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Investigating Social Ability, Empathy, and Attachment as Correlates of the Leftward Cradling Bias in Young Adolescents.

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Abstract

The leftward cradling bias (LCB) is a universal social phenomenon wherein 74% of the female population cradles an infant to the left of the body midline when attempting to sooth it (Harris, 2010; Packheiser et al., 2019). Previous research has consistently demonstrated that the male population exhibits a less pronounced bias and suggests that leftward cradling may be contingent on handedness. A cerebral monitoring hypothesis suggests that LCB is due to a lateralized evolutionary behavioural system which facilitates optimal socio-cognitive development, emotional attunement, and attachment behaviours between parent and infant. The current proposition is that LCB may be part of an evolutionarily adaptive leftward bias for social interaction (Huggenberger et al., 2009; Malatesta et al., 2019a; Malatesta et al., 2019b). This research investigated social ability, empathy, and attachment as potential correlates of LCB in a developing sample of young adolescent boys and girls aged between 9-14 years (n=38). Additionally, the psychometric properties of some measures used were investigated in relation to the South African context. In contrast to previous research, results of this study indicated that the cradling side was not contingent on handedness or gender in this sample. A hierarchical multiple regression revealed that potential correlates of the LCB, namely attachment, social ability, and affective empathy, did not predict LCB. Given the emerging evidence suggesting the influence of LCB on socio-cognitive development, further research into the relationship between these variables and LCB is essential.

Keywords: leftward cradling bias, neurotypical children, social ability, affective empathy, attachment.

Leftward cradling bias (LCB) is a well-documented social phenomenon whereby 74% of the female human population, and to a lesser extent male, cradle an infant to the left of the body midline when soothing it (Packheiser et al., 2019). This LCB is universal, having been documented across cultures, historical periods, and in some non-human primates (Harris, 2010; Hopkins, 2004). Notably, this bias has also been demonstrated in child samples and in children as young as 3 years of age, highlighting an early emergence of the phenomenon (e.g., Bonert & Saling, 1983; Forrester et al., 2019; Pileggi et al., 2015). This early appearance, taken together with the presence of the bias across human cultures, times and non-human primates, supports an evolutionary biological basis for LCB.

Recently, researchers have proposed that LCB reflects an evolutionary side bias for social interactions, and facilitates optimal development of social skills, empathic capacities, and attachment (Forrester et al., 2019; Malatesta et al., 2019a; Malatesta et al., 2019b). Evidence for this is, however, sparse and mixed (Blacher & Levetan, 2019; Jooste, 2018). Given the proposed influence on socio-cognitive development, further investigation into the relationship between these variables and LCB is imperative.

Explanations for LCB

Many hypotheses have been proposed to explain LCB. The heartbeat hypothesis, for example, proposed that this bias emerges because the sound of the mother's heartbeat soothes the infant, and is more audible on the left side (Salk, 1960). This hypothesis lacks empirical support, as an infant will hear the heartbeat regardless of side preference as long as its ear is pressed against the mother's skin (Bundy, 1979). A second hypothesis, the handedness hypothesis, proposed that LCB emerges to free the dominant right hand (for most people (~90%); Perelle & Ehrman, 1994) to perform other tasks (Huheey, 1977). Despite a lack of empirical support for this hypothesis, a recent meta-analysis found a relationship between handedness and LCB (Packheiser et al., 2019). However, caution must be applied when interpreting this finding as the context of cradling was not consistent across the articles reviewed. To elaborate, cradling with the intention to soothe (i.e., non-functional cradling) should be differentiated from cradling the infant while performing another task (i.e., functional cradling; van der Meer & Husby, 2006). In this latter case, handedness plays a determining role in cradling the side. Furthermore, only 5 of the 40 articles included in the meta-analysis by Packheiser and colleagues (2019) found significant relationships between handedness and LCB. Importantly, this meta-analysis reports that LCB is still present in left-handed populations, albeit to a lesser extent when compared to right-handed populations.

For some time, the consensus has been that a cerebral hypothesis can explain LCB. Specifically, lateralisation of emotion processing to the right hemisphere of the brain is cited as the underlying mechanism involved (Bourne & Todd, 2004). The cerebral monitoring hypothesis proposes that the right hemisphere's dominance for processing facial emotions underlies LCB (Huggenberger et al., 2009; Manning & Chamberlain, 1990). It is well-documented that the right hemisphere specialises in the processing of affective facial stimuli (Dimberg & Petterson, 2000). As such, the cerebral monitoring hypothesis argues that leftward cradling positions the infant and caregiver in each other's respective left visual fields, facilitating optimal recognition, interpretation, and monitoring of affective facial cues between infant and cradler (Bourne & Todd, 2004; Huggenberger et al., 2009; Scola & Vauclair, 2010). Consequently, LCB is argued to facilitate optimal socio-emotional attunement and stronger infant-cradler bonding and attachment (Huggenberger et al., 2009; Malatesta et al., 2019a; Malatesta et al., 2019b; Sieratzki & Woll, 2004).

Given the cerebral monitoring hypothesis, it is unsurprising that autistic traits/autism spectrum disorder (ASD) diagnosis have been negatively associated with LCB (Fleva & Khan, 2015; Herdien et al., in press; Pileggi et al., 2015). This absence/reduced LCB suggests that something characteristic of these samples is disrupting the bias. ASD is characterised by severe and chronic impairments in empathic and socio-communicative abilities, such as impaired use of eye-contact, abnormal emotional facial expressions and a lack of social and emotional reciprocity, all of which can result in a failure to develop meaningful relationships with others (Bons et al., 2013). Social relation seems therefore to be a fundamental aspect of LCB. In keeping with this, left-cradling neurotypical children demonstrated significantly higher mean social ability scores in comparison to right cradlers (Forrester et al., 2019).

A study by Weiland and Sperber (1970) draws attention to this social relation aspect of LCB. Their study asked participants to cradle a pillow, noting no side preference initially. Notably, once asked to imagine that the pillow was a distressed infant, a leftward bias emerged. Recently, Forrester and colleagues (2019) demonstrated similar findings. Across four different trials, children were asked to cradle a pillow, a protoface pillow, a human doll, and a primate doll. LCB was elicited only by the protoface pillow and the human doll, and these instances of LCB were associated with social ability scores. These findings suggest that species-specific exposure to human faces may be evolutionarily vital for socio-cognitive development.

Most recently, in keeping with this cerebral monitoring hypothesis, a group of researchers have suggested that an evolutionary side bias for social interaction in general may be responsible for the left bias in cradling (Malatesta et al., 2019b). In support of this, several studies have found a left preference for other social interactions including hugging and kissing (Ocklenburg et al., 2018). An argument can therefore be made that LCB comes about via a lateralized evolutionary behavioural system to facilitate optimal socio-cognitive development, emotional attunement, and attachment behaviours between parent and infant (Dagenbach et al., 1988; Forrester et al., 2019; Malatesta et al., 2019a; Malatesta et al., 2019b; Sieratzki & Woll, 2004).

