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FROM PRESCHOOL TO KINDERGARTEN: THE EFFECT OF FEARFULNESS AND
CORTISOL ON CHILDREN'S DEVELOPMENT OF SOCIAL ANXIETY

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ABSTRACT

This study examined the effects of fearfulness and stress reactivity on the development of social anxiety symptoms in young children. At age 2, children participated in six different putatively fear-evoking episodes, which were used to assess their fearful temperament and stress reactivity. Saliva samples were collected before and after this visit to test cortisol for the measure of stress reactivity. The current study evaluated if profiles of behavioral and cortisol reactivity predicted the development of social anxiety. It was expected that a profile of high behavioral and cortisol reactivity across contexts would predict the highest levels of social anxiety from preschool to kindergarten. Using fearful composite scores and cortisol levels, three groups of children were identified: (1) low fear, low cortisol reactivity, (2) high fear with high threat, moderate cortisol reactivity, and (3) consistent high fear, high cortisol reactivity. We found that cortisol significantly increased the prediction of the development of social anxiety in children who were fearful across all episodes, even the non-fearful social episodes such as clown and puppet show.

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Chapter 1

Introduction

The prevalence of social anxiety disorder, one of the most common forms of anxiety in children and adolescents, ranges from 6% to 20% (Cartwright-Hatton, McNicol, & Doubleday, 2006; Merikangas et al., 2010). The link between early fearfulness (i.e. fearful temperament) and the development of social anxiety has been well established (Schwartz, Snidman, & Kagan, 1999; Rapee & Coplan, 2010; Buss, 2011). The exact processes that account for this association are still widely unknown. As a part of normative development, children learn how to respond to different stressors and regulate their emotional responses. It is normal for children to experience positive stress (frustration, coping with challenges) during their early years. Fearful and emotional responses are both innate and learned, which can be observed in both behavioral and physiological factors. As a result of differences in emotion regulation, some children have a higher disposition to develop internalizing disorders (Buss, 2011). High levels of stress reactivity suggest that a child has difficulty coping with stress, which can lead to behavioral problems in the future (Buss, 2011). The interaction between fearful temperament and other variables (i.e. stress response) are associated with the development of social anxiety.

Fearful Temperament as a Behavioral Factor

Temperament is generally characterized as stable individual differences in behavioral tendencies that emerge during infancy and include biological and innate factors (Goldsmith et al., 1987). Temperament varies within an individual and across different social situations. In

order to effectively examine temperament, an individual must be observed within different contexts that elicit a variety of behaviors and must be observed by different coders to avoid bias (Goldsmith and Campos, 1986). By assessing the intensity, frequency, and duration of approach/withdraw behaviors across different contexts, we can characterize a child's temperament as behaviorally inhibited or uninhibited. Roughly 10% - 20% of children are classified as behaviorally inhibited (Buss, 2011). Behavioral inhibition, also known as fearful temperament, in children is characterized by shyness, decreased activity, avoidance, withdrawnness, and increased anxiety within unknown situations (Buss, 2011). It is considered a risk factor for anxiety problems. There are different reasons behind a child's development of a fearful temperament, such as a lack of motivation to approach (Davidson et al., 1994) or as a way to cope with anxiety (Gunnar, 1994). For this reason, children with fearful temperament cannot all be considered to be exactly the same, mentally or behaviorally (Buss, 2011).

Studies have shown that temperament is a stable model and can change as a child develops. Of the number of children who are characterized as behaviorally inhibited, 30% - 50% continue to identify as behaviorally inhibited throughout their childhood (Caspi & Silva, 1995; Pfeifer, Goldsmith, Davidson, & Rickman, 2002). Other research has provided evidence for temperament as a more malleable model, in which very few children remain behaviorally inhibited throughout their childhood. Children who did remain behaviorally inhibited were a select few who made up the extremes of fearful behaviors (Rothbart & Bates, 2006). Conclusively, temperamental instability may be the standard for behavior (Rothbart & Bates, (2006), with the extreme cases being the most stable identities throughout childhood (Garcia Coll et al., 1984). Looking at the extremes of temperament in comparison to more stable individuals

in development can help answer the question of which children are more likely to develop social anxiety.

Cortisol as a Psychological Factor

An individual's response to a stressor involves multiple physiological systems including the hypothalamic-pituitary-adrenocortical (HPA) axis (Buss et al., 2004). One main aspect of a child's physiological response to stress is the release of cortisol. Cortisol is a hormone produced by the hypothalamic-pituitary adrenal (HPA) axis during times of stress, both acute and severe (Hutt, Kiel, Buss, 2013). Preliminary research on children's salivary cortisol levels has found that levels are low until about age eighteen to twenty-four months when they rise slightly, and then decrease after twenty-four months (Donzella & Gunnar, 2002). Thus, kindergarten-aged children (5 – 6 years old) should normally have lower baseline cortisol levels than two year olds. Higher levels of cortisol are indicative of the body reacting to a situation that is more stressful than normal.

