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

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Chapter 3

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

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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).

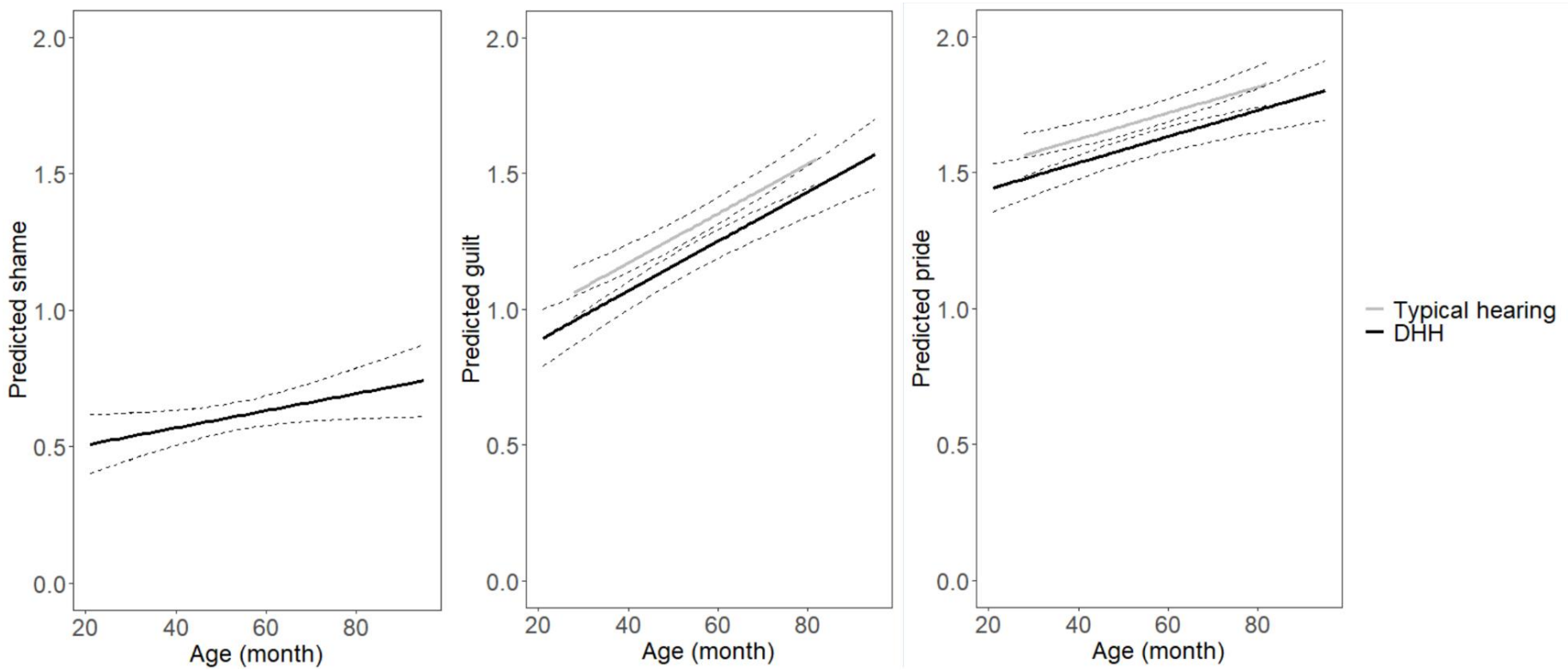
As for the development of pride, the model with the fixed effects of age (b = 0.005, beta = 0.14, t = 4.21, p < 0.001, 95% CI: [0.003, 0.007]) and group (b = -0.09, beta = -0.09, t = -2.35, p = 0.019, 95% CI: [-0.16, -0.01]) improved the model fit to the largest extent: -2LL (195.3). The results suggested 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.