Social ability, Empathy, and Attachment in relation to LCB

There has been very little investigation into the relationship between social ability, empathy, attachment, and LCB. To date, only a few studies have investigated possible associations, and of these studies two have found contradictory evidence (i.e., Blacher & Levetan, 2019; Jooste, 2018). To elaborate, Forrester and colleagues (2019) found an association between social ability and cradling side in children, while Blacher and Levetan (2019) did not find a relationship between cognitive empathy (i.e., perspective-taking), which should be related to social ability, and LCB. Similarly, while a slight positive relationship was found between empathy and cradling bias (Malatesta et al., 2019a), Blacher and Levetan (2019) did not find this. Finally, a relationship between attachment and cradling bias is supported by Malatesta and colleagues' (2019b) findings, but only partially supported by Jooste (2018).

In terms of the relationship between empathy and LCB, the more primitive/innate aspects of emotional attunement/empathy have been proposed to facilitate cradling preference (Pileggi et al., 2015). Pileggi and colleagues (2015) proposed that the innate difficulty in relating to others as seen in the ASD population may be responsible for the absence of LCB in their sample. As such, affective empathy (i.e., the sharing in the emotional states of others; Blacher & Levetan, 2019), in which relating plays a key role, may be an underlying biologically innate factor facilitating the LCB. Supporting this, Malatesta and colleagues (2019a) found a slightly positive correlation between empathy and LCB. As such, it may be that affective empathy represents an evolutionarily innate mechanism whereby early socio-emotional communication between infant and mother is optimised via LCB.

Furthermore, optimal monitoring and responding to the needs of an infant (as is hypothesised to be facilitated by LCB) has been shown to directly shape social development

outcomes and future attachment behaviours of the infant as attachment styles are transmitted through generations (Bowlby, 1969/1982; Durrani, 2019; Henschel et al., 2019; Malatesta et al., 2019b; Schore, 2001).

Malatesta and colleagues (2019a) have recently demonstrated that leftward cradling may improve the affective aspects of mother-infant relatability in neurotypical women. To elaborate, they found positive attachment with a parent or romantic partner to be correlated with LCB, suggesting that there is a relationship between secure attachment and leftward cradling. In contrast, women who cradled to the right demonstrated greater anxiety around aspects of child-care. An emerging body of evidence has demonstrated that symptoms of stress and anxiety may disrupt LCB (Reissland et al., 2009) and symptoms of depression have been associated with cradling to the right (Malatesta et al., 2019a; Pileggi et al., 2020). Weatherill and colleagues (2004) suggest that this may occur because depressive symptoms reduce the ability to respond to an emotionally aroused infant.

It is therefore possible to hypothesise the existence of evolutionarily specific circuitry for attachment in females, which localises empathetic and socio-communicative processes to the right hemisphere of the brain (Zhang et al., 2018). This is suggested to facilitate the optimal transference of emotional information to the infant, in turn supporting the development of typical brain asymmetries (Hendriks et al., 2011; Vervloed et al., 2011). As such, a gender difference in cradling bias is to be expected and is also supported (Harris, 2010; Packheiser et al., 2019). While LCB is a universal phenomenon, there is ample evidence to suggest it may be more pronounced in females.

Currently, research supports a cerebral monitoring hypothesis, extending into an evolutionary hypothesis of a side bias for social interaction. This extension is relatively new, requiring further evidence, particularly through the investigation of the relationship between social ability, empathy, attachment, and LCB. The majority of research in this field has been conducted in adult samples. However, given the proposed influence of leftward cradling on socio-cognitive development, particularly the facilitation of optimal social and empathic development and the promotion of positive attachment behaviours, investigating cradling bias in developing samples (i.e., child and adolescent samples) could deliver novel insights into underlying evolutionary mechanisms.

Rationale, Aims, and Hypotheses

To date, research investigating LCB has supported associations between this bias and several variables related to socio-emotional interaction, namely social ability, empathy and attachment (Forrester et al., 2019; Jooste, 2018; Malatesta et al., 2019a; Malatesta et al., 2019b; Pileggi et al., 2015). Although these studies are few and have demonstrated some mixed findings (Blacher & Levetan, 2019; Jooste, 2018), they provide tentative support for the recent cerebral monitoring hypothesis, which argues that LCB may be part of an evolutionary side bias for social interaction (Fleva & Khan, 2015; Huggenberger et al., 2009; Manning & Chamberlain, 1990; Pileggi et al., 2013, 2015). Specifically, one study found increased social ability scores in leftward cradlers (Forrester et al., 2019), another found increased empathy scores was associated with increased LCB (Malatesta et al., 2019a), and finally that increased emotional attunement was related to positive attachment between infant and caregiver (Malatesta et al., 2019b).

The evolutionary monitoring hypothesis highlights several implications of LCB for socio-emotional development. Evidence suggests that this bias may facilitate optimal social and empathic development and promote positive future attachment behaviours in children (Bowlby, 1969/1982; Durrani, 2019; Huggenberger et al., 2009; Malatesta et al., 2019b; Schore, 2001; Seifer et al., 1996). As such, the value in investigating cradling bias in developing samples (i.e., child and adolescent samples) lies in the possibility of new insights into the development of underlying evolutionary mechanisms of social interaction.

The primary aim of the study was therefore to investigate the relationships between social ability, empathy, and/or attachment and LCB in a developing sample, namely young adolescent boys and girls. Based on recent research the following hypotheses were proposed:

H1: A leftward cradling bias will be present in both males and females, but more pronounced in females.

H2: Higher social ability scores will be positively associated with increased leftward cradling.

H3: Higher affective empathy scores will be positively associated with increased leftward cradling.

H4: More secure attachment will be positively associated with increased leftward cradling.

While it would have been ideal to answer these questions fully, the current global situation meant it was a challenge to recruit a large enough sample due to restricted access to schools. As such, results may well need to be interpreted with caution. We therefore also investigated the psychometric soundness of the questionnaire measures we employed for the South African context. This will be helpful information for research going forward.

Method

Design and Setting

The study employed a cross-sectional correlational design. It investigated six potential predictors in relation to LCB, namely gender, social ability, affective empathy, parent and peer attachment, and handedness. Cradling bias, the outcome variable, was determined by assessing the most preferred cradling side across four separate trials.

The global pandemic restricted face-to-face interaction. Consequently, parents completed questionnaires via email, and children participated via video call, whereby questionnaires and task instructions were shown to participants via the shared screen function.

Participants

Forty young adolescents aged 9 to 14 years (15 male and 23 female), as well as their primary caregivers, participated in this study (most of whom were the mothers of the children). Participants came from a wide range of socio-economic backgrounds. Given restricted/limited access to schools, we recruited our sample through snowball sampling, whereby our initial participants were asked to suggest other potential participants who suited the eligibility criteria for the study (Etikan et al., 2016). Initial participants were recruited through personal contacts and via advertisement on Facebook.

Inclusion and Exclusion Criteria

All participants were fluent in English as measures were administered in English. Only typically developing adolescents were included. Specifically, adolescents on the autism spectrum were excluded since findings of an inverse association between autistic traits and ASD diagnosis and LCB (Fleva & Khan, 2015; Pileggi et al., 2015). Individuals diagnosed with depressive and/or anxiety disorders were also excluded given evidence that these mental states may disrupt LCB (Malatesta et al., 2019a; Pileggi et al., 2020; Reissland et al., 2009).

