Yet, longitudinal research did not find a significant effect of prosocial behaviors on internalizing and externalizing behavioral problems (Tsou et al., 2021).

Present Study

To date, only one research has explored the development trajectory of empathy in DHH preschoolers (Tsou et al., 2021), and the roles of different empathic levels in children's social-emotional development remain almost unexplored. To address the knowledge gap, the present study aimed to use a longitudinal design to investigate the development of empathy and its associations with social-emotional functioning in Chinese DHH and TH preschoolers.

Our first goal was to compare the different empathic levels between DHH and TH preschoolers. Based on prior studies, we expected the DHH group to show similar levels of emotion contagion and attention to others' feelings, whereas lower levels of prosocial behaviors, compared to their TH peers (Ketelaar et al., 2013, 2015; Tsou et al., 2021).

The second goal was to explore the development of empathy in preschool years among DHH and TH preschoolers. We expected emotion contagion to decrease whereas prosocial behaviors to increase among both DHH and TH preschoolers at a similar pace (Tsou et al., 2021). Moreover, we expected the DHH preschoolers to show a significant increase in attention to others' feelings over time, whilst the TH preschoolers may have a slower increase over time in this regard (Tsou et al., 2021).

Our third goal was to investigate the longitudinal effects of these three empathic levels on DHH/TH preschoolers' social-emotional functioning, i.e., social competence, internalizing, and externalizing behaviors. According to previous research, we expected that all three empathic levels would contribute to better social competence across time in both groups (e.g., Da Silva et al., 2022; Simon & Nader-Grosbois, 2023). Moreover, we expected that emotion contagion and attention to others' feelings may contribute to more internalizing behaviors (e.g., Rieffe et al., 2010; Tsou et al., 2021); and prosocial behaviors to fewer internalizing and externalizing behaviors, over time in both TH and DHH preschoolers (Ashori & Aghaziarati, 2023).

METHOD

Participants

This study is part of a larger-scaled longitudinal research project investigating the early development of social-emotional functioning in Chinese DHH and TH children (using

different data from the same dataset as in **Chapter 3**).

A total of 250 children (DHH: 129; TH: 121) aged 21 to 84 months (M = 48.61 months, SD = 12.39 months at the first wave) participated in the study. Two waves of data were collected on this sample, with an average interval of 14.62 (SD=4.33) months. The participants were recruited from the China Rehabilitation Research Center for Hearing and Speech Impairment (CRRCHSI) in China, from 2019 to 2020. Most of the DHH participants had severe hearing loss with mean unaided hearing thresholds of 78 dB at the better-hearing ear, and 87 dB at the worse-hearing ear. 86% of the DHH participants used a hearing aid (HA) or cochlear implant (CI) (mean hearing thresholds after adjustments: 23 dB at the better hearing ear; 33 dB at the worse hearing ear).

CRRCHSI is a research and intervention institution located in Beijing, China, dedicated to providing early interventions and support to children with hearing loss. CRRCHSI has an affiliated kindergarten offering preschool education to both DHH and TH children. DHH children receive special education for two years before being integrated into mixed classes with TH peers. Their special education/intervention programs are designed to support DHH preschoolers' language and social development. Spoken language is the emphasis in education, and sign language is not preferred to be used in their daily routines. The demographic characteristics of our DHH participants are similar to their TH peers (Table 1). No group difference was found when comparing the group means.

Our recruitment inclusion criteria were: (1) for DHH children, they should have pre-lingual hearing losses (hearing impaired before three years of age) with a minimum threshold of 40 decibels in the better-hearing ear (calculated as averaging their unaided hearing thresholds at 500, 1000, 2000, 4000 Hz); (2) for both groups, they should have a non-verbal IQ of 80 at the minimum, with no other psychiatric diagnoses.

The non-verbal IQ data of the participants were retrieved from CRRCHSI. The Griffiths Mental Development Scales (Griffiths & Huntley, 1996) were used to assess the non-verbal intelligence of the participants. The testing and scoring were performed by the researchers from CRRCHSI before this study.

Table 1 The personal characteristics of participants

	DHH (*n*=129)	**TH (*n*=121)**
Personal Characteristics		
Age at Time 1, years, mean (*SD*)	47.20 (14.95)	50.12 (8.70)
Gender, *n* (%)		
Male	74 (57.4%)	64 (52.9%)
Female	55 (42.6%)	57 (47.1%)
Non-verbal intelligence score [a]**,** mean (*SD*)	100.23 (16.10)	103.56 (12.25)
Socioeconomic Status, mean (SD)		
Maternal Education [b]	3.64 (0.93)	4.04 (0.99)
Parental Education [b]	3.62 (0.83)	4.07 (0.90)
Annual household income [c]	4.11 (0.85)	3.76 (1.99)
Hearing Characteristics		
Age of Identification, months, mean (*SD*)	14.78 (14.87)	
Hearing device, *n* (%)		
Unilateral CI	5 (3.93%)	
Unilateral HA	1 (0.79%)	
Bilateral CI	15 (11.8%)	
Bilateral HA	24 (18.9%)	
Bilateral CI + HA	54 (42.5%)	
Not using any equipment	19 (15.0%)	
Missing data	9 (7.09%)	
HA use, months, mean (*SD*)	33.95 (16.45)	
CI use, months, mean (*SD*)	29.09 (12.84)	
Unaided Hearing threshold, better ear, mean (SD) [d]	82.73 (25.11)	
Unaided Hearing threshold, worse ear, mean (SD) [d]	87.63 (29.21)	
Aided Hearing threshold, better ear, mean (SD) [d]	30.20 (7.81)	
Aided Hearing threshold, worse ear, mean (*SD*) [d]	40.29 (16.90)	

Note: SD = standard deviation; HA = hearing aid; CI = cochlear implant.
[a] Mean (SD) of the values for different conditions: 1 = "Primary school & below", 2 = "Junior high", 3 = "High school", 4 = "University or College", 5 = "Postgraduate & above".
[b] Mean (SD) of the values representing different conditions, the values: 1 = "<€3,000"; 2 = "€3,000-€15,000"; 3 = "€15,000-€20,000"; 4 = "€20,000-€25,000"; 5 = "€25,000-€40,000"; 6 = "€40,000-€65,000"; 7 = "€65,000-€130,000"; 8 = "> €130,000".
[d] These values represent the hearing threshold of the worse/better ear.
** p<.001, *p<.05 between DHH and TH children.

Procedure

Prior to data collection, the research protocol was approved by CRRCHSI and the ethics committee of Leiden University. The teachers of the participating preschoolers were contacted before data collection. We informed the teachers about the requirements of this study, and then acquired their agreement to comply with these requirements.

The purposes, execution, data management, privacy policy of the study, and the voluntary nature of participation were stated in the informed consent. The caregivers of the children were requested to sign the informed consent, prior to data collection. Upon receiving the signed informed consent, the teachers then distributed the (paper-form) questionnaires to the children. These questionnaires were taken home by the children to their caregivers and were brought back to the teachers after completion. The teachers finally collected all the responses and sent them to the researchers. In the meantime distributing the paper questionnaires, a link to the portal with an online questionnaire was sent (via email) to the participants who could not access the paper questionnaires, allowing them to fill out the questionnaire online.

Measures

Empathy. To assess the empathic levels of preschool children, the Chinese version of the Empathy Questionnaire (EmQue) was used. The EmQue is a parent report designed to measure the manifestations of empathy among preschoolers, originally Dutch (Rieffe et al., 2010), and validated in many different languages such as Italian (Grazzani et al.,

2017), Spanish (Lucas-Molina et al., 2018), Portuguese (Da Silva et al., 2022), Japanese (Takamatsu et al., 2021), showing robust psychometric properties. The EmQue was also validated in Chinese and the three-level empathy construct applied to Chinese preschool children as well (Li et al., 2024). The EmQue consists of 19 items, each item depicts a specific behavior in a specific situation, divided over three scales that measure the three distinct levels of empathy. More specifically, the "Emotional Contagion" scale (6 items) assesses to what extent children are affected by their peers' emotions (e.g., "My child also needs to be comforted when another child is in pain", "When another child cries, my child gets upset too"). The "Attention to Others' Feelings" scale (7 items) measures to what extent children's attention is attracted by others' expressions (e.g., "When adults laugh, my child tries to get near them", "My child looks up when another child cries"). The "Prosocial Behavior" scale (6 items) evaluates how motivated children are to help others in various occasions (e.g., "When two children are quarrelling, my child tries to stop them", "When I make clear that I want some peace and quiet, my child tries not to bother me"). Accordingly, the three scales focus on different aspects/levels of empathy. Respondents are instructed to rate to which extent each item's depiction represented the child's behavior in the past two months upon a 3-point scale (0 = never, 1 = sometimes, 2 = often). A higher score indicates a higher disposition of the corresponding empathic feature. Respondents are encouraged to rate all items, even if some items do not apply to them. Table 2 shows the descriptive statistics of the three scales, and the McDonald's omegas ranged from 0.78 to 0.86.

Internalizing and Externalizing Behaviors. To assess the severity of internalizing and externalizing behaviors, the Early Childhood Inventory - 4th edition (ECI-4, Sprafkin et al., 2002) parent checklist was used. Given that there was no validated Chinese version of ECI-4, we used a (back-)translation procedure to convert the English version of ECI-

4 into Chinese (see "Translation procedure" below). The ECI-4 consists of 9 scales and 108 items, which screen for 15 social-emotional and behavioral disorders. Respondents are instructed to rate on a 4-point scale (0 = never, 1 = sometimes, 2 = often, 3 = very often) to what extent their child manifested each behavior in the past three months. A higher score indicates a higher likelihood of manifesting the corresponding symptom. Following Ketelaar et al., (2017)'s method, we combined several (sub)scales to measure internalizing and externalizing behaviors:

To measure "Internalizing Behaviors", four ECI-4 scales were combined, which included the "Major Depressive Disorder" scale (10 items, e.g., "The child cries, freezes, or avoids communicating with others when they are placed in an uncomfortable social setting"); the "Separation Anxiety" scale (8 items, e.g., "Having nightmares upon being separated from their parents"); the "Social Phobia" scale (3 items, e.g., "Climbs to the parents' bed at the middle of the night"); the "Generalized Anxiety" scale (4 items, e.g., "Is overly afraid of/avoiding some particular objects or situations").

