

Investigating the Effect of Depression, Stress, and Attachment Style on Leftward Cradling Bias.

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

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Abstract

The majority of women cradle infants to the left of their midline – this phenomenon is known as leftward cradling bias. The right hemisphere's specialization for emotional processing is believed to explain the bias as it would facilitate emotional communication between the parent and child. Thus, it is of scientific and clinical interest to investigate the disruptors of leftward cradling bias. This study examined three possible disruptors of leftward cradling: stress, depression and attachment style. In total, after exclusion criteria were applied, 468 female students participated. Information was collected over the internet via surveys and using an imaginary cradling task, to facilitate obtaining a large sample. A hierarchical regression model was developed to concurrently examine the effect of depression, stress, and attachment style on leftward cradling bias. The hierarchical regression model was not statistically significant; however, four points of interest were found in the data. First, depression was a significant predictor of reduced leftward cradling bias. This supports the findings of previous studies that depression disrupts leftward cradling bias (Alzahrani, 2012; Scola, Arciszewski, Measelle, & Vaclair, 2013; Vaclair & Scola, 2009; Weatherill et al., 2004). Second, stress was not a statistically significant predictor of reduced leftward cradling bias. This was surprising as stress has been shown to disrupt leftward cradling bias in the literature (Alzahrani, 2012; Reissland, Hopkins, Helms, & Williams, 2009; Suter, Huggenberger, Blumenthal, & Schachinger, 2011; Suter, Huggenberger, & Schächinger, 2007). This lack of significance was attributed to the measure of daily stress used, indicating that future research should concentrate on major life stressors. Third, depression and stress were significantly correlated with each other. Thus, future research should take into account the interaction between them. Fourth, attachment style was not a significant predictor of reduced leftward cradling bias. However, it had a statistically significant correlation with depression and stress, which are connected to disrupted leftward cradling bias. Thus, the role between depression, stress, attachment style should be further explored.

Keywords: cradling bias, stress, depression, attachment, students

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The parent-child relationship is vital in maintaining an infant's physical and psychological wellbeing. An important part of this relationship is expressed through cradling. Cradling may be for functional purposes such as feeding and transport, or for non-functional emotional reasons such as soothing, communication, and bonding (Anisfeld, Casper, Nozyce, & Cunningham, 1990). Research indicates that 60-90% of mothers cradle infants to the left of their midline in instances of non-functional cradling (Bogren, 1984; Dagenbach, Harris, & Fitzgerald, 1988; de Château, P., 1991; Harris, Almerigi, & Kirsch, 2000; Harris, Spradlin, & Almerigi, 2006; Lucas, Turnbull, & Kaplan-Solms, 1993; Manning & Chamberlain, 1991; Salk, 1960; Scola et al., 2013; Vauclair & Donnot, 2005). This phenomenon is known as leftward cradling bias.

It is important to study leftward cradling because it is believed to enhance emotional communication and bonding between the parent and infant. On the other hand right-sided cradling is regarded as an indication that there may be disruptions in the parent-child relationship. For example, research found that mothers who are separated for more than 24 hours from their newborn infants tended to cradle more on the right (Salk, 1973).

The parent-child relationship is important for the child's lifelong development, hence it is vital to maintain and protect it. Right-sided cradling may be a clear and informative indicator that there is some disruption in the parent-child relationship. For right-sided cradling to be used in this way clinicians need to know what psychological problems tend to cause it. Negative affect has been indicated as a disruptor of leftward cradling bias. It is not clear if this negative affect is a result of depression, stress, attachment style or some combination.

Therefore, the purpose of this study was to concurrently examine potential disruptors of leftward cradling – stress, depression, and attachment style. This study measured the participants' everyday stress levels, depression, and attachment style to see if there was an association between these variables and leftward cradling bias.

Literature Review

This section describes the phenomenon of leftward cradling bias. It details the different explanations of leftward cradling bias. Finally, it describes the various psychological disruptors of leftward cradling.

Leftward Cradling Bias Incidence

Leftward cradling bias was first observed by Salk (1960) while observing a female Rhesus monkey with her newborn baby. (Salk, 1960) noticed that the mother frequently held the newborn on her left side with the newborn's ear pressed against her heart. To examine if this pattern was consistent, random observation over three days was set up. Of 42 total observations, 40 showed the newborn being held on the left while only two showed holding on the right side. To see if this bias extended to humans, (Salk, 1960) observed 287 women with their newborns at Elmhurst Hospital in New York. Among right handed mothers ($n = 255$) 83.1% held their babies on their left side and 16.9% the on the right. Of left handed mothers ($n = 32$) 78.1% held their babies on their left side and 21.9% on their right. Further research has confirmed that 60-90% of women cradle infants on the left of their midline (Bogren, 1984; Bruser, 1981; de Château, P., 1991; Harris et al., 2006; Lucas et al., 1993; Manning & Chamberlain, 1991; Salk, 1960; Vauclair & Donnot, 2005).

Leftward cradling bias is a robust phenomenon that can be seen in various contexts. For example naturalistic observations (Saling & Cooke, 1984), experiments with mothers and infants (Salk, 1960; Weatherill et al., 2004), using lifelike dolls (Manning & Chamberlain, 1991; Suter et al., 2007) and even imaginary cradling tasks (Almerigi, Carbary, & Harris, 2002; Donnot, 2007; Harris et al., 2000; Matheson & Turnbull, 1998; Nakamichi & Takeda, 1995). This leftward cradling bias does not appear with other objects. For example, when women were asked to hold a pillow, they did not show a bias to either side. However, when the women were asked to imagine the pillow to be a baby, the majority of the women showed a leftward cradling bias (Weiland & Sperber, 1970). Likewise women do not show a leftward cradling bias for carrying shopping (Weiland, 1964). However, it may be argued that pillows and shopping packages do not have the same qualities of value and fragility that infants do. So, Almerigi et al. (2002) asked participants to imagine holding an expensive French vase and an infant. Eighty percent of the participants imagined holding the vase in their right hand, while 66% imagined holding the infant in their left hand. Thus, the value and fragility associated with infants cannot account for the leftward cradling bias. It seems that infants hold specific psychological qualities that arouse leftward cradling bias in women. In particular, it appears that leftward cradling bias is found in a context of soothing and social interaction with the infant (Turnbull & Lucas, 1996; Weatherill et al., 2004).

Leftward cradling bias appears to be a deeply wired instinct. In females, experience and age do not seem to influence leftward cradling bias. Nulliparous female students (Saling & Tyson, 1981; Turnbull & Lucas, 1996) and pre-school girls (de Château & Andersson, 1976; Saling & Bonert, 1983) all show a leftward cradling bias. Even primates have shown a leftward cradling bias (Manning & Chamberlain, 1991).

Incidence of leftward cradling bias in men. Incidence of leftward cradling bias has been investigated in various male populations including fathers and university students; using actual infants as well as imaginary cradling tasks. Additional surveys have been taken by examining photographs and artwork. The results of these studies have been mixed.

Fathers show a leftward cradling bias in the majority of studies. In one study, fathers of newborns and fathers of older children (at least a year old) had an 80% leftward cradling bias rate, which was the same as mothers of newborn infants. Men with no children did display a leftward cradling bias but only at the rate of 60% (de Château, 1983). Two further studies also found that fathers of newborn infants exhibited a leftward cradling bias rate of 80% (Bogren, 1984; and Dagenbach et al., 1988). In another study, fathers of newborns exhibited a lower, but statistically significant, leftward cradling bias rate of 65% (Celine Scola & Vauclair, 2010). In contrast, observations of adult and child groupings in Seattle noted that males did not exhibit any side bias; while the women did exhibit a leftward cradling bias (Lockard, Daley, & Gunderson, 1979). This data must be interpreted with some caution, however, as many of these cradling interactions were functional and transport interactions, and not soothing or bonding interactions as in other studies. Additionally, in another study observing participants carrying infants in Sri Lanka, the majority of men preferred a right arm hold (Bruser, 1981). These results must be interpreted cautiously. No information about the type of interaction between the holder and infant being carried was noted. Thus, many of the observations may have been examples of functional cradling (however the women observed in this study did show a leftward cradling bias).

The evidence for leftward cradling bias in male students has been more mixed. In one study, 73% of the men showed a leftward cradling bias (Bundy, 1979). However, another article that published the results for two studies found very different results. In one study the students held a book and in the other a doll. In both studies the students were told to imagine the book or

the doll was an infant they were cradling to sleep. In the book experiment, 83% of men showed a leftward cradling bias. However, in the next study, when asked to soothe a doll to sleep only 48% of the men showed a leftward cradling bias (Turnbull & Lucas, 1996). This unusually low figure may be due to sampling error - the study had a very small sample size. Only 23 men participated in the second study compared to the 41 in the first study.

The evidence for leftward cradling bias in men from photographs and artwork has been mixed. In a survey of photographs from undergraduate textbooks, of the photographs showing men cradling, 65% showed a leftward cradling bias (Harris & Fitzgerald, 1985). This was further supported by a survey of photographs of mothers and fathers from the World Wide Web. Of the photographs depicting fathers cradling, 67% showed men exhibiting a leftward cradling bias (Harris et al., 2006).

In contrast, in a photographic survey of Western, Eastern and American Indian photographs; men did not show a significant side bias in any of the cultural groups (exact figures were not given, there were 268 photographs in total) (Richards & Finger, 1975). Additionally, a survey of 24 paintings depicting men holding infants in Western Art did not find a preference to either side (Finger, 1975). In survey of family albums, 557 pictures of men cradling infants were found. Of these photographs, 47% showed a leftward cradling bias (Manning, 1991).

The results vary from studies that find no difference between men and women in rates of leftward cradling bias to the opposite end with a study where men showed a rightward cradling preference. The general consensus seems to be that men do exhibit a leftward cradling bias, but not as consistently as women. Thus, in this study only female students will be used.

Incidence of leftward cradling bias across cultures. If leftward cradling bias is a result of an innate mechanism to promote parent-child bonding, then leftward cradling bias should be universal. Research into incidences of leftward cradling bias across cultures has used naturalistic observations, artwork, and photographs.

Numerous studies into leftward cradling bias have taken place in America (Dagenbach et al., 1988; Salk, 1960) and Europe (Bogren, 1984; de Château, 1983; Scola et al., 2013; Suter et al., 2011). Studies have also specifically looked at leftward cradling bias in non-Western cultures. Lockard et al. (1979) observed family groupings walking in Seattle, United States of America and Dakar, Senegal. In Seattle the majority of women showed a leftward holding bias.

However, the Dakar data is difficult to interpret as most infants are carried on the back in a loose rucksack. Given the growing awareness of how important it is to differentiate between functional and non-functional cradling it would be interesting to see Dakar women in situations where they are nurturing their infants. Additionally, Bruser (1981) observed 342 cases of women carrying infants in Sri Lanka. The majority of women showed a statistically significant preference for carrying infants in their left arm. Saling and Cooke (1984) observed Black, Coloured and Indian (different cultural groupings in South Africa) mothers and infants who were waiting in a clinic. There was a statistically significant preference for leftward cradling in all three cultural groups.

In contrast, Nakamichi (1996) observed women and infants in public settings in Madagascar, where 64% of the women showed a rightward cradling bias. Nakamichi (1996) attributes this difference to a strong cultural association between the left being bad and the right being good. However, Alzahrani (2012) found a strong leftward cradling bias in 369 Saudi Arabian citizens who also associate the left as being bad. Thus, data from the Madagascar study may have been confounded by some other variable such as functional cradling.

Investigations into artwork show leftward cradling bias both across cultures, and across time within cultures. Salk (1973) surveyed 466 works of art containing an adult holding a child in museums and art galleries. Of these, 80% showed a leftward hold. Salk (1973) also surveyed artwork from other cultures which demonstrated a leftward cradling bias, but no details about which cultures were examined was given. Richards and Finger (1975) gathered 268 photographs from Western, Eastern, and American Indian cultures to test whether leftward cradling bias is universal. A statistically significant majority of the women in the photographs showed a leftward cradling bias. Alvarez (1990) investigated 71 pieces of Pre-Colombian ceramic art depicting mothers holding infants. Of these, 65% showed a leftward cradling bias. Finger (1975) found 649 pictures of mothers holding infants in history of art books. The majority of the pictures showed a leftward cradling bias. Grüsser (1983) examined 594 sculptures and 1251 paintings depicting mothers and children. The artwork ranged from the Middle Egyptian Empire to the present. Most centuries showed a leftward cradling bias, except for the Renaissance period.

In conclusion the literature shows strong support for leftward cradling bias being a universal trend. Naturalistic and photographic information both support this trend. Only one

study found an opposing view. Thus, it is appropriate to investigate leftward cradling bias in the South African context.

Explanations of Leftward Cradling

Heartbeat Explanation. One of the first proposed explanations of leftward cradling bias was the heartbeat explanation (Salk, 1960, 1973). Salk (1960), upon seeing a mother rhesus monkey cradle its infant on to the left of its midline, wondered if the phrase “close to a mother’s heart” was more than anecdotal. Salk (1960, 1973,) following on from the work of Bowlby (1960) and Harlow (1958), proposed that in the womb the infant is in a secure, tranquil, stress free environment; where the most prominent and constant sound is that of the mother’s heartbeat. At birth the infant is exposed to a new environment with dissonant sounds that produce anxiety. He suggested that mothers instinctually realized that infants find hearing their heartbeat soothing. Thus, mothers predominantly cradle on the left, where the infant can hear the heartbeat better.

Salk (1960) theorized that the sound of a heartbeat would buffer infants’ anxieties. Therefore, if an infant was provided with the soothing heartbeat sound they would be physically more healthy and even possibly emotionally healthier long term. Salk (1960) tested these predictions by conducting an experiment in a New York hospital. In the experimental phase a normal heartbeat sound at 72 paired beats a minute at 85 decibels was played continuously in the nursery. During the control phase no sound was played. The experiment took place over 16 weeks. Weeks 1-4 and 9-12 were the experimental phases where the heartbeat sound was played. Weeks 5-8 and 12-16 were the control phases, where no sound was presented. This was arranged to control for possible extraneous variables such as temperature and prevalence of viral infections. All the infants were healthy and stayed in the nursery for four days except for feedings.

In the experimental phase, infants exposed to the heartbeat sound showed significant weight gain compared to infants not exposed to the heartbeat sound. The heartbeat group showed an average increase of 40 grams, while the control group actually showed a decrease of 20 grams. However, there was no significant difference in the food intake of the two groups. Salk (1960) attributed this difference in weight gain to the infants in the heartbeat group being calmer and having a more coordinated autonomic nervous system. In the heartbeat group one or

more infants were heard crying 38.4% of the time while in the control group one or more infants were crying 59.8% of the time. The heartbeat infants were also clinically observed to have more regular breathing.

While Salk's work on recognizing leftward cradling bias has been the starting point for much research, the heartbeat hypothesis has not stood the test of time. Due to methodological flaws and failures to replicate Salk's results the heartbeat hypothesis has fallen into disuse. For example, Turnbull and Lucas (2000) argued that it is difficult to weigh infants reliably. Since, the nurses who weighed the infants were aware of the study they may have been unconsciously affecting the results through experimenter bias. This is further supported by the fact that weight gain in response to heartbeat recordings has not been confirmed by other studies (Palmqvist, 1975).

