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THE EFFECTS OF A STABLE DYSREGULATED FEAR PROFILE ON SOCIAL ANXIETY
IN EARLY CHILDHOOD

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ABSTRACT

Fearful temperament is one of the best early predictors of the development of social anxiety in childhood. Among the characterization of this temperament style is a model suggesting that it is not how much, or how intensely children experience fear, but when and under what circumstances that is critical to predicting this risk, that is, when the fear is considered dysregulated. This study examined the effect of a dysregulated fear profile on the development of social anxiety symptoms in young children. At age two, children participated in six novel, fear-evoking episodes and at age five, children participated in a similar set of novel episodes. One episode classified as low-threat and one classified as high-threat at each age were used to determine their fearful temperament. Children displaying intense fear specifically in low threat scenarios are considered to have a dysregulated fear profile. It was predicted that if a child displayed a stable dysregulated fear profile at age two and age five, then they were at an increased risk for developing social anxiety symptoms during kindergarten. Using fear composite scores, three groups of children were identified at age 2 and age 5: (1) Normative Fear Profile (low fear in low threat contexts, high fear in high threat contexts), (2) Moderate Fear Profile (moderate fear across all tasks), and (3) Dysregulated Fear Profile (consistently high fear across all tasks). Because of the small sample of participants who displayed a stable dysregulated fear profile, accurate predictions about social anxiety from this profile could not be determined. Instead, predictors of social anxiety at kindergarten were examined under the context of each age group separately, and it was found that the age 2 dysregulated fear profile best predicted social anxiety symptoms at kindergarten.

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Chapter 1

Introduction

There is a critical need to predict and recognize the symptoms of Pediatric Social Anxiety Disorder because of the longstanding impact that it has on academic and social development and its association with substance abuse and adjustment difficulties in adulthood (Buss & McDoniel, 2016). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines Social Anxiety Disorder (SAD) as marked, or intense fear of social situations in which the individual could be scrutinized by others. In such situations, the individual fears that they will be negatively evaluated by their peers, and the fear or anxiety of being judged is out of proportion to the actual risk of a negative evaluation (American Psychiatric Association, 2013). In contrast to many other anxiety disorders, SAD is typically diagnosed at a young age, with a mean age of onset of 15.5 years, and with the youngest diagnosis of 8 years. However, research has shown that symptoms can appear as early as preschool. Infants that react negatively to novel situations tend to become toddlers that avoid new social situations, and have been termed “behaviorally inhibited”. This behavioral inhibition predicts a two-to-four fold increase in risk for pediatric anxiety disorders, including social anxiety disorder, generalized anxiety disorder, and social phobia (Pine, 2007). SAD is associated with significant distress and impairment that often persists into adulthood, leading to lower levels of attainment in work, education, and relationships. In children and adolescents, it is associated with lower levels of perceived social support and higher levels of negative affect and social pessimism (Kashdan & Herbert, 2001). Despite its early onset, seriousness, and prevalence in children, a large portion of the previous research on SAD has

been focused on adult and adolescent samples, thus once again highlighting how imperative it is to find ways to predict pediatric SAD early so that intervention programs can be designed and implemented in the treatment of this disorder.

Previous research has focused on identifying the factors that contribute to SAD in order to establish early risks. It has been shown that social withdrawal and social avoidance lead to difficulties in peer interactions, developing peer relationships, and adjustments in school. However, both of these factors are often preceded by fearful temperament in infancy, and as such, fearful temperament has been characteristically linked to social anxiety disorder (Chronis-Tuscano et al., 2009). A fearful temperament can be defined as the tendency to withdraw and avoid new situations (particularly ones that most children tend to approach), and is associated with many physiological symptoms including increased heart rate (Chronis-Tuscano et al., 2009). The link between fearful temperament and pediatric SAD is the focus of this present study. The goal is to understand how the individual differences in how children display fear from toddlerhood to age five lead to behavioral patterns that predict social anxiety in kindergarten.

In order to study this, it is important to examine the fear profiles across multiple contexts, including those that are classified as low threat. Children displaying intense fear specifically in low threat scenarios, are considered to have a dysregulated fear profile (Buss, 2011). It has already been established that a dysregulated fear profile at age two is an early predictor of anxiety at age five (Buss et. al, 2013). The aim of this study is to understand how the stability of a dysregulated fear profile, that is, displaying dysregulated fear both in toddlerhood and later childhood, affects the severity of social anxiety symptoms. It is hypothesized that if a child displays a stable dysregulated fear profile from age two to age five, then they are at an increased risk for developing social anxiety symptoms during kindergarten. Previous research was

examined in order to define fearful temperament and specifically dysregulated fear, describe how it has been studied and operationalized in the past, and make connections to Social Anxiety Disorder and its impact.

Delineating Emotion Regulation and Dysregulation

Previous studies on anxiety and mood disorders have offered evidence for the importance of emotional processes in characterizing and distinguishing these disorders from one another. For example, fear has been more commonly associated with SAD, whereas anxiety has been more commonly associated with Generalized Anxiety Disorder (GAD) and sadness is the central emotional element in Major Depressive Disorder (MDD) (Mennin et. al, 2007). Delineating the core emotional features of each anxiety/mood disorder, as well as understanding the role of emotion regulation (the way in which individuals influence, manage, and express their emotions) is key to clarifying the unique features of each disorder.