As for "Externalizing Behaviors", two scales were combined for the assessment, including the "Oppositional Defiant Disorder" scale (8 items, e.g., "Refuses to do what you asked him/her to"), and the "Conduct Disorder" scale (10 items, e.g., "Intentionally fights with others").

Social Competence. To assess social competence, the Chinese version of the Strengths and Difficulties Questionnaire (SDQ; Lai et al., 2010) was used. The SDQ consists of 5 scales, each of which has 5 items, that screen for children's social and emotional functioning. Respondents are instructed to rate to what extent their child manifested each symptom/behavior on a 3-point scale (0 = not true, 1= somewhat true, 2 = certainly true), based on observations of their child's performances in the past six months.

Following the method of Ketelaar et al. (2017), we combined two scales of SDQ to measure "Social Competence", including the "Peer Problems" scale (5 items, e.g., "Is relatively lonely and playing with himself or herself"), and the "Prosocial Behavior" scale (5 items, e.g. "Is very willing to share with other children their candies, toys, and pens, etc.").

Table 2 reports the descriptive statistics of the measurements used in this study. McDonald's omegas ranged from 0.78 to 0.91, indicating that the internal consistencies of the used measurements are sufficient.

Notably, although two items of "Social Competence" may conceptually overlap with the Prosocial Behaviors scale of the EmQue, the examination to see if the data met the assumption of collinearity suggested that multi-collinearity between the two indices was not a concern (Tolerance = 1.00, VIF = 1.00).

Table 2 The characteristics and reliabilities of study variables at each time point

	NO. Items	Scale	McDonald's omega	DHH		TH	
				mean	SD	mean	SD
Time1							
Emotional Contagion	6	0-2	0.81	0.54	0.35	0.54	0.37
Attention to Others	7	0-2	0.78	1.32	0.36	1.34	0.37
Prosocial Behaviors	6	0-2	0.84	0.90	0.43	0.96	0.42
Social Competence	10	0-2	0.81	1.30	0.33	1.43	0.32
Internalizing Behaviors	25	0-3	0.89	0.75	0.32	0.84	0.13
Externalizing Behaviors	18	0-3	0.90	0.82	0.38	0.86	0.39
Time2							
Emotional Contagion	6	0-2	0.85	0.53	0.37	0.59	0.40
Attention to Others	7	0-2	0.80	1.36	0.35	1.37	0.36
Prosocial Behaviors	6	0-2	0.86	1.10	0.42	1.13	0.36
Social Competence	10	0-2	0.73	1.47	0.27	1.50	0.28
Internalizing Behaviors	25	0-3	0.91	0.88	0.14	0.85	0.13
Externalizing Behaviors	18	0-3	0.90	0.78	0.35	0.77	0.36

Translation procedure

As the ECI-4 has not been translated or validated in Chinese, we used a back-translation procedure to adapt it to Chinese (Brislin et al., 1973). The first translation was performed by a senior psychologist from our research team who was fluent in English and Chinese. Thereafter, a back-translation from Chinese to English was conducted by another senior psychologist who was bilingual. The translations were examined in terms of consistency. The inconsistencies in translation were resolved by discussions with our research team.

Statistical Analyses

Linear mixed models (LMMs) were used to analyze our data. Our longitudinal data had two waves (time points) that were nested within participants. The stepwise method was used to enter variables to the models. The criterion used for evaluating the LMM models was: lower −2 Log likelihood [−2LL] values in likelihood ratio tests (Wood et al., 2008). The best-fitting model was determined by selecting the one with the lowest -2LL. When two models showed equal -2LL values, the simpler model was preferred over the more complex one. Unstandardized (B) and standardized (Beta) estimates were both reported. When B and Beta values indicated different results, greater consideration was given to the Beta values as they are considered more reliable in revealing the effect sizes of predictors (Lorah, 2018).

To investigate the development of empathy during preschool years in DHH and TH children, we began with three baseline unconditional-means models including only fixed and random intercepts for the three empathic levels (emotion contagion, attention to others' feelings, and prosocial behaviors), respectively. Next, age was added to the models as a fixed factor, to evaluate how these empathic levels changed across two time points. Thereafter, group as a fixed factor was entered into the models, to evaluate if there were group differences regarding the reported levels of empathy. The interaction

of age with group was entered into the models at last, to assess if the developmental trajectories varied between groups.

To examine the contribution of the three empathic levels to predicting the social-emotional development of DHH and TH preschoolers, we began with three models with only fixed and random intercepts, of social competence, internalizing, and externalizing behaviors, respectively. Firstly, mean and change variables were created for each of the empathic levels. The values of the mean variables were the mean scores of time 1 and time 2. The values of the change variables were computed by subtracting participants' scores of time 1 from those of time 2. Specifically, the mean variables were used to evaluate how the mean levels of empathy contributed to social-emotional development (between-subject effects), whilst the change variables were used to examine how the increase or decrease of empathy contributed to social-emotional development (within-subject effects). After creating the mean and change variables, we started to construct the models. Age, group, and their interaction were entered into the baseline model in the first step. Next, we added the mean and change variables of each empathic level to the corresponding model. Lastly, we added the interactions of group with mean/change variables to the models to examine the group differences.

All the analyses mentioned above were conducted using R version 4.2.3 (R Core Team, 2023). Linear mixed models (LMMs) were performed using the "Lme4" package (Bates et al., 2015). Figures were crafted using the package "ggplot2" (Wickham, 2016).

Missing Data Analysis

240 participants filled in all the questionnaires at time 1. Due to the Covid-19 pandemic, the researchers lost contact with some of these participants during the second collection. Caregivers of 128 participants who attended in the first wave collection provided data

again for the second wave collection. The attrition rate of our longitudinal data is thus 48.8%. According to simulation research, attribution rates of lower than 50% would be considered acceptable, as the estimations based on which data were not largely biased compared to data with no attrition (e.g., Gustavson et al., 2012). Considering also that LMMs are relatively robust in handling data with attrition, we consider the attrition rate of 48.8% suitable for LMM analyses (Pan & Zhan, 2020).

Little's MCAR was used to assess whether our missing values were distributed randomly. At time 1, less than 3% missing values were found, and they were missing completely at random: $\chi2 = 3923.35$, $df = 5643$, $p > 0.05$. At time 2, less than 0.5% of data were missing, which was missing at random: $\chi2 = 3658.62$, $df = 5643$, $p > 0.05$.

RESULTS

The development of empathy during preschool years

Table 3 shows the best-fitting LMM models for the development of emotion contagion, attention to others' feelings, and prosocial behaviors. Figure 1 depicts the development trajectories and group differences of the three empathic levels.

For emotion contagion and attention to others' feelings, the best-fitting model (having the lowest -2LL) includes only a fixed and random intercept. Adding the effects of age and group did not improve the models. This suggests that emotion contagion and attention to others' feelings stayed unchanged with age in TH and DHH preschoolers. Also, TH and DHH preschoolers manifested a similar extent of emotion contagion and attention to others' feelings across the preschool years.

As for prosocial behaviors, the best-fitting model included a fixed effect of age ($b = 0.009$, $beta = 0.28$, $t = 6.65$, $p < 0.001$, 95% CI: [0.19, 0.36]). The result indicates that prosocial behaviors increased with age among TH and DHH preschoolers. Adding

the effect of the group did not further improve the model, suggesting no group differences between TH and DHH preschoolers.

Table 3 *Fixed and random effects of the best models in predicting the empathic levels over time*

	EC -2LL = 293.1		**Attention to Others' Feelings -2LL = 274.7**		**Prosocial Behaviors -2LL = 355.2**			
	B (SE)	CI	B (SE)	CI	B (SE)	CI	Beta (SE)	CI
Fixed effects								
Intercept	**.55 (.02)**	[.51, .59]	**1.33 (.02)**	[1.29, 1.38]	**.47 (.08)**	[.31, .63]	**1.00 (.02)**	[.95, 1.04]
Age (linear)	-	-	-	-	**.009 (.001)**	[.006, .012]	**.28 (.04)**	[.19, .36]
Group	-	-	-	-	-	-	-	-
Random effects								
Residual	**.08 (.29)**	[.25, .32]	**.08 (.28)**	[.25, .31]	**.09 (.30)**	[.26, .34]	**.09 (.30)**	[.26, .34]
Intercept	**.05 (.23)**	[.18, .28]	**.05 (.22)**	[.17, .27]	**.08 (.27)**	[.22, .32]	**.08 (.27)**	[.22, .32]