Detterman (1978) further argues that Salk's (1960) report of substantially reduced crying in the experimental group is also misleading. In Salk's study crying was measured by a tape recorder that turned on every 7 minutes in the nursery. Crying was measured as any infant in the nursery crying during these 30 second intervals. With this type of measurement it is important that the groups are matched. However, in Salk's (1960) study the experimental heartbeat group had 102 infants, while the control group had 112. Thus at any given time there were more infants in the control group and therefore more crying. When Detterman (1978) controlled for this by measuring individual infants crying, Salk's (1960) results could not be replicated.

Salk's (1960) heart beat hypothesis rested on the assumption that infants associate the heart beat sound with the calm tranquil environment in the womb. However, later research suggests that the mother's heartbeat may be inaudible for much of the time in the womb (Lecanuet & Schaal, 1996). Voicing a related concern, Bundy (1979) pointed out that unless the infant's ear was directly against the mother's chest the heartbeat is inaudible. Since, in many cradling situations the infant is held against the shoulder, or in the arms, as well as being insulated by clothing, it appears that in many situations where the infant is cradled on the left, the holder's heartbeat may not be audible.

Salk suggested infants found the heartbeat soothing; mothers learnt this and thus showed a leftward cradling bias. However, this is refuted by the many studies that recorded leftward cradling bias in nulliparous women (Almerigi et al., 2002; Saling & Tyson, 1981), and even in

pre-school girls (de Château & Andersson, 1976; Saling & Bonert, 1983). This suggests that that leftward cradling is an innate instinct not a learned skill.

Finally, the heartbeat hypothesis might be argued to be untestable as the heart is only slightly left in all humans (Turnbull & Lucas, 2000). However, there are rare cases of dextrocardia, where a person's organs are transposed. There is one recorded case of leftward cradling bias being tested in a mother with dextrocardia; the mother cradled leftwards (Todd & Butterworth, 1998). Even if mothers with dextrocardia were found to cradle on the right, the phenomenon is extremely rare. Thus, it could not account for the 25% of participants that do not show a leftward cradling bias in most studies (Turnbull & Lucas, 2000).

Handedness Explanation. The second explanation that arose is the handedness explanation. This explanation theorizes that people cradle with their non-dominant hand to leave their dominant hand free for tasks. Therefore, according to the handedness explanation leftward cradling bias is explained by the fact that most people are right handed and thus cradle on the left (Huheey, 1977). This was supported by van der Meer & Husby (2006) who tested this theory by asking 765 participants to cradle a doll and insert a dummy in its mouth. The participants showed a clear preference for cradling with their non-dominant hand; thus leaving their dominant hand free for manual tasks.

Theorists of the handedness explanation argue that the leftward cradling bias is simply the result of the high proportion of right handers in the population. It is estimated that as many as 9 in 10 people are right handed (Corballis, 2003). However most studies put the range of leftward cradling bias as between 60 and 90% (Bogren, 1984; de Château, P., 1991; Harris et al., 2006; Lucas et al., 1993; Manning & Chamberlain, 1991; Salk, 1960; Vauclair & Donnot, 2005). Thus the handedness theory alone cannot explain why many right-handed holders do not cradle to the left.

Moreover, the handedness hypothesis does not explain the many studies that did find a leftward cradling bias in left handers (Harris et al., 2000; Saling & Tyson, 1981; Salk, 1960; Sieratzki & Woll, 2002). When asked why they cradle to their left side, right handed mothers say they cradle on the left to leave their right arm free for other functions. However, left handed mothers reply they can better hold their infant with their stronger left arm. Given these differing

explanations it seems that handedness is a rationalization rather than the underlying cause of left sided cradling bias (Salk, 1960).

However, a distinction must be made between functional cradling and communication cradling. People hold infants for a number of reasons – transport, feeding, display and soothing. When people functionally cradle (cradling the baby while doing something else with the free hand, e.g. feeding) they do cradle with their non-dominant hand to leave their dominant hand free for manual tasks (van der Meer & Husby, 2006). However, when the cradling purpose is soothing or contact, the left side is favored irrespective of handedness (Harris, Almerigi, & Kirsch, 2000; Salk, 1960).

What the handedness explanation fails to take into account are the psychological aspects underlying cradling. In the van der Meer and Husby (2006) study, cradling was secondary to performing another task. In contrast, other studies have focused on observing cradling in the context of bonding and communication. For example, in one study when participants were asked to hold a pillow no side preference was noted. When asked to imagine the pillow was a baby, participants cradled the pillow to the left (Weiland & Sperber, 1970).

Right Hemisphere Specialization Explanation. First theorized by Lockard et al. (1979), this explanation rests on the right hemisphere's specialization for emotional processing. The right hemisphere is particularly specialized in processing the non-verbal emotional aspects of communication – prosody, facial expression, posture, tactile and bodily gestures (R. Campbell, 1982). It is through these non-verbal communications that many parent-child interactions take place during the first two years (Schore & Schore, 2008). Thus, the right hemisphere explanation theorizes that holders cradle infants on the left to put the infant into their left visual and auditory fields, as well as to present their face's more emotionally expressive side toward the infant – both of which are argued to facilitate better social communication and bonding.

To test this theory Manning & Chamberlain (1991) asked participants to pick up and cradle a doll under various conditions: the control group (with no vision impediment), a group with the left eye occluded, a group with the right eye occluded, and a blindfolded group. The control group and the right eye occluded group showed normal rate of leftward cradling bias of 80 and 79% respectively. In contrast, compared to the control group the left eye occluded group and the blindfolded group showed a significantly reduced leftward cradling bias. However,

when Matheson and Turnbull (1998) replicated the study they found left eye occlusion made no difference to rates of leftward cradling bias. Furthermore, they also found a strong leftward cradling bias in blind participants. Thus while the ability to monitor the infant with the right hemisphere may be important; it does not seem to be the total explanation.

A number of studies have used the Chimeric Faces Test (CFT) to measure which hemisphere is preferred for processing visual emotional stimuli. The CFT involves pictures of faces, typically smiling and neutral. These faces are split down the midline and joined together. These composite or chimeric faces are then mirrored. Participants are presented with the mirror images of the composite faces, and asked to choose which face is happier. If the participant consistently chooses a face with the smile on the left or right the contralateral hemisphere is believed to be consistently involved. Thus if a participant consistently chooses the face with the smile on the left it indicates a left visual field preference and thus a right hemisphere preference for processing emotion. The results of studies using CFT have been mixed. Two studies did not find a correlation between leftward cradling bias and right hemisphere preference (Donnot & Vauclair, 2007; Lucas et al., 1993). However, three other studies have shown a statistically significant relationship between leftward cradling bias and right hemisphere preference (Bourne & Todd, 2004; Harris, Almerigi, Carbary, & Fogel, 2001; Vauclair & Donnot, 2005).

Other studies have used Dichotic Listening Tasks (DLT) to measure which hemisphere is preferred for processing auditory emotional stimuli. In a dichotic listening task, participants simultaneously hear sentences with different emotional valences in each ear. The participants are asked which emotion they heard most clearly. If they repeatedly answer the emotion heard in the left ear, the participant has a left ear preference and thus a right hemisphere preference for processing auditory emotional stimuli. The support for left cradling bias and processing auditory emotional stimuli has been small. One study did find a significant correlation between leftward cradling bias and right hemisphere preference (Donnot, 2007). However, two other studies did not find a significant correlation between leftward cradling bias and right hemisphere preference (Donnot & Vauclair, 2007; Turnbull & Bryson, 2001). Additionally, leftward cradling bias has been noted in deaf participants (J S Sieratzki, 2004; Turnbull, Rhys-Jones, & Jackson, 2001). Thus, a right hemisphere preference for processing auditory emotional stimuli may account somewhat for the leftward cradling bias, but much is still left unaccounted.

Alternatively, leftward cradling may also calm the holder. Students who were asked to cradle a doll on their left were calmer (as measured by eye blinks and heart rate) than students who cradled to their right when startled by a sudden noise (Suter, Huggenberger, Richter, Blumenthal, & Schachinger, 2009). Additionally, mothers, who cradled to the left, used a lower pitch when speaking to their infants (a low pitch is more soothing). In contrast, mothers who cradled to the right used a higher pitch (Reissland, 2000).

The right hemisphere explanation can account for the leftward cradling bias in men. It may be argued that in general men do not seek out bonds and interaction with infants thus explaining the studies that did not find a leftward cradling bias in men (Lockard et al., 1979; Richards & Finger, 1975). However, men who are seeking social interactions and bonding with infants such as new fathers do show a leftward cradling bias (Bogren, 1984; Dagenbach et al., 1988; de Château, 1983; Harris et al., 2006).

The right hemisphere explanation could also explain why left vs. right cradling seems to be related to the quality of the holder-infant interaction (Turnbull & Lucas, 2000). For example, children with autism did not show a cradling bias towards either side while typically developing children showed a strong leftward cradling bias (Pileggi, Malcolm-Smith, Hoogenhout, Thomas, & Solms, 2013). This study showed that leftward cradling bias is absent in a population where the core deficit is in relating and bonding with others.

While not all studies have supported the right hemisphere explanation, many have provided supporting evidence. Additionally, its good theoretical underpinning makes it the best explanation of leftward cradling bias currently.

The Effect of Depression and Stress on Leftward Cradling Bias

Parents may change their cradling side for many reasons. There are simple functional reasons such as feeding or fatigue. However, it is also clear that there is an emotional component underpinning left cradling bias. For example, when asked to hold a pillow, women do not show a cradling bias, but when asked to imagine the pillow is an infant, they do show a leftward cradling bias. Thus logically, disruptions in the holder's psychological wellbeing will reflect in their cradling side. Research has concentrated on two of the most common emotional disorders – stress and depression.

Studies investigating the effect of depression on the parenting relationship generally show that women who are depressed are less responsive to their infants and spend less time touching and talking to them (Cohn, Campbell, Matias, & Hopkins, 1990; Field, 1995). Depressed mothers are less able to perceive and interpret their infants' emotions (Field, Healy, Goldstein, & Guthertz, 1990). Children of depressed mothers more often show behavioral problems and irregular frontal lobe functioning (Dawson et al., 2003). The evidence that depressed mothers are less communicative and demonstrative would suggest this reduced emotional expression manifests in reduced leftward cradling bias as well.

Depression is often characterized by dysfunction of the right hemisphere (Davidson, 1992; Flor-Henry, Lind, & Koles, 2004; Grimm et al., 2008; Heller, Etienne, & Miller, 1995; Henriques & Davidson, 1991; Rotenberg, 2004). People with depression also struggle to perceive and name emotions (Rubinow & Post, 1992; Silberman & Weingartner, 1986). Thus, depression may disrupt the right hemisphere's role in perceiving and producing emotions resulting in a reduced leftward cradling bias.

Stress affects mothers' parenting skills, resulting in poorer mother-child interaction and conflicts between the mother and child (Crnic, Gaze, & Hoffman, 2005). Emotionally stressed mothers show less warmth in interactions with their infants (Assel et al., 2002) and are less sensitive to their infants (Muller-Nix et al., 2004). Stressed parents tend to have more negative interactions and be less involved overall (Deater-Deckard, Pinkerton, & Scarr, 1996). Given how stress disrupts the mother-child relationship, this disruption should also be seen in reduced leftward cradling bias.

Stress has not been shown to affect the right hemisphere directly. However, stress has been shown to disrupt the regulation of a large number of neurotransmitters: including steroids (cortisol, dehydroepiandrosterone), amines (serotonin, dopamine, noradrenaline), and peptides (corticotrophin) (Fuchs & Flügge, 2002, 2003; Herbert, 1997). Thus, the effect on brain functioning is widespread and pervasive, extending beyond the right hemisphere.

Only 10 papers in total have investigated the effect of stress and depression on cradling bias (Alzahrani, 2012; Bogren, 1984; de Château, Holmberg, & Winberg, 1978; Reissland et al., 2009; Salk, 1973; Scola et al., 2013; Suter et al., 2011, 2007; Vauclair & Scola, 2009; Weatherill et al., 2004). The following section fully examines each paper in detail, in order of publication.

“The role of the heartbeat in the relations between mother and infant.” Salk (1973) noted at a follow-up clinic for premature infants, that a large number of the mothers held their infants on the right. Salk (1973) attributed this disruption to the separation of the mother and infant that occurs in premature cases. The author, Salk (1973), further investigated this in a prospective study, where mothers at a clinic participated. In the experimental group, (n = 115) all the mothers did not have contact with their infants during the first 24 hours after birth or longer. In the control group (n = 286) all mothers handled their infants during the first 24 hours after birth. At a clinic after the separation, the experimenter presented the mother’s infant to the midline of the mother. The experimenter noted on which side of the mother’s body the infant was then held.

Mothers in the control group showed the expected distribution with 77% cradling their infants on the left. In contrast, mothers in the experimental group did not show a side preference: 53% placed their infants on their left side and 47% on their right. In his interpretation, Salk (1973) focused on the role of maternal separation in disrupting leftward cradling bias. However, this study is confounded by the fact that mothers in the experimental group were separated from their infants because of prematurity or medical reasons. These are all naturally stressful situations, and this negative affect and stress could have caused the differences in cradling (Reissland et al., 2009; Suter et al., 2007; Weatherill et al., 2004).

“Left-side preference in holding and carrying newborn infants.” de Château et al. (1978) observed mothers with their newborn infants two to eight days post birth to see if leftward cradling bias is present following delivery. The mother was asked to carry her infant to a crib and then cradle her infant while sitting in a chair. Cradling side was noted both in the carrying and sitting condition. Eighty percent of primiparous mothers and 86% of multiparous mothers showed a leftward cradling bias. The rate of right sided cradling was doubled in mothers who had been separated from their infants due to medical concerns. The left side preference was not as marked in the carrying condition, but this may have been confounded by the functional nature of the carrying condition.

Of the mothers who had healthy full term infants only a small minority cradled to the right. So, to investigate what other possible factors caused these mothers to show rightward cradling, a group of left cradling mothers (n = 35) and right cradling mothers (n = 35) were

selected from the larger sample. Both groups gave birth to healthy full-term infants, and were matched for maternal age, parity and sex of the infant. There was no difference between the groups on socioeconomic factors such as housing, occupation, education, and composition of the family. However, the non-separated right cradling mothers reported that it had taken them a long time to bond to their infants. Additionally, medical records showed that the right cradling mothers had more frequent contact with the Child Health Centre and received significantly more home visits from district nurses in the three years post the infant's birth. This is an indication that disruptions in the mother-child relationship are associated with right-sided cradling.

“Side preferences in women and men when holding their newborn child: psychological background.” Bogren (1984) examined parents' social and psychological backgrounds to see if they affected cradling side. Originally, 112 parents awaiting their first child were randomly selected from maternity clinics in Linköping. After participant dropout and exclusion criteria, 81 couples participated in the study. All the men and women were interviewed early in the pregnancy (during the 13th to 14th week) and again a week after delivery. During the first interview, information about social, psychological background and feelings about the pregnancy were collected. Information was also collected about the participants' relationship with their parents. During the second interview information about the pregnancy and birth was collected as well as cradling side.