Measures

Parent-Report Measures

Demographic Questionnaire. Primary caregivers completed a basic demographic questionnaire (Appendix A). This questionnaire included questions pertaining to eligibility for participation.

Children's Social Understanding Scale (CSUS). A short-form version of the CSUS (Tahiroglu et al., 2014) was used as a parent-report measure of individual differences in their child's theory of mind (i.e., a form of social ability; Appendix B). This questionnaire consists of 42 items which assess six subscales of theory of mind, namely belief, knowledge, perception, intention, desire and emotion, with 7 items in each. It employs a 4-point Likert scale with response options ranging from 1 ("Definitely untrue of my child") to 4 ("Definitely true of my child"). Higher scores reflect higher social ability.

The CSUS has yielded strong psychometric properties, including good reliability and validity in French, Chinese, and Polish samples (Brosseau-Liard & Poulin-Dubois, 2019; Gluck et al., 2017; Smogorzewska et al., 2019). The psychometric properties of this questionnaire for South African samples are yet to be determined.

Questionnaire of Cognitive and Affective Empathy (QCAE). The QCAE was used as a parent-report measure of their child's cognitive and affective components of dispositional empathy (Reniers et al., 2011; Appendix C). This questionnaire consists of 31 items of which 19 assess cognitive empathy (e.g., "My child sometimes finds it difficult to see things from another's point of view) and 12 assess affective empathy (e.g., "My child is inclined to get nervous when others around them seem nervous"). It employs a 4-point Likert scale with response options ranging from "Strongly disagree" to "Strongly agree". Higher scores reflect higher cognitive and affective empathy, respectively.

The QCAE has demonstrated good reliability and validity cross-culturally (Di Girolamo et al., 2019; Liang et al., 2019; Queiros et al., 2018; Reniers et al., 2011), as well as good reliability in South African samples to date (Pileggi, 2018; Viglietti, 2014).

Attachment Style Classification Questionnaire – Revised (ASCQ-R). The ASCQ-R was used as a parent-report measure of their child's attachment style (Finzi et al., 1996; Appendix D). This questionnaire consists of 15 items measuring secure attachment (e.g., "It's all right with my child if good friends trust and depend on them"), anxious attachment (e.g., "It's hard for my child to trust others completely"), and avoidant attachment (e.g., "My child finds it uncomfortable and gets annoyed when someone tries to get too close to them"). The

measure employs a 3-point Likert scale with response options of "Not true", "Unsure", and "True". Scores were calculated on a continuum, with higher scores reflecting more secure attachment and lower scores reflecting more insecure attachment (i.e., anxious and avoidant).

Finzi and colleagues (1996) report good test-retest reliability and internal consistency for the original self-report version of this questionnaire. The revised version yielded satisfactory internal consistency for each attachment style (Finzi et al., 2002). The psychometric properties of this questionnaire for South African samples is yet to be determined.

Child Measures

Cradling Bias Task. The cradling bias task assessed non-functional cradling bias. In this task the participant was asked to cradle an imaginary infant on four separate occasions. An imaginary version of this task was used to eliminate potential gender stereotypes associated with playing with a doll. The researcher provided the following instruction: "Imagine that you are holding a baby, like this", and will demonstrate a cradling hold. The researcher was sure to look forward during this demonstration, and not to a particular side. The researcher then said: "Will you hold the baby, like you are putting it to sleep?" Once the child demonstrated this action, the researcher asked: "Could you look at the baby's face?" and recorded the cradling side accordingly.

Scoring followed that of Pileggi and colleagues (2015). Cradling side (left or right) was determined by which side the participant looked when asked to look at the face of the imagined baby. Each leftward cradle was coded as -1 and each rightward cradle as +1. A cradling laterality quotient was then calculated by summing the responses for the four trials. A negative total score was classified as left cradling bias, while a score of 0 reflected no bias, and a positive score was classified as right cradling bias. Cradling bias was therefore scored both continuously and categorically.

Edinburgh Handedness Inventory (EHI). A short-form version of the EHI was used to measure handedness (Veale, 2014; Appendix E). While the original full-form version is often used globally as the gold-standard measure of handedness, the short-form has been found to be a reliable measure of handedness (Veale, 2014). This short-form questionnaire consists of 4 items asking which hand/s the participant prefers to use in the following everyday activities: writing, throwing something, using a toothbrush, using a spoon. Participants were asked to choose from 5 response options for each item namely "Always right", "Usually right", "Both equally", "Usually left", "Always left".

Handedness is calculated in the same way as the full-form version EHI (Oldfield, 1971). Each response option is awarded a value: "Always right" = + 100, "Usually right" = + 50, "Both equally" = 0, "Usually left" = 150, and "Always left" = -100. A laterality quotient (LQ) is calculated by summing the responses for the four items and dividing the total by 4. Individuals with a LQ of 61-100 were classified as right-handed, -100 to -61 as left-handed, and those in between as mixed handed. Handedness is therefore represented by both categorical and continuous scoring.

The Inventory of Parent and Peer Attachment – Revised (IPPA-R). The IPPA-R was used to assess the child participant's attachment to his/her parents (Gullone & Robinson, 2005; Appendix F). The original IPPA, developed for older adolescents (16-20 years), was revised to be more understandable for younger children/young adolescents aged 9-15 years. The participants were assessed using the parent attachment subscale of the IPPA-R, which consists of 28 items. These items tap into three scales, namely trust (e.g., "I can count on my parents when I need to talk about a problem"), communication, (e.g., "My parents support me to talk about my worries"), and alienation (e.g., "I don't get much attention at home"). It employs a 3-point Likert scale with response options ranging from "Always" to "Never". A higher total score on the IPPA-R will be interpreted as a higher level of secure attachment.

The parent attachment subscale of the IPPA-R has demonstrated good reliability for all three of the areas (i.e., trust, communication, and alienation; Gullone & Robinson, 2005). When comparing the IPPA-R with the previously established parental bond instrument (PBI), it also showed good convergent validity. Furthermore, Koen and colleagues (2013) reports good reliability within the South African context ($\alpha = 0.82$).

Attachment Style Classification Questionnaire (ASCQ). The self-report version of the ASCQ was used as a measure of a child's attachment style (Finzi et al., 1996; Appendix G). The questionnaire was designed to be administered to children between the ages of 7-14 years. Further details have been described in the parent measure (i.e., ASCQ-R).

Procedure

Once ethical approval was obtained, potential participants were contacted initially through acquaintances of the researchers and advertising on Facebook and then via snowball sampling. Parents were provided with a document including study information (Appendix J), an informed consent form (Appendix H), and the demographic questionnaire (Appendix A) to complete. Once informed consent was obtained, parent participants were asked to complete an interactive Word document comprising the ASCQ-R, CSUS and QCAE

measures which was returned to us via email. A convenient meeting time was then arranged for their child's session.