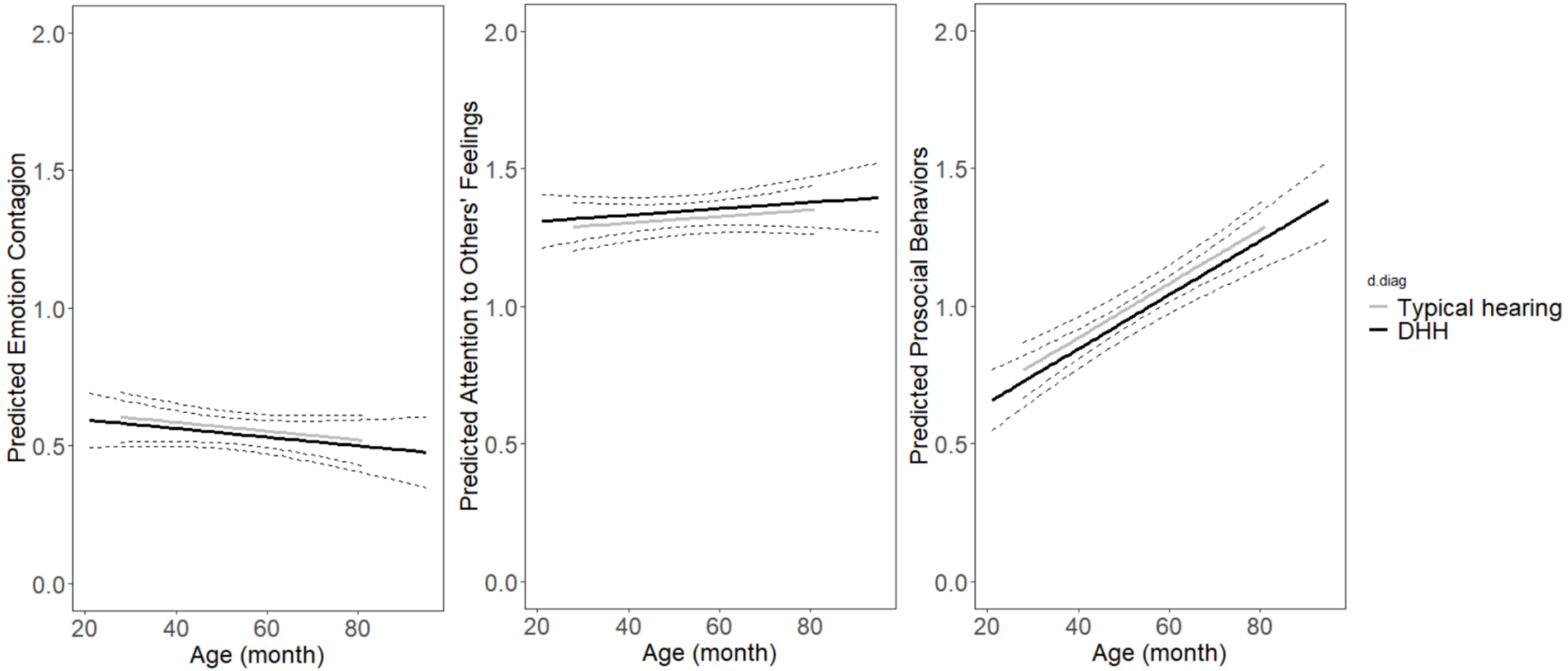
Note: B = Unstandardized estimates of fixed effects; Beta = Standardized Estimates of fixed effects; SE = standard error. CI [low, high] = lower to upper bounds; Significant effects are marked bolded.

Longitudinal associations between empathy and social-emotional functions

Table 4 shows the best-fitting models for predicting the contribution of empathy to the development of social-emotional development in DHH and TH children.

For social competence, the best-fitting model that had the lowest -2LL included: fixed effects of age (b = 0.005, beta = 0.15, t = 5.15, $p < 0.001$), group (b = -0.08, beta = -0.08, t = -2.54, p = 0.012), the mean score of attention to others' feelings (b = 0.10, beta = 0.07, t = 2.04, p = 0.042), and the mean score of prosocial behaviors (b = 0.34, beta = 0.26, t = 7.57, $p < 0.001$). The results meant that social competence increased with age, whilst DHH preschoolers manifested lower social competence than their TH peers. For both DHH and TH preschoolers, higher attention to others' feelings, or more prosocial behaviors, was related to better-developed social competence.

Figure 1: Longitudinal graphic representation of the predicted values based on the optimal fitting models of empathy



Note: Black solid lines represent the predicted mean values of DHH children, whilst Grey solid lines represent the predicted mean values of TH children. Dotted lines represent the upper and lower bounds of the 95% confidence interval.

Table 4 Fixed and random effects of the best predicting models of empathy contributing to social-emotional functioning over time

	Social Competence -2LL = 71.4				**Internalizing Behaviors -2LL = -132.9**				**Externalizing Behaviors -2LL = 251.6**			
	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]	B (SE)	CI [low, high]	Beta (SE)	CI [low, high]
Intercept	**.69 (.09)**	[.51, .86]	**1.40 (.02)**	[1.37, 1.43]	**.85 (.06)**	[.82, .96]	**.83 (.01)**	[.81, .85]	**1.13 (.10)**	[.94, 1.33]	**.82 (.02)**	[.77, .86]
Age (linear)	**.005 (.001)**	[.003, .007]	**.15 (.03)**	[.09, .21]	.001 (.001)	[-.001, .002]	.02 (.02)	[-.03, .07]	**-.004 (.001)**	[-.007, -.001]	**-.12 (.04)**	[-.20, -.04]
Group	**-.08 (.03)**	[-.14, -.02]	**-.08 (.03)**	[-.14, -.02]	**-.09 (.02)**	[-.14, -.04]	**-.03 (.02)**	[-.07, -.01]	.03 (.04)	[-.05, .12]	.03 (.04)	[-.05, .12]
EC mean	**-**	-	-	-	**.10 (.04)**	[.03, .17]	**.07 (.02)**	[.02, .11]	**.17 (.07)**	[.02, .30]	**.11 (.05)**	[.02, .21]
ATO-Mean	**.10 (.05)**	[.004, .205]	**.07 (.03)**	[.002, .136]	**-**	-	**-**	-	**-**	-	**-**	-
PB-Mean	**.34 (.04)**	[.25, .43]	**.26 (.03)**	[.19, .33]	**-.10 (.03)**	[-.15, -.03]	**-.08 (.02)**	[-.12, -.02]	**-.17 (.06)**	[-.29, -.05]	**-.13 (.05)**	[-.22, -.04]
EC-Change	**-**	-	**-**	-	**.06 (.03)**	[.004, .12]	**.06 (.03)**	[.003, .12]	**.13 (.05)**	[.04, .22]	**.13 (.05)**	[.04, .22]
ATO-Change	**-**	-	-	-	-.03 (.03)	[-.16, -.04]	**-.12 (.03)**	[-.18, -.06]	**-**	-	**-**	-
PB- Change	**-**	-	-	-	-	-	-	-	-	-	-	-
Group * ATO - Change	-	-	-	-	**-.10 (.03)**	[-.15, -.04]	**-.15 (.04)**	[-.23, -.06]	**-**	-	**-**	-
Random effects												
Residual	**.05 (.22)**	[.20, .25]	**.05 (.22)**	[.20, .25]	**.04 (.20)**	[.19, .22]	**.04 (.20)**	[.19, .22]	**.06 (.24)**	[.21, .27]	**.06 (.24)**	[.21, .28]
Intercept	**.03 (.16)**	[.11, .20]	**.03 (.16)**	[.11, .20]	**.001 (.001)**	[.001, .005]	**.001 (.001)**	[.001, .005]	**.07 (.27)**	[.22, .31]	**.07 (.27)**	[.22, .31]

Note: EC=emotion contagion; AOT=attention to others' feelings; PB=prosocial behaviors B = Unstandardized estimates of fixed effects; Beta = Standardized Estimates

of fixed effects; SE = standard error. CI [low, high] = lower to upper bounds, of the 95% confidence interval. Significant fixed/random effects are marked bolded.

For internalizing behaviors, the best-fitting model included the effects of group (b = -0.09, beta = -0.03, t = -3.70, p < 0.001), the mean and change scores of emotion contagion (mean score: b = 0.10, beta = 0.07, t = 2.82, p = 0.005; change score: b = 0.06, beta = 0.06, t = 2.82, p = 0.04), the mean score of prosocial behaviors (b = -0.10, beta = -0.08, t = -3.16, p = 0.001), the change score of attention to others' feelings (b = -0.03, beta = -0.12, t = -1.15, p = 0.250), and the interaction between group and the change score of attention to others' feelings (b = -0.10, beta = -0.15, t = -3.38, p < 0.001). The results indicated that internalizing behaviors did not change with age, whilst DHH preschoolers showed more internalizing behaviors than their TH peers. For both groups, higher levels or an increase over time in emotion contagion, as well as fewer prosocial behaviors, were predictive of developing/displaying more internalizing behaviors. Also, only in DHH preschool children, an increase over time in attention to others' feelings was related to fewer internalizing behaviors (post-hoc analysis within the DHH group: b = -0.14, beta = -0.22, t = -4.18, p < 0.001).

For externalizing behaviors, the best-fitting model included effects of age (b = -0.004, beta = -0.12, t = -2.99, p = 0.003), the mean and change scores of emotion contagion (mean score: b = 0.17, beta = 0.11, t = 2.29, p = 0.023; change score: b = 0.13, beta = 0.13, t = 2.75, p = 0.006), and the mean score of prosocial behaviors (b = -0.17, beta = -0.13, t = -2.80, p = 0.006). The results suggested that preschoolers' externalizing behaviors decreased with age, and TH and DHH preschoolers manifested similar levels of externalizing behaviors. For both groups, higher levels or an increase over time in emotion contagion, as well as fewer prosocial behaviors, were predictive of developing more externalizing behaviors.

DISCUSSION

Empathy is crucial to children's social-emotional development. However, little research

focused on the development of empathic components in DHH preschoolers. The present study is amongst the first to investigate the developmental trajectories of three empathic levels, i.e., emotion contagion, attention to others' feelings, and prosocial behaviors, in DHH and TH preschool children, and how the empathic development is related to their psychosocial functioning. Unlike prior studies that found some differences in empathy between DHH and TH children (e.g., Ketelaar et al., 2015; Tsou et al., 2021), our study revealed similar levels and developmental trajectories between DHH and TH children regarding the three empathy components. In both groups, emotion contagion stayed stable over the preschool years, contributing to more internalizing behaviors as expected, whereas the expected relation with social competence was absent. Attention to others' emotions also remained stable over time and was associated with better social competence in both DHH and TH children, whilst unexpectedly, an increase in attention to others' feelings was related to fewer internalizing behaviors in DHH children only. Prosocial behaviors, increased over time, contributing to better social competence and fewer internalizing and externalizing behaviors in both TH and DHH children, which was in line with prior findings. Below, we discuss these outcomes in greater detail.

Regarding emotion contagion, we had hypothesized a decrease in both TH and DHH children over time, based on the expectation that preschoolers would become less aroused by others' emotions with their improved emotion regulation skills. Our study however found stable levels of emotion contagion over time similarly in the two groups. This finding may partly be explained by the age of this sample (mean age of 49 months at Time 1) and the time span of the study (mean interval of 15 months). For children at this age, they have already developed the ability to recognize that the personal distress they experience is the consequence of witnessing other people's emotions, rather than from themselves. This ability to differentiate their own and other people's emotions can

help them better regulate their emotions, keeping those emotions at a certain level that is easier to manage while leaving them the mental space to pay attention and respond to other people in distress (Hoffman, 1987; Rieffe et al, 2010). With age, their skills for this process could still improve, leading to further decreases in emotion contagion (e.g., Dennis & Kelemen, 2009; Tsou et al., 2021), yet with the time span used in this study, we may fail to capture that.