External stressors have an important influence on a child's physiological response and the release of cortisol. Studies have found that continuous exposure to stress in one's environment (i.e. social surroundings) can increase stimulation of the HPA axis to future stressors (Davies, Sturge-Apple, Cicchetti, and Cummings, 2007). As a result, the child's behavioral and stress responses (i.e. cortisol) become stimulated. Children in both threatening and non-threatening situations have shown this increased reactivity of the HPA axis (Gunnar & Donzella, 2002, Gunnar & Quevedo, 2007). The temperament of a child also has an influence on the effects that certain environmental stressors may have on their stress response (Buss, Kiel, & Davis, 2011;

Goldsmith & Boyce, 2011).

Stress Response Linked to Fearful Behaviors

Previous research has found evidence that supports the concept that a child's unique psychological and physiological stress responses are related to his or her temperamental reactivity (Buss, Goldsmith, & Davidson, 2005; Gunnar & Quevedo, 2006; Kagan, Reznick, & Snidman, 1987, 1989; Lupien, King, Meaney, & McEwen, 2000). Studies have shown that there is a link between fearful social behaviors and an individual's stress response (e.g., Buss, Davidson, Kalin, & Goldsmith, 2004; Buss et al., 2003; Davidson, 2001). More specifically, it has been discovered that these fearful behaviors result in an individual's increase of cortisol levels (Gunnar, 1989). This relationship is supported by the work done by Gunnar (1996), which showed that infants with fearful temperament had significantly higher cortisol levels at the age of fifteen-months when compared to six months of age (Donzella & Gunnar, 2002). The study found evidence of a relationship between temperament and quality of care (regarding parenting, specifically physical presence and response), which successfully predicted an increase in the infant's cortisol level. Fear and anger have also been associated with increases in cortisol levels when the quality of care is insufficient; conversely, fear and anger did not predict an increase in cortisol when the infant was with a responsive and attentive caregiver, recognizing the importance of the relationship between fearful temperament and cortisol levels when predicting social anxiety (Donzella & Gunnar, 2002).

Maternal Personality and Behavior

Research suggests that parent attributions (i.e. anxiety, depression) may have an effect on their children's temperament, especially behavioral inhibition (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). It is postulated that children express behavioral inhibition (activation of behavioral inhibition system) as a result of their efforts to escape negative consequences or punishments by their parents (Robinson et al., 1992). It is known that parenting also predicts the social and behavioral outcomes of children. The way a mother views her child influences her behavior towards the child and can affect the child's social development. Parents that view their child as vulnerable or socially inept may not encourage independence or autonomy, and be more sensitive, warm, and physically affectionate towards the child (Rubin et al, 1999; Rubin et al. 2002). These parental behaviors are classified as overprotective behaviors, which lead children to become dependent on their parents (Chorpita & Barlow, 1998). Overprotective parenting is found to commonly occur with fearful children (Shamir-Essakow et al., 2004). In order to further explain this relationship between fearful children and overprotective parenting, Dadds and Roth developed the "anxious-coercive model", which states that fearful children seek attention, protection, and comfort from their parents in novel situations (Dadds and Roth, 2001). Furthermore, when parents provide this attention and protection for their fearful children, they are reinforcing avoidant and parent-dependent behavior (Dadds and Roth, 2001). Overprotective parenting is a primary cause of internalizing problems in children (Lambourn, Mounts, Steinberg, & Dornbusch, 1991); this is a result of the positive relationship between BIS (Behavioral Inhibition System) sensitivity and overparenting (Kiel & Maack, 2012).

The Current Study

The purpose of this study was to extend the research done on the relationship between a child's temperament and development of social anxiety, specifically investigating if cortisol levels can increase the prediction of the development of social anxiety from preschool to kindergarten. Fearful temperament was studied across six context episodes, ranging from mildly fearful to greater fear-evoking situations. These fearful behaviors were looked at in accordance with parent reports of fearfulness and cortisol levels. The four groups we expect to find are (1) high fear, high cortisol reactivity, (2) high fear, low cortisol reactivity, (3) low fear, high cortisol reactivity, and (4) low fear, low cortisol reactivity. We predicted that the most fearful children with the highest levels of cortisol will be the most likely to develop social anxiety.

Chapter 2

Method

Participants

Participants were 235 children (110 girls; 46.8%) taken from a large, 2 sample, longitudinal study of temperament. Children were followed from age 2 to age 6 (end of kindergarten year). The first sample of children (N =111) was comprised of children residing in a small city in the Midwest and the bordering rural areas. The second sample of children was comprised of children (N = 124) from a small city in the mid-Atlantic region of the country. Participants were recruited via mail after being identified using newspaper published birth announcements, public interest mailings, and advertisements. Children were considered eligible participants for the study if they were healthy, full-term babies.

Procedure

Caregivers of participants in both samples who fit the eligibility criteria were mailed information describing the upcoming study. Those who followed up with the mailing and expressed interest in the study were then contacted via phone to further describe the study, obtain verbal consent, and schedule the first of many laboratory visits. After verbal consent was obtained, mothers were mailed a written consent form along with a series of questionnaires about their children.