The adolescent participant sessions were completed via a zoom call and took approximately 20 minutes. The call was recorded by the researcher in order to substantiate the participant's provision of informed assent, which was obtained before any further research took place. (Appendix I). The researcher presented the measures and cradling trials to the participants via the shared screen function. Participants were asked to complete the measures in the following sequence: Cradling Bias (CB) trial 1, EHI (short form), IPPA-R, CB trial 2, CB trial 3, ASCQ, CB trial 4. The CB task trials were separated from the other tasks in order to eliminate possible carry-over effects. The researcher engaged the participants with a conversation about their 'prize' (i.e., participants were thanked for their participation with a chocolate of their choosing) between CB trial 2 and 3. At the end of the session, child participants were given the opportunity to ask any questions. Parents were thanked and provided with the opportunity to ask any questions and offered the opportunity of receiving the feedback of the study findings once the study was completed.

Ethical Considerations

Parents were provided with a written consent for the participation of their child and themselves (Appendix H). Parents were required to sign the consent form digitally prior to the commencement of the study. Those without an e-signature were asked to write their name on the signature line and a copy of the email containing their consent was kept confirming their active consent. Adolescents participants were asked to provide consent via the assent form (Appendix I) which the researcher signed on their behalf during the zoom call which was recorded in order to confirm their assent. Our email addresses were provided on all forms of communication, if parents need clarification or have any concerns regarding the study.

Risks and Benefits

Participation in this study carried no foreseeable risk and was completely voluntary. Participants were informed that they could withdraw at any stage of the research process without any consequences. The children were informed that they would be allowed to take breaks during the study if they needed. Confidentiality was upheld for all participants as no names were used, but instead research numbers were used to maintain confidentiality.

Data Analysis

Statistical analyses were computed using the R Studio package (version 1.2.5.033), maintaining a significance threshold of 0.05. Initially, basic descriptive statistics were calculated including chi-squared contingency analysis on categorical data, namely gender, handedness and cradling bias (categorically coded). Correlational analyses and t-tests were conducted on the continuous data where necessary. Assumptions were upheld, unless otherwise stated.

For inferential analysis, hierarchical multiple regression analysis investigated potential predictor variables of LCB, namely social ability, empathy (i.e., affective empathy), and both parent and peer attachment. Variables were included in the following sequence: In step 1 and 2 we entered parent attachment as measured by the IPPA-R, and peer attachment was measured by the ASCQ given Malatesta and colleagues' (2019b) finding linking these variables. In step 3, the social ability variable, as represented a grouped variable of the CSUS and the cognitive empathy subscale of the QCAE, was added given findings linking social ability to LCB (Forrester et al., 2019). Finally, we added affective empathy, given weaker evidence supporting its connection to LCB in the literature (Jooste, 2018; Malatesta et al., 2019a). Note that multicollinearity between the CSUS and the cognitive empathy subscale of the QCAE was dealt with by grouping these variables. Furthermore, the ASCQ-R was excluded from the regression analysis due to poor internal consistency and convergent validity with the other attachment measures. Notably, gender and handedness were also excluded from the regression analysis as chi-squared analysis indicated that cradling was not contingent on either of these.

Due to the pandemic circumstances this year, we were unable to collect substantial data, which made it necessary to utilise internal consistency reliability and convergent validity investigations on the measures being used in addition to the planned regression analysis. This study therefore served as pilot study, investigating the usefulness and psychometric properties of these measures in a South African sample.

Results

Descriptive Statistics

The final sample for the study consisted of 38 child participants between the ages of 9 and 14 years (15 boys and 23 girls). As can be seen in Table 1, most of the participants were first-language English speakers (i.e., 86.84%). All participants were, however, fluent in

English. Initially, 40 children had participated. However, two children had to be excluded as they had previously been diagnosed with depression and/or anxiety disorders. Sample characteristics of the study participants are presented in Table 1.

Table 1

Demographic Characteristics of the Study Sample

Characteristics	Total Sample (n = 38)
Age Range (years)	9-14
M (SD)	11 (1.73)
Age Range (months)	108-168
M (SD)	132 (1.73)
Gender	
Male: Female	15:23
Home Language	
English: isiXhosa: Setswana	34:2:2
Handedness	
Left:Mixed:Right	32:3:3

Note. [a] Means presented with standard deviations in parentheses. [b] Handedness is represented as categorical data in this table, is coded from continuous data with a laterality quotient (LQ) of 61-100 being classified as right-handed, a LQ of -100 - -61 being classified as left-handed and those in between as mixed handed.

Descriptive statistics for each of the questionnaire measures employed are presented in Table 2. These statistics were calculated across gender in order to determine if there were any gender differences in the measure outcomes. Independent samples *t*-tests revealed that there were no significant differences across gender groups on these measures. As can be seen in Table 2, boys and girls scored similarly on each of the measures reported here (i.e., no significant differences).

Table 2

Descriptive Statistics for the Measures used across Gender

	Group		Significance	
Measure	Female (*n*=23)	Male (*n*=15)	*t*	*p*
CSUS	135.7 (12.1)	137.3 (8.9)	-0.48	0.63
QCAE (T)	90.4 (9.3)	92.4 (11.9)	-0.57	0.57
QCAE (A)	36 (6.57)	35.53 (4.66)	0.26	0.79
IPPA-R	70.5 (7.7)	71.4 (4.3)	-0.47	0.63
ASCQ	35.6 (5.0)	32.7 (6.4)	1.48	0.15
ASCQ-R	34.9 (4.4)	35.7 (4.7)	-0.51	0.61
CBT	-1.61 (3.23)	-1.60 (3.58)	-0.00	0.99

Note. CSUS = Children's Social Understanding Scale; QCAE (T)= Questionnaire of Cognitive and Affective empathy total score; QCAE(A)= Affective subscale of QCAE; IPPA-R= Inventory of Parent and Peer Attachment - Revised; ASCQ= Attachment Style Classification Questionnaire; ASCQ-R= Parent report adaptation of ASCQ; CBT= continuous cradling bias variable.

Cradling Bias, Gender and Handedness

In terms of gender distribution, 71.05% of all participants cradled to the left, similar to previous findings (i.e., 74%, Packheiser et al). Eighty percent of the male subsample cradled to the left and 69.57% of the female subsample cradled to the left. Assessing CB as a continuous variable, an independent samples *t*-test revealed that the difference across gender was not significant, $t(27.8) = -.01$, $p = .99$. To confirm the absence of a difference/relationship between gender and cradling side in our sample, a chi-square test of contingency was employed. Once again, cradling side was not contingent on gender, ($x^2 = 0.67$, df = 2, $p = .71$).

Regarding handedness, the majority of participants were right-handed (88.89%). This applied to both the male and female subsamples (as presented in Table 3). Assessing handedness using the laterality quotient, an independent samples *t*-test revealed that the difference across gender was not significant, $t(23.3) = .09$, $p = .92$. Lastly, a chi-square test of contingency revealed that cradling side was not contingent on handedness ($x^2 = 3.02$, df=4, $p = .55$).

Table 3

Handedness and Cradling Side by Gender (%)

	Cradling Bias		Handedness	
	Left	Right	Left	Right
Total (*n*=38)	71.05	28.96	11.11	88.89
Female (*n*=23)	69.57	30.43	6.25	93.75
Male (*n*=15)	80	20	16.67	83.33

Psychometric Properties of the Measures

Reliability

Before further inferential analysis, we investigated the internal consistency of each of the measures used by calculating Cronbach's alpha (Table 4). A high level of internal consistency was returned for the CSUS (α =.86), the IPPA-R (α =.82), and the QCAE (α =.83). The internal consistency of the child version of the ASCQ was only marginally lower than the other measures but was still good (α =.79). However, the ASCQ-R returned a much lower score of internal consistency (α =.59).