Cradling was measured by asking the participants to imagine holding their infant and to show how they would do this. The experimenter noted on which side the infant was held. Eighty percent of the women held their child on the left and 20% to the right. Similarly, 83% of the men held on the left and 17% on the right. Over 80% of the women were also observed in the ward. There was a 100% agreement between the imagined cradling and actual cradling. Social factors such as the participants' age, age of the participants' parents, civil status, relationship duration, current financial situation, educational level, and work satisfaction in both men and women did not affect cradling side. Only men who were unsatisfied with their present accommodation were more likely to cradle on the right. Overall social factors did not seem to play a role in determining cradling side.

Women who worried about their pregnancy were significantly more likely to cradle on the right. Right holders (men and women) reported significantly more psychiatric history than

left holders. However, Bogren (1984) did not discuss what types of psychiatric history were reported. Given that depression is a common psychiatric disorder, this may be evidence that depression does affect leftward cradling bias. While not statistically significant, women who had unplanned pregnancies and those who had waited more than 6 months for a wanted pregnancy tended to be right holders, indicating that stress and anxiety affect leftward cradling bias.

“Is maternal depression related to side of infant holding?” Weatherill et al. (2004) investigated whether maternal depression affected cradling side. One-hundred-and-seventeen pregnant women were initially recruited. To increase the chance of recruiting mothers with depression, participants were recruited as part of a larger study investigating domestic violence (domestic violence is associated with increased chances of depression (Campbell & Lewandowski, 1997)). Mothers were interviewed one year postpartum. During the interview, information on depression symptoms (Beck Depression Inventory) and experiences of domestic violence (The Severity of Violence against Women Scales) was gathered. Cradling side was elicited using the strange situations task. The strange situations consist of eight episodes that alternate between those designed to be stressful – for example the mother leaves the room and a stranger enters and non-stressful events such as when the mother returns and is available to provide comfort to the child. Mothers were only told when to leave and return to the room and to respond to their child as usual. These episodes were videotaped and coded for side of hold, type of hold (e.g. shoulder, lap), and purpose of hold (e.g. comfort or transport). The duration of the hold was also calculated.

In the sample, 19 of the 117 mothers were classified as mildly depressed and above on the BDI scale. There was a significant difference between the depressed mothers and the non-depressed mothers. The depressed mothers were more likely to exhibit a reduced leftward cradling bias.

Of the participants in the study, 25% were classified as experiencing domestic violence during the past year. Mothers who did not report domestic violence showed a significant left cradling bias. Mothers who did report domestic violence showed a non-significant left bias reduction.

The strength of this study was its use of a validated measure of depression. It was the first study to do this. Given the small proportion of depressed mothers to non-depressed mothers, further studies, with more balanced groups, may find significant results. However, cradling was

elicited using the strange scenarios task, which is stressful for both mother and child. Therefore, this study may have inadvertently also have been examining the effects of stress (Reissland et al., 2009).

“Cold pressor stress reduces left cradling preference in nulliparous human females.” Suter et al. (2007) investigated the effect of an acute physical stressor on cradling bias. Sixty-four female undergraduate students were recruited from the University of Basel. In the experimental group participants immersed their hands in ice cold water for two minutes as part of the cold pressor stress protocol. In the control group, participants immersed their hands in warm water for two minutes. At the beginning of the assessment participants were given the German short form of the Profile of Mood States questionnaire (POMS) and had to rate how intensively they felt happy, angry, dull and aroused. The protocol for both groups consisted of a pre-intervention cradling assessment (using a lifelike doll), the intervention and a post-intervention cradling assessment. Cradling was measured using three trials. Each trial consisted of 10 seconds of standing and then 10 seconds sitting while cradling. In the pre-intervention the majority of participants held the doll on their left side: 62.5% during the standing condition and 65.6% in the sitting condition. In the standing condition there was a significant difference between the pre- and post-stress cradling assessments, with stress reducing leftward cradling. However, in the sitting condition there was not a significant difference between the pre and post cradling assessments.

The strength of this study is its experimental design. It clearly shows the effect of a physical stressor on leftward cradling. However, the limitation of this study is the non-significant results, for cradling while sitting, with the experimental group. No sitting or standing permutations were done, so the results could mean that the effects of stress are seen only in a standing situation or that the stressor effects were so short lived that it could not be measured 10 seconds later in the sitting condition.

“Maternal stress and depression and the lateralization of infant cradling.” Reissland et al. (2009) investigated the effect of maternal depression and stress on cradling side. Seventy-nine mothers and their infants were recruited from Aberdeen maternity hospital. Cradling was assessed by asking the mothers to pick up and cradle their child, which was videotaped and

coded. Depression was assessed using the Edinburgh Postnatal Depression Scale (EPDS). Stress was assessed by the Parental Stress Index/Short form PSI/SF. In the study 6 mothers were classified as depressed, 31 as only stressed, 13 as both depressed and stressed, and 29 mothers as neither depressed nor stressed. There was no association between cradling and handedness or whether the mother was sitting ($n = 65$) or standing ($n = 14$).

Of the mothers that were neither stressed or depressed, 86.2% cradled on the left and 13.8% on the right. The mothers who were both stressed and depressed showed a significant right bias. Mothers who were only stressed also showed a significant rightward cradling bias. However, contrary to the study's hypothesis, when comparing mothers who were only depressed with mothers who were neither depressed nor stressed, the depressed mothers did not show a significant difference in cradling bias.

The strength of this study is that it balanced using ecologically sound data with valid measures. The limitation of this study was the very small subset of depressed mothers in the sample ($n = 9$). This limitation could account for the non-significant results of the mothers with depression only.

“Infant-holding biases in mothers and affective symptoms during pregnancy and after delivery.” Vaclair and Scola (2009) investigated the effect of depression and anxiety on leftward cradling bias. Seventy-six mothers were recruited for the study. Participants were interviewed 6 months into the pregnancy and 2 months post birth. Cradling side was measured using a cradling questionnaire during pregnancy and by observing the mother and infant after birth. Anxiety was measured using the State-Trait Anxiety Inventory (STAI). Depression was measured using the Centre for Epidemiological Studies Depression Scale (CES-D). State anxiety and depression were both measured during pregnancy and post birth. Seventy-one percent of mothers showed a leftward cradling bias.

Anxiety and depression were highly correlated, so the measures were combined into one affective symptoms factor. During pregnancy affective symptoms did not affect cradling side. However, post birth, mothers with affective symptoms showed significantly less leftward cradling.

This study's strength is its good use of ecological data to investigate the relationship between negative affect and reduced leftward cradling. The study also highlights the issue of

depression and anxiety co-occurring (Brady & Kendall, 1992; Scott et al., 2007). The study's weakness is its joining of depression and anxiety into one factor. Thus, the interactions between depression and anxiety could not be investigated.

“Differential effects of ill-being and chronic stress on cradling behaviour of first and multi-time parents.” Suter et al. (2011) investigated the effects of perceived ill-being and chronic stress on parents of newborns. Eighty-five women and 82 men participated in the study. Forty-two percent of the couples were first time parents, while for 58% it was their second or third child. The participants were interviewed during the last trimester, 10 days postpartum, 8 weeks postpartum, and 15 weeks postpartum. Cradling side was determined using the same cradling questionnaire as Vauclair & Scola (2009). Perceived ill-being and chronic stress was measured in the second session using the Berne Subjective Well-Being Inventory (BFW) and Trier Inventory for the Assessment of Chronic Stress (TICS) respectively.

Multi-time mothers and first time fathers followed the expected pattern of leftward cradling when their reported ill-being and chronic stress levels were low, and rightward cradling when their ill-being and chronic stress levels were high. However, first time mothers and multi time fathers showed the reverse. When their chronic stress levels were high they showed a leftward cradling bias and when their chronic stress levels were low they showed rightward cradling.

This study provides support for stress disrupting leftward cradling. However, the opposing pattern seen in first time mothers mitigates this support. Suter et al. (2011) suggested that the different experiences of multi vs. first time mothers may account for this opposing pattern. But, this does not explain why the fathers also showed an opposing pattern. Perhaps, this study tried to examine too many factors (multi vs. first time parents, mothers vs. fathers, ill-being, chronic stress, and longitudinal effects) for its sample size.

“Effects of depression, stress and other factors on Saudi males and females.” Alzahrani (2012) investigated cradling bias in 267 Saudi females and 102 Saudi males. Cradling was measured by asking participants to report which side they imagined holding an infant. Twenty-four percent of the sample was classified as having high levels of depression by scoring 18 or higher on the Beck Depression Inventory. Thirty-two percent of the sample was classified as having high levels of stress by scoring 24 or above on the Perceived Stress Scale. Seventy-six

percent of the sample showed a leftward cradling bias. Chi squared analysis showed that depression and stress had a statistically significant relationship with cradling side, with higher levels of depression and stress associated with less leftward cradling.

In the next phase of the study participants were videotaped while cradling an infant. However, due to cultural biases against observing and videotaping women only the 102 males participated in this phase. In this phase depression and stress only neared a statistically significant relationship with cradling bias.

This study's strength is its large sample size to give it statistical power, as well as its use of repeatable measures of stress and depression. The second phase of this study also emphasizes the need for large sample sizes to be able to gather an adequate number of participants with stress and depression.

“Infant-holding bias variation in mother-child relations: a longitudinal study.”

Scola et al. (2013) the same investigators as those who published “Infant-holding biases in mothers and affective symptoms during pregnancy and after delivery,” further investigated the longitudinal effects of affect and cradling bias on each other. Following the protocol from their last study, depression, anxiety and cradling side were measured 6 months into the pregnancy, 2 months post birth, and additionally 19 months post birth.

Forty-three mothers were recruited for the study. In this study anxiety did not have a significant effect statistically, so it was excluded from the analyses. This contradicts their previous study which did show a significant relationship between anxiety and cradling side. No explanations were given for this lack of significance. Possibly the smaller sample size meant too few participants had high levels of anxiety.

Sixty-six percent of mothers showed a leftward cradling bias across all three periods, showing that cradling bias is consistent. Prior and current depressive symptoms did not predict changes in cradling bias, but, depressive symptoms were associated with reduced leftward cradling. The inability of depressive symptoms to predict changes in cradling bias may be a result of the strong consistency in cradling bias.

Given that, until now, research into leftward cradling bias has been correlational; the effect of cradling side on depressive symptoms was also investigated. Cradling side did predict changes in depressive symptoms between the pre-birth and 2 month period, but not between the

2 month and 19 month period. Mothers who had a rightward cradling bias 2 months post birth showed an increase in depressive symptoms from the pre-birth period. Mothers who had a leftward cradling bias 2 months post birth showed a decrease in depressive symptoms from the pre-birth period.

Do we have satisfactory knowledge regarding the effects of mood on cradling? There is evidence that depression reduces leftward cradling bias (Alzahrani, 2012; Scola et al., 2013; Weatherill et al., 2004), but these studies have been few, and some have been flawed. In Weatherill et al. (2004) a significant association between depression and reduced cradling bias was found. However, the strange scenario tasks were used to elicit cradling, which means the study could have been confounded by stress. In a study by Reissland et al. (2009) a significant effect was not found, but that may be due to the very small subset of depressed mothers in the sample. Thus, a study that managed to recruit a larger sample of participants with depression could be valuable in elucidating the effect of depression on leftward cradling bias.

Likewise, two studies have shown that stress reduces leftward cradling bias (Alzahrani, 2012; Reissland et al., 2009). However, others have only provided partial support for stress reducing leftward cradling (Suter et al., 2011, 2007). Thus, further research could strengthen and confirm the effect of stress on leftward cradling bias.

There is also a tension in the literature regarding whether depression or stress or both affect left-sided cradling bias. For example, Salk (1973) found that mothers separated from their infants due to immaturity or medical reasons tended to cradle their infants on their right side which opposed the general trend of leftward cradling in mothers of healthy infants. Weatherill et al. (2004) regarded this as evidence for dysphoria affecting cradling side, while Suter et al. (2007) argued that that it was evidence for stress affecting cradling side. One study even combined depression and anxiety into one variable (Vauclair & Scola, 2009). Thus, a study that looked at both depression and stress could elucidate whether these variables have an interactive effect on leftward cradling.

Attachment

The right hemisphere theory emphasizes the role of leftward cradling in bonding and communication, so it makes sense to examine leftward cradling bias in terms of attachment theory. In the 1940's many theorists believed that children only develop a close tie to their mothers because they are their source of food, and thus are critical for physical survival. However, various researchers began publishing papers describing marked social and emotional deficits, despite adequate physical care, in children raised in institutions or with other causes of maternal deprivation (Bender & Yarnell, 1941; Bowlby, 1944; Goldfarb, 1943). Secondly, research into the effect of maternal deprivation in Rhesus monkeys also showed that the tie between mothers and infants goes beyond food. In Harlow's famous experiment infant rhesus monkeys were raised by surrogate mothers. One mechanical mother was comfortably covered in cloth while the other was just wire mesh. Half the group could only receive milk from the wire mother and half from the cloth mother. The monkeys were not restricted from reaching either mother at any time. Except for feeding, the monkeys fed by the wire mother spent the majority of time with the cloth mother. When a frightening stimulus was placed in the cage, such as a toy bear, the monkeys would go the cloth mother for comfort (Harlow, 1958).

Drawing on this research, Bowlby theorized a system distinct from basic survival and reproductive drives that promoted relationships. Bowlby referred to this basic tendency of humans to make intimate emotional bonds as attachment. Attachment behaviours are any behaviour that results in the person attaining or maintaining proximity with an attachment figure. Attachment figures are people who are conceived of as caregivers. Attachment behaviours are activated particularly in situations where the person is frightened, sick or fatigued and is seeking comforting or care giving. In contrast when a child or adult is feeling secure they are more likely to explore away from the attachment figure. If a child is secure in the knowledge that their caregiver is available when needed they become more confident to explore. This is known as exploration from a secure base. As an infant grows these explorations grow in time and space. The purpose of attachment behaviours helps to ensure the survival of the infant by maintaining their proximity to a familiar figure that will come to their aid in emergencies (Bowlby, 1988).

Ainsworth developed attachment theory by identifying how different experiences can create three different attachment patterns: secure, anxious resistant and anxious avoidant. These patterns were identified using the strange situations protocol. The protocol allows a standard

assessment of behaviours. In the protocol there is a pre-separation period, during which the child plays while the mother is in the room, a separation period, where the mother leaves the room, and a reunion period where the mother returns. The child's behaviour is observed in each of these situations.

Children classified as having a secure attachment, were confident to explore the room while their mother was present, became upset when she left, and went to her for comfort when she returned. Mothers of securely attached infants were found to be available and responsive to the needs of the infants (Ainsworth, 1979).

Children classified as having an anxious resistant attachment showed anxiety while the mother was in the room, become increasingly anxious when she left the room, but were not soothed by her return. Mothers of anxious resistant attachment infants tended to be inconsistent with caregiving (Ainsworth, 1979).