REFERENCE

Akimov, A. V., Gemuea, K. A., & Semenova, N. K. (2021). The Seventh Population Census in the PRC: Results and prospects of the country's demographic development. *Herald of the Russian Academy of Sciences, 91,* 724–735. https://doi.org/10.1134/S1019331621060083

Bafunno, D., & Camodeca, M. (2013). Shame and guilt development in preschoolers: The role of context, audience and individual characteristics. *European Journal of Developmental Psychology, 10(2),* 128–143. https://doi.org/10.1080/17405629.2013.765796

Bagozzi, R. P., Bergami, M, & Leone, L. (2003). Hierarchical representation of motives in goal setting. Journal of Applied Psychology, 88(5), 915-943. https://doi.org/10.1037/0021-9010.88.5.915

Bates, D., Mächler M., Bolker, B., & Walker, S. (2015). "Fitting Linear Mixed-Effects Models Using lme4." *Journal of Statistical Software, 67(1),* 1–48. https://doi.org/10.18637/jss.v067.i01

Brislin, R. W., Lonner, W. J., & Thorndike, R. M. (1973). *Cross-cultural research methods* (pp. 47-82). New York: John Wiley & Sons. Retrieved from URL: https://journals.sagepub.com/doi/10.1177/136346157501200101

Broekhof, E., Bos, M. G. N., & Rieffe, C. (2021). The roles of shame and guilt in the development of aggression in adolescents with and without hearing loss. *Research on Child and Adolescent Psychopathology, 49,* 891–904. https://doi.org/10.1007/s10802-021-00769-1

Broekhof, E., Bos, M. G. N., Camodeca, M., & Rieffe, C. (2018). Longitudinal associations between bullying and emotions in deaf and hard of hearing adolescents. *Journal of Deaf Studies and Deaf Education, 23(1),* 17–27. https://doi.org/10.1093/deafed/enx036

Broekhof, E., Ketelaar, L., Stockmann, L., Van Zijp, A., Bos, M. G. N., & Rieffe, C. (2015). The understanding of intentions, desires and beliefs in young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45,* 2035-2045.

https://doi.org/10.1007/s10803-015-2363-3

Broekhof, E., Kouwenberg, M., Oosterveld, P., Frijns, J. H. M., & Rieffe, C. (2020). Use of the Brief Shame and Guilt Questionnaire in deaf and hard of Hearing children and adolescents. *Assessment, 27(1),* 194-205. https://doi.org/10.1177/1073191117725169

Bulgarelli, C., Blasi, A., de Klerk, C. C. J. M., Richards, J. E., Hamilton, A. Southgate, V. (2019). Fronto-temporoparietal connectivity and self-awareness in 18-month-olds: A resting state FNIRS study. *Developmental Cognitive Neuroscience, 38,* 100676. https://doi.org/10.1016/j.dcn.2019.100676

Calderon, R., & Greenberg, M. T. (2011). Social and emotional development of deaf children: Family, school, and program effects. In M. Marschark & P. E. Spencer (Eds.), *Oxford handbook of deaf studies, language, and education* (Vol. 1, 2nd Ed., pp. 188–199). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199750986.013.0014

Caldwell, A., & Nittrouer, S. (2013). Speech perception in noise by children with cochlear implants. *Journal of Speech, Language, and Hearing Research, 56(1),* 13–30. https://doi.org/10.1044/1092-4388(2012/11-0338)

Chao, W. C., Lee, L. A., Liu, T. C., Tsou, Y. T., Chan, K. C., & Wu, C. M. (2015). Behavior problems in children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology, 79(5),* 648–653. https://doi.org/10.1016/j.ijporl.2015.02.006

Da Silva, B. M. S., Frijns, Y., Veiga, G., Guroglu, B., Tsou, Y., & Rieffe, C. (2022). Moral emotions in early childhood: Validation of the Moral Emotions Questionnaire (MEQ). *International Journal of Behavioural Development, 46(2),* 157–168. https://doi.org/10.1177/01

De Villiers, J. G., & de Villiers, P. A. (2014). Linguistic determination and the understanding of false beliefs. In Mitchell, P., & Riggs, K. J. (Eds.), *Children's Reasoning and the Mind.* (pp. 201-212). Psychology Press. Retrieved from URL: https://scholarworks.umass.edu/aae_groundwork/15/