Moreover, for children who had difficulties regulating their emotion contagion levels, thus manifesting overall higher levels of contagion or an increase over time in their contagion level, our study showed that these children were at greater risks of developing not only internalizing behaviors but also externalizing behaviors. Although most prior studies using the same empathy questionnaire found no relationship between contagion and externalizing behaviors (Da Silva, 2022; Li et al., 2024), also one other study, including Dutch children with a CI, found a similar relationship over time (Tsou et al., 2021). These outcomes seem to converge with the explanation that the tendency to experience overarousal can motivate an individual to feel overwhelmed and to focus excessively on their own emotions in emotionally charged situations that further trigger defensive behaviors. Alternatively, cultural variances may have a role. Cross-cultural research showed that East-Asian individuals are usually more inter-dependent on each other in social contexts compared to Western individuals, hence they might be more easily and strongly affected when observing others' negative emotional states (Atkins et al., 2016; Markus & Kitayama, 1991; Matsumoto et al., 2008).

Regarding attention to others' emotions, in line with the literature, children who paid more attention to others' feelings showed better social competence over time (Tsou et al., 2021). However, contradictory to Tsou and colleagues, our results indicated that an increase in attention to others' feelings was associated with fewer, instead of more,

internalizing behaviors in DHH preschoolers, whilst being unrelated to externalizing behaviors in both groups. Therefore, children's attention to others' feelings in our study seems a more positive factor, especially for the DHH population. Whilst overall the level of attention to others' feelings was shown to be stable over time in our sample, it seems that DHH children who started with lower levels can benefit from increasing levels of attention towards others over time. An increase in attention may allow children who initially had difficulties attending to social-emotional situations to better follow, process, and understand what is happening, thus reducing their anxiety in those social situations. Yet, future research is still required to further explore and deepen our understanding of this topic.

Lastly, regarding prosocial behaviors, our study did not demonstrate any group difference, unlike previous studies (Ketelaar et al, 2015; Tsou et al., 2021). The DHH children in our sample might have a more advanced social development due to several factors. First, thanks to the Chinese governmental support since 2012, a large proportion (73.2%) of DHH children in our sample had bilateral/bimodal hearing through CI and/or HA, which allowed these DHH children living in a predominantly hearing environment to have greater access their daily social world, and in turn, acquire more opportunities for incidental social learning (Broekhof et al., 2021). Second, all DHH children in this study attended intensive rehabilitation programs in a national rehabilitation center. The early intervention/rehabilitation programs of CRRCHSI hold the idea to facilitate both language and social-emotional development of DHH children, by using multiple methods in early interventions: DHH children attend classes with other DHH peers in the center so that they have plenty of opportunities to engage in social interactions; they also receive one-on-one supervision from their teachers hence their mental fitness is safeguarded. Notably, sign language is not the emphasis of

education and interventions, while the teachers set up goals to improve children's listening and speaking skills, cognitive skills, and social adjustment. The parents of these DHH children also attended the programs to learn how to interact or communicate with their children. The relatively high educational levels of the parents in our sample might contribute to stronger support for their children's social-emotional development effectively (El Nokali et al., 2010). Accordingly, we believe that the intensive care for DHH children can at least partially explain the positive outcomes observed in this study, where DHH children appeared to feel, attend to and react pro-socially to other people's emotions to a similar extent as their TH peers.

Limitations and Future Directions

The present study was amongst the first to investigate empathic development among Chinese preschoolers and brought new insights into the role of empathy in preschoolers' social-emotional development. Nonetheless, several limitations should be noted. First, our study collected data from only two-time points, whereas prior studies showed age-related changes followed children's development over a longer time (e.g., Li et al., 2023; Tsou et al., 2021). Following children's development for a longer duration may increase the likelihood of observing developmental changes.

Furthermore, it is notable that 49% of participants dropped out at the second time point, which may increase the likelihood of selection bias in our longitudinal data. Although linear mixed models are known for being good at handling data with attrition (Gustavson et al., 2012), selection biases may still exist and lower the accuracy of estimation in linear regressions. Notably, we found the DHH children who dropped out at the second wave differed from those who stayed on the mean values of internalizing behaviors and social competence, which implies a selection bias that might impact our results. Future research with longer tracking time and lower attrition is needed to verify

our findings and to further our knowledge of the empathic development of preschool children.

Second, the present study relied solely on parental report questionnaires. Yet using only one type of measure could result in higher common method bias (Podsakoff et al., 2003). Multi-method designs using other operationalizations of the constructs in the study, such as observational tasks and neuropsychological approaches, can be utilized to improve the validity of the study.

Third, although the socioeconomic status of our participants (e.g., parental and maternal education level, annual household income) was not different from the national average levels of China (Akimov et al., 2021), caution is still warranted during generalizing our findings to other ethnic/minority groups, as China is a large, populous country with high diversity in population. It is also notable that the preschool children in our sample received intensive early intervention (including auditory training, and special education) in a professional rehabilitation centre. However, on the national level, not all Chinese children have access to such treatment/intervention due to financial or other reasons. The intervention of CRRCHSI might be a reason why we did not detect large group differences between DHH and TH children in their development. In order to improve the external validity of the sample, future studies are recommended to recruit participants from different regions and social classes, so that the overall status of the DHH children in the country can be revealed.

Lastly, the longitudinal design allowed us to observe changes in study variables over time, offering insights into the possible mechanisms and dynamics of development. However, we could not establish whether changes in predicting variables preceded changes in outcomes variables, nor could we rule out reverse causality or bidirectional relationships without additional theoretical and analytical frameworks. Future research

that combines the longitudinal approach with experimental manipulations might be of help to unravel the causal links between the study variables.

A practical implication of this study is that timely/early intervention and hearing rehabilitation seem key to children's social-emotional development over the preschool years. As children's social-emotional development largely relies on their socialization, researchers and practitioners should explore more effective strategies that mitigate the difficulties DHH children encounter in social settings. For example, our experience in CRRCHSI shows that one-on-one interactions between practitioners and DHH children is crucial to providing sufficient verbal input for DHH children, which supports as well as facilitates their early language and social-emotional development. Creating inclusive studying and living environments might be another efficient way to increase children's motivations for social participation, and to establish interpersonal bonds between DHH children and their peers. Furthermore, new techniques such as wearable sensors can be utilized to evaluate the interacting patterns between DHH children and their peers. The data collected by wearable sensors can provide detail information on DHH preschoolers' physiological activities (e.g., heart rate, arousal levels), peer relations (e.g., frequencies of interactions), and cognitive abilities (e.g., emotion recognition, reactional tendency), which is of great help in evaluating DHH children's social-emotional development and providing well-directed support to promote children's developmental progress (Pal et al., 2021; Sousa, et al., 2023). These suggestions call for verification from future studies to deepen our understanding about how to support the social-emotional growth of DHH children.

Conclusion

The present study supports previous research stressing the important role that empathy has in preschool children's social-emotional functioning. However, it also became

evident that empathy cannot be studied as a unidimensional concept. For DHH and TH children alike, higher levels of emotion contagion, feeling what the distressed person feels, thus perhaps being more self-focused, seemed quite maladaptive to their psycho-social functioning, relating to more internalizing and externalizing symptoms over time. On the other hand, attention to another person' s feelings and trying to comfort the other person, which are more other-focused, seemed to show an opposite effect; these aspects of empathy related to better psychosocial functioning instead, over time, and in both groups. These findings seem to align with values commonly taught to children in a collectivistic-oriented country such as China, which may encourage children to be more interdependent and responsive to each other; although it is important to note that the maladaptive function of emotion contagion is also shown in studies with western children (Tsou et al., 2021). These findings bear clinical importance, as professionals working with these young children should thus also develop a more nuanced understanding of the different aspects that empathy consists of; and being overwhelmed by other peoples' emotional responses might denote an inability to self-regulate, but could also imply a high-sensitivity for interpersonal stimuli.

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Chapter 6

GENERAL DISCUSSION

Social emotions help children navigate their social lives by facilitating interpersonal interactions, strengthening social bonds, and regulating social behaviors to align with moral standards and social expectations (Tangney et al., 2007; Tracy & Robins, 2004). Empirical research has shown that social emotions play an essential role in children's social-emotional development, relating to better social competence, more prosocial behaviors, and fewer internalizing or externalizing behaviors (e.g., Decety & Jackson, 2006; Rieffe et al., 2010; Li et al., 2020; Tangney et al., 2007). However, due to hearing loss, deaf and hard-of-hearing (DHH) children have relatively limited access to social interactions, whether by participating themselves or by overhearing others during social interactions. The limited social access might cause delays in their socialization and, in turn, their internalization of social norms (e.g., Calderon & Greenberg, 2011; Leibold & Buss, 2013). These delays might further impact their acquisition of social emotions, as the elicitation of social emotions requires children to have an adequate understanding of social expectations (Tangney et al., 2007). Investigating the longitudinal effects of hearing loss on preschoolers' development of social emotions could provide valuable insights and practical suggestions for the rehabilitation and early intervention of DHH children.

Several cross-sectional studies examined the associations between hearing loss and social emotions, indicating that DHH preschoolers manifest lower levels of shame, guilt, pride, and prosocial behaviors, compared to their hearing peers (Ketelaar et al., 2015; Rieffe et al., 2010). Yet, it remains unclear how the developmental trajectories of social emotions are affected by children's hearing conditions, as longitudinal evidence on preschoolers' social-emotional development is scarce. Moreover, current studies on moral emotions mostly focus on children from Western societies, thus leaving a gap in understanding the moral development of non-Western children, such as Chinese DHH

children (Tsou et al., 2021). This thesis aimed to fill these research gaps by exploring the impact of hearing loss on developmental trajectories of social emotions in Chinese preschoolers. Using the assessment tools validated in **Chapter 2** and **4,** we investigated the impact of hearing loss on the developmental trajectories of social emotions (moral emotions and empathic levels) in **Chapter 3** and **5**. The research was conducted with samples of DHH and TH preschoolers recruited from the China Rehabilitation Research Center for Hearing and Speech Impairment (CRRCHSI) in Beijing. The longitudinal contributions of social emotions to predicting children's social-emotional functioning were also evaluated and reported in these chapters. Importantly, outcomes showed similar results between DHH and TH children as discussed in **Chapter 3** and **5**. These similarities are briefly summarized here, but the implications of these findings will be discussed in greater detail below.