Children classified as having an anxious avoidant attachment rarely cried when the mother left the room and tended to avoid her when she returned. Mothers of anxious avoidant children often avoided close bodily contact with their infants, showed restricted affect and tended to be rebuffing. Thus, these infants did not respond with typical attachment behaviours, having learnt that they will be rebuffed (Ainsworth, 1979).

The original attachment relationship is thought to make an enduring pattern for interacting with the world that continues into adulthood. This pattern of interacting is called the person's attachment style. As in childhood the goal of the attachment system is to increase a person's sense of security. People with secure attachment are more likely to use attachment behaviours and relationships as an effective strategy for regulating stress. People with insecure attachment styles struggle to make connections (Shaver & Mikulincer, 2010).

Attachment may help our understanding of leftward cradling bias in two ways. First, the attachment system is particularly activated by stress, and second, attachment style is an indicator of a person's supportive and caregiving behaviour. For example, parents with insecure attachment styles gave their children less emotional support and caregiving than parents with a secure attachment style when the children were in stressful situations such as painful medical procedures (Edelstein et al., 2004; Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997). Additionally, adults with insecure attachment styles gave less support and caregiving than adults with a secure attachment style to their partners in distress (B. C. Feeney & Collins,

2001; J. A. Feeney, 1996; Fraley & Shaver, 1998; Simpson, Rholes, & Nelligan, 1992; Simpson, Rholes, Oriña, & Grich, 2002).

No study has looked at the relationship between attachment and leftward cradling bias, using a repeatable measure of attachment. Bogren (1984) found that women who had a good relationship to their parents more frequently showed leftward cradling. However, the study does not explain how the quality of the relationship was measured. Another indication that there is a relationship between attachment and leftward cradling bias is the study that found right cradling mothers held their infants further away from their bodies while cradling (de Château et al., 1978). Given the links between leftward cradling bias and bonding, examining the connection between attachment style and cradling side seems the next step to expand understanding about leftward cradling bias.

Specific Aims and Hypotheses

Studies have indicated that stress and depression may reduce leftward cradling bias in women. However, these studies have been few and have had methodological flaws. In particular, many had small sample sizes which limited the studies' power, so the aim of this study was to recruit a large sample of participants. Additionally, previous studies have tended not to take account of the co-morbidity between depression and stress (Brady & Kendall, 1992; Scott et al., 2007). Thus, the overarching aim of this study was to clarify the link between depression, stress, and cradling bias. By using multiple regression analysis the effect of depression and stress on cradling bias could be examined concurrently. Specifically, I hypothesized that participants with high levels of depression and stress would show reduced leftward cradling bias.

The right hemisphere theory of leftward cradling bias posits that leftward cradling promotes better emotional communication. Thus, attachment theory which explains a person's communication style may be connected to cradling side. Specifically, I hypothesized that people with secure attachments, who seek emotional bonds, should cradle more readily to the left. In contrast, people with insecure attachments, who avoid emotional bonds, should cradle more readily to the right.

H₁ – Participants with high levels of depression and stress will show reduced leftward cradling bias.

H₀ – Participants with high levels of depression and stress will not show reduced leftward cradling bias

H₂ – Participants with insecure attachment styles will show reduced leftward cradling bias.

H₀ – Participants with insecure attachment styles will not show reduced leftward cradling bias.

Methods

Design

This cross sectional correlational study examined the effects of stress, depression, and attachment style on leftward cradling bias. Data for this exploratory study were collected using surveys and an imaginary cradling task. These were delivered via the internet. Internet delivery was chosen to enable a larger sample size than previous studies investigating the connection between stress, depression, and leftward cradling bias. For example, Weatherill et al. (2004) had a large sample of 177 but most studies have been smaller: Reissland et al. (2009) had 79 participants, Suter et al. (2007) had 64 participants, and Bogren (1984) had 81 participants.

Participants

Participants were recruited using the UCT Psychology Department's undergraduate Student Research Participant Program (SRPP). This study was granted ethical approval from the Ethics Committee of the UCT Department of Psychology. There was little potential harm in this study as the participants only had to fill in some simple self-report questionnaires.

Informed consent procedures. The first screen participants saw described the purpose of the study: to examine the effect of stress and mood on bonding. This screen explained the participants' right to withdraw from the study at any time. It also reassured the participants that all information would be kept confidential, any publications would not mention the participants by name, and that the data would be securely stored and only used by authorized scientific investigators. Participant details were taken down solely to acknowledge SRPP participation; the rest of the survey was anonymous. Participants were also encouraged to contact the researcher if they had any questions. For a copy of the actual text please see Appendix A. Participants were not able to see the rest of the survey until they had confirmed that they had read the information and consented to participating in the study.

Initially participants were not told that the full purpose of the study was to examine the effects of stress, depression and attachment style on leftward cradling bias, as this could have had a priming effect disturbing the participants' automatic cradling response. Instead participants were informed that the aim of this study was to examine the effect of stress and mood on bonding. This was adopted from the protocol in Suter et al. (2007), who to avoid priming the participants told them that the purpose of the study was to examine some aspects of bonding

between mothers and children. At the end of study, however, the participants were debriefed and informed of the full purpose of the study via email.

Inclusion and exclusion criteria. Women have shown a consistent cradling bias, with 60 to 90% of women cradling to the left (Bogren, 1984; Dagenbach et al., 1988; de Chateau, P., 1991; Harris et al., 2000, 2006; Lucas et al., 1993; Manning & Chamberlain, 1991; Salk, 1960; C Scola et al., 2013; Vauclair & Donnot, 2005). The results for left cradling bias in men have been mixed. Some studies have not found different rates between men and women (de Chateau, 1983; Harris et al., 2006; Vauclair & Donnot, 2005). However, others have found different rates of left cradling bias between men and woman (Bruser, 1981; Lockard et al., 1979; Manning & Chamberlain, 1991; Richards & Finger, 1975), with men exhibiting a reduced leftward bias. Thus, to exclude a possible extraneous variable only women were recruited for the study.

Originally 669 participants completed the survey. 201 individuals were excluded from the study, resulting in a final sample size of 468. These exclusions occurred for the following reasons: 1) the data set was checked for duplicate entries and 7 individuals were found to have completed the survey twice. 2) At the end of the survey participants were asked to rate how much thought they put into their answers, on a scale of 1 to 5 (with 1 being no thought and 5 being intense thought). Participants who scored themselves as putting little thought (a score of 1 or 2) into the survey were excluded. 126 participants were excluded on this criterion. 3) 36 participants who did not show a cradling bias to either side were excluded. This was done as the literature has only examined cradling in terms of left and right bias. 4) Left-handers show a left sided cradling bias but this may be somewhat reduced in comparison to right-handers (Harris et al., 2000; Salk, 1973), so to rule out any possible effect 32 participants who scored below 20 on the Edinburgh handedness inventory (i.e. indicating that they were left-handed or ambidextrous) were excluded. The study was limited to adults over 18 years of age.

Participant characteristics. The mean age of the participants was 19.6 years ($SD = 2.3$). The youngest participant was 18; the oldest was 38. Participants' were not asked to disclose their race as left cradling bias has been exhibited across cultures (Bruser, 1981; Harris et al., 2006; Richards & Finger, 1975; Saling & Cooke, 1984).

There is some evidence that parity affects leftward cradling bias, particularly in stressful situations. Parity indicates the birth status of a woman. For example, a nulliparous woman is one who has not given birth, while a multiparous woman is one who has given birth multiple times.

Salk (1973) found that parity affected mothers separated from their newborn infants due to illness. On reunion, mothers that were multiparous showed a left cradling bias. In contrast, mothers of firstborns, who were separated from their child, showed a right cradling bias on reunion. However, there are ample studies where left cradling bias is evident in nulliparous students (Harris et al., 2000; Huggenberger, Suter, Reijnen, & Schachinger, 2009; Lucas et al., 1993; Saling & Tyson, 1981; Suter et al., 2009, 2007). There is even evidence of left cradling bias in pre-school girls (de Château & Andersson, 1976; Saling & Bonert, 1983). In this sample the majority of participants were nulliparous, but the majority did indicate experience looking after young children (see Figure 1) mitigating possible concerns about parity.

The majority of participants (74.1%) showed a leftward cradling bias versus the minority of participants (25.9%) with a rightward cradling bias (see Figure 2). This falls within the expected distribution found in previous studies (Bogren, 1984; de Château, P., 1991; Harris et al., 2006; Lucas et al., 1993; Manning & Chamberlain, 1991; Salk, 1960; Vauclair & Donnot, 2005).

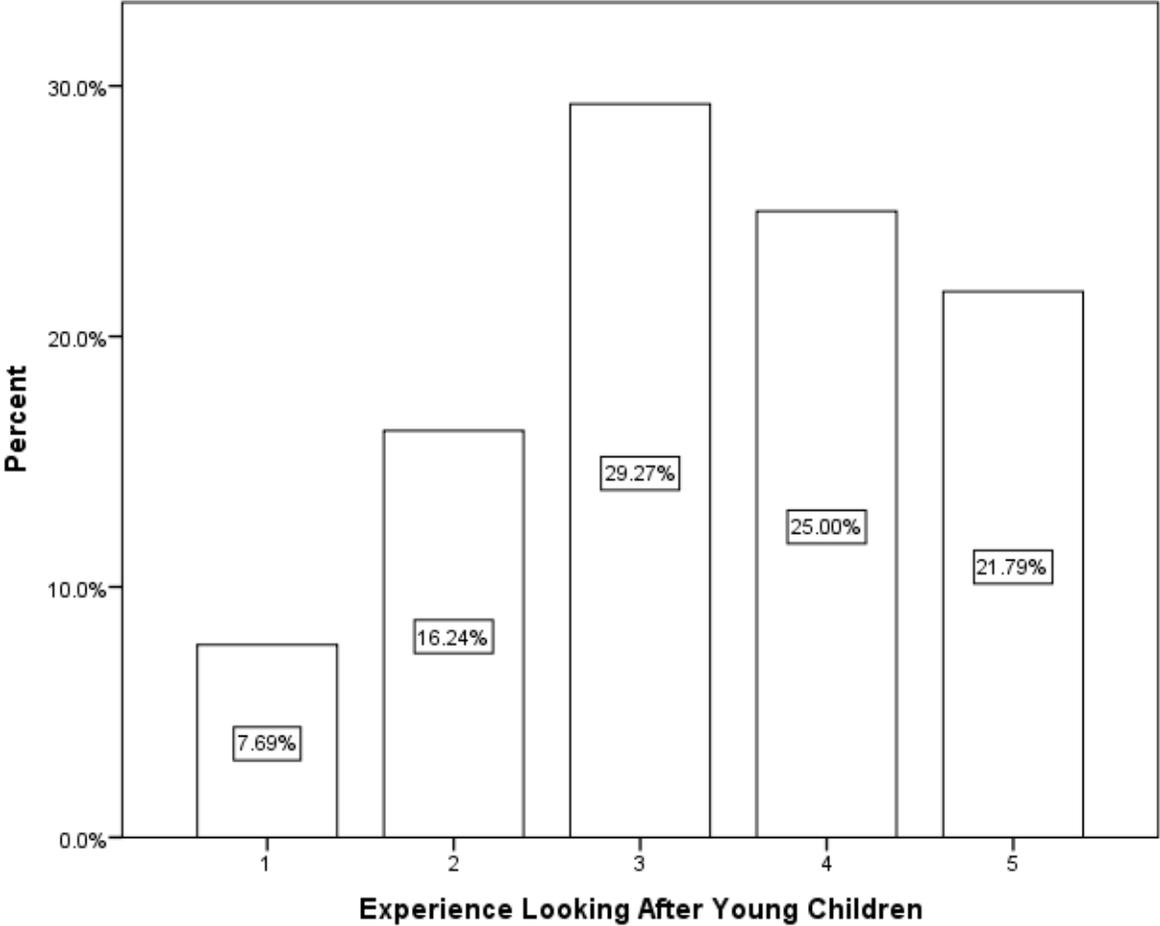


Figure 1. Participants' rating of their experience looking after young children on a scale from 1 to 5 (1 = no experience, 5 = extensive experience).

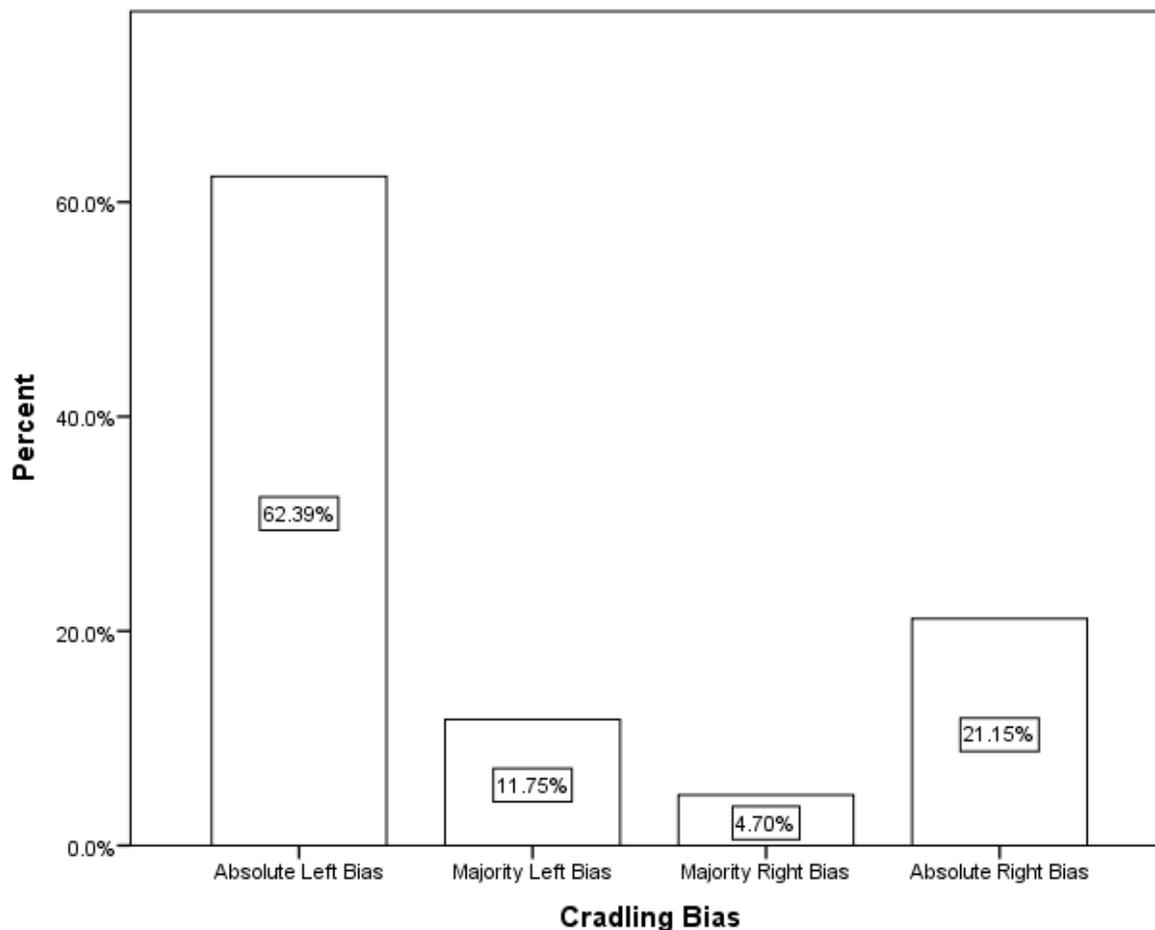


Figure 2. Graph showing percentage of left vs. right cradling bias in sample.