Ding, W., Xie, R., Sun, B. H, Li, W. J., Wang, D., & Zhen, R. (2016). Why does the "sinner" act prosocially? The mediating role of guilt and the moderating role of moral identity in

motivating moral cleansing. *Frontiers in Psychology, 7,* 1317. https://doi.org/10.3389/fpsyg.2016.01317650254221075031

Dirks, E., Stevens, A., Kok, S., Frijns, J., & Rieffe, C. (2020). Talk with me! Parental linguistic input to toddlers with moderate hearing loss. *Journal of Child Language, 47(1),* 186–204. https://doi.org/10.1017/S0305000919000667

Drummond, J. D. K., Hammond, S. I., Satlof-Bedrick, E., Waugh, W. E., & Brownell, C. A. (2017). Helping the One You Hurt: Toddlers' Rudimentary Guilt, Shame, and Prosocial Behavior After Harming Another. *Child Development, 88(4),* 1382-1397. https://doi.org/10.1111/cdev.12653

Eisenberg, N., Cumberland, A., & Spinrad, T. L. (1998). Parental Socialization of Emotion. *Psychological inquiry, 9(4),* 241–273. https://doi.org/10.1207/s15327965pli0904_1

Ferguson, T. J., Stegge, H., Miller, E. R., & Olsen, M. E. (1999). Guilt, shame, and symptoms in children. *Developmental Psychology, 35,* 347–357. Retrieved from URL: https://web.p.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=ffb384e1-ffb0-44f3-a8b7-ade082b9c935%40redis

Gadow, K. D., Sprafkin, J., & Nolan, E. E. (2001). DSM-IV symptoms in community and clinic preschool children. Journal of the American Academy of Child & Adolescent Psychiatry, 40(12), 1383-1392. https://doi.org/10.1097/00004583-200112000-00008

Gelman, A., & Hill, J. (2006). *Analytical methods for social research: Data analysis using regression and multilevel/hierarchical models* (pp. 279-298). Cambridge University Press & Assessment. https://doi.org/10.1017/CBO9780511790942

Griffiths, R., & Huntley, M. (1996). *Griffiths Mental Development Scales-Revised: Birth to 2 years* (GMDS 0-2). APA PsycTests. https://doi.org/10.1037/t03301-000

Gruenewald, T. L., Kemeny, M. E., Aziz, N., & Fahey, J. L. (2004). Acute threat to the social self: Shame, social self-esteem, and cortisol activity. *Psychosomatic medicine, 66(6),* 915-924. https://doi.org/10.1097/01.psy.0000143639.61693.ef

Gummerum, M., López-Pérez, B., Ambrona, T., Rodríguez-Cano, S., Dellaria, G., Smith, G., & Wilson, E. (2016). Children's moral emotion attribution in the Happy Victimizer Task:

The role of response format. *The Journal of Genetic Psychology, 177(1),* 1-16. https://doi.org/10.1080/00221325.2015.1103694

Gustavson, K., von Soest, T., Karevold, E., & Røysamb, E. (2012). Attrition and generalizability in longitudinal studies: findings from a 15-year population-based study and a Monte Carlo simulation study. *MC Public Health, 12,* 918. Retrieved from URL: http://www.biomedcentral.com/1471-2458/12/918

Hardecker, S., Schmidt, M. F. H., Roden, M., & Tomasello, M. (2016). Young children's behavioral and emotional responses to different social norm violations. *Journal of Experimental Child Psychology, 150,* 364-379. https://doi.org/10.1016/j.jecp.2016.06.012

Heaven, P. C. L., Ciarrochi, J., & Leeson, P. (2009). The longitudinal links between shame and increasing hostility during adolescence. *Personality and Individual Differences, 47(8),* 841-844. https://doi.org/10.1016/j.paid.2009.07.002