(1) Comparing the levels of social emotions between groups, DHH preschoolers manifested lower levels of guilt and pride than their TH peers over time, but there were no group differences on shame or the three empathic levels. These results did not fully align with prior findings on shame and prosocial behaviors (Ketelaar et al., 2015; Tsou et al., 2021).

(2) Regarding the developmental trajectories of social emotions, linear mixed models (LMM) showed that shame, guilt, and pride increased with age, and children's hearing status did not affect the developmental trends. These results were largely in line with prior research, except for shame, which was shown in prior studies to remain static over preschool years (e.g., Li et al., 2020; Ongley & Malti, 2014). Regarding empathy, our result indicated that only prosocial behaviors increased over time in both DHH and TH preschoolers, while emotion contagion and attention to others' feelings remained static in both groups. This result was inconsistent with prior findings suggesting that

emotion contagion decreased in DHH and TH preschoolers, whilst attention to others' feelings increased in DHH preschool children (Ketelaar et al., 2015; Tsou et al., 2021).

Taken together, our results showed an overall trend that Chinese preschool DHH children manifested similar levels of social emotions and developmental trajectories as their TH peers did. It is possible that our results were affected by some latent factors such as culture and the intervention. For instance, the absence of group differences may provide supporting evidence of the positive effects of early interventions at CRRCHSI. The interpretation and implications of the results are discussed in greater detail below. We also further discuss the measurement and developmental patterns of social emotions in Chinese DHH and TH preschoolers, as well as their associations with psychosocial functioning.

Prerequisite for studying social emotions in Chinese preschool children - the validation of questionnaires

At the start of this project, there was no questionnaire specifically designed to measure distinct moral emotions and empathy components for Chinese preschoolers. Validating suitable questionnaires developed for Western children in the Chinese context was thus a necessary first step toward fulfilling our research goals. To this end, **Chapter 2 and 4** validated two parent-report questionnaires, the Moral Emotion Questionnaire (MEQ) and the Empathy Questionnaire (EmQue), to assess the three different moral emotions and three distinct empathic levels, respectively.

The Moral Emotion Questionnaire (MEQ) was developed to assess shame, guilt, and pride in Dutch preschoolers, which had reported robust psychometric properties for construct validity (Da Silva et al., 2021). In **Chapter 2**, we tested the translated version

of MEQ on a group of Chinese children aged 2 to 6 years. Confirmatory factor analyses (CFA) indicated adequate construct validity of this Chinese version of MEQ, suggesting that Chinese children of preschool age can already experience shame, guilt, and pride, displaying corresponding behavioral reactions. Measurement invariance was met for all scales, suggesting that the values of shame, guilt, and pride as measured by the Chinese MEQ can be meaningfully compared across gender and age groups. Notably, two items from the original MEQ were removed during the constructing of the new models, which were from the "Guilt" scale depicting the emotional expressions of guilt. The removal of the items implied a cultural variance in expressing negative emotions in the Chinese social context.

The Empathy Questionnaire (EmQue) was also a parental-report questionnaire originally designed for Dutch preschoolers (Rieffe et al., 2010). The EmQue measured three distinct empathic levels/components as proposed by Hoffman (1987), and showed robust psychometric properties in the prior validation research (e.g., Rieffe et al., 2010; Takamatsu et al., 2021). In **Chapter 4**, the CFA suggested adequate construct validity, supporting Hoffman (1987) that three empathic levels develop over the preschool years. Measurement invariance of the Chinese EmQue was obtained, indicating that the scores measured by the Chinese EmQue had equivalent psychological meanings/implications for preschoolers of different genders and age. Overall, **Chapter 2** and **4** suggest that the Chinese versions of MEQ and EmQue can be useful tools for measuring social emotions in Chinese preschoolers.

The developmental trajectories of social emotions in Chinese preschool children

The development of social emotions was examined, by using a longitudinal design with two time points (approximately 15 months apart). According to our result in **Chapter 3**, shame, guilt, and pride all increased with age over the preschool years (for both DHH and TH children), which indicated that preschooler's capabilities of experiencing and expressing moral emotions may develop in accordance to their socialization (Lagattuta & Thompson, 2006). In **Chapter 5**, our results indicated that prosocial behaviors (the third level of empathy) also displayed an increasing trajectory over the preschool years, whilst unexpectedly, emotion contagion and attention to others' feelings (the first two empathic levels) remained unchanged (in contrast to the findings of Tsou et al., 2021).

Over the preschool years, children become increasingly more involved in social interactions, and during this period, they learn and begin to understand the social norms and values, and others' expectations for particular behaviors (Tangney et al., 2007). Consequently, children become more capable of reflecting on and evaluating their own social behaviors in light of social expectations, therefore their experiences of moral emotions may increase in both frequency and intensity (Chaparro et al, 2013; Daniel et al., 2014). Accordingly, our results on the development trajectories of social emotions are generally in line with prior research and theories (e.g., Tracy et al., 2007; Tracy & Robins, 2004).

However, as for the development of shame, several studies revealed that shame remained unchanged over the preschool years, because experiencing and understanding shame requires rich life experience and adequate cognitive skills, whereas preschoolers are relatively naive in experiencing deep emotions that are highly dependent on social cognition (Ross, 2017; Sette et al., 2019). Nevertheless, our longitudinal result showed an increase of shame over time in both Chinese DHH and TH preschoolers.

Considering that most studies on preschool children's social emotions are based on samples from Western countries, (potential) cultural variances have not been taken into account. In cross-cultural comparisons, shame is typically viewed as a maladaptive emotion in individualistic-oriented societies, as it often entails a depreciation of one's self-esteem that is not socially acceptable (Hofstede, 1980; Tracy et al., 2007). On the contrary, China is an East Asian country where collectivistic-oriented cultural ideology prevails (Hofstede, 1980). In the Chinese tradition, shame could be adaptive in various social circumstances, as the Chinese indoctrination encourages its social members to prioritize collective values over personal accomplishments. In this cultural atmosphere, shame functions to induce self-reflection and to keep social behaviors aligned with the moral norms (Bagozzi et al., 2003; Wang et al., 2020).

In fact, Chinese parents often use shame as a parenting strategy/tool to motivate children to improve and perfect themselves (Stadter & Jun, 2020). The high frequency of inducing shame for disciplinary purposes could contribute to more displays of shame in Chinese children, and this cultural explanation may partially account for the increase of shame during the preschool years in Chinese children. However, our studies in this thesis did not examine any cultural factors, such as cultural identity. Hence, the cultural influence remains an assumption and requires further investigation by future research. This issue is further discussed as a limitation in "Implications and Future Directions".

As indicated by prior research, as socialization progresses, preschoolers become more willing to engage in social learning and develop a better understanding of other's perspectives along with a stronger motivation to help others in distress (Beeler-Duden et al., 2022; Zahn-Waxler et al., 1992). Consequently, children display more prosocial behaviors taking the forms of helping, sharing, and comforting in the preschool years

(Tsou et al., 2021). Our finding regarding the developmental trajectory of prosocial behaviors (i.e., an increase over time) was in line with prior research.

However, our results indicated that emotion contagion and attention to others' emotions remained stable, whereas our hypotheses were that emotion contagion would decrease with age, and attention to others' feelings would increase with age (Tsou et al., 2021). According to prior studies, given that children's cognitive abilities and emotion regulation develop as their socialization carries on, they tend to be increasingly capable of regulating their emotional arousal, therefore their emotion contagion should decrease with age across the preschool years (Rieffe et al, 2010; Tsou et al., 2021). A possible explanation for our unexpected finding may be that we tracked children's development across a relatively short time span (i.e., an average interval of 15 months), which might not be sufficient to capture a significant change in their developmental trajectories (see "Considerations and Future Directions" for further discussions).

Associations between social emotions and psychosocial functioning in Chinese DHH and TH preschoolers

Lastly, the association between social emotions and children's psychosocial functioning was examined, both cross-sectionally and longitudinally. According to our analysis on concurrent validity in **Chapter 2**, preschoolers' display of shame was related with more internalizing and externalizing behaviors. Furthermore, in **Chapter 3**, the linear mixed models (LMM) demonstrated that the mean and the change levels of shame contributed to more externalizing behaviors over time for both DHH and TH preschool children. In particular, for TH children, their mean level of shame contributed to predicting lower social competence over time. Taken together, our results from both the cross-sectional

and longitudinal studies suggest that shame may be maladaptive to preschoolers' social-emotional development: frequent, intense shame can disrupt and jeopardize children's interactions with others, leading to more social avoidance and reactive aggression (e.g., Fergus et al., 2010; Gruenewald et al., 2004). This result is in line with those findings on shame based on Western children (Bennett et al., 2005; Fergus et al., 2010), yet it contradicts studies suggesting that shame can benefit individuals' social competence in (South-)East Asian countries (Bagozzi et al., 2003; Heine, 2002). Further investigations into how cultural identities affect children's understanding of shame is warranted, as our studies did not account for any cultural variables.

As for guilt and pride, the manifestations of guilt and pride were related to better social competence. Also, the mean and change levels of guilt and pride contributed to better social competence over time in TH and DHH preschoolers, whilst the mean level of guilt contributed also to fewer internalizing and externalizing behaviors among these preschoolers (see **Chapter 4**). Our findings on guilt and pride were by and large in line with previous studies, indicating a positive impact of guilt and pride on the psychosocial functioning of preschool children, which were not influenced by hearing loss (Broekhof et al., 2018; Ketelaar et al., 2015).

As for empathy, our results on concurrent validity (**Chapter 4**) and longitudinal associations (**Chapter 5**) revealed that prosocial behaviors contributed to better social competence, fewer internalizing and externalizing behaviors over time in DHH and TH preschoolers, suggesting that prosocial behaviors may be largely adaptive to children's psychosocial functioning, regardless of their hearing abilities (Salerni & Caprin, 2022; Ashori & Aghaziarati, 2023).