Convergent Validity

Table 4 also presents the intercorrelations between questionnaire measures. Some multicollinearity can be seen, as expected. To elaborate, the CSUS and the QCAE were

significantly correlated $r = 0.44$, $p < .05$. Theory dictates that the reason for this relationship is that the cognitive subscale of the QCAE should be correlated with the CSUS. These two were indeed correlated, $r = .48$, $p < .05$, demonstrating convergent validity. As expected, the correlation between the CSUS and the affective empathy subscale of the QCAE was not significant, $r = .14$, $p = .42$ (diverged). Furthermore, as noted by the authors of the QCAE, the affective and cognitive subscales of the QCAE should not correlate significantly, hence $r = .15$, $p = .36$.

A test of convergent validity was also carried out for the two versions of the ASCQ as the parent measure is simply an adapted version of the child measure. An insignificant and minimal correlation was found between the total scores of the ASCQ and the ASCQ-R, $r = .12$, $p = .46$, which indicates that these measures are not measuring the same construct to the same extent. Furthermore, the ASCQ was compared to the IPPA-R in order to further investigate the construct validity as theoretically these measures both determine attachment security. In contrast to the expectations, the two measures returned very low and insignificant correlation $r = -.03$, $p = .84$ (diverged). Similarly, the ASCQ-R returned a low and insignificant correlation with the IPPA-R, $r = .08$, $p = .64$, indicating a lack of convergent validity.

Table 4

Correlations Between Measures

Measure	1.	2.	3.	4.	5.	6.	7.
1. QCAE (T)	**.78**						
2. QCAE (A)	.66*	**.79**					
3. QCAE (C)	.83*	.15	**.80**				
4. CSUS	.44*	.14	.48*	**.83**			
5. IPPA-R	.31	.20	.27	.23	**.81**	.	
6. ASCQ	-.15	-.16	-.08	.10	.03	**.77**	
7. PASCQ	-.16	-.33*	.03	.08	.08	.12	**.61**

Note. [a] * Indicates a significant correlation at the significance level of $p < .05$. [b] **Emboldened** correlations represent the internal consistency of each measure.

Regression Analysis

Finally, a hierarchical regression analysis was employed to investigate four potential predictors of LCB, namely social ability, affective empathy, parent attachment and peer attachment. While gender and handedness have consistently been noted as significant predictors of cradling side, our contingency analyses suggested that they were not associated with cradling side and as a result they were not included in this regression analysis. Attachment was entered first as this factor has the most literature suggesting a relationship between this variable and cradling side. We employed three measures of the child attachment; however, the ASCQ-R was not included in the regression analysis as it returned a low level of internal consistency. Attachment to parents was therefore represented by the IPPA-R and attachment to peers was represented by scores on the ASCQ. Each of these was examined separately as they did not demonstrate convergent validity. Social ability was entered second in the regression analysis. Social ability was represented by a grouped variable which included scores from the CSUS cognitive empathy subscale of the QCAE. Lastly, affective empathy was entered as a potential predictor variable of cradling side given suggestions from previous research that cradling side may be associated with a rudimentary level of empathy. Affective empathy was represented by scores from the affective empathy subscale of the QCAE.

The first and second steps of the regression analysis revealed that neither parent nor peer attachment significantly predicted cradling side in this sample although parent attachment demonstrated a small effect size with an R^2 of .06, p=.07. Peer attachment returned a lower and also non-significant effect size with an R^2 of -.02, p=.89. Similarly, the third step of the regression analysis revealed that social ability alone did not significantly predict cradling side in this sample with an R^2 of .04, p=.09. Finally, cradling side was shown to not be significantly predicted for by the affective empathy variable, returning a small effect size of R^2 =-.02, p=.68. As a result, it was not possible to produce a significant model which predicted cradling side.

Discussion

This study investigated the relationship between variables associated with social interaction and cradling side in a neurotypical developing sample, namely young adolescent boys and girls. In our sample we found that 71.05% of all participants cradled to the left, consistent with previous literature (Packheiser et al., 2019). While the literature dictates that this bias is more pronounced in females, we found that 80% of adolescent boys cradled to the

left and 69.75% of the young adolescent girls cradled to the left. The difference across gender was not significant which supports our first hypothesis, that a leftward bias was present across gender. We did not, however, find a more pronounced bias in the female subsample.

As gender did not significantly predict the LCB, our research is in line with the current cerebral hypothesis for this phenomenon. The consensus at this point posits that the LCB is underpinned by right hemispheric specialisation for emotional and social processing (Bourne & Todd, 2004; Huggenberger et al., 2009; Malatesta et al., 2019a2019b; Scola & Vauclair, 2010; Sieratzki & Woll, 2004). This hypothesis suggests that LCB is non-gendered and human-wide. Our data supports this view, as the presence of LCB in younger children provides evidence for the suggestion that caregiving experience is not solely responsible for LCB. The presence of the bias in young children further supports the suggestion that the bias is evolutionarily adaptive as it optimises infant-parent bonding and attachment and has been observed in other social interactions like hugging and kissing (Ocklenburg et al., 2018). It therefore is sensible to expect a relationship between social ability, empathy and attachment.

The Relationship Between LCB and Social Skills

We did not find support for a relationship between social ability and leftward cradling. Following the evolutionary theory for a side bias for social interactions, it would be reasonable to posit that one would find increased social ability scores to be associated with increased leftward cradling. Indeed, despite the minimal empirical evidence for this relationship, Forrester and colleagues (2019) did find an association between socio-communicative ability and leftward cradling in their sample of 98 young children. They measured social ability using a teacher report survey of basic social ability and basic communication skills on a Likert scale, while we used parent-report questionnaire measures, but of the same construct. Nevertheless, we found no correlation between social ability and cradling side in our sample.

The Relationship Between LCB and Affective Empathy

We likewise found no support for a relationship between affective empathy and LCB in our sample. Given the negative association between ASD and LCB, and the severe impairment of empathetic abilities that characterise ASD, it follows that the most basic form of empathy (affective empathy) may be related to the LCB in neurotypical populations. The available literature suggests that these more innate aspects of emotional attunement, particularly the ability to quickly determine the emotional state of another through facial expressions and voice prosody may underlie the hypothesised evolutionary function of the

leftward cradling phenomenon (Ocklenburg et al., 2018; Pileggi et al., 2015; Reniers et al., 2011). Our results, however, do not align with those found by Malatesta and colleagues (2019a) who reported a positive, albeit weak relationship between empathy scores and leftward cradling. There has however been contradictory evidence on this proposed relationship as our results are in line with those of Blacher and Levetan (2019) who found no association between affective empathy and leftward cradling.