Procedure

Students were recruited through the SRPP website. An announcement was placed on the site describing the study as an investigation into the effect of stress and mood on bonding. If students were interested in participating they were given the link to the study. The first screen that the link led them to outlined the purpose of the study and their rights as participants (please see Appendix A for the full text). Participants were not able to see the rest of the study until they confirmed they had read the information and had consented to participate in the study.

Participants were then asked for basic background information (please see Appendix B for the full text). Participants then alternated between the cradling elicitation protocol and the various questionnaires. The protocol was as follows: cradling elicitation, Daily Stress Inventory (DSI) (Brantley, Waggoner, Jones, & Rappaport, 1987) cradling elicitation, Relationship Scale

Questionnaire (RSQ) (Griffin & Bartholomew, 1994), cradling elicitation, Beck Depression Inventory (BDI-II) (Beck, Steer, & Brown, 1996)), cradling elicitation, Positive and Negative Affect Schedule (PANAS; (Watson, Clark, & Tellegen, 1988)). Finally, the Edinburgh Handedness Inventory (Oldfield, 1971) was administered last so the participants were not primed to think about handedness, and cradled instinctually during the preceding elicitations. Participants were also asked for information on their sex, age, and experience with infants. After the data collection period students were sent a debriefing email. This email thanked the students for their participation and explained the full focus of the study and their role in it.

Measures

Cradling elicitation. Studies have used different cradling protocols: from observing mothers and infants (Salk, 1960; Weatherill et al., 2004), to using lifelike dolls (Manning & Chamberlain, 1991; Suter et al., 2007) to imaginary cradling tasks (Almerigi et al., 2002; Donnot, 2007; Harris et al., 2000; Matheson & Turnbull, 1998; Nakamichi & Takeda, 1995). Given the desire to reach a larger sample through the internet, an imaginary cradling task was used. Imaginary cradling has been shown to be a good measure of true cradling. One study first asked mothers to imagine cradling their baby and then later observed the mothers physically cradling. There was a 100% agreement between the two measures (Bogren, 1984). This study used an imaginary cradling task adapted from Harris et al. (2001). Participants were given the following instruction to elicit cradling; ‘Imagine you are holding a small baby in your arms. Imagine the infant’s face, eyes, mouth, body and arms. To help you imagine put your arms in the position you would use to cradle the infant. Turn your head to the side so you can look directly into the baby’s face. Now on which side are you holding the infants head – on your left or on your right?’

Cradling was elicited on four occasions between the questionnaires. Many studies traditionally only use 3 elicitations (Suter et al., 2007; Turnbull & Lucas, 1996), but statistically this means that all participants will automatically have either a left or right sided cradling bias. Thus, this study used 4 elicitations to control for the possibility of people having no cradling bias. For the regression analysis cradling was coded as a continuous variable, ranging on a scale of -4 to 4. Each instance of left cradling was scored -1, while each instance of right cradling was

scored +1. A score of -4 indicates an absolute leftward cradling bias (4 out of the 4 elicitations showing cradling to the left), a score of -2 indicates a majority leftward cradling bias (3 out of the 4 elicitations showing cradling to the left). A score of 0 indicates no leftward cradling bias (2 out of the 4 elicitations cradling to the left). A score of 2 indicates a majority rightward cradling bias, and a score of 4 indicated an absolute rightward cradling bias. While most studies have coded cradling as a categorical variable (Reissland et al., 2009), some researchers have coded cradling as a continuous variable (Suter et al., 2007). This is preferable as it allows more powerful statistical methods, such as multiple regression, to be used as needed.

Stress. Stress was measured with the Daily Stress Inventory (DSI) (Brantley et al., 1987). The DSI is a 58 item self-report measure designed to quantify minor daily stress. Participants read a checklist of events and mark if the event occurred in the last 24 hours. Examples of items are ‘criticized or verbally attacked,’ ‘argued with another person,’ and ‘forgot something.’ If the event occurred the participants are asked to rate how stressful they found it on a Likert scale ranging from 1 (‘occurred but was not stressful’) to 7 (‘caused me to panic.’) The number of events that occurred as well as their impact is determined. The Daily Stress Inventory has been used in a number of studies investigating stress, for example (Moraska & Chandler, 2008) and (Reinecke, 2009). The DSI was chosen because major stresses such as divorce, death, and job changes occur less frequently, and since the study was cross sectional potentially very few participants would have had stressful events during the data collection period (Kanner, Coyne, Schaefer, & Lazarus, 1981). Additionally, the DSI has been shown to correlate with participants’ cortisol levels (a marker of stress) (Brantley, Dietz, Tipton, Jones, & Tulley, 1988). A copy of the DSI may be found in Appendix C.

Attachment. The Relationship Scale Questionnaire is a 30 item measure of attachment style (RSQ; (Griffin & Bartholomew, 1994)). Participants rate how much each item matches their characteristic style in close relationships, on a 5 point Likert scale ranging from 1 (not at all like me) to 5 (very much like me). Examples of items are “I find it difficult to depend on other people, ‘I want to be completely emotionally intimate with others,’ ‘I worry about being alone.’ The items are summed to form three subscales: secure, avoidant, and anxious/ambivalent attachment styles (Kurdek, 2002). Both the avoidant and anxious/ambivalent are measures of an

insecure style. So, to streamline the data the avoidant and anxious/ambivalent scores were combined to form one insecure attachment score. The RSQ has been used in a variety of studies (Cicero, Lo Coco, Gullo, & Lo Verso, 2009; Erozkhan, 2009; Madey & Rodgers, 2009).

The RSQ was designed to measure adult romantic attachments. However, the RSQ has been used successfully to predict parent's behaviour to their children (Edelstein et al., 2004). It is the best measure available given that traditional measures of parent-child attachment are narrative, and thus not suitable for internet use.

Depression. The Beck Depression Inventory-II (BDI-II; (Beck et al., 1996)) was used to measure depression. The BDI-II determines the severity and depth of depression from 21 self-report items. Scores higher than 20 are indicative of clinical depression. The BDI-II possesses high internal consistency and correlates positively with other measures of depression (Weeks & Heimberg, 2005).

Mood state. The Positive and Negative Affect Schedule (PANAS; (Watson et al., 1988)) was given to measure general mood. The PANAS is a 20-item self-report measure. Participants are given a checklist of emotionally descriptive words and they rate the extent to which they felt that way over a given time period. Researchers can choose a time period ranging from moments to years; to get current or general mood state. This study needed a measure of current mood state, so participants were asked to rate the extent to which they felt each item over the last 24 hours. Examples of items are 'interested,' 'irritable,' and 'afraid.' The scale ranges from 1 (slightly or not at all) to 5 (extremely). The PANAS is a reliable and valid measure of positive and negative affect (Crawford & Henry, 2004).

Handedness The short form of the Edinburgh Handedness Inventory (Oldfield, 1971) was used to measure handedness. Participants indicated which hand they prefer using for 10 different activities (examples are writing, throwing, and using a toothbrush). These are scaled to get a score between -100 and 100. Scores above 20 are indicative of a fixed right hand preference. The Edinburgh Handedness Inventory has been used in a number of studies (Suter et al., 2009, 2007).

Data Analysis

Detailed descriptive statistics about the data set are given. Hierarchical multiple regression was used to examine whether differences in left-sided cradling were associated with the predictors (stress, depression, attachment and current affect). Due to concerns around restriction of range with the stress and depression predictors, two new data sets were created. This allowed the effects of depression and stress to be more clearly investigated. The same hierarchical regression analysis was repeated in each subset. A one-way ANOVA was also completed to examine the effect of significant predictors on cradling direction.

Statistics were calculated using SPSS 21 (*IBM SPSS Statistics for Windows*, 2012). Significance levels for all analyses were set to $\alpha = 0.05$. Unless otherwise stated all assumptions were upheld. None of the regression analyses met the assumption of normal distribution, however given that regression is a robust analysis it was still used (Cohen & Cohen, 1983).

Ethical Considerations

This study received ethical approval from the Ethics Committee of the UCT Department of Psychology. There was little potential harm in this study as the participants only had to fill in some simple self-report questionnaires.

All the participants signed an informed consent notice (see Appendix A) to partake in the study. This detailed what the participants were required to do in the study. The form explained the rights of the participant to withdraw from the study at any point in time and for confidentiality. All the participants' information was kept confidential and any publications will not mention them. The participants were also given the researchers contact details and encouraged to communicate any questions or concerns.

There is the concern that the study's hypothesis was not fully disclosed to the participants, so as not to sensitize them or prime them regarding their cradling laterality. However, once the data collection was complete the full hypothesis was disclosed to the participants via email.

This study may be of benefit to researchers and clinicians. For researchers it will add to their knowledge of what does and does not influence cradling. For clinicians this greater understanding will aid them in appropriately using right-sided cradling as a symptom of psychological distress.

Results

Descriptive Statistics

Restriction of Range. Table 1 shows the descriptive statistics for the full data set. Of particular note is the restriction of range in the data set. This can be seen very clearly on the depression and stress variables. This is concerning as the effect of depression and stress on leftward cradling is masked by the majority of participants with low levels of depression and stress. Thus, two new data sets were created, as set out below.

Depression. To be classified as moderately depressed participants need to have a score of 20 on the BDI. However, in this dataset the 75th percentile is only 13, meaning three-quarters of the participants fall below the cut off for being even mildly depressed. This is clearly illustrated in figure 3 (a box plot illustrating the depression scores in the full data set). The scores indicated above the 75th percentile are considered to be outliers; but these are the only scores falling in the depression range that is needed for a meaningful investigation of the effect of depression. The fact that the majority of the data set falls in the ‘not depressed’ range is likely to mask the effects of depression on cradling bias.

Therefore, a new data set was created to account for this problem (viz., the depression data set; $n = 100$). It was created by taking the 50 participants with the highest depression scores and the 50 participants with the lowest depression scores. In this new data set, the 50th percentile is 11, indicating that half the participants are not depressed. However, the 75th percentile is a score of 25 (see Table 2), indicating at least a quarter of the sample have scores indicative of clinical depression. Figure 4 illustrates this clearly: the outliers have been absorbed into the sample but the majority of the sample still lies on the extreme bottom of the BDI range.

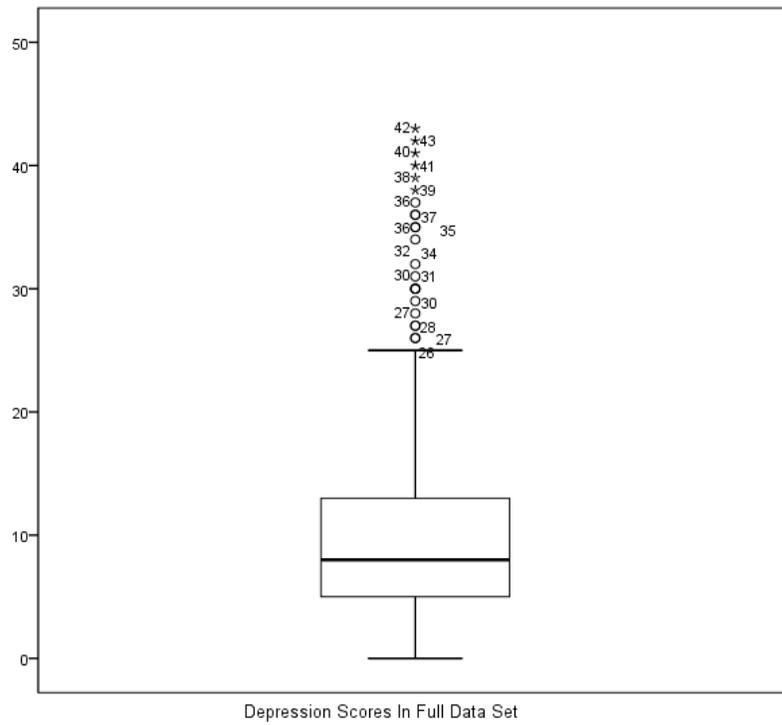


Figure 3. Box plot of depression scores in full data set.

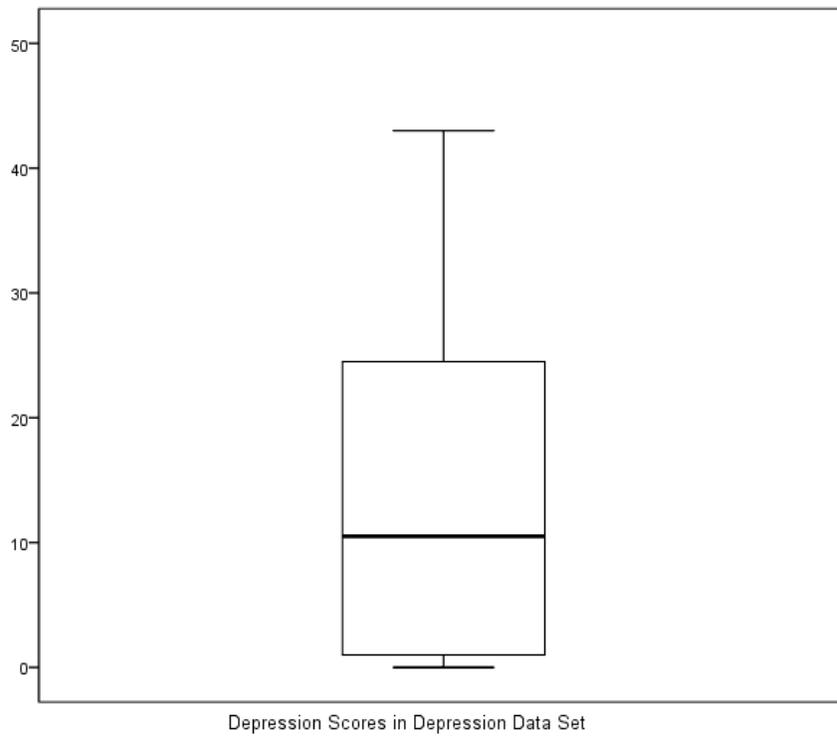


Figure 4. Box plot of depression scores in depression data set.

Stress. The DSI does not have standardized score ranges like the BDI, but higher scores indicate a higher stress level; the maximum possible score is 408. As with depression the majority of the scores are clustered around the bottom of the DSI range. The 75th percentile has a score of 110, which is a third lower than the maximum score. Figure 5 illustrates this with a box plot, showing that scores above 199 are considered outliers. Once again, this restriction of range may mask the effect of stress on cradling bias. To ameliorate this possible effect, a new data set (viz, the stress data set; n = 100) was created. This was done by including the 50 participants with the highest stress scores and the 50 participants with the lowest. In the stress data set the 75th percentile for stress now has a score of 214 (Table 3) double the 75th percentile of the full data set (Table 1). Figure 6 illustrates that the high stress scores, considered outliers in the full data set, have now been absorbed into the sample.