However, our cross-sectional research (**Chapter 3**) found emotion contagion to relate with more internalizing behaviors and lower social competence; The linear mixed

models (**Chapter 5**) also showed that the mean level of emotion contagion contributed to more internalizing and externalizing behaviors across time in both DHH and TH preschoolers. In other words, too much emotion contagion may be an emotional burden and a sign of a lack of regulation abilities for preschoolers (Geng et al., 2012; Rieffe et al., 2010). A possible explanation is that Chinese children, influenced by the collective cultural norms, are more interdependent and more emotionally affected and disturbed by contagious emotions as compared to their Western counterparts (Atkins et al., 2016; Matsumoto et al., 2008). Future research is needed to verify/complement our findings and explore the cultural variances of social emotions impacting children's psychosocial development.

As for attention to others' feelings, Spearman correlations (**Chapter 4)** showed that attention to others' feelings was related to better social competence, but also more internalizing behaviors. Linear mixed models (**Chapter 5**) showed that the mean level of attention to others' feelings contributed to better social competence in DHH and TH preschoolers. However, the change in scores of attention to others' feelings contributed to predicting fewer internalizing behaviors over time in DHH preschool children. These findings thus indicate an impact of hearing loss on children's development in terms of switching attention to others, which will be discussed in the next section.

In sum, shame and emotion contagion, both implying a self-focus perspective, are related to more maladaptive psychosocial functioning, whereas the other emotions studied in this thesis, including pride, guilt, and the second and third levels of empathy (i.e., attention to others' emotions and prosocial actions), which allocate one's attention and cognition onto the outside world, are related to better psychosocial functioning over time.

The impact of hearing loss on preschoolers' development

Overall, the lack of differences between DHH and TH Chinese children in our studies was striking and positive. The longitudinal findings obtained in our **Chapter 3** and **5** did not show a significant impact of hearing loss on the abovementioned developmental trajectories: the developmental trends, or the increasing/decreasing rates of shame, guilt, pride, and empathy, were similar in Chinese DHH and TH preschoolers.

Group differences between DHH and TH preschoolers were shown only on the levels of guilt and pride: DHH children manifested lower levels of guilt and pride over time compared to their TH peers, and these group differences persisted in the preschool years. Accordingly, we summarize: (1) Hearing losses limit children's access and social to their social world from an early age, leading to lower levels of guilt and pride (whilst not for shame and empathy). (2) Hearing losses may not affect the trajectories of moral development, and the lower levels shown in DHH children persist in preschool years.

When the relations between social emotions and psychosocial functioning were considered, an impact of hearing loss was indicated: shame contributed to lower social competence over time in TH preschoolers only. Considering that the manifested levels of shame were indifferent in DHH and TH preschoolers, these results might indicate that the link between shame and social competence is more salient in TH children. As TH children are more involved in social activities, manifesting more shame could imply lower social adaptability and lower self-esteem (Ferguson et al., 1999); but this effect might be less pronounced in DHH children who have relatively limited social access (Netten et al, 2015).

The impact of hearing loss was shown also on attention to others' feelings. This level of empathy contributed to better social competence of DHH and TH preschoolers,

thus supporting Hoffman (1987) that the switch of attention from the self to the outer world is dependent on socialization. However, attention to others' feelings contributed also to fewer internalizing behaviors in only the DHH group. Presumably, when DHH children focus their attention on the social world, they have less energy to ruminate on their negative thoughts or emotions, resulting in fewer internalizing behaviors (Tsou et al., 2021). The impact of hearing loss on preschool children's empathic development, therefore, is likely to be mediated by their social participation. Yet, these assumptions may need further verification. Nonetheless, they highlight the importance of creating inclusive environments, just as the CRRCHSI practitioners did in the early intervention programs to safeguard DHH children's development.

Considering that only one other longitudinal study investigated the development trajectories of these distinct empathic components in DHH and TH preschoolers (Tsou et al., 2021), it is unclear to what extent our results revealed the reality. Meanwhile, we also cannot rule out the possibilities of latent effects (e.g., the effects of the interventions and hearing rehabilitation) or biases (e.g., caused by data attrition, or the short intervals in between data collections). Important to note that the governmental support and early intervention projects of CRRCHSI, may be crucial to the hearing rehabilitation of DHH preschoolers, and these might have contributed to these amazingly positive outcomes when DHH and TH children were compared.

The Chinese national hearing-screening policy for new-born infants guarantees early detection of hearing loss and deafness from birth (Wen & Huang, 2023); and the financial support for HA/CI usage enables nearly 80% of the DHH population to assist their hearing with suitable equipment (Jiang et al., 2019). The governmental screening tests and health insurance for HA/CI ensure that DHH children are diagnosed since birth, and have access to suitable hearing equipment (Ding et al., 2009; Wen & Huang,

2023). It is worth mentioning that most of the children in our sample received bilateral CI or HA at a very young age, which seemed to be a great support for them to overhear speeches. As a comparison, prior studies were based on DHH children who received unilateral CI/HA relatively later in their childhood (e.g., Ketelaar et al., 2015), therefore the children in our study may have certain advantages in language and social-emotional development.

Accordingly, our Chinese DHH children had already received sufficient medical and rehabilitation treatments compared to those of other countries (Jiang et al., 2019). On this basis, CRRCHSI also provides rehabilitation projects focusing on one-on-one interventions and establishing inclusive environments. Through close interactions with practitioners, our DHH children had access to a sufficient amount of verbal input which safeguarded their language development. On this basis, the language development of our DHH participants in CRRCHSI was to some extent safeguarded and might have a smaller impact on their social-emotional development (Li et al., 2017).

Furthermore, our DHH participants were assigned to special classes consisting of only DHH children who received intensive care from the teachers, so that they could study in an inclusive environment and socialize with their peers in daily lives, which may therefore facilitate their social development. These inclusive environments created by CRRSCHSI could increase DHH children's motivation for social participation in their DHH community and overcome their barriers in interpersonal interactions. Thus, we could presume that our DHH participants have better communicative abilities and social skills, which led to better development of social emotions accordingly.

To summarize, the governmental policies and rehabilitation projects improved our DHH participants' hearing status and possibly safeguarded their social development. By these means, similar results were shown regarding the development trajectories of

social emotions of DHH and TH children. Yet, it is noteworthy that our research did not use quantitative methods to study the impact children's hearing losses their social emotions. Instead, we operationalized DHH and TH as a categorical variable, and thus future studies are still needed to deepen our understanding.

Considerations and Future Directions

Our research raises issues that demand further consideration. First, further research is called for to examine the effects of early intervention and rehabilitation projects on DHH children's social participation and development. Our **Chapter 3** and **5** revealed that children's hearing loss contributed only to delays in manifested levels of guilt and pride in DHH children, whereas having no impact on most aspects of the development of social emotions. Presumably, our samples of DHH and TH preschool children might have smaller gaps in social participation than we previously expected, because of the governmental support and early intervention/rehabilitation projects for DHH children (Ding et al., 2009; Li et al., 2017; Wen & Huang, 2023). Yet, several limitations and suggestions for future research are important to note here.

First, we must point out that we collected only two waves of longitudinal data with 49% attrition at the second wave, in **Chapter 3** and **5**. Although simulation studies indicated that an attrition rate of lower than 50% was considered acceptable for LMM analyses, higher attrition rates still lead to larger biases in estimations (e.g., Pan & Zhan, 2020). For instance, an unneglectable issue was that those participants who dropped out at the second wave were slightly different from those participants who stayed on several study variables (e.g., guilt, internalizing behaviors), and these differences could lead to higher sampling bias and lower external validity of our results. Furthermore, due to the

fact that our two-wave longitudinal data had an interval of 15 months, our examination of the development trajectories was thus based on a 15-month interval. Considering that the development of social emotions is a continuous, gradual process, a relatively short period for longitudinal tracking might not be sufficient to capture all significant changes in preschool children's development. In other words, the data quality may be a potential factor that influenced our final results (e.g., the result that hearing loss did not affect preschoolers' empathic development). Therefore, in further explorations on this topic, future studies will benefit from collecting data from larger samples as well as tracking children's development for a longer period.

Second, although our studies explored the developmental trajectories of several social emotions in DHH and TH respectively, we did not evaluate or quantify children's social participation and the latent effects of early interventions. Further investigations are warranted to further our understanding of this issue, for example, wearable sensors are useful for assessing children's interactional patterns in schoolyards and playgrounds, which can provide quantitative measures of children's social participation and feedback information for the improvement of rehabilitation projects (e.g., Nasri et al., 2023).

Third, although our studies explored the development of social emotions among Chinese preschoolers, we did not measure any cultural factor. Despite the adequacy of the construct validity of social emotions, cultural variances may still exist especially on the associations between social emotions and psychosocial functioning. Prior findings show that social emotions may function differently in different cultural contexts. For example, shame motivates self-improvement in South-East Asian countries (e.g., Cole et al., 2006; Heine, 2002); whereas shame is maladaptive to children's socialization in the Chinese cultural contexts (e.g., Wu et al., 2020; Zhong et al., 2008). Furthermore, East-Asian individuals tend to experience more intense arousal by witnessing others in

distress and are more heavily affected by contagious emotions, compared to Western individuals (Atkins et al., 2016; Matsumoto et al., 2008; Markus & Kitayama, 1991). These results imply cultural variances in individuals' subjective emotional experiences and behavioral reactions to social emotions. Future research is recommended to include cultural variables such as cultural orientation and cultural identity in their study designs to better examine these cultural effects.