The Relationship Between LCB and Attachment

Similarly, we did not find any evidence of a relationship between attachment security to both parents and peers, and LCB in this sample. The proposed evolutionary cerebral monitoring hypothesis suggests that the LCB optimises socio-emotional communication between parent and infant which increases parent-infant bonding and facilitates the development of optimal attachment relationships throughout life. Our results contrast with previous studies which reported a significant relationship between attachment security and LCB (Huggenberger et al., 2009; Malatesta et al., 2019a, 2019b; Sieratzki & Woll, 2004). The discrepancy may be due to the South African context, as a study by Cooper and colleagues (2009) suggests that mothers' experience of issues relating to poverty and lack of co-parenting may affect their ability to respond to their child, which in turn may negatively impact the security of their attachment. Furthermore, the theory of attachment may not have cultural relevance within a non-western context, as research in other contexts remains limited, and those which have been published cannot be generalized to all populations (Van Ijzendoorn & Sagi-Schwartz, 2008).

Handedness

Finally, we did not find support for an association between handedness and LCB. For decades, handedness has been considered an important variable to consider in relation to LCB. The handedness hypothesis proposes that the population-wide tendency to cradle to the left mirrors the distribution of handedness in the human population and posits that the LCB exists purely to free up the dominant hand of caregivers (Huheey, 1977). However, non-functional cradling and functional cradling are differentiated, whereby the former is done with the intention to sooth the infant and the latter so that the caregiver may perform other tasks (van der Meer & Husby, 2006). For many years, definitions employed were not mutually exclusive. This, of course, is problematic. The available literature on LCB has produced mixed results in terms of whether handedness is related to cradling side. There is

ample evidence to suggest a relationship between handedness and non-functional cradling, as laid out in the recent review by Packheiser and colleagues (2019). However, van der Meer and Husby (2006) explain why these results need to be interpreted with caution, as the context of cradling (functional/non-function) was not consistent across the articles reviewed. Our findings therefore provide further support for an evolutionarily advantageous cerebral monitoring hypothesis as they exclude handedness as an explanation for the non-functional cradling bias investigated in our sample.

Psychometric Applicability of the Measures to the South African Context

Although none of the questionnaires used were produced within the South African context, all but the ASCQ-R measure demonstrated good internal consistency reliability within this sample. The internal consistency of the IPPA-R (α =.82) was identical to that found by Koen et al., (2013) in South Africa, providing more evidence of this measure's reliability in this context. The internal consistency was satisfactory for the ASCQ (α =0.79), however the internal consistency of the parent-report ASCQ-R was not good (α = 0.59) and findings did not converge (p = .46). The study noted that several adolescent participants struggled to understand some of the questions in the ASCQ and this may have affected our psychometric results. For example, Q4 of the ASCQ, "I feel uncomfortable if others get too friendly or close to me" required the researchers to explain the meaning of this and a number of participants indicated that they would now feel uncomfortable due to the current pandemic. In addition, attachment is notoriously difficult to measure which was highlighted within this sample by the poor convergent validity between all three attachment questionnaire measures.

The QCAE measure demonstrated good internal consistency reliability within this South African sample (α =.83), mirroring the reliability found by Louw (2014) and Pileggi (2018) in the South African context. Additionally, divergent validity between the affective and cognitive subscales of the QCAE was demonstrated, indicating that they are measuring two distinct facets of dispositional empathy. Furthermore, good convergent validity was demonstrated between the cognitive empathy subscale and the CSUS measure, r = .48, p<.05, which indicates that they both measure the same construct. These results echo those found by similar studies indicating that the QCAE demonstrated good validity cross-culturally (Brosseau-Liard & Poulin-Dubois, 2019; Gluck et al., 2017; Smogorzewska et al., 2019). The psychometric properties of the CSUS in the South African context are yet to be determined,

however, the results of this sample demonstrated good internal consistency of the measure (α =.86).

Limitations and Directions for Future Research

This study faced several limitations. To start with, the Coronavirus pandemic resulted in notable limitations. Firstly, as a result of the pandemic, it was not possible to carry out the preferred participant recruitment plan which meant that all of our participants were sourced through personal contacts and via advertisement on Facebook. As a result, there may have been a recruitment bias wherein the parents who responded to the advertisement were likely to be more involved in their children's lives which may have knock-on effects on their children's social abilities, empathy, and attachment security. This bias may have further impacted our recruitment process in that it may have prevented the creation of a representative sample, as all participants had basic access to a stable internet connection, therefore excluding a low-income demographic which might not have the same resources. Socio-economic demographic information was not collected; however, it is likely that our final sample was not representative of the broader South African population. Ideally, we would have approached different schools in the nearby areas to carry out our research, which would have meant a bigger sample pool and a larger variety in participants. Future research should therefore aim for a larger, more representative sample in order to increase generalisability to the South African population **(**Johnson & Christensen, 2012**)**.

A second major limitation stemming from the pandemic, was reduced sample size (*n* = 38). An ideal sample of *n* = 73 was determined through G* power analysis on the basis of our three predictor variables and the significance level of *p* =.05 (Faul et al., 2007). Our recruitment method, i.e. snowball sampling was insufficient for recruiting this sample size. In addition to this the dropout rate was high, which could be attributed to the difficulties associated with connectivity, delays in participants opening emails and scheduling appropriate time for zoom calls which would accommodate everyone. Ideally, data collection would have been face to face with the children. Since not many studies have investigated these variables in relation to LCB, a larger sample is necessary. Our smaller sample is limited in the extent to which statistically significant conclusions can be drawn.

Thirdly, Covid-19 resulted in some children interpreting the questions with reference to the current lockdown restrictions, such as staying a meter away from one another, no hugging or kissing. For example, when they answered questions such as, "I feel uncomfortable if others get too friendly or close to me", many remarked saying that they did

feel uncomfortable as they were afraid of getting infected with the Covid-19. As a result, the children may not have answered these questions in relation to their usual attachment behaviours.

The unequal gender subsamples may be another limitation to this study. Although in keeping with our expectations, we found no significant relationship between LCB and gender which indicates that cradling side was not contingent on this variable. Future research should aim for an equal gender distribution within the sample, which may be able to support the results of this study with more confidence.

Lastly, all measures were in English, which may have affected those whose home languages are isiXhosa or Sisweti. Since differences across these languages exist, this may account for possible differences in how children understood the questions, e.g differences in how cultures express empathy, what is considered to be acceptable behaviour, or differences in grammatical construction of questions. Future research could thus employ researchers who are able to speak a number of South African languages and use measures adapted for these languages in order to avoid this limitation.

Significance of the Research

Despite all the limitations outlined above, the results of this study have demonstrated that the IPPA-R, CSUS and QCAE measures are suitable for use within the South African context. In addition, our sample confirmed the existence of the LCB in adolescent populations which was not contingent on gender or handedness. These results provide tentative support for an evolutionarily adaptive cerebral monitoring hypothesis for a leftward bias for social interactions including non-functional cradling. The structure of the study provides insight for future research in this field.

Conclusion

Thus far, few studies have investigated the possible associations between the social ability, affective empathy and attachment of neurotypical adolescents in relation to the leftward cradling bias. This study has subsequently addressed this gap and the contradictory findings of the few studies that have been published. In keeping with some of the previous findings, we found no relationship between social ability, affective empathy, and/or parent and peer attachment and the leftward cradling bias within our neurotypical sample of adolescents. However, several limitations may have influenced these findings. Given these

limitations, psychometric properties of questionnaire measures within the South African context were investigated. We found that future studies interested in these variables in the South African context could incorporate the IPPAR, CSUS and the QCAE. However, as the ASCQ-R has demonstrated minimal convergent validity as well as poor internal consistency, the results obtained using this measure should be interpreted with caution.