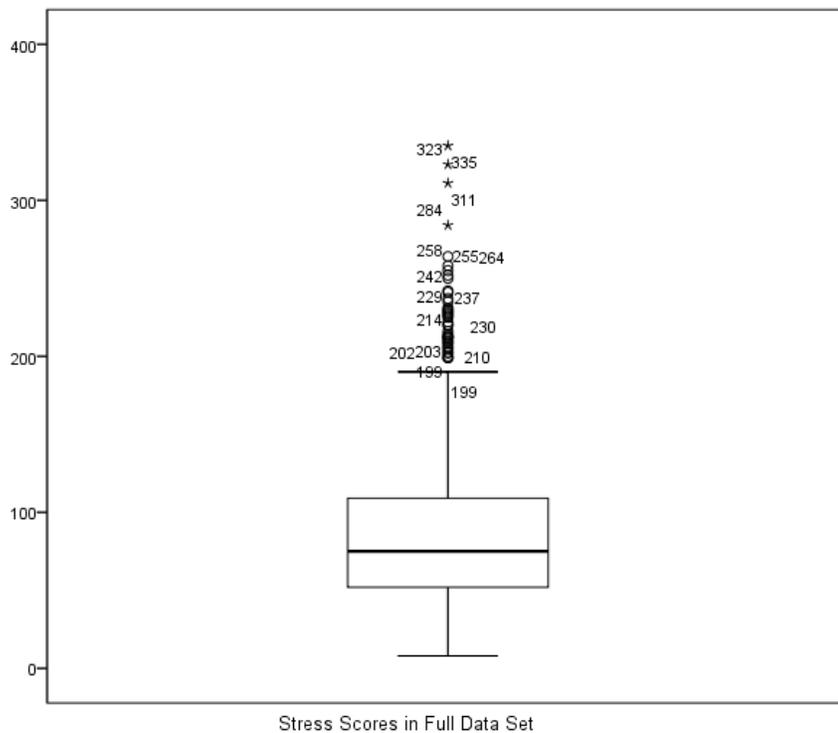


Figure 5. Box plot of stress scores in full data set.

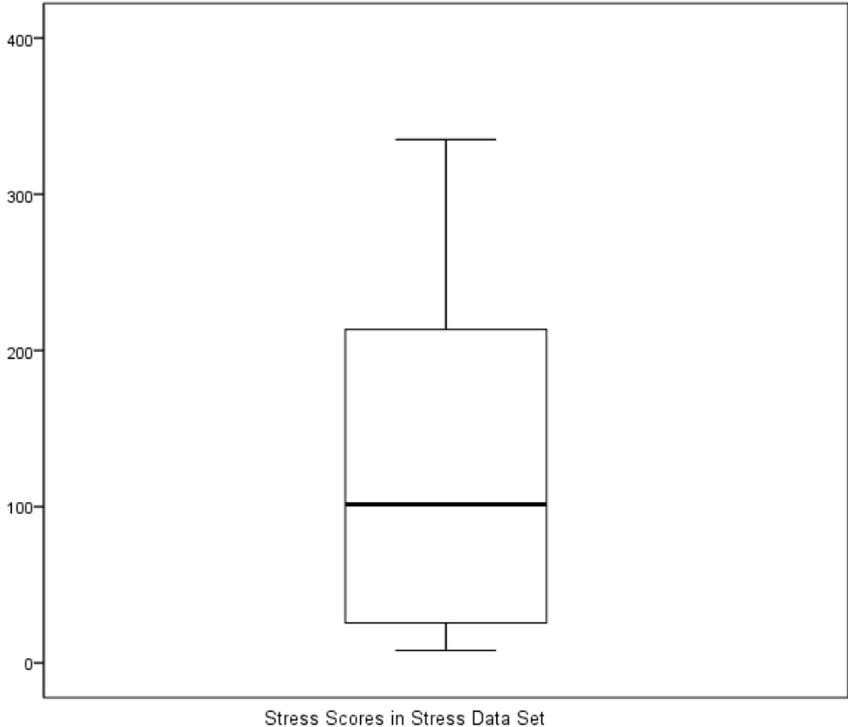


Figure 6. Box plot of stress scores in stress data set.

Table 1

Descriptive Statistics: Full Data Set

Predictors	Mean	SD	Minimum	Maximum	Percentiles		
					25	50	75
Depression	9.98	7.93	0	43	5	8	13
Stress	89.8	56.99	8	335	52	75	109
Secure Attachment	3.3	0.74	1	5	2.8	3.4	3.8
Insecure Attachment	2.57	0.78	1	5	2	2.44	3.11
Current Positive Affect	3.1	0.82	1	5	2.6	3.1	3.7
Current Negative Affect	2.23	0.76	1	4.67	1.67	2.11	2.78

Table 2

Descriptive Statistics: Depression Data Set

Predictors	Low Scores	High Scores	Min.	Max.	Percentiles		
	Mean (SD)	Mean (SD)			25	50	75
Depression	.74 (.75)	27.24 (7.03)	0	43	1	11	25
Stress	71.16 (61.09)	133.48 (65.1)	13	335	43.25	86	137
Secure Attachment	3.69 (.61)	2.84 (.78)	.814	1.40	2.60	3.40	3.80
Insecure Attachment	2.01 (.61)	3.27 (.81)	.952	1.00	1.92	2.44	3.44
Positive Affect	3.05 (.87)	3.15 (.81)	.838	1.00	2.60	3.20	3.78
Negative Affect	2.14 (.76)	2.37 (.80)	.786	1.00	1.67	2.11	2.78

Table 3

Descriptive Statistics: Stress Data Set

Predictors	Low Scores Mean (SD)	High Scores Mean (SD)	Min.	Max.	Percentiles		
					25	50	75
Depression	4.54 (4.92)	13.70 (10.45)	0.00	42.00	2.00	7.00	13.00
Stress	24.62 (6.84)	221.10 (36.40)	8.00	335.00	25	102	214
Attachment Anxiety	3.64 (.71)	3.14 (.75)	1.40	5.00	2.85	3.40	4.00
Attachment Avoidance	2.05 (.70)	2.80 (.88)	1.00	5.00	1.9	2.22	3.00
Positive Affect	2.94 (.95)	3.11 (.80)	1.00	4.90	2.40	3.00	3.70
Negative Affect	2.38 (.75)	2.12 (.74)	1.00	4.67	1.667	2.11	2.78

Correlations between Predictors and Cradling Bias. Table 4 shows the correlation matrix for cradling bias and the predictors in the full data set. Of particular concern is the fact that that none of the predictors are strongly correlated with cradling bias and only depression is significantly correlated ($r = 0.078, p < 0.05$). This decreases the likelihood of a multiple regression analysis finding significant results. The predictors have weak to moderate correlations with each other (.003 - .49). This usually indicates that the predictors are measuring different factors, so there is no issue of multicollinearity. However, the predictors are significantly ($p < 0.0001$) correlated with each other, indicating a weak but significant underlying relationship between the predictors that needs to be explored.

The correlation matrix, for the depression data set, shows that the relationship between depression and cradling bias has increased in strength and significance (Table 5). Additionally insecure attachment and cradling bias also show a significant relationship now. Thus, the correlation matrix clearly shows that the steps taken to ameliorate the restriction of range problems in the depression scores have been effective.

However, while the correlation matrix for the stress data set (Table 6) shows that the strength of the relationship between stress and cradling bias has improved from .006 to -.014; the relationship is still not significant. In fact stress has a stronger, though still non-significant relationship with cradling bias in the depression data set. Thus, the attempt to ameliorate the restriction of range in the stress scores has not been as effective as with the depression scores.

Table 4

Correlations of Full Data Set

	Cradling	Depression	Stress	Secure Attachment	Insecure Attachment	Positive Affect	Negative Affect
Cradling	1	.078*	.006	-.013	.016	-.026	.006
Depression		1	.372***	-.347***	.491***	.003	.071
Stress			1	-.205***	.317***	.039	-.032
Secure Attachment				1	-.688	-.139*	.050
Insecure attachment					1	.079*	-.012
Positive Affect						1	-.177
Negative Affect							1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$

Table 5

Correlations of Depression Data Set

	Cradling	Depression	Stress	Secure Attachment	Insecure Attachment	Positive Affect	Negative Affect
Cradling	1.000	.255**	.127	-.132	.189*	-.044	.045
Depression		1.000	.460***	-.547***	.695***	.065	.162
Stress			1.000	-.340***	.434***	.062	-.017
Secure Attachment				1.000	-.743***	-.186*	.036
Insecure attachment					1.000	.176*	.017
Positive Affect						1.000	-.097
Negative Affect							1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$

Table 6

Correlations of Stress Data Set

	Cradling	Depression	Stress	Secure Attachment	Insecure Attachment	Positive Affect	Negative Affect
Cradling	1.000	.067	-.014	-.063	.017	-.122	.086
Depression		1.000	.516***	-.372***	.548***	-.052	-.084
Stress			1.000	-.382***	.522***	.118	-.189*
Secure Attachment				1.000	-.718***	-.280**	.256**
Insecure attachment					1.000	.125	-.183*
Positive Affect						1.000	-.238**
Negative Affect							1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$

Full Data Set

Multiple regression. Figure 7 shows the steps of the planned hierarchical model. Step 1 contains Depression and Stress as past literature has concentrated on these predictors. Step 2 contains attachment as the next most likely predictor. Step 3 contains Positive and Negative affect over the last 24 hours.

Step 1: Depression (BDI), Stress (DSI)
Step 2: Attachment – (RSQ secure and insecure attachment styles)
Step 3 Positive and Negative Affect over the last 24 hours (PANAS)

Figure 7. Hierarchical model

None of the hierarchical model's steps were statistically significant: step 1, $R^2 = .007$, $F(2,465) = 1.55$, $p = .214$; step 2, $R^2 = .007$, $F(2,463) = 0.824$, $p = .511$; step 3, $R^2 = .008$, $F(6,461) = .595$, $p = .734$. The model is not good as it explains less than 1% of the variance, as shown in table 7.

Table 8 shows the coefficients of the hierarchical model. The only coefficient that comes close to significantly predicting leftward cradling bias is depression, $\beta = .087$, $t(465) = 1.75$, $p = 0.08$.

Table 7

Model Summary of Hierarchical Regression Full Data Set

Model	R	R ²	Adjusted R ²	SE	ΔR^2	F	Sig.
1	.081	.007	.002	3.289	.007	1.55	.214
2	.084	.007	-.002	3.295	.000	.824	.511
3	.088	.008	-.005	3.301	.001	.595	.734

Table 8

Coefficients of Hierarchical Model Full Data Set

	Model	B	SE	β	t	p
1	Constant	-2.018	.305		-6.623	.000
	Depression	.036	.021	.087	1.753	.080
	Stress	-.002	.003	-.026	-.522	.602
2	Constant	-1.782	1.502		-1.187	.236
	Depression	.041	.023	.098	1.780	.076
	Stress	-.001	.003	-.022	-.437	.662
	Secure Attachment	-.006	.282	-.001	-.022	.983
	Insecure Attachment	-.109	.292	-.026	-.372	.710
3	Constant	-1.345	1.740		-.773	.440
	Depression	.040	.023	.097	1.754	.080
	Stress	-.001	.003	-.022	-.427	.669
	Secure Attachment	-.022	.285	-.005	-.078	.938
	Insecure Attachment	-.110	.293	-.026	-.377	.707
	Positive Affect	-.103	.192	-.025	-.534	.593
	Negative Affect	-.028	.205	-.006	-.135	.892

Simple regression. Given that depression was the only coefficient nearing significance, a simple regression with depression as the only predictor was done. The simple regression was still not significant, $R^2 = .006$, $F(1,466) = 2.82$, $p = .094$, with depression still not a significant coefficient in this model $\beta = 0.08$, $t(465) = 1.68$, $p = 0.09$. However, this simple model is an improvement compared to the hierarchical model; as most of the explanatory power ($R^2 = .006$) is kept with only one variable.

Depression Data Set

Multiple regression. Given the possible restriction of range effect and given that depression was the only variable that significantly correlated with cradling bias; a further hierarchical regression model (see Figure 3) was run on the subset of depression data. Step 1 of the model was significant, $R^2 = .065$, $F(2,97) = 3.37$, $p = .039$. However, the other steps were not significant, step 2, $R^2 = .066$, $F(2,95) = 1.67$, $p = .163$; step 3, $R^2 = .070$, $F(2,93) = 1.16$, $p = .334$. The model was improved as it now explains 6.5% of the variance (Table 9), but again depression is the only statistically significant coefficient (Table 10).

Table 9

Model Summary of Hierarchical Regression Depression Data Set

Model	R	R ²	Adjusted R ²	SE	Δ R ²	F	Sig
1	.255	.065	.046	3.19	.065	3.37	.039
2	.256	.066	.026	3.21	.001	1.67	.163
3	.264	.070	.010	3.25	.004	1.16	.334

Table 10

Coefficients of Hierarchical Model Depression Data Set

	Model	B	SE	β	<i>t</i>	<i>p</i>
1	Constant	-2.86	.577		-4.96	.000
	Depression	0.06	.025	.249	2.248	.027
	Stress	.001	.005	.013	.117	.907
2	Constant	-3.68	3.11		-1.18	.240
	Depression	.054	.033	.237	1.664	.099
	Stress	.000	.005	.010	.090	.929
	Anxiety Attachment	.140	.596	.035	.235	.815
	Avoidance Attachment	.157	.599	.046	.262	.794
3	Constant	-2.86	3.52		-.812	.419
	Depression	.053	.034	.229	1.550	.124
	Stress	.000	.005	.010	.090	.929
	Anxiety Attachment	.106	.606	.026	.174	.862
	Avoidance Attachment	.193	.607	.056	.317	.752
	Positive Affect	-.253	.400	-.065	-.632	.529
	Negative Affect	.001	.429	.000	.002	.998

Simple regression. As the above regression indicated that only depression significantly predicted cradling, a simple regression with depression as the only predictor was run. This model was significant, $R^2 = .065$, $F(1,98) = 6.8$, $p = .011$. This is a better model than the previous one as it explains the same amount of variance (6.5%) but with only one predictor. Depression was a significant coefficient $\beta = .255$, $t(98) = 2.61$, $p = 0.11$. The amount of variance it explains, however, remains small.

ANOVA. A one way ANOVA was done to further clarify the relationship between depression and leftward cradling bias. Cradling bias was used as the independent variable and depression as the dependent variable. There was a significant main effect, $F(1, 98) = 6.19$, $p = 0.02$. Participants with a leftward cradling bias had significantly lower depression scores ($M = 12.05$, $SD = 14.07$) than participants with a right cradling bias ($M = 20.13$, $SD = 13.14$). This is clearly illustrated by Figure 8 which shows the analysis's means plot.