2- Year Old Visit

Participants were invited to participate in a 2-year old visit, which was designed to resemble everyday encounters and novel, putatively fear-evoking situations. The six situations (stranger approach, stranger working, puppet show, clown, spider, and robot) took place in a controlled environment where the participants could respond normally while being observed via a video recording. In the stranger approach episode, the participant was left in the room playing with a toy for thirty seconds when a male experimenter posing as a stranger to the child entered the room. The stranger then approached the child from across the room to initiate the interaction. The stranger was a male wearing a baseball hat. The stranger transitioned to the opposite side of the room step-by-step until he ended up at eye level with the child. At that point, the stranger asked the child a question that a child would be comfortable answering in order to evoke a response. At the end of the episode, the experimenter explained who the stranger was and informed the child that he was just there to say hello. If at any point the child was uncomfortable with the situation and became noticeably upset, the stranger would leave the room and the episode would conclude.

In the stranger working episode, the child was again placed in a room and given a toy to play with. After thirty seconds, a female experimenter entered the room and pretended to be working at a desk, all while ignoring the presence of the child. It was up to the child to initiate contact with the stranger by walking over to the desk and engaging in conversation. If prompted, the stranger would respond to the child but if not the stranger remained quiet. After three minutes, the stranger exited the room, thanked the child, and said goodbye if the child had previously engaged in conversation.

In the puppet show episode, the child was placed on his or her mother's lap across the room from a play puppet theater. A female experimenter entered the room and acted as a puppeteer, using two different puppets. The two puppets engaged in conversation and invited the child to play catch and a fishing game with them. The purpose of this episode was to engage the child in the situation by approaching the puppets and interacting with them by playing the games. The episode was stopped after about three minutes or after the child approached the puppets. At the end of the episode, the female experimenter left the puppet theater and allowed the child to play with the puppets and clean up the other toys.

In the clown episode, a female experimenter (same person as puppet show), dressed as a clown, entered the room and asked the child to play with bubbles, play catch, and use different musical instruments. The child's response was observed, specifically focused on his or her inhibition and willingness to approach the clown.

In the spider episode, the child was placed on his or her mother's lap in the corner of the room furthest from the door. From outside of the room the experimenters controlled a toy spider that was attached to a remote control car and drove the spider into the room, switching between driving forward and backward toward the child. The purpose of this episode was to assess the child's inhibition and risk-taking behavior according to his or her response to the spider. If the child became too fearful of the spider, the episode was concluded and the experimenter explained that the spider was simply a toy.

In the robot episode, the child again was sitting on his or her mother's lap in the corner of the room. The experimenters moved a remote control robot into the room, both towards and away from the child. The purpose of this episode was to assess the child's inhibition and

approach response to the robot. If the child became too fearful of the robot, the episode was concluded and the experimenter explained that the robot was simply a toy.

Fear Coding and Fear Composite Calculation

Each of the six episodes was recorded using a video camera positioned behind a two-way mirror. The child's behaviors were coded on a second-by-second basis for the entirety of each episode. A complete description of coding can be found in Buss, 2011. Here we only describe the coding used in the current analyses. The AFFEX coding system (Izard, Dougherty, & Hembree, 1983) was used to score children's fear facial expressions. Using the AFFEX coding system, coders specifically focused on three specific areas of the child's face and rated the intensity of muscle movement across the child's face on a scale of 0 to 3. Facial expressions indicating fear included raised and drawn together eyebrows, raised or tense eyelids, and an open mouth with corners pulled straight back. Facial expressions indicating sadness included raised outer eyebrows, narrow or squinted eyes, and mouth corners pulled out and down, sometimes causing the protrusion of the upper lip. Children displaying no facial expression were assigned a score of "0". Children displaying brief or moderate in a single area of the face were assigned a score of "1". Children displaying moderate facial expression in two areas of the face or a strong expression in one area of the face were assigned a score of "2". Children displaying a strong emotional expression in two or more facial regions were assigned a score of "3". Bodily fear expressions included reduced activity, muscle tensing, trembling, or freezing.

For each episode, the second-by-second codes for facial and bodily fear behaviors were transformed into duration scores that represented the amount of time children displayed that

particular behavior during the episode. Those scores were then averaged into a fear composite resulting in one score for each episode.

Cortisol Sampling

Three saliva samples were collected during the laboratory visit. A baseline sample was taken upon arrival. Two samples were taken after the conclusion of the visit, one immediately after the last episode and the other 20 minutes later. Participants were asked to not eat or drink thirty minutes before providing the saliva samples in the laboratory. Saliva samples were collected using cotton swabs. The children were then asked to move the cotton swab around in their mouth. Samples from the visit were kept frozen and sent to the Behavioral Endocrinology Laboratory at Penn State University for analysis. The samples were analyzed using an enzyme immunoassay US FDA (510) to test for salivary cortisol.

The cortisol reactivity levels used were measured at three different times during the in-laboratory visit. Lab cortisol 1 (lab cort difference raw pre-raw mean post and post-post) was the difference between cortisol reactivity before the start of the visit and mean of cortisol reactivity taken directly after the visit and twenty minutes after the end of the visit. Lab cortisol 2 (raw pre-raw post) was the difference between cortisol reactivity before the start of the visit and at the end of the visit. Lab cortisol 3 (raw baseline-raw post-post) was the difference between the child's baseline cortisol reactivity and the cortisol level twenty minutes after the end of the lab visit.