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Appendix A

DEMOGRAPHIC QUESTIONNAIRE

Child's Information:

Name: _____

Age: _____ Date of Birth (dd/mm/yy): _____

Sex (tick one): Male / Female Home language: _____

Number of siblings: _____ Number of older siblings: _____

Does your child have any experience looking after his/her younger siblings or other young children? Yes / No

1. Has your child every experienced a head injury (e.g., being hit on the head, falling and hitting his/her head)?: Yes / No
   If yes, did your child lose consciousness/pass out as a result of the head injury?: Yes / No

2. Has your child ever experienced/received a diagnosis of any of the following:

a. Neurological conditions (e.g., epilepsy, Autism Spectrum Disorders): Yes / No
   If yes, please elaborate _____

b. Depression and/or anxiety: Yes / No
   If yes, please elaborate: _____

c. Has your child ever been diagnosed with attention-deficit/hyperactivity disorder (ADD or ADHD)?: Yes / No
   If yes, please elaborate: _____

d. Is he/she currently taking any prescription medication?: Yes / No
   If yes, please elaborate: _____

e. Has your child ever been diagnosed with a social disorder (e.g., conduct disorder or oppositional defiant disorder)?: Yes / No
   If yes, please elaborate: _____

Appendix B

Children's Social Understanding Scale (CSUS)

Questionnaire Two

How true is each of these sentences of your child?

	Definitely untrue	Fairly untrue	Fairly true	Definitely true
1. Understands telling lies can mislead other people				
2. Talks about how their beliefs have changed over time (e.g., I used to think drinking from a cup was hard but now I think it's easy)				
3. Talks about peoples mistaken beliefs (e.g., he thought it was a cat but it was really a dog)				
4. Tries to persuade others that their point of view is incorrect				
5. Is good at playing tricks on others				
6. Talks about what other people think or believe				
7. Talks about differences in their beliefs and someone else's				
8. Realises that experts are more knowledgeable than others (e.g., doctors know more about illness)				
9. Uses words that express uncertainty (maybe, might)				
10. Is good at playing "hide and seek" (e.g., is hard to find, doesn't make give-away noises)				
11. Can tell you how they found out about things (e.g., "Sally told me about it', "I heard it on the radio")				
12. Is good at explaining things to younger children				
13. Talks about what people know or don't know				
14. Talks about teaching and learning				

How true is each of these sentences of your child?	**Definitely untrue**	**Fairly untrue**	**Fairly true**	**Definitely true**
15. Talks about the difference between the way things look and the way they really are				
16. When talking on the phone, behaves as if the listener can see them (e.g., can see what they are wearing)				
17. Is good at directing people's attention to things				
18. Thinks that you can still see an object even if you are looking in the opposite direction				
19. Thinks that they cannot be seen if their eyes are closed				
20. Talks about what people see or hear				
21. Tells lies that are really easy to discover				
22. Talks about the difference between what people want and what people get				
23. Takes into account what others want				
24. Talks about differences in what people like or want				
25. Understands that wishes don't always come true				
26. Understands that just because you want something doesn't mean you really need it				
27. Talks about what people like or want				
28. Recognises that if a person wants something, that person will probably try to get it				

How true is each of these sentences of your child?	**Definitely untrue**	**Fairly untrue**	**Fairly true**	**Definitely true**
29. Talks about the difference between intentions and outcomes (e.g., he tries to open the door but it is locked)				
30. Has trouble figuring out whether you are being serious or joking				
31. Understands that hurting others on purpose is worse than hurting others accidentally				
32. Understands the difference between doing something intentionally and doing it by mistake				
33. Understands when they are being teased or made fun of				
34. Talks about peoples' intentions (e.g., he did it on purpose)				
35. Understands that people can perform the same action for different reasons				
36. Understands that different people can have different feelings about the same thing				
37. When given an undesirable gift, pretends to like it so as not to hurt the other person's feelings				
38. Talks about conflicting emotions				
39. Has difficulty figuring out how you feel from your tone of voice or facial expressions of emotions				
40. Realises that if they do something bad, others may get upset or angry				
41. Talks about how people feel				
42. Tries to understand the emotions of other people				

Appendix C

Questionnaire of Cognitive and Affective Empathy (QCAE)

Questionnaire Three

Please read each characteristic and indicate how much you agree or disagree with the statement by selecting the appropriate box.

	Strongly agree	**Slightly agree**	**Slightly disagree**	**Strongly disagree**
1. My child sometimes finds it difficult to see things from another's point of view.				
2. My child is usually objective when he/she watches a film or play, and doesn't often get completely caught up in it.				
3. My child tries to look at everybody's side of a disagreement before he/she makes a decision.				
4. My child sometimes tries to understand his/her friends better by imagining how things look from their perspective.				
5. When my child is upset at someone, he/she will usually try to "put him/herself in the person's shoes" for a while.				
6. Before criticizing somebody, my child tries to imagine how he/she would feel in their place.				
7. My child often gets emotionally involved in his/her friends' problems.				
8. My child is inclined to get nervous when others around him/her seem nervous.				

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree
9. People my child is with have a strong influence on his/her mood.				
10. It affects my child very much when one of his/her friends seems upset.				
11. My child often gets deeply involved with the feelings of a character in a film, play, or novel.				
12. My child gets very upset when he/she sees someone cry.				
13. My child is happy when he/she is with a cheerful group and sad when others are glum.				
14. It worries my child when others are worrying and panicky.				
15. My child can easily tell if someone else wants to enter into a conversation.				
16. My child can quickly pick up if someone says one thing but means another.				
17. It is hard for my child to see why some things upset people so much.				
18. My child finds it easy to put him/herself in somebody else's shoes.				

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree
19. My child is good at predicting how someone will feel.				
20. My child is quick to spot when someone in a group is feeling awkward or uncomfortable.				
21. Other people tell my child he/she is good at understanding what others are feeling and what others are thinking.				
22. My child can easily tell if someone else is interested or bored with what he/she is saying.				
23. Friends talk to my child about their problems as they say that my child is very understanding.				
24. My child can sense if he/she is intruding, even if the other person does not tell him/her.				
25. My child can easily work out what another person might want to talk about.				
26. My child can tell if someone is masking their true emotion.				
27. My child is good at predicting what someone will do.				
28. My child can usually appreciate the other person's viewpoint, even if he/she does not agree with it.				

	Strongly agree	Slightly agree	Slightly disagree	Strongly disagree
29. My child usually stays emotionally detached when watching a film.				
30. My child always tries to consider the other person's feelings before he/she does something.				
31. Before my child does something, he/she tries to consider how his/her friends will react to it.				

Thank You!

Thank you so much for your participation in our research!

If you would like to receive an email regarding our research findings, we are happy to do so once we have completed our study.

Would you like to receive an email regarding our research findings? Yes No

Thank you again for your time! It Is greatly appreciated.

If you have any questions regarding the research please do not hesitate to contact the researchers Faieeza Khalfe or Amy Gribble or our supervisor.