CONCLUSION

This thesis planned to investigate the developmental trajectories of moral emotions and empathy and their associations with psychosocial functioning, in preschoolers with and without hearing loss. Our validation studies provided supporting evidence that the two questionnaires used by our research could successfully distinguish shame, guilt, pride, and three empathic levels in Chinese preschool children. Furthermore, our longitudinal studies suggested that shame, guilt, pride, and prosocial behaviors increased across the preschool years, whilst children's emotion contagion and attention to others' feelings remained stable. These moral emotions and empathic levels played an essential role in facilitating children's social development as well as in regulating children's behavioral problems. Overall, we found that hearing loss affected children's displays of guilt, pride, as well as the psychosocial functioning of shame and empathy. These findings support our assumption that children's access to the social world is crucial to their socialization and social-emotional development. Hearing loss, which can lead to challenges for social participation, may delay children's social-emotional development, hence more research attention should be paid to reducing DHH children's difficulties in language and social

development. Additionally, more research could focus on adapting the environment as to better benefit these children and provide them with better access to their community.

This thesis shed light on the crucial significance of the hearing rehabilitation and early intervention programs in improving children's hearing conditions, language skills, and social-emotional functioning. The national screening and insurance of China played a key role in diagnosing hearing loss shortly after birth, and in supporting DHH children's hearing by using devices such as CI and HA. Furthermore, one-on-one interaction can improve DHH children's language development by providing them with large amount of verbal input. More importantly, creating an inclusive and accessible environment where DHH children can easily participate in social interactions and learn social knowledge is vital for children's social-emotional development. Our findings have shown a narrowed gap between DHH and TH children in their social-emotional functioning. Researchers should further verify our findings and take steps to adapt the physical and social environment for DHH children to support their social-emotional development.

Hopefully, our research can inspire other like-minded researchers. We envision future research that deepens our understanding of preschool children's social-emotional development and the challenges DHH children face in navigating the social world.

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Dutch Summary

Nederlandse Samenvatting

Sociale emoties zijn een speciale klasse van emoties die voornamelijk dienen voor het ondersteunen van sociaal functioneren. Sociale emoties, zoals schaamte, schuld, trots en empathie, worden beschouwd als een ontwikkelingsmijlpaal van de socialisatievoortgang van kinderen. Echter, door beperkt gehoorvermogen en beperkte toegang tot de sociale wereld, kunnen dove en slechthorende (DHH) kinderen meer moeilijkheden ondervinden bij hun ontwikkeling van sociale emoties. Deze ontwikkelingsvertraging kan resulteren ineen lager sociaal-emotioneel functioneren in vergelijking met hun typisch horende (TH) leeftijdsgenoten, zoals lagere sociale competentie of vaker voorkomend internaliserend en externaliserend gedrag. Om deze DHH-kinderen tijdig te kunnen ondersteunen bij het verbeteren van hun sociaal-emotionele functioneren, is het cruciaal om eerst de ontwikkelingstrajecten van sociale emoties bij DHH-kleuters te bestuderen.

Deze thesis had als doel de impact van gehoorverlies op de ontwikkeling van sociale emoties bij kleuters in de Chinese sociale context te onderzoeken. Het begon met het valideren van twee speciaal ontworpen vragenlijsten voor de beoordeling van morele emoties (schaamte, schuld, trots; Hoofdstuk 2) en empathie (emotionele besmetting, aandacht voor de gevoelens van anderen, prosociaal gedrag; Hoofdstuk 4) bij Chinese kleuters. Door deze twee gevalideerde vragenlijsten te gebruiken, onderzochten we verder hoe morele emoties (Hoofdstuk 3) en empathie (Hoofdstuk 5) zich ontwikkelen tijdens de kleuterjaren, terwijl we onderzochten in welke mate gehoorverlies de ontwikkelingstrajecten van DHH-kinderen kan beïnvloeden.

Het meten van sociale emoties bij Chinese kleuters

Momenteel was er geen vragenlijst die specifiek was ontworpen om morele emoties en empathie te meten bij Chinese kleuters. Het valideren van geschikte vragenlijsten die eerder waren ontwikkeld voor westerse kinderen in de Chinese context was dus een

noodzakelijke eerste stap om onze onderzoeksdoelen te bereiken. Hoofdstuk 2 en 4 valideerden respectievelijk de Moral Emotion Questionnaire (MEQ) en de Empathy Questionnaire (EmQue). De validatie van de MEQ toonde voldoende constructvaliditeit terwijl de meetinvariantie ook werd gehaald, wat suggereert dat de MEQ toepasbaar was voor het meten van schaamte, schuldgevoel en trots bij Chinese kleuters. Vergelijkbare resultaten en robuuste psychometrische eigenschappen werden ook bevestigd voor de EmQue. Deze validatiestudies leverden dus geschikte meetinstrumenten op voor de beoordeling van sociale emoties bij Chinese DHH- en TH-kleuters.

De ontwikkelingstrajecten van sociale emoties bij Chinese kleuters

In Hoofdstuk 3 en 5 werden de ontwikkelingstrajecten van sociale emoties onderzocht met behulp van longitudinale ontwerpen. Schaamte, schuldgevoel en trots namen naar verluidt toe met de leeftijd bij zowel DHH- als TH-kleuters, wat impliceert dat de verwerving van morele emoties door kleuters waarschijnlijk voortkomt uit hun socialisatie. Prosociaal gedrag nam ook toe tijdens de kleuterjaren, terwijl emotiebesmetting en aandacht voor de gevoelens van anderen naar verluidt statisch bleven.

Tijdens de kleuterjaren raken kinderen steeds meer betrokken bij sociale interacties, waardoor ze leren om de sociale normen en de verwachtingen van anderen met betrekking tot bepaald gedrag te begrijpen. Dienovereenkomstig worden kleuters in staat om na te denken over en hun eigen sociale emoties te uiten. Het begrijpen en uiten van schaamte kan echter een rijke levenservaring en hoge cognitieve vaardigheden vereisen, wat kan verklaren waarom kleuters minder schaamte uiten tijdens de kleuterjaren.

Het onderzoeken van de ontwikkeling van sociale emoties vanuit een intercultureel perspectief is een belangrijk aandachtspunt voor toekomstig onderzoek. Aangezien het huidige onderzoek dat zich richt op de sociale emoties van kinderen voornamelijk is gebaseerd op een westerse steekproef, is het onduidelijk hoeveel culturele verschillen er in dit opzicht kunnen bestaan. Bijvoorbeeld, in westerse contexten wordt schaamte vaak als maladaptief beschouwd omdat het een afbreuk aan iemands zelfrespect omvat. Echter, in de Chinese traditie kan schaamte af en toe adaptief zijn omdat de Chinese indoctrinatie de prioriteit van collectieve waarden bepleit. Chinese ouders gebruiken schaamte vaak als een opvoedingsstrategie om hun kinderen aan te moedigen zichzelf te verbeteren. De culturele verschillen zouden een deel van de redenen kunnen zijn waarom we zagen dat Chinese kinderen schaamte in hoge mate uitten tijdens de vroege jaren, een trend die aanhield gedurende de hele voorschoolse periode. De culturele invloed blijft echter een aanname en vereist verder onderzoek door toekomstig onderzoek.

Wat betreft prosociaal gedrag, naarmate de socialisatie van kinderen vordert, worden kleuters bereidwilliger om deel te nemen aan sociaal leren en ontwikkelen ze een sterkere motivatie om anderen te helpen, wat de vorm kan aannemen van helpen, delen en troosten. Echter, zowel emotionele besmetting als aandacht voor de emoties van anderen zal mogelijk niet in grote mate toenemen, aangezien de regulatievaardigheden van kinderen zich pas sneller ontwikkelen in de late kindertijd en adolescentie.

Verbanden tussen sociale emoties en psychosociaal functioneren

In dit proefschrift werd gerapporteerd dat schaamte geassocieerd wordt met meer internaliserend en externaliserend gedrag (in de loop van de tijd) bij zowel DHH- als TH-kleuters. Dit betekent dat schaamte een maladaptieve emotionele functie kan zijn

voor het sociaal-emotionele functioneren van kleuters: frequente, intense schaamte kan de interacties van kinderen met anderen in gevaar brengen, wat kan leiden tot lagere kwaliteit van relaties met leeftijdsgenoten en meer agressie. Wat betreft schuld en trots, bleken de manifestaties van schuld en trots gerelateerd aan betere sociale competentie in de loop van de tijd bij DHH- en TH-kleuters, en schuld droeg ook bij aan minder internaliserend en externaliserend gedrag.

Prosociaal gedrag bleek gerelateerd te zijn aan betere sociale competentie, minder internaliserend en externaliserend gedrag bij zowel DHH- als TH-kleuters. Toch bleek emotionele besmetting gerelateerd te zijn aan lagere sociale competentie, meer internaliserend en externaliserend gedrag in de loop van de tijd bij zowel DHH- als TH-kleuters. Dat wil zeggen dat te veel emotionele besmetting een emotionele last kan zijn voor kleuters. Vooral voor Chinese kinderen, omdat ze meer van elkaar afhankelijk zijn, kunnen negatieve, besmettelijke emoties meer emotionele problemen voor hen veroorzaken. Wat betreft aandacht voor de gevoelens van anderen, bleek dat dit verband hield met betere sociale competentie en minder internaliserend gedrag, wat aangeeft dat het verleggen van de aandacht van kinderen van zichzelf naar anderen een goed teken is voor hun socialisatie.

De impact van gehoorverlies op de ontwikkeling van kleuters

Volgens onze resultaten in Hoofdstuk 3 en 5 ontdekten we geen significante impact van gehoorverlies op de ontwikkelingstrajecten van kleuters: de ontwikkelingstrends en de veranderingswaarden van alle sociale emoties waren vergelijkbaar bij DHH- en TH-kleuters. Groepsverschillen tussen DHH- en TH-kleuters werden alleen waargenomen op de niveaus van schuld en trots: DHH-kinderen vertoonden lagere niveaus van schuld en trots in de loop van de tijd vergeleken met hun TH-leeftijdsgenoten, en deze groepsverschillen bleven bestaan in de kleuterjaren.

Opvallend was dat schaamte alleen verband hield met lagere sociale competentie bij TH-kleuters. Dit zou kunnen aangeven dat het verband tussen schaamte en sociale competentie meer uitgesproken is bij TH-kinderen. Omdat TH-kinderen meer betrokken zijn bij sociale activiteiten, zou het manifesteren van meer schaamte kunnen duiden op een lager sociaal aanpassingsvermogen en een lager zelfbeeld, maar dit effect zou minder krachtig kunnen zijn bij DHH-kinderen. Bovendien was aandacht voor de gevoelens van anderen alleen gerelateerd aan minder internaliserend gedrag bij DHH-kinderen. Het is mogelijk dat DHH-kinderen minder energie om te mijmeren over negatieve gedachten en emoties wanneer ze hun aandacht richten op de sociale wereld, wat kan resulteren in minder internaliserend gedrag.