Social Inhibition

At age two and three, caregivers completed the Infant Toddler Social and Emotional Assessment (ITSEA) (Carter, Briggs-Gowan, Jones, et al., 2003). The ITSEA is comprised of 166 items that are used to measure the child's behaviors including externalizing, internalizing, dysregulatory, and compensatory behaviors. For this study, we only focused on internalizing behaviors included depression/withdrawal, general anxiety, anxiety/oc (obsessive compulsive), anxiety/worry, inhibition to novelty, and separation distress. Responses to each item were rated using the following 3-point scale: (0) Not true/rarely, (1) Somewhat true/sometimes, or (2) Very true/often. If the mother has not been able to observe the behavior in question, this behavior is coded as "No opportunity" to observe behavior.

In the spring of the child's kindergarten year, mothers completed the Health and Behavior Questionnaire (HBQ) (Lemery-Chalfant, Schrieber, Schmidt, Van Hulle, et al., 2007). The HBQ is comprised of 84 items, which are aimed at evaluating the mental and physical health of children from the ages of six to eight years old. Responses to behavior-related questions were answered using a 3-point scale: (0) rarely applies, (1) applies somewhat, and (2) certainly applies. The questionnaire focuses on three main categories including ADHD symptoms, externalizing symptoms, and internalizing symptoms, as well as physical health variables. The ADHD behaviors include ADHD, externalizing ADHD, inattention, and impulsivity. Externalizing behaviors include peer accept/reject, bullied, peer relationships, antisocial, oppositional defiance, conduct problems, overt hostility, relational aggression, and externalizing. The internalizing behaviors include depression, overanxiousness, separation anxiety, and internalizing. We also examine social scales including social inhibition, social withdrawal, and prosocial behavior.

Parent Personality

At age six, mothers completed the Behavioral Inhibition/Behavioral Approach System (BIS/BAS) Scales. The BIS/BAS Scales are comprised of 24 items that are used to measure an individual's motivations for behavior. The Behavioral Inhibition Systems Scale is used to identify behaviors that are motivated by the urge to move away from unpleasant stimuli. The Behavioral Approach Systems Scale is used to identify those behaviors that are motivated by the urge to move closer to something that is of interest to the individual (Carver & White, 1994). Responses to these behavior-related questions were answered using a 4-point scale: (1) very true for me, (2) somewhat true for me, (3) somewhat false for me, and (4) very false for me.

Chapter 3

Results

Preliminary Analyses

Descriptive statistics were run on all key variables and listed in Table 1. The lab cortisol variables used in this study were difference scores, used to represent the participants' cortisol levels over different periods of time. Correlations were also run on all key study variables (Table 2). Lab cortisol 1 (lab cortisol difference raw pre-raw mean post and post-post) was significantly correlated with the spider fear composite score. Lab cortisol 2 (raw pre-raw post) was significantly correlated with the spider fear composite score.

Primary Analyses

Group Classification

A K-means cluster analysis was performed to classify participants into different groups according to fearful temperament composite scores and cortisol reactivity. Results are presented in Table 3. Fearful temperament composite scores were taken from stranger working, stranger approach, puppet show, clown, spider, and robot episodes. Cortisol variables included lab cortisol difference (raw pre-raw mean post and post-post), lab cortisol difference (raw pre- raw post), and lab cortisol difference (raw baseline- raw post-post). The findings resulted in three groups of children: (Group 1) low fear, low cortisol reactivity (N = 115), (Group 2) high fear in

high threat only, moderate cortisol reactivity (N = 68), and (Group 3) consistent high fear, high cortisol reactivity (N = 52).

One-way Analysis of Variance

A series of one-way analysis of variance (ANOVA) were performed using cluster assignments predicting inhibition to novelty, social inhibition, internalizing scores (depression/withdrawal, general anxiety, anxiety/oc, anxiety/worry, inhibition to novelty, and separation distress) to test for significance in predicting social anxiety outcomes in kindergarten-aged children. We also ran an additional test to examine how the clusters predict mother personality, BIS Scale Score. The variable cluster number was controlled for in each of these tests. Post hoc and homogeneity tests were performed within these one-way analyses of variance to account for similarities and differences among the three groups.

Age 2 Inhibition to Novelty and Internalizing

At age 2, there were no significance differences between any of the groups for internalizing behaviors. There was a significant difference between group 1 and group 3, $p = .004$, for inhibition to novelty. Children in group 3 were more likely to exhibit inhibition to novelty at age 2 than children in group 1.

Age 3 Inhibition to Novelty and Internalizing

At age 3, there was a significant difference between group 1 and group 3, $p = .033$, for internalizing behaviors. Children in group 3 were more likely to exhibit internalizing behaviors at age 3 than children in group 1. There was also a significant difference between group 1 and group 3, $p < .001$ and group 2 and group 3, $p = .021$ for inhibition to novelty at age 3. Children in group 3 were more likely to exhibit inhibition to novelty at age 3 than children in group 1, and children in group 3 were more likely to exhibit inhibition to novelty at age 3 than children in group 2.

Age 6 Social Inhibition and Internalizing

At age 6, there were no significant differences between any of the groups for internalizing behaviors. There was a significant difference between group 1 and group 2, $p = .039$, and group 1 and group 3, $p = .007$, for social inhibition at age 6. Children in group 3 were more likely to exhibit social inhibition at age 6 than children in group 2, and children in group 3 were also more likely to exhibit social inhibition at age 6 than children in group 1.