Hofstede, G. (1980). Culture and organizations. *International studies of management & organization, 10(4),* 15-41. https://doi.org/10.1080/00208825.1980.11656300

Heine, S. J. (2002). Self as Cultural Product: An examination of East Asian and North American selves. *Personality, 69(6),* 881-905. https://doi.org/10.1111/1467-6494.696168

Ibrahim, J. G., & Molenberghs, G. (2009). Missing data methods in longitudinal studies: a review. *Test, 18(1),* 1-43. https://doi.org/10.1007/s11749-009-0138-x

Ketelaar, L., Wieferink, C.H., Frijns, J.H.M., Broekhof, E., & Rieffe, C. (2015). Preliminary findings on associations between moral emotions and social behavior in young children with normal hearing and with cochlear implants. *European Child & Adolescent Psychiatry, 24,* 1369-1380. https://doi.org/10.1007/s0078701506882

Ketelaar, L., Wiefferink, C. H., Frijns, J. H. M., & Rieffe, C. (2017). Children with cochlear implants and their parents: Relations between parenting style and children's social-emotional functioning. *Ear & Hearing, 38,* 321-331. https://doi.org/10.1097/AUD.0000000000000387

Kochanska, G., Aksan, N., & Koenig, A. L. (1995). A longitudinal study of the roots of preschoolers' conscience: Committed compliance and emerging internalization. *Child development, 66(6),*

1752-1769. https://doi.org/10.2307/1131908

Krettenauer, T., Asendorpf, J. B., & Nunner-Winkler, G. (2013). Moral emotion attributions and personality traits as long-term predictors of antisocial conduct in early adulthood: Findings from a 20-year longitudinal study. *International Journal of Behavioral Development, 37(3),* 192-201. https://doi.org/10.1177/0165025412472409

Lai, K. Y. C., Luk, E. S. L., Leung, P. W. L., Wong, A. S. Y., Law, L., & Ho, K. (2010). Validation of the Chinese version of the Strengths and Difficulties Questionnaire in Hong Kong. *Social Psychiatry and Psychiatric Epidemiology, 45,* 1179–1186. https://doi.org/10.1007/s00127-009-0152-z

Lapan, C., & Boseovski, J. J. (2017). The effects of guilt on preschoolers' cognitive flexibility and inhibition. *Early Childhood Research Quarterly, 41,* 95–102. https://doi.org/10.1016/j.ecresq.2017.06.004

Leibold, L. J., & Buss, E. (2013). Children's Identification of Consonants in a Speech-Shaped Noise or a Two-Talker Masker. *Journal of Speech, Language, and Hearing Research, 56(4),* 1144-1155. https://doi.org/10.1044/1092-4388(2012/12-0011)

Li, B., Tsou, Y. T., Stockman, L., Greaves-Lord, K., & Rieffe, C. (2021). See the self through others' eyes: The development of moral emotions in young children with Autism Spectrum Disorder. *Development and Psychopathology, 35(3),* 1–11. https://doi.org/10.1017/S0954579421000973

Li, Z., Li, B., Tsou, Y., Oosterveld, P., & Rieffe, C. (2023). Moral emotions in early childhood: Validation of the Chinese moral emotion questionnaire. *Social Development, 32,* 527-545. https://doi.org/10.1111/sode.12645

Lorah, J. (2018). Effect size measures for multilevel models: definition, interpretation, and TIMSS example. *Large-scale Assessments in Education, 6,* 8. https://doi.org/10.1186/s40536-018-0061-2

Mazzone, A., Camodeca, M., & Salmivalli, C. (2016). Interactive effects of guilt and moral disengagement on bullying, defending and outsider behaviour. *Journal of Moral Education, 45(4),* 1-32. https://doi.org/10.1080/03057240.2016.1216399

Mills, R. S. L., Hastings, P. D., Serbin, L. A., Stack, D. M., Abela, J. R. Z., Arbeau, K. A., & Lall, D. I. K. (2015). Depressogenic thinking and shame proneness in the development of internalizing problems. *Child Psychiatry & Human Development, 46,* 194–208. https://doi.org/10.1007/s10578-013-0416-4