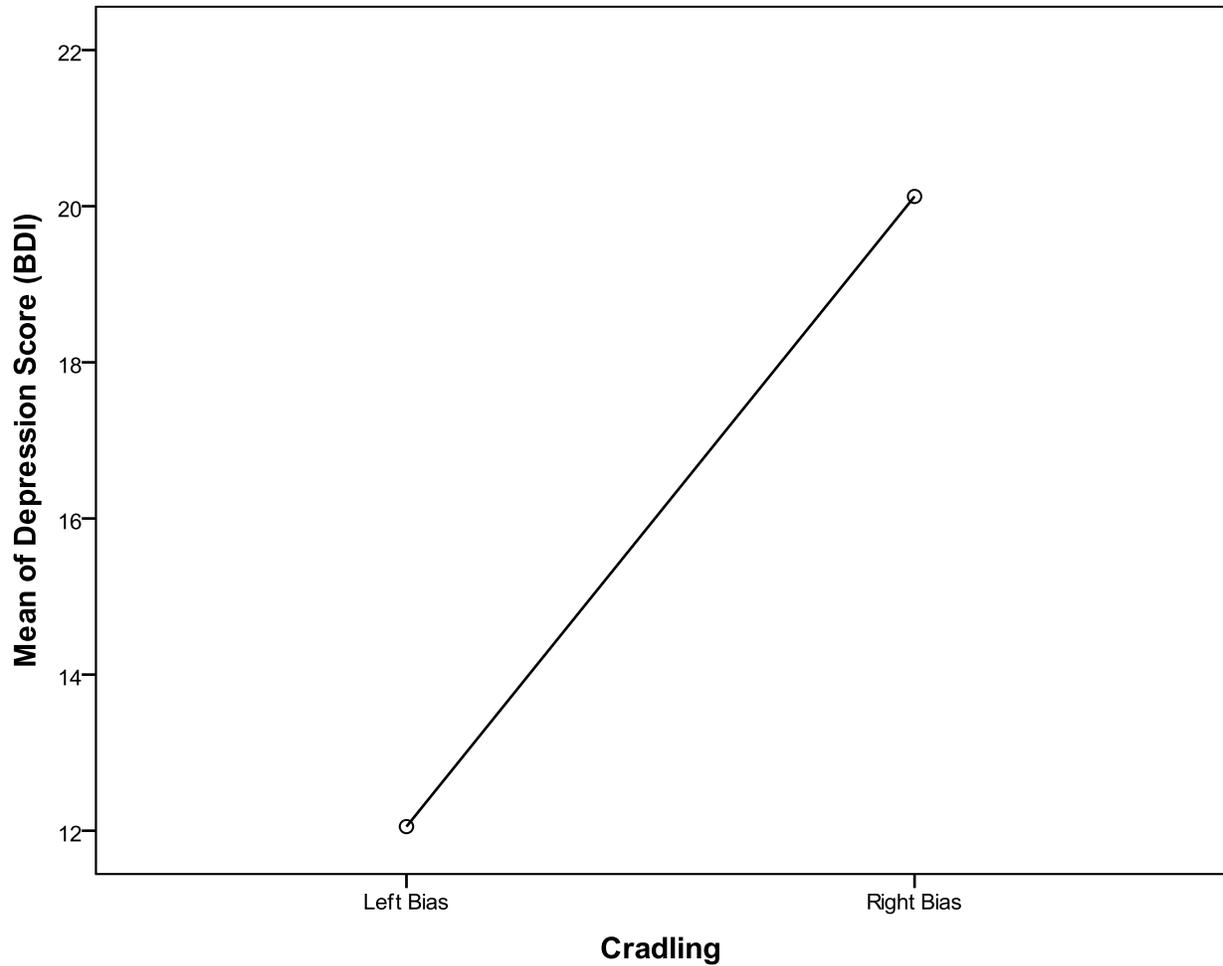


Figure 8. Mean depression scores of left bias cradlers vs. right bias cradlers

Stress Data Set

Multiple regression. This was done because stress is one of the most significant predictors in the literature (Alzahrani, 2012; Reissland et al., 2009; Suter et al., 2011; Vauclair & Scola, 2009). A multiple regression was done using the hierarchical model (figure 3), none of the steps were significant: Step 1, $R^2 = .008$, $F(2,97) = .373$, $p = .690$; step 2, $R^2 = .014$, $F(2,95) = .328$, $p = .89$; step 3, $R^2 = .038$, $F(2,93) = .616$, $p = .717$. The model was not a good one, explaining less than 1 percent of the variance (see Table 11). None of the coefficients were significant (see Table 12).

Table 11

Model Summary of Stress Subset Hierarchical Regression

Model	R	R ²	Adjusted		ΔR^2	F	Sig.
			R ²	SE			
1	.087	.008	-.013	3.57	.008	.373	.690
2	.117	.014	-.028	3.59	.006	.328	.89
3	.196	.038	-.024	3.59	.025	.616	.717

Table 12

Coefficients of Hierarchical Model Stress Data Set

Model		B	SE	β	t	p
1	Constant	-1.43	0.58		-2.46	.016
	Depression	0.04	.045	0.10	0.85	.396
	Stress	-.002	.004	-0.07	-0.56	.577
2	Constant	1.141	3.507		.325	.746
	Depression	.041	.049	.107	.831	.408
	Stress	-.002	.004	-.066	-.526	.600
	Anxiety Attachment	-.512	.676	-.111	-.757	.451
	Avoidance Attachment	-.351	.679	-.087	-.518	0.39
3	Constant	3.165	4.226		.749	.456
	Depression	.029	.050	.075	.576	.566
	Stress	-.001	.004	-.037	-.290	.772
	Anxiety Attachment	-.838	.707	-.182	-1.186	.239
	Avoidance Attachment	-.422	.679	-.104	-.621	.536
	Positive Affect	-.535	.446	-.132	-1.200	.233
	Negative Affect	.382	.507	.081	.753	.453

Discussion

Integration and Discussion of Results.

The study's overall aim was to concurrently examine the effect of depression, stress, and attachment style on leftward cradling bias in women. Previous studies have examined depression and stress separately, but depression and stress are often co-morbid (Brady & Kendall, 1992; Scott et al., 2007). Thus, the study aimed to specifically examine if depression and stress had an interactive or additive effect on cradling bias, and to investigate attachment style as a possible explanation for disruptions in leftward cradling bias. Data was collected over the internet via an imaginary cradling task and questionnaires. Seventy-four percent of the participants showed a leftward cradling bias. A hierarchical multiple regression model was developed to test the hypotheses. The model had 3 steps. First, depression and stress were entered into the model, as depression (BDI) and stress (DSI) have been shown to disrupt cradling bias in previous studies (Alzahrani, 2012; Reissland et al., 2009; Scola et al., 2013; Suter et al., 2011; Vauclair & Scola, 2009; Weatherill et al., 2004). Second, attachment style (RSQ) was entered into the model, as a likely indicator of care giving (Edelstein et al., 2004). Finally, mood over the last 24 hours (PANAS) was entered in. This was to compare current mood (PANAS) with long term mood disturbance of depression (BDI).

Initially, this hierarchical regression analysis was completed in the full data set. The model was not statistically significant. Thus, it seemed the study's overall hypothesis that depression, stress, and an insecure attachment style would concurrently reduce leftward cradling bias was not supported. Depression was the only variable that neared significance as a predictor of cradling bias. However, a simple regression analysis, using depression as the sole predictor, was not significant. Thus, the study's hypothesis that high levels of depression would decrease leftward cradling bias was not supported. This contradicts the literature where depression was associated with reduced leftward cradling bias in samples of American mothers at risk for domestic violence (Weatherill et al., 2004), Saudi Arabian mothers and university students (Alzahrani, 2012), and French mothers (Scola et al., 2013; Vauclair & Scola, 2009). Stress was not a statistically significant predictor of leftward cradling bias either. Likewise, this contradicts the literature where stress was associated with reduced leftward cradling bias in samples of British mothers (Reissland et al., 2009), Swiss mothers, (Suter et al., 2011), and Saudi Arabian mothers and university students (Alzahrani, 2012).

However, these statistically insignificant results, for the full sample, may be due to the restricted spread of the depression and stress scores. In this sample of university students, the majority of participants scored low on the depression and stress scales; so much so that participants with high levels of depression and stress were identified as outliers. This raised concerns that the effects of high depression and stress levels were being masked by the majority of participants with low depression and stress scores. To address this problem, two new data sets were created: the depression and the stress data sets. The depression data set was created by taking the 50 participants with the lowest depression scores and the 50 participants with the highest depression scores. Likewise, the stress data set was created by taking the 50 participants with the lowest scores and the 50 participants with the highest stress scores. Using these datasets the effect of low vs. high levels of depression and stress could be more effectively examined.

Depression Data Set: The same hierarchical regression model using depression, stress, attachment style, and current mood in three steps to predict cradling side was used in the depression data set. This time depression was a statistically significant predictor of cradling side. However, the other predictors remained statistically insignificant. Thus, again the overall hypothesis that depression, stress, and an insecure attachment style reduce leftward cradling was not supported. Nonetheless, depression was a significant predictor of cradling side, and the simple model, with depression as the only predictor, best describes the data. A further one way ANOVA showed that left cradlers had significantly lower depression scores than right cradlers. Thus, the study's hypothesis that depression disrupts leftward cradling bias is confirmed. This result strengthens the link between depression and reduced leftward cradling seen in previous studies (Alzahrani, 2012; Scola et al., 2013; Vauclair & Scola, 2009; Weatherill et al., 2004). However, variability in depression scores was found to explain only 6.5% of the variance in cradling

Notably, this was the first study to solely recruit nulliparous students when investigating depression as other studies recruited mothers (Scola et al., 2013; Weatherill et al., 2004) or a combination of mothers and students (Alzahrani, 2012). The fact that leftward cradling bias appears so clearly in a sample of nulliparous students and was affected by depression emphasizes how instinctual leftward cradling is. This was also the third study to use the BDI that found depression reduced leftward cradling bias (Alzahrani, 2012; Weatherill et al., 2004); indicating that the BDI is a good measure of depression to use when investigating leftward cradling bias.

The simple regression showed that depression alone explained 6.5% of the variability in cradling side. Thus, depression does have an impact on cradling bias, but this study shows that the impact is limited. Additional factors are needed to explain the variability in leftward cradling bias. Therefore, stress and attachment style are explored as possible disruptors next. Overall, the limited explanatory power showcases how leftward cradling bias appears to be a simple phenomenon, it nonetheless seems to rest on complex psychological mechanisms and numerous interrelating factors.

Stress Data Set: As with the depression data set the same hierarchical model using depression, stress, attachment style, and current mood to predict cradling side was applied. However, the hierarchical regression model was not significant. Thus, again the study's overall hypothesis that depression, stress, and insecure attachment style reduced leftward cradling bias was not supported. Additionally, even though only the 50 participants with the highest stress scores and the 50 participants with the lowest stress scores were included; stress was still not a statistically significant predictor of cradling bias. Thus, the study's hypothesis that stress would reduce leftward cradling bias was not supported. This finding was surprising given studies that have found stress significantly disrupted leftward cradling bias (Alzahrani, 2012; Reissland et al., 2009; Suter et al., 2011; Vauclair & Scola, 2009).

This lack of significance may be due to the scale used to measure stress, in the current study. Initially, the DSI was chosen for several reasons. First, the participants were thought to be more likely to experience minor daily stressors than intense life stressors during the brief data collection period (Crnic et al., 2005; Kanner et al., 1981). Second, DSI scores have been shown to correlate with cortisol levels – a good physiological measure of stress (Brantley et al., 1988). Third, when the DSI was used to measure daily hassles in parents it was found to be positively correlated with parental distress (Creasey & Reese, 1996). Specific parenting hassles have also been correlated with poor parenting styles and satisfaction (Crnic & Booth, 1991; Crnic & Greenberg, 1990).

However, in another study that examined the effect of parenting hassles and major life events on the mother-child relationship; parenting hassles were correlated with a lack of pleasure in the mother-child relationship while life stressors were associated with conflict in the mother-child relationship (Crnic et al., 2005). This indicates that major life stressors have a more

detrimental influence on the mother-child relationship. Thus, it may be that only major life stressors disrupt leftward cradling side.

The effect of major life stress can be seen in previous studies investigating cradling side. For example, the first report of disrupted leftward cradling bias was in mothers whose newborns required medical treatment that separated them for 24 hours or longer (Salk, 1973). Thus, leftward cradling disruption occurred in the context of a significant stressor. In addition, other studies that found a significant association between stress and cradling side recruited mothers of newborns (in itself a significant stressor) as participants and used more global measures of stress such as the Trier Inventory for the Assessment of Chronic Stress or the State-anxiety Scale (Suter et al., 2011; Vauclair & Scola, 2009) or used a measure of parental stress such as the Parental Stress Index/Short form (Reissland et al., 2009). The one study that had a mixed group of mothers and nulliparous students also used a more global measure of stress with the Perceived Stress Scale (Alzahrani, 2012). Additionally, examining the effect of a physical stressor, such as immersing the participant's hand in ice water, only had a brief effect on nulliparous students' cradling side (Suter et al., 2007). Thus, milder everyday stressors do not seem to disrupt leftward cradling bias significantly, while other studies have indicated intense life stressors do. This may be very valuable information for future studies and clinical work.

Correlations between Depression and Stress: Part of the study's aim was to concurrently examine the effect of depression and stress on cradling bias; to see whether they had an additive effect on cradling side or influenced each other. To examine this, depression and stress were entered in the same step of the hierarchical multiple regression. However, all three multiple regression analyses were statistically non-significant, so the interaction of depression and stress could not be analyzed. However, depression and stress were statistically significantly correlated with each other in the full data set as well as the depression and stress subsets. This strong correlation between depression and stress is supported by the literature in general (Brady & Kendall, 1992; Scott et al., 2007). Additionally, one study investigating the effect of depression and stress on leftward cradling bias reported that depression and stress had a significant correlation: in fact this correlation was so significant that factor analysis was used to combine the scores (Vauclair & Scola, 2009). Thus, the current study has again shown that there is a strong relationship between depression and stress which should be taken into account when examining leftward cradling bias.

However, in the past, most studies have tended to focus on either depression or stress. For example, Suter et al. (2011, 2007) examined the effect of stress on cradling bias, without any measurement of depression. While, Weatherill et al.(2004) investigated the effect of depression on cradling bias, without any measurement of stress. In particular, this opened up the study for criticism as participants were recruited via a larger study investigating domestic violence, so potentially the participants had higher levels of stress which were not taken into account. Even studies that have investigated the effects of depression and stress on cradling bias have done separate analyses and did not report correlation scores (Alzahrani, 2012). Thus, even though the current study did not support the combined effect of depression and stress on leftward cradling bias; the strong correlation between depression and stress indicates there is a relationship that needs to be taken into account in future studies. This will allow for clearer results to be gathered.