Mother Personality

There was a significant difference between group 1 and group 2, $p = .022$, for the Mother BIS Scale Score at age 6. Mothers of children in group 2 were more likely to report exhibiting inhibited behaviors than mothers of children in group 1.

Table 1. *Descriptive Statistics for Key Variables*

	N	Minimum	Maximum	Mean	SD
Cortisol					
Lab cort 1	159	-.98	.28	-.01	16
Lab cort 2	155	-.98	.64	-.01	18
Lab cort 3	107	-.56	.33	.01	12
Episode					
Spider	234	.00	99.69	49.65	3.36
Robot	233	.00	99.68	50.44	6.50
SA	230	.00	81.50	23.90	8.94
SW	229	.00	69.04	19.41	4.89
Clown	235	.00	94.22	25.55	2.96
PS	234	.09	104.43	33.32	4.11
Mother BIS Scale Score	153	12.00	28.00	20.61	.21

Table 2. *Correlations for Key Variables*

		Lab Cort 1	Lab Cort 2	Lab Cort 3
Spider	Pearson Correlation	.20*	.22**	.16
	Sig. (2-tailed)	.01	.01	.11
	N	158	154	106
Robot	Pearson Correlation	.12	.13	.06
	Sig. (2-tailed)	.14	.14	.52
	N	157	153	105
SA	Pearson Correlation	.03	.06	.10
	Sig. (2-tailed)	.69	.474	.29
	N	156	152	107
SW	Pearson Correlation	.04	.07	.01
	Sig. (2-tailed)	.64	.39	.92
	N	154	150	104
Clown	Pearson Correlation	.04	.06	.09
	Sig. (2-tailed)	.65	.47	.34
	N	159	155	107
PS	Pearson Correlation	-.04	-.03	.04
	Sig. (2-tailed)	.62	.72	.71
	N	158	154	106
Mother BIS Scale Score	Pearson Correlation	.13	.12	.09
	Sig. (2-tailed)	.18	.22	.47
	N	105	101	75

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

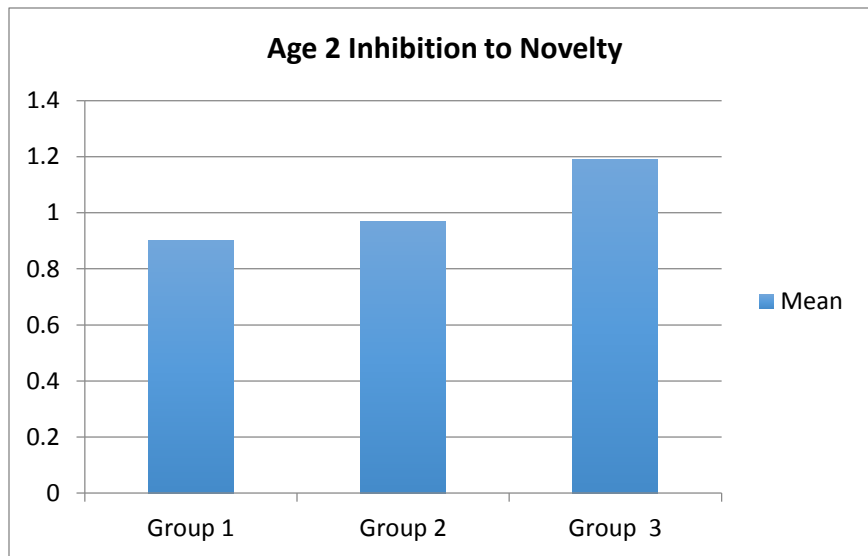
Table 3. *Group Classifications*

	Group 1	Group 2	Group 3
<i>Fear-cortisol</i>	<i>Low- low</i>	<i>High- moderate</i>	<i>Consistent</i> <i>high- high</i>
Cortisol			
Lab cort 1	.08	.05	.27
Lab cort 2	.06	.02	.42
Lab cort 3	.09	.08	.12
Episode			
Spider	7.78	70.33	85.71
Robot	.00	93.79	92.67
SA	6.86	20.00	60.89
SW	4.38	1.37	57.99
Clown	2.80	2.70	89.04
PS	23.90	38.18	74.13

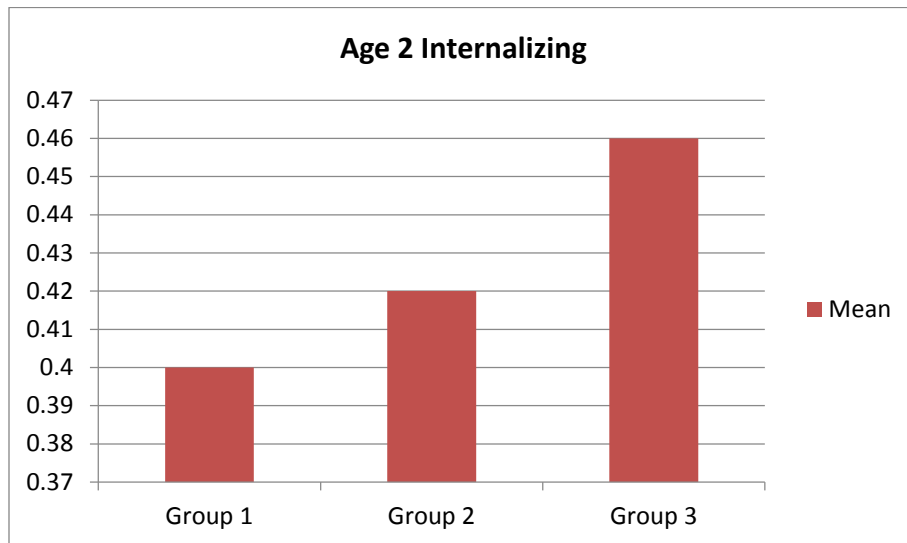
Table 4. *Group Differences in Child Outcomes*