Mitchell, R. E., & Karchmer, M. A. (2004). Chasing the mythical ten percent: Parental hearing status of deaf and hard of hearing students in the United States. *Sign Language Studies, 4(2),* 138–163. Retrieved from URL: https://www.jstor.org/stable/26190985

Misurelli, S. M., & Litovsky, R. Y. (2015). Spatial release from masking in children with bilateral cochlear implants and with normal hearing: Effect of target-interferer similarity. *Journal of the Acoustical Society of America, 138(1),* 319–331. https://doi.org/10.1121/1.4922777

Morgan, G., Meristo, M., Mann,W., Hjelmquist, E., Surian, L., & Siegal, M. (2014). Mental state language and quality of conversational experience in deaf and hearing children. *Cognitive Development, 29(1),* 41–49. https://doi.org/10.1016/j.cogdev.2013.10.002

Muris, P., & Meesters, C. (2014). Small or big in the eyes of the other: On the developmental psychopathology of self-conscious emotions as shame, guilt, and pride. *Clinical Child and Family Psychology Review, 17,* 19-40. https://doi.org/10.1007/s10567-013-0137-z

Netten, A. P., Rieffe, C., Theunissen, S. C. P. M., Soede, W., Dirks, E., Briaire, J. J., & Frijns, J. H. M. (2015). Low empathy in deaf and hard of hearing (pre)adolescents compared to normal hearing controls. *PLOS ONE, 16(3),* e0248546. https://doi.org/10.1371/journal.pone.0124102

Ongley, S. F., & Malti, T. (2014). The role of moral emotions in the development of children's sharing behavior. *Developmental Psychology, 50(4),* 1148–1159. https://doi.org/10.1037/a0035191

Pan, Y. F., & Zhan, P. (2020). The impact of sample attrition on longitudinal learning diagnosis: A prolog. *Frontier in Psychology, 11,* 1051. https://doi.org/10.3389/fpsyg.2020.01051

Peng, Y. Q., Anderson, J. R., Johnson, M . D., & Liu, W. L. (2018). The associations between

perceived harsh and controlling parenting, shame proneness, and psychological aggression among Chinese dating couples. *Violence and Victims, 33(4),* 759-768. https://doi.org/10.1891/0886-6708.VV-D-17-00116

Pluta, A., Krysztofiak, M., Zgoda, M., Wysocka, J., Golec, K., Gajos, K., Dołyk, T., Wolak, T., & Haman, M. (2023). Theory of mind and parental mental-state talk in children with CIs. *Journal of Deaf Studies and Deaf Education, 28,* 288–299. https://doi.org/10.1093/deafed/enad004

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88(5),* 879–903. https://doi.org/10.1037/0021-9010.88.5.879

R Core Team (2021). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing. Retrieved from URL: https://www.R-project.org/

Rieffe, C., Netten, A. P., Broekhof, E., & Veiga, G. (2015). The role of the environment in children's emotion socialization: The case of deaf and hard-of-hearing children get access arrow. In Knoors, H., & Marschark, M. (Eds.), *Educating Deaf Learners: Creating a Global Evidence Base* (pp. 369-372). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780190215194.003.0016

Roos, S., Hodges, E. V., & Salmivalli, C. (2014). Do guilt-and shame-proneness differentially predict prosocial, aggressive, and withdrawn behaviors during early adolescence? *Developmental Psychology, 50(3),* 941. https://doi.org/10.1037/a0033904

Ross, J. (2017). You and me: investigating the role of self-evaluative emotion in preschool prosociality. *Journal of Experimental Child Psychology, 155,* 67-83. https://doi.org/10.1016/j.jecp.2016.11.001

Rudner, M., & Holmer, E. (2016). Working memory in deaf children is explained by the Developmental Ease of Language Understanding (D-ELU) model. *Frontiers in Psychology, 7.* https://doi.org/10.3389/fpsyg.2016.01047

Sette, S., Baldwin, D., Zava, F., Baumgartner, E., & Coplan, R. J. (2019). Shame on me?