Attachment: I hypothesized that an insecure attachment style would be reflected in a right cradling bias, given the theory that leftward cradling is connected to emotional communication and bonding (Lockard et al., 1979; Manning & Chamberlain, 1991). The results did not fully support this hypothesis. Attachment style was not a significant predictor in all three of the regression analyses. However, insecure attachment style had a small but significant positive correlation with cradling side in the depression dataset. This indicates a connection between insecure attachment style and reduced leftward cradling bias. Additionally, insecure attachment style had a statistically significant positive correlation with depression (which was a significant predictor of cradling side) in all three data sets. The wider literature supports this relationship between insecure attachment style and depression (Bifulco, Moran, Ball, & Bernazzani, 2002; Carnelley, Pietromonaco, & Jaffe, 1994; Cole-Detke & Kobak, 1996; Muris, Mayer, & Meesters, 2000; Pettem, West, Mahoney, & Keller, 1993; Priel & Shamai, 1995; Roberts, Gotlib, & Kassel, 1996; Whiffen, 2001). Thus, while attachment style was not shown to directly affect cradling side, the strong correlations with depression indicate that it may be an underlying factor in understanding leftward cradling bias. However, it is unclear whether attachment style directly affects leftward cradling side or rather mediates the relationship between depression and cradling side.

Insecure attachment also had a statistically significant positive correlation with stress in the full data set as well as the depression and stress subsets: people with higher insecure attachment scores also had higher stress scores. Although stress did not significantly predict

cradling side in this study; the literature does support stress reducing leftward cradling bias (Alzahrani, 2012; Reissland et al., 2009). Additionally, the wider literature supports the correlation between insecure attachment and stress (Bernard & Dozier, 2010; Besser, Neria, & Haynes, 2009; Muris et al., 2000; Priel & Shamai, 1995). Therefore, attachment style may well play a mediating role between stress and cradling side.

Attachment theory proposes that early childhood experiences shape internal working models of self and others. These models are enduring and guide thoughts and behavior throughout a person's lifespan. If a child's needs are met consistently and reliably, they develop a secure attachment and working model of themselves as lovable and of others as caring and reliable (Bowlby, 1988; Main, Kaplan, & Cassidy, 1985). Thus, a secure attachment may directly promote caring behavior as seen with leftward cradling bias. In contrast if a child's needs are not met consistently or reliably, they develop a working model of themselves as unlovable or of others as unloving, unreliable, and distant. This in turn can make the person more vulnerable to depression (Carnelley et al., 1994; Mezulis, Hyde, & Abramson, 2006; Toth, Rogosch, Sturge-Apple, & Cicchetti, 2009), and susceptible to stress (Besser et al., 2009; Erozkhan, 2009; Muris et al., 2000; Priel & Shamai, 1995). In turn the depression and stress may be reflected in reduced leftward cradling bias.

However, while attachment style is believed to be constant throughout the lifespan, there is evidence that it is vulnerable to stressful life events. In a sample of children at risk, attachment style was measured in infancy and at 19 years of age. Many of the children moved from a secure to an insecure attachment style. This was attributed to maltreatment, maternal depression, and family dysfunction (Weinfield & Sroufe, 2000). Additionally, insecure attachment is more prevalent in people whose partners are depressed (Whiffen, 2001) or those who have experienced constant terrorist attacks (Besser et al., 2009). Thus, stress may affect attachment style which may be reflected in reduced leftward cradling bias.

In contrast, there is also evidence that the mother's attachment style can buffer the effects of depression on their infant. Studies have shown that while mothers with depression tend to have insecure attachment styles, and their infants are more likely to be insecurely attached; there are mothers with depression who are able to provide adequate caring for their infants. These mothers have a secure attachment style. The secure maternal attachment style buffers the infant from maternal depressions and promotes secure attachment (McMahon, Barnett, Kowalenko, &

Tennant, 2006; Pearson, Cohn, Cowan, & Cowan, 1994). Thus, secure attachment style may act as a buffer between depression and reduced leftward cradling bias.

Current Mood: Current mood (measured over the last 24 hours) was included in the study to act as a contrast for depression. However, current mood was not a statistically significant predictor in any of the hierarchical regression analyses. Additionally, it did not have a significant correlation with cradling side in the full data set or the depression and stress sub sets. Thus, there is no indication in this study that current mood disrupts leftward cradling bias. This supports the assertion made with respect to stress, that only intense stressors or mood fluctuations such as depression affect cradling side.

Limitations and Future Directions.

Using nulliparous students was a tradeoff. It allowed a large sample to be collected. However, university students are generally healthy with low base rates of depression and stress. This meant that to adequately investigate the effect of depression and stress smaller subsets had to be created. Additionally, while leftward cradling bias has been seen in nulliparous students (Saling & Tyson, 1981; Suter et al., 2007; Turnbull & Lucas, 1996) and even pre-school girls (de Chateau & Andersson, 1976; Saling & Bonert, 1983) the study would have been more ecologically valid using mothers of infants.

This study highlighted the issue of recruiting sufficient participants with adequate levels of depression and stress. The majority of participants had low levels of depression and stress. Thus, the effect of depression and stress could only be examined meaningfully when the participants with the highest and lowest levels of depression and stress were examined separately. This may explain why Reissland et al. (2009), with only 6 participants classified with depression, did not find a significant effect for depression and cradling side. It may also account for why Alzahrani (2012) found a significant relationship between stress, depression and cradling side in the questionnaire phase of the study with 379 participants, but only near significance in the smaller observation phase with 102 participants. It may also explain why Vauclair and Scola (2009) with 79 participants found a significant effect from anxiety, but their later study, which used the same recruitment strategy and measures, did not find a significant effect for anxiety with only 43 participants (Scola et al., 2013). Future research should focus on recruiting adequate samples of participants with high levels of depression and stress. For

example, using the internet and an imaginary cradling task similar to this study would allow more potential participants to be reached. Alternatively, matching participants with high and low depression and stress scores would allow depression and stress to be examined more effectively.

In hindsight, using the DSI to measure stress limited the study's scope. Including an additional measure of intense stressors such as the Life Changes Questionnaire, which investigates potential life stressors such as losing a job, would have increased the strength of the study. Nonetheless, the likelihood of a high incidence of severe stressors in this sample is not great. Additionally, this study highlighted the need to be more specific when using such a broad construct such as stress. In general the studies investigating the effect of stress on leftward cradling bias have not specified which aspect of stress they are measuring. This can especially be seen in that every study has used a different measure of stress – Perceived Stress Scales, Parental Stress Index, Trier Inventory for the Assessment of Chronic Stress, cold pressor test, and the State-anxiety Scale (Alzahrani, 2012; Reissland et al., 2009; Suter et al., 2011, 2007; Vauclair & Scola, 2009). Thus, future research may want to characterize the particular aspects of stress under investigation, and replicate previous findings by using one of the measures previously utilized.

Another limitation may be the attachment measure used. The RSQ was chosen because it could be administered electronically and had been shown to successfully measure attachment style between parents and children (Edelstein et al., 2004; Goodman et al., 1997). However, the RSQ was originally developed to be a measure of romantic attachment style. In contrast, most research into parent-child attachment has used the Adult Attachment Interview (AAI) (van Ijzendoorn, 1995). The two measures are constructed very differently. The RSQ is a self-report measure; while the AAI is a semi structured interview. Additionally, believing that many attachment processes are unconscious, the AAI places more emphasis on the subject's coherence compared to the content of their responses. Therefore, some scholars question the validity of using self-report attachment measures to investigate parent-child attachment (Crowell, Treboux, & Waters, 1999; Crowell & Treboux, 1995), so future researchers may want to use the AAI to measure attachment.

Attachment was not a significant predictor of cradling side; however it was significantly correlated with depression and stress. Given that depression and stress do affect cradling side (Alzahrani, 2012; Reissland et al., 2009; Scola et al., 2013; Suter et al., 2011; Weatherill et al.,

2004), and that the wider literature supports the relationship between attachment, depression, and stress (Bernard & Dozier, 2010; Besser et al., 2009; Carnelley et al., 1994; Cole-Detke & Kobak, 1996; Muris et al., 2000; Pettem et al., 1993; Priel & Shamai, 1995); further research into disruptors of leftward cradling bias should include attachment as a measure. Additionally, attachment behaviours are more common when the subject is under stress (Bowlby, 1988; Goldberg, Grusec, & Jenkins, 1999). This may explain why attachment style was not a significant predictor in this study; as the participants were not in a stressful situation. Thus, future research should examine how stressful situations affect the relationship between attachment styles and cradling bias.

A potential limitation of the study was excluding the 36 participants (7% of the sample) who did not show a cradling bias to the left or the right. These participants were excluded because the aim of the study was to examine possible disruptors of leftward cradling bias, since the proportion of participants with no cradling bias was small compared to those with a left or right bias the possible effect of these participants was deemed to be small. Additionally, previous studies have tended to look at cradling as a dichotomous variable (Alzahrani, 2012; Reissland et al., 2009; Scola et al., 2013; Suter et al., 2007; Vauclair & Scola, 2009), so there was no literature on which to base a hypothesis regarding the possible effect of participants with no cradling bias. However, in hindsight the relationship between cradling disruptors and participants with no cradling bias would have been valuable to explore. Therefore, future research should include the possibility of participants with no cradling bias.

A future direction for South African researchers is examining mothers who do not cradle habitually. In many African cultures the infants are held on the mother's back with a shawl (Lockard et al., 1979; Saling & Cooke, 1984). However, there is no research into how often infants are held like this versus cradled in arms, or if this type of holding is strictly functional for transport or if there is a soothing aspect to it. Additionally, South Africa's high crime and poverty rates may give researchers a good opportunity to examine the effect of life stressors on leftward cradling bias.

A relationship between negative affect, such as depression and stress, and cradling bias has been established; however, the causality of the relationship has not been determined. Studies have shown that while we express our emotions through our bodies, the opposite is also true – our bodies can also change our emotions. For example, when participants were asked to hold a

pencil between their teeth to unobtrusively make them smile; they found cartoons more humorous (Strack, Martin, & Stepper, 1988). Another study found participants, who adopted facial expressions or postures characteristic of emotions such as sadness, anger, or fear; felt an increase of the emotion they assumed (Duclos et al., 1989). Additionally, in another study participants who held high power (open and expansive) poses as opposed to participants who held low power (closed and contractive) poses had opposing changes in endocrine hormones and behaviour (Carney, Cuddy, & Yap, 2010). One study so far has indicated that this might be true with cradling bias as well. Participants, who had a leftward cradling bias on an imaginary cradling task three months prior to giving birth, showed a decline in depressive symptomology two months post birth (Scola et al., 2013). If future research showed that leftward cradling could change a mother's emotions towards her infant it could be immensely beneficial in clinical settings.

Conclusion

The aim of this study was to concurrently examine the effect of depression, stress, and attachment style on leftward cradling bias. Although the hierarchical regression analysis was not statistically significant, four points arose from the data to further aid understanding of potential leftward cradling bias disruptors. First, when only a subset of high vs. low scores was examined (because depression scores were generally very low in the full dataset), depression was found to be a statistically significant predictor of cradling side, with leftward cradlers having lower depression scores. This provides additional support for the studies that show depression disrupting leftward cradling bias (Alzahrani, 2012; Scola et al., 2013; Vaclair & Scola, 2009; Weatherill et al., 2004). Second, even in a subset including high scorers, stress was not found to be a statistically significant predictor of cradling side. This was surprising given that studies have shown stress to disrupt leftward cradling bias (Alzahrani, 2012; Reissland et al., 2009; Suter et al., 2011, 2007). This non-significance was attributed to the measure of daily stress used. This valuable finding indicated that future research examining stress and leftward cradling bias should concentrate on major life stressors. Third, depression and stress had a statistically significant correlation, that is supported by the wider literature (Brady & Kendall, 1992; Scott et al., 2007; Vaclair & Scola, 2009). Past research has tended to focus on either depression or stress (Suter et al., 2011, 2007; Weatherill et al., 2004), so future research should take this

relationship into account when investigating disruptors of leftward cradling bias. Fourth, even though attachment was not a significant predictor of cradling side; its statistically significant correlation with depression and stress indicates a possible mediating effect that should be further investigated. Given the importance of mother-infant relationship, these points may be very beneficial for future research and clinical applications involving leftward cradling bias and bonding.

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Appendix A: Informed Consent Form

INFORMATION AND INFORMED CONSENT FORM:

PURPOSE:

The purpose of this study is to examine some aspects of stress and mood on bonding.

STUDY PROCEDURE:

If you decide to participate you will be asked to fill in various questionnaires about your mood and stress levels. You will also be asked to imagine you are holding a baby.

CONFIDENTIALITY:

If you consent to participate in this study, your identity will be kept confidential. All research information will be safely stored and will be limited to authorized scientific investigators. Any publications resulting from this study will not identify you by name.

VOLUNTARY PARTICIPATION:

Your participation in this study is voluntary and you may refuse to participate or withdraw from the study at any time.

RESEARCH QUESTIONS AND CONTACTS:

The researchers will answer any questions you might have about the procedures described above, or about the results of the study. If you have any questions, you may call Susan Malcolm-Smith on 021 650 4605. Or preferably e-mail Margaret Mc Grath at Margaret.McGrath@uct.ac.za.

INFORMED CONSENT:

I have read the above information, my questions have been answered, and I consent voluntarily to participate in this study.

Participant name: _____

Date: _____

Appendix C: Daily Stress Inventory

Below is a list of various events that may be viewed as stressful or unpleasant. Read each item carefully and decide whether or not that event occurred with the past 24 hours. If the event did not occur please place an X by that item. If the event did occur, indicate the amount of stress that it caused you by choosing a number from 1 to 7.

X = did not occur (past 24 hours)

1 = occurred but was not stressful

2 = caused very little stress

3 = caused little stress

4 = caused some stress

5 = caused much stress

6 = caused very much stress

7 = caused extreme stress

Performed poorly at task

Performed poorly due to others

Thought about unfinished work

Hurried to meet deadline

Interrupted during task/activity

Someone spoiled your completed task

Did something you are unskilled at

Unable to complete task

Was unorganized

Criticized or verbally attacked

Ignored by others

Spoke and performed in public

Dealt with rude waiter/salesperson

Interrupted while talking

Was forced to socialize

Someone broke promise/appointment
 Competed with someone
 Was stared at
 Did not hear from someone you expected to hear from
 Experienced unwanted physical contact (crowded, pushed)
 Was misunderstood
 Was embarrassed
 Had your sleep disturbed
 Forgot something
 Feared illness/pregnancy
 Someone borrowed something without your permission
 Your property was damaged
 Had minor accident (broke something, tore clothing)
 Thought about the future
 Ran out of food/personal article
 Argued with spouse/boyfriend/girlfriend
 Argued with another person
 Waited longer than you wanted
 Interrupted while thinking/relaxing
 Someone 'cut' ahead of you in a line
 Performed poorly at sport/game
 Did something that you did not want to do
 Unable to complete all plans for today
 Had car trouble
 Had difficulty in traffic
 Money Problems
 Shop lacked desired item
 Misplaced something
 Bad Weather
 Unexpected expenses (fines, traffic ticket, etc.)
 Had confrontation with an authority figure

Heard some bad news

Concerned over personal appearance

Exposed to feared situation or object

Exposed to upsetting TV, show, movie, book

'Pet peeve' violated (someone fails to knock, etc.)

Failed to understand something

Worried about another's problems

Experienced narrow escape from danger

Stopped unwanted personal habit (overeating, smoking, nail biting)

Had problem with kid(s)

Was late for work/appointment