	F	Group 1		Group 2		Group 3	
		Mean	SD	Mean	SD	Mean	SD
Age 2 Inhibition to Novelty	5.44(.005)	.90	.47 ^A	.97	.54	.19	.55 ^A
Age 2 Internalizing	1.46(.234)	.40	.18	.42	.18	.46	.19
Age 3 Inhibition to Novelty	7.84(.001)	.73	.45 ^A	.83	.53	1.11	.49 ^A
Age 3 Internalizing	3.29(.040)	.35	.21 ^A	.40	.25	.46	.17 ^A
Age 6 Social Inhibition	6.00(.003)	.62	.49	.84	.53	.94	.47
Age 6 Internalizing	1.24(.293)	.29	.20	.26	.16	.23	.14
Mother BIS Scale	4.15(.018)	19.88	3.02 ^A	21.48	3.55 ^A	21.12	2.83

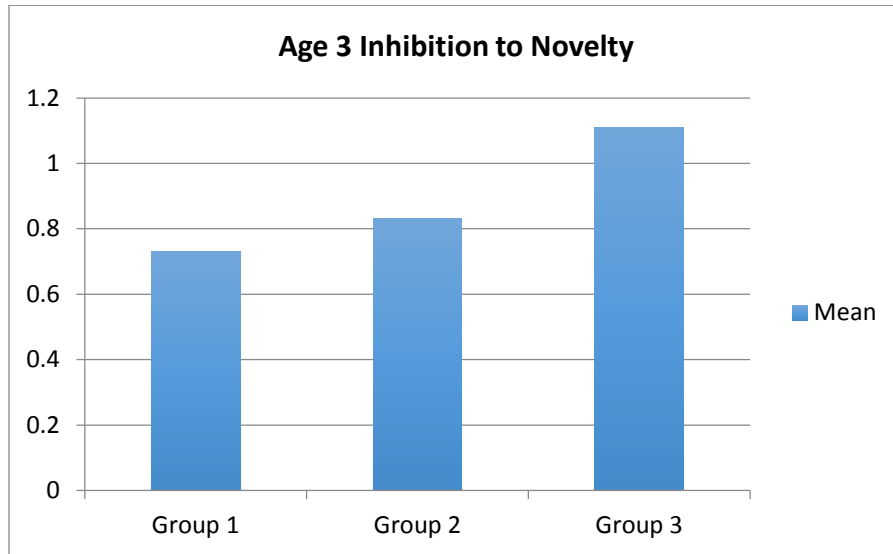
*Superscript "A" denotes significant difference between clusters at the 0.05 level

Figure Set 1 (A & B), Age 2**Figure A.** *Age 2 Inhibition to Novelty*

Note: Group 1 (N = 104), Group 2 (N = 66), Group 3 (N = 51)

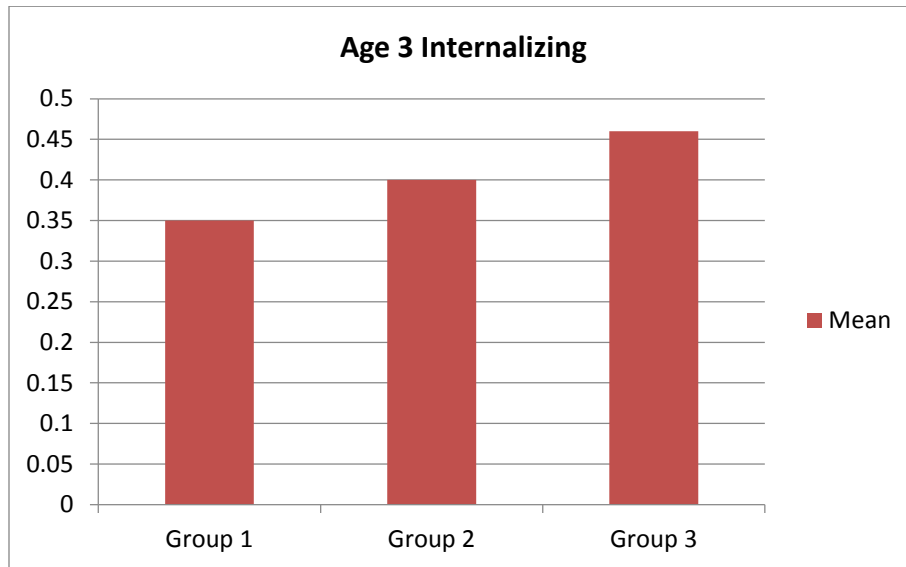
Figure B. *Age 2 Internalizing*

Note: Group 1 (N = 104), Group 2 (N = 66), Group 3 (N = 51)

Figure Set 2 (C & D). Age 3**Figure C. Age 3 Inhibition to Novelty**

Note: Group 1 (N = 78), Group 2 (N = 53), Group 3 (N = 38)