Shyness, social experiences at preschool, and young children's self-conscious emotions. *Early Childhood Research Quarterly, 47,* 229-238. https://doi.org/10.1016/j.ecresq.2018.12.012

Sprafkin, J., Volpe, R. J., Gadow, K. D., Nolan, E. E., & Kelly, K. (2002). A DSM-IV-referenced screening instrument for preschool children: The Early Childhood Inventory-4. Journal of the American Academy of Child & Adolescent Psychiatry, 41(5), 604–612. https://doi.org/10.1097/00004583-200205000-00018

Stadter, M., & Jun, G. (2020). Shame East and West: similarities, differences, culture, and self. *Psychoanalysis and Psychotherapy in China, 3(1),* 1-21. https://doi.org/10.33212/ppc.v3n1.2020.1

Stuewig, J., & McCloskey, L. A. (2005). The relation of child maltreatment to shame and guilt among adolescents: Psychological routes to depression and delinquency. *Child maltreatment, 10(4),* 324-336. https://doi.org/10.1177/1077559505279308

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behaviour. *Annual Review of Psychology, 58,* 345-372. https://doi.org/10.1146/annurev.psych.56.091103.070145

Tracy, J. L., & Robins, R. W. (2004). " Putting the Self Into Self-Conscious Emotions: A Theoretical Model". *Psychological inquiry, 15(2),* 103-125. https://doi.org/10.1207/s15327965pli1502_01

Tracy, J. L., Robins, R. W., & Tangney, J. P. (Eds.). (2007). *The self-conscious emotions: Theory and research.* (pp. 57-112). Guilford Press. Retrieved from URL: https://www.guilford.com/excerpts/tracy2.pdf?t

Triandis, H. C. (1993). Collectivism and Individualism as Cultural Syndromes. *Cross-Cultural Research, 27(3-4),* 155-180. https://doi.org/10.1177/106939719302700301

Tsai, J. L. (2007). Ideal affect: Cultural causes and behavioral consequences. *Perspectives on Psychological Science, 2(3),* 242-259. https://doi.org/10.1111/j.1745-6916.2007.00043.x

Tso, W. W. Y., Wong, V. C. N., Xia, X., Faragher, B., Li, M., Xu, X., Ao, L., Zhang, X., Jiao, F., Du, K., Shang, X., Wong, P. T. Y., & Challis, D. (2018). The Griffiths Development

Scales-Chinese (GDS-C): A cross-cultural comparison of developmental trajectories between Chinese and British children. *Child Care Health and Development/Child, Care, Health and Development, 44(3),* 378–383. https://doi.org/10.1111/cch.12548

Tsou, Y., Li, B., Kret, M. E., Frijns, J. H. M., & Rieffe, C. (2021). Hearing status affects children's emotion understanding in dynamic social situations: an Eye-Tracking study. *Ear And Hearing, 42(4),* 1024–1033. https://doi.org/10.1097/aud.0000000000000994

Twisk, J., de Boer, M., de Vente, W., & Heymans, M. (2013). Multiple imputation of missing values was not necessary before performing a longitudinal mixed-model analysis. *Journal of Clinical Epidemiology, 66(9),* 1022–1028. https://doi.org/10.1016/j.jclinepi.2013.03.017

Wang, L. S., Pan, H., & Zhang, H .Y. (2020). The effect of emotional intensity of shame on children's prosocial behaviour. *European Journal of Developmental Psychology, 17(2),* 263-274. https://doi.org/10.1080/17405629.2019.1573666

Wickham, H. (2009). *Ggplot2: Elegant graphics for data analysis.* Springer. Retrieved from URL: https://www.springer.com/series/6991

Wood, A. M., White, I. R., & Royston, P. (2008). How should variable selection be performed with multiply imputed data? *Statistics in medicine, 27(17),* 3227-3246. https://doi.org/10.1002/sim.3177