Yours sincerely,

Amy Gribble: grbamy003@myuct.ac.za

Faieeza Khalfe: khlfai002@myuct.ac.za

Dr. Lea-Ann Pileggi: lea-ann.pileggi@uct.ac.za

Appendix D

ASCQR

Questionnaire One

How true is each of these sentences of your child? Please select the box that is most applicable.

	Not true	Unsure	True
1. My child makes friends with other children easily.	0	1	2
2. My child doesn't feel comfortable trying to make friends.	0	1	2
3. It is easy for my child to depend on others, if they're good friends of his/hers.	0	1	2
4. Sometimes others get too friendly and too close to my child.	0	1	2
5. Sometimes my child is afraid that other kids won't want to be with him/her.	0	1	2
6. My child would like to be really close to some children and always be with them.	0	1	2
7. It's all right with my child if good friends trust and depend on him/her.	0	1	2
8. It's hard for my child to trust others completely.	0	1	2
9. My child sometimes feels that others don't want to be good friends with him/her as much as he/she does with them.	0	1	2
10. My child usually believes that others who are close to him/her will not leave him/her.	0	1	2
11. My child is sometimes afraid that no one really loves him/her.	0	1	2
12. My child finds it uncomfortable and gets annoyed when someone tries to get too close to him/her.	0	1	2
13. It's hard for my child to really trust others, even if they're good friends of his/hers.	0	1	2
14. Children sometimes avoid my child when he/she wants to get too close and be a good friend of theirs.	0	1	2
15. Usually when anyone tries to get too close to my child, it does not bother him/her.	0	1	2

Appendix E

Edinburgh Handedness Inventory – Short Form

Edinburgh Handedness Inventory - Short Form

Please indicate your preferences in the use of hands in the following activities or objects:

	Always right	Usually right	Both equally	Usually left	Always left
Writing					
Throwing					
Toothbrush					
Spoon					

Appendix F

IPPA-R

Subject ID: _____
Date: _____
Page 1 of 1

Parent Questionnaire

We would like to know more about your relationships with your parents. Please read each question and circle the appropriate number to the right. Please answer all the questions.

	Always True	Sometimes True	Never True
1. My parents respect my feelings.	1	2	3
2. My parents are good parents.	1	2	3
3. I wish I had different parents.	1	2	3
4. My parents accept me as I am.	1	2	3
5. I can't depend on my parents to help me solve a problem.	1	2	3
6. I like to get my parents' view on things I'm worried about.	1	2	3
7. It does not help to show my feelings when I'm upset.	1	2	3
8. My parents can tell when I'm upset about something.	1	2	3
9. I feel silly or ashamed when I talk about my problems with my parents.	1	2	3
10. My parents expect too much from me.	1	2	3
11. I easily get upset at home.	1	2	3
12. I get upset a lot more than my parents know about.	1	2	3
13. When I talk about things with my parents they listen to what I think.	1	2	3
14. My parents listen to my feelings.	1	2	3
15. My parents have their own problems, so I don't bother them with mine.	1	2	3
16. My parents help me to understand myself better.	1	2	3
17. I tell my parents about my problems and troubles.	1	2	3
18. I feel angry with my parents.	1	2	3
19. I don't get much attention at home.	1	2	3
20. My parents support me to talk about my worries.	1	2	3
21. My parents understand me.	1	2	3
22. I don't know who I can depend on.	1	2	3
23. When I am angry about something, my parents try to understand.	1	2	3
24. I trust my parents.	1	2	3
25. My parents don't understand my problems.	1	2	3
26. I can count on my parents when I need to talk about a problem.	1	2	3
27. No one understands me.	1	2	3
28. If my parents know that I am upset about something, they ask me about it.	1	2	3

Appendix G

ASCQ

Appendix D

How true are these for you?	Not true	Unsure	True
1. I make friends easily			
2. I don't feel comfortable making new friends			
3. It is easy for me to depend on people, especially if they are my good friends			
4. I feel uncomfortable if others get too friendly or close to me			
5. Sometimes I feel afraid when other kids no longer want to be my friend			
6. I like having good friends and being with them all the time			
7. It's all right with me if good friends trust and depend on me			
8. It is hard for me to trust others completely			
9. I sometimes feel that others don't want to be good friend with me as much as I do with them			
10. I believe those who are close to me will not leave me alone.			
11. I'm sometimes afraid that no one really loves me			
12. I feel uncomfortable and get annoyed when someone tries to get too close to me			
13. It's hard for me to really trust others, even if they are good friends of mine			
14. Children sometimes avoid me when I want to be good friends with them			
15. I don't when people get too close to me.			

Appendix H

Parent Consent Form

I hereby consent to my child's participation in this study.

Child's name: _____

*Signature of parent/guardian:*_____

Date (dd/mm/yyyy): _____

I hereby consent to my participation in this study.

Parent/guardian's name: _____

*Signature of parent/guardian:*_____

Date: _____

Contact number: _____

Email: _____

If consent is given for participation, please indicate whether you would like to receive the three additional questionnaires via email or in hardcopy (Tick one): **Email / Hard copy**

Appendix I

Assent Form

Child assent form

Hello! We want to tell you about an exciting research study we are doing. A research study is a way to learn more about something. We would like to find out more about how you interact with your friends and your parents.

Depending on whether we are still locked down or not, we will either come to you to do the research or we will do the study over video call. We will ask you to fill out three short questionnaires that will ask about your friendships and your parents. During the study we will also ask you to do one pretend task where we will ask you to carry out an action.

This will take around an hour, but if you get tired, we can take a break at any time.

You do not have to join this study. It is up to you. No one will be angry with you if you don't want to be in the study. You can also join the study and change your mind later if you want to stop.

When we are all done you will receive a prize to say thank you for participating!

If you sign your name below, it means that you agree to take part in this study.

Participant's Signature/Name: _____

Researcher signature: _____ Date: _____

Appendix J

Parent information sheet

Dear Parent(s)

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

You are invited to participate in a research study investigating social skills and the ability to relate to others in young children/adolescents. We are currently completing our Honours in Psychology Degree UCT) and are in the process of conducting research for our thesis. This study has been approved by the Research Ethics Committee of the Faculty of Humanities at UCT. Your child will be asked to fill out three short questionnaires relating to how they interact with other people, look at some pictures and comment on what they think is going on, and do one pretend task where we will ask them to carry out an action.

We are requesting your written consent for yourself and your son or daughter to participate in our study. If you consent to participate you will be asked to complete three questionnaires which can be emailed to you, or you can complete it in person. Your child will be asked to complete a task and three questionnaires with our researchers. Depending on the progression of the current national lockdown, the study will either be completed in person or online over video call. The research process should take no longer than 45 minutes with your child.

If you consent to your child's participation as well as your own, please complete the consent form and demographic questionnaire below and email it back to us. We will then send an email with three questionnaires for you to complete regarding your child and request a convenient time to have a zoom call/in person consultation with your child.

Please be assured that your child and your identities will be kept absolutely confidential and all information will be stored on a private, password protected computer. If you have any questions regarding the research, please do not hesitate to contact the researchers Faieeza Khalfe or Amy Gribble or their supervisor. Any questions regarding your rights as a research participant can be directed to Rosalind Adams, whose details are also listed below.

Thank you for your participation.

Amy Gribble
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Any questions of ethics:
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