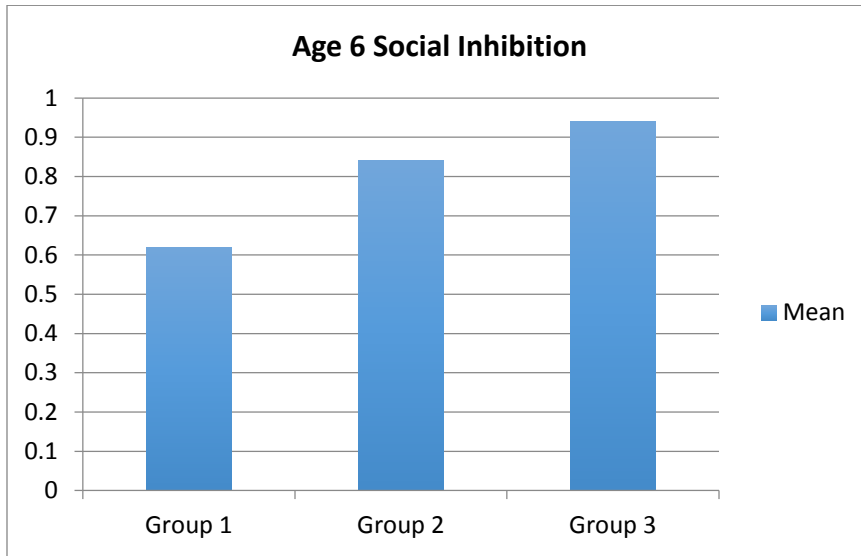
Figure D. *Age 3 Internalizing*



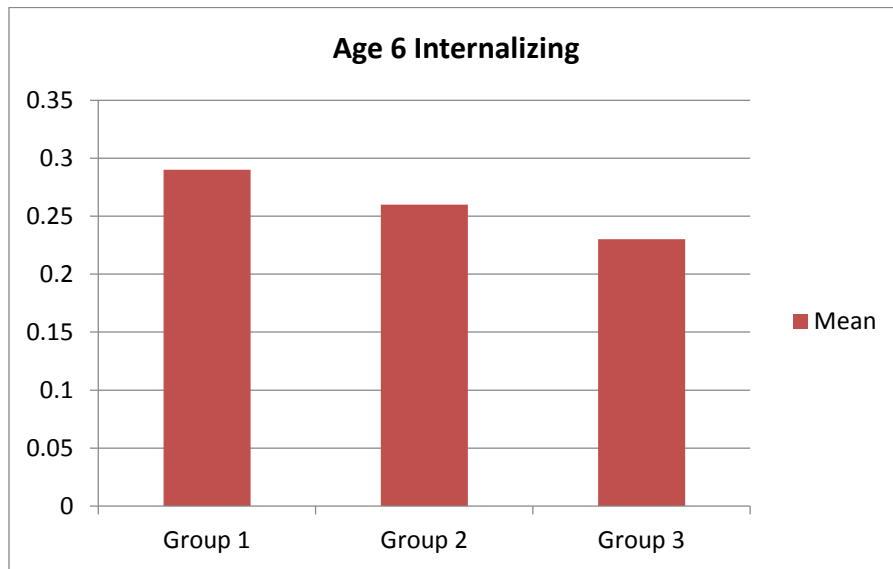
Note: Group 1 (N = 78), Group 2 (N = 53), Group 3 (N = 38)

Figure Set 3 (E, F, & G). Age 6

Figure E. Age 6 Social Inhibition

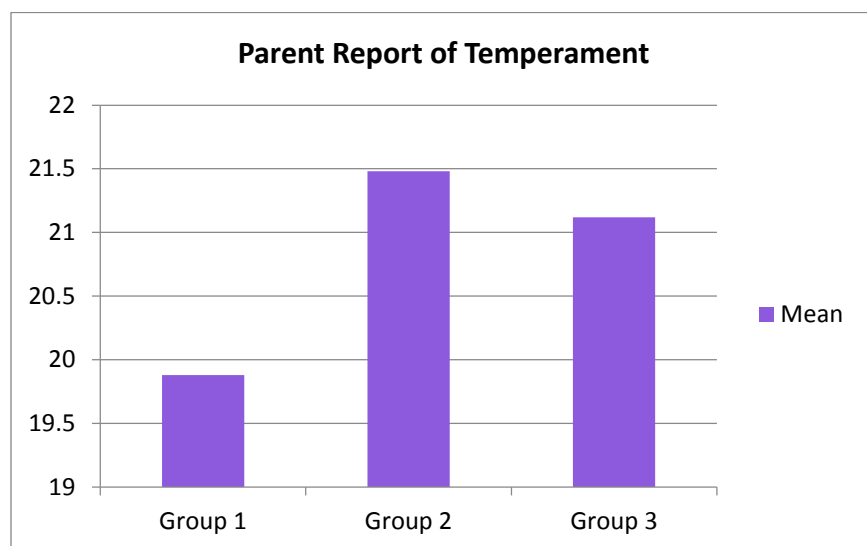


Note: Group 1 (N = 78), Group 2 (N = 45), Group 3 (N = 30)