Aangezien er slechts één andere longitudinale studie is die de ontwikkelingstrajecten van deze verschillende empathische componenten bij DHH- en TH-kleuters heeft onderzocht (Tsou et al., 2021), is het onduidelijk in hoeverre onze resultaten de realiteit weergeven. Ondertussen kunnen we ook de mogelijkheden van latente effecten (bijv. de effecten van interventies en gehoorrevalidatie) of bias (bijv. veroorzaakt door dataverlies of de korte intervallen tussen dataverzamelingen) niet uitsluiten.

Het Chinese nationale gehoorscreeningbeleid voor pasgeboren baby's garandeert vroege detectie van gehoorverlies en doofheid vanaf de geboorte (Wen & Huang, 2023); en de financiële steun voor CI-gebruik stelt bijna 80% van de DHH-populatie in staat om hun gehoor te helpen met geschikte apparatuur. De overheidsscreeningtests en ziektekostenverzekering voor HA/CI zorgen ervoor dat DHH-kinderen vanaf de geboorte worden gediagnosticeerd. Bovendien kregen de kinderen in onze steekproef op jonge leeftijd bilaterale CI of HA, wat een belangrijke ondersteuning voor hen leek te zijn om toespraken te horen. De

gehoorrehabilitatiecentrabiedt ook revalidatieprojecten met één-op-één-interventies. Via interacties met specialisten hadden onze DHH-kinderen toegang tot voldoende verbale input, wat hun taalontwikkeling heeft kunnen ondersteunen.

Bovendien werden onze DHH-deelnemers toegewezen aan speciale klassen die alleen bestonden uit DHH-kinderen die intensieve zorg van de leraren kregen, zodat ze in een inclusieve omgeving studeerden en in het dagelijks leven met hun leeftijdsgenoten omgingen. Deze inclusieve omgevingen die door CRRSCHSI zijn gecreëerd, kunnen de motivatie van DHH-kinderen voor sociale participatie vergroten. Dienovereenkomstig verbeterden het overheidsbeleid en het revalidatieproject de gehoorstatus van onze DHH-deelnemers en beschermden mogelijk hun sociale ontwikkeling. Deze effecten kunnen dus zichtbaar zijn in onze bevindingen, waardoor kleinere verschillen tussen DHH- en TH-kinderen werden waargenomen in termen van hun sociaal-emotionele ontwikkeling.

Appendices

Supplementary Materials

Acknowledgments

Curriculum Vitae

List of Publications

Appendices & Supplementary Materials of Chapter 2

Table A. Items of the Moral Emotions Questionnaire, MEQ (Da Silva et al. 2022)

Pride	
2	When my child has done something remarkable, he/she comes over to show me
6	When he/she has accomplished something difficult, my child looks at me
8	When my child receives a compliment, he/she smiles
10	My child tries to do well
12	My child wants me to come over and take a look when he/she has accomplished something difficult.
14	My child likes receiving compliments
17	When my child has done something well, he/she says something positive about him-/herself
Guilt	
3	When my child does something he/she is not allowed to do, he/she tries to make up for it (e.g., saying sorry)
5	My child shows that he/she regrets something
9	When my child has broken something of someone else, he/she tries to repair it
11	My child cries when he/she has accidentally hurt someone
13	When my child does something wrong (e.g., spill something), he/she tries to fix it (e.g., fetches a cloth)
16	My child does not respond when I scold him/her for doing something he/she is now allowed to do (R)
Shame	
1	My child hides when he/she has done something wrong
4	When my child has done something wrong, he/she does not look at me
7	My child quickly walks away when he/she has done something he/she is not allowed to do
15	When my child has broken something, he/she tries to hide it from me

Table B. Age distribution and mean scores (standard deviations).

	Age Distribution				
	2 years	3 years	4 years	5 years	6 years
N (total = 182)	10	46	48	63	15
Moral Emotions					
Pride	2.41 (0.27)	2.66 (0.27)	2.65 (0.46)	2.59 (0.31)	2.61 (0.29)
Guilt	2.11 (0.40)	2.33 (0.43)	2.31 (0.43)	2.38 (0.41)	2.40 (0.40)
Shame	1.67 (0.41)	1.67 (0.46)	1.71 (0.48)	1.69 (0.39)	1.78 (0.39)
Social-Emotional Functioning					
Internalizing Behaviors	1.70 (0.27)	1.66 (0.23)	1.66 (0.21)	1.59 (0.17)	1.61 (0.21)
Externalizing Behaviors	1.49 (0.31)	1.33 (0.28)	1.35 (0.23)	1.27 (0.22)	1.24 (0.31)
Social Competence	2.14 (0.34)	2.29 (0.31)	2.37 (0.44)	2.41 (0.35)	2.55 (0.42)

Table C. Spearman's correlations between the study variables.

	3.	4.	5.	6.	7.	8.
1. Age	-.02	.11	.06	-.12	-.18*	.22**
2. Gender	-.20**	.003	-.02	.01	.12	-.13
3. Pride		.50***	-.08	.09	.01	.47***
4. Guilt			-.09	-.05	-.14	.38***
5. Shame				.17*	.23**	-.12
6. Internalizing Behaviors					.36***	-.23**
7. Externalizing Behaviors						-.22**
8. Social Competence						-

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table D. Group differences of means of moral emotions across Gender and Age groups.

	Gender			Age		
	df	t	p	df	t	p
Configural test						
Pride	179	-2.52	.01	179	-.42	.67
Guilt	179	.05	.96	179	-1.82	.07
Shame	179	-.41	.68	179	-.07	.95
Partial Metric test [a, b]						
Pride	179	-2.62	.01	179	-.42	.67
Guilt	179	.16	.87	179	-1.82	.07
Shame	179	-.41	.68	179	.33	.74
Partial Scalar test [c]						
Pride	179	-2.62	.01	179	.35	.72
Guilt	179	.16	.87	179	-.89	.38
Shame	179	-.41	.68	179	.34	.73

Note:
a. For the partial metric model across gender, equality constraints on the factor loadings of Item 14 and 16 were freed.
b. For the partial metric model across age, equality constraint on the factor loading of Items 4 was freed from the model.
c. For the partial scalar model across age, equality constraints on the intercepts of Items 9 and 17 were freed from the model.

Appendices & Supplementary Materials of Chapter 4

Table A. The items of the existing five versions of the EmQue (by country)

	Versions of EmQue	NL	IT	JP	SP	PT
	Emotional Contagion					
1	When another child cries, this child gets upset too.	X				X
4	This child also needs to be comforted when another child is in pain.	X	X	X	X	X
7	When another child makes a bad fall, shortly after this child pretends to fall too.	X	X	X	X	
10	When another child is upset, this child needs to be comforted too	X	X	X	X	X
13	When another child gets frightened, my child freezes or starts to cry	X	X	X	X	X
16	When other children argue, this child gets upset.	X				X
19	When another child cries, this child looks away.					
	Attention to Others					
3	When this child sees other children laughing, he/she starts laughing too.	X	X	X	X	
6	When an adult gets angry with another child, this child watches attentively.	X	X	X	X	X
9	This child looks up when another child laughs.	X	X	X	X	X
12	When adults laugh, this child tries to get near them.	X	X	X	X	X
15	This child looks up when another child cries.	X	X	X	X	X
18	When another child is angry, this child stops his own play to watch.	X				X
20	When other children quarrel, this child wants to see what is going on.	X				X
	Prosocial Behaviors					
2	When I make clear that I want some peace and quiet, this child tries not to bother me.	X				
5	When another child starts to cry, this child tries to comfort him/her.	X	X	X	X	X
8	When another child gets upset, this child tries to cheer him/her up.	X	X	X	X	X
11	When I make clear that I want to do something by myself (e.g. read), this child leaves me alone for a while.	X				
14	When two children are quarrelling, this child tries to stop them.	X	X	X	X	X
17	When another child gets frightened, this child tries to help him/her.	X	X	X	X	X

Note: "X" means the corresponding item is included in that version of EmQue.
The abbreviations represent the country in which the corresponding version of EmQue was validated: NL = Netherlands; IT = Italy; JP = Japan; SP = Spain; PT = Portugal.

Table B. Spearman's correlations between the study variables.

	3.	4.	5.	6.	7.	8.
1. Age	-.06	-.06	.34***	-.12	-.18*	.22**
2. Gender	-.02	-.12	-.10	.01	.12	-.13
3. Emotional Contagion		.26**	.06	.20**	.01	-.39***
4. Attention to Others' Feelings			.32***	.29**	.09	.22**
5. Prosocial Behaviors				-.25*	-.17**	.39***
6. Internalizing Behaviors					.37***	-.23**
7. Externalizing Behaviors						-.24**
8. Social Competence						-

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

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Zijian Li,

Leiden, December 2024

Curriculum Vitae

Zijian Li was born in 1991 on the 14th of June in Lin-Fen, China. In 2010 he graduated from the Affiliated Senior High School of South-East University of China. He obtained a bachelor's degree in Applied Psychology at Shanghai Normal University in 2014. In 2017, he acquired a (research) master's degree in Psychology, at Renmin University of China. In October 2019, he started his PhD program at the Institute of Developmental Psychology of Leiden University, under the supervision of Prof.dr. Carolien Rieffe, Dr. Boya Li, and Prof.dr.ir. Johan H. M. Frijns.

Zijian Li's research focused on the social-emotional development of preschool children who are deaf and hard of hearing. In the PhD period, he worked on longitudinal studies examining the impact of hearing loss on the development of social emotions in preschool children. He has also worked on many validation studies aimed at developing questionnaires for measuring moral emotions, empathy, parental-child communication, and cultural identities for preschool children. His interest lies also in neuropsychology: he is skilled at designing and operating EEG experiments and published several relevant studies during his master's stage in China. Currently, he seeks to continue his academic career after his PhD study.

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