Figure F. *Age 6 Internalizing*

Note: Group 1 (N = 78), Group 2 (N = 45), Group 3 (N = 30)

Figure G. Age 6 Parent Report of Temperament



Note: Group 1 (N = 76), Group 2 (N = 44), Group 3 (N = 33)

Chapter 4

Discussion

The purpose of this study was to examine the effects fearfulness and stress-reactivity have on children's development of social anxiety. Previous literature has found a robust and consistent prediction from early fearful temperament to social anxiety symptom development (Buss, 2011). However, the processes associated with this association still remain unclear. As a result of differences in emotion regulation, some children are more disposed to developing internalizing disorders (Buss, 2011). High levels of stress reactivity suggest that a child has difficulty coping with stress, which can lead to behavioral problems in the future (Buss, 2011). In particular, we were investigating cortisol levels, a marker of stress reactivity, as one possible mechanism accounting for this association. It was predicted that we would find four different groups of children based on fearfulness and cortisol reactivity: (1) low fear, low cortisol reactivity, (2) low fear, high cortisol reactivity, (3) high fear, low cortisol reactivity, and (4) high fear, high cortisol reactivity. However, our work identified three groups of children: (1) low fear, low cortisol reactivity, (2) high fear with high threat, moderate cortisol reactivity, and (3) consistent high fear, high cortisol reactivity.

It was found that the three groups of identified children fall on a continuum of cortisol reactivity. This continuum spans from low cortisol reactivity to moderate cortisol reactivity to high cortisol reactivity. While a continuous scale of cortisol reactivity is expected among the

three groups, it is the level of fearfulness combined with cortisol levels that are important for determining their group membership and prediction of developing social anxiety.

Distinct low fear, high cortisol reactivity and high fear, low cortisol reactivity groups were not found. Participants in the high fear with high threat and moderate cortisol reactivity share characteristics of these two originally predicted groups. These children are a combination of the two predicted groups of low fear, high cortisol reactivity and high fear, low cortisol reactivity.

Our primary interest is focused on the participants who fell into the consistent high fear, high cortisol reactivity group. The normally assumed behavioral responses in children are low fear in low threat situations and high fear in high threat situations; fearfulness is related to the fear context of the situation. Children who experience consistent high fear and high cortisol reactivity across all six episodes have a heightened fear response to both ordinary situations and fear-evoking situations. These children are more anxious and experience a higher threshold of fear than children who only show fear in high fear situations – like those observed in group 2. Children's fearful temperament and high fear in low threat or neutral situations is characterized as dysregulated fear (Buss, 2011).

Dysregulated fear is linked to an increased risk in social wariness (Buss, 2011) and social anxiety symptoms (Buss, 2013). Dysregulated fear in the consistent high fear children may account for the difference in stress reactivity between this group and the moderate cortisol reactivity group. Children with fearful temperament express higher levels of fear, are weary of novel situations and strangers, show increased withdrawal behaviors, and have higher levels of stress reactivity (Fox et al., 2005). Research has also shown that these fearful children are more

likely to develop social anxiety problems during adolescence (Biederman et al., 2001; Schwartz et al., 1999).

Our study investigated social inhibition, inhibition to novelty, and internalizing behavior outcomes including depression, withdrawal, general anxiety, anxiety/worry, inhibition to novelty, and separation distress as fearful behaviors associated with social anxiety symptoms. At age 2, there was a difference between low fear children and consistent high fear children with expressing inhibition to novelty. At age 3, there was a difference between consistent high fear children, and low fear and high fear with high threat children for both internalizing behaviors and inhibition to novelty. At age 6, there was a difference between consistent high fear children and low fear children for experiencing social inhibition.

Consistently high fear children differed from the other two groups of children and were more likely to be socially inhibited and express internalizing problems. The reason these children may have a greater propensity for developing social anxiety during kindergarten is due to their dysregulated fear responses from age 2 until age 6. During childhood development, a child's inability to self-regulate fearful emotions can lead to future social anxiety. For this reason, children who experienced high fear across all episodes were more likely to develop social anxiety symptoms at age 6.

Limitations and Future Directions

There were a few limitations to consider in this study. The participant pool consisted of mainly white, middle-class families with both parents as active caregivers. For this reason, the results of the study cannot be generalized to other populations with more diverse demographics.

It is also important to consider the effect that the in-house laboratory visits had on the fearful responses of the children. Children attending these laboratory visits may have been primed with fear of a new setting and new people before the episodes were conducted. Therefore, it could be argued that it is difficult to tell whether the children's fearfulness and cortisol reactivity were a result of the fearful context situations or if their fear was caused by the mere introduction to a new setting.

Future research should include participants from a variety of geographical locations, particularly more urban settings where a diverse group of children can be recruited. Having a more diverse participant population is beneficial for obtaining results that are more generalizable. It would also be interesting to conduct similar episodes in school settings, where children may be initially more familiar with the setting.

Chapter 5

Conclusion

The findings of this study present a novel approach to identifying and classifying children with fearful temperament. We identified a group of children with consistent high fear and high cortisol reactivity across all six episodes. These children are at the highest risk for expressing internalizing behaviors and behavioral inhibition, which are all risk symptoms of social anxiety. Thus, cortisol reactivity helps predict the development of social anxiety in children of kindergarten age.

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