Effective emotional regulation, is marked by being able to recognize emotional experiences, understanding their meaning, and most importantly, being able to express emotions in a context-appropriate manner (Mennin et. al, 2007). In defining emotion dysregulation, it is important to examine problems in initial generation of emotions and difficulties in interpreting these emotions. In a study by Mennin, Holaway, Moore, and Heimberg (2007), the researchers described four components of emotion dysfunction: (a) heightened emotional intensity, (b) poor understanding of emotions, (c) negative reactivity to one's emotional state, and (d) maladaptive emotional management responses. They sought to understand how these components determined the distinctiveness of anxiety and mood disorders. In the first part of the study, exploratory factor

analysis revealed that these four factors together best reflected appropriate measure of emotion function and dysregulation. In the second part of the study, the researchers showed that these four components demonstrated both common and unique relationships to self-reported measures of SAD, GAD, and MDD. Correlational analysis reveal a majority of nonspecific positive relationships between these factors and the disorders (Mennin et. al, 2007). These results support the idea that emotion dysregulatory factors are an important area for incorporation into treatment of anxiety and mood disorders.

Operationalization of Fearful Temperament

Despite substantial research on the link between fear-related behaviors and physiological reactivity, findings have often been inconsistent because until recently, no single measure of behavior has been found to be sufficient in describing individual differences in temperament. Previous literature focused on fear in a limited variety of contexts, in which children only displayed some fearful behaviors, but did not successfully capture maladaptive fear responses (Buss et. al, 2004). A study by Buss, Goldsmith, Davidson, and Kalin (2004) sought to determine an alternative measure of fear response by examining the regulation of fearful behavior across contexts of varying threat intensity. A low threat task was one that was still novel, and still threatening to some degree, but was considered mild compared to the high-threat tasks. They studied fear-related behaviors across four mildly threatening contexts and hypothesized that intense fear-related behaviors, specifically freezing, in less threatening circumstances would classify these children as dysregulated. Their results largely supported this hypothesis. They found that freezing during stranger free play episode (low-threat context) was associated with

higher basal cortisol levels and resting PEP. Therefore, children who maintained this freezing response across all contexts is a contextualization of the dysregulated fear response. They suggested that examining both the context and physiological response of fear (i.e freezing) is needed to operationalize dysregulated fear response and is necessary in identifying children at risk for developing Social Anxiety Disorder (Buss et. al, 2004). The importance of the context specificity of the fear response has been replicated in other studies, as well. Research by Buss (2011) found that by characterizing tasks as low, moderate, of high in threat, fear and engagement behavior could be classified as low to moderate and were consistent with the level of threat of the task. It allowed for the identification of a dysregulated fear profile at age two, in which children displayed high fear in low threat contexts beyond a general level of inhibition (Buss, 2011). This was the first study to identify dysregulated fear as a potential precursor to social anxiety, and its methods were largely replicated in this current study.

This operationalization of dysregulated fear response through context-dependent changes in threat has also been demonstrated in nonhuman primates. Because humans and rhesus monkeys exhibit individual differences in their relative degree of right and left frontal electrical activity, and have electrophysiological similarities, these animals could be used to study the behavioral correlates in humans. A study by Kalin, Larson, Shelton, and Davidson (1998) manipulated context through the scenarios of maternal separation, human intruder with no eye contact, and human intruder staring. The researchers found a unique fear response across each of these contexts. For example, monkeys typically would freeze more in the intruder with no eye-contact scenario. In previous research, they determined that individual differences in asymmetric frontal electrical activity in the brain was a stable characteristic in rhesus monkeys. By monitoring frontal electrical activity, the researchers observed individual differences in fear

intensity and regulation, despite the context effect. They showed that specifically, animals that displayed a freezing response under the human staring context, reflected a dysregulation of fearful behavior which associated with higher basal cortisol levels (Kalin et. al, 1998).

Moderating Link between Dysregulated Fear and SAD

When examining dysregulated fear in the context of SAD, it is important to understand the possible mechanisms through which the two are related. It has been proposed that dysregulated children are more likely to detect threat than regulated children, show a greater attention bias towards the threat, and therefore display a high level of a physiological fearful response (Morales et. al, 2015). A study by Morales, Perez-Edgar, and Buss (2015) examined differences in this attention bias in six-year olds, comparing children who displayed dysregulated fear behavior at age two and those that did not. They hypothesized that attention bias towards threat would be positively correlated with social withdrawal only for children who were characterized as having a dysregulated fear pattern. The researchers measured attention bias and behavioral inhibition across six contexts designed to elicit varying levels of fear at age two. At age six, parent reports on the MacArthur Health Behavior Questionnaire (HBQ) were used to operationalize social withdrawal. The results of the study were largely consistent with the hypothesis. The researchers found that children characterized with dysregulated fear showed a significant bias away from threat, and that children without it did not show any significant bias towards or away from it. They concluded that attention bias towards threat was positively related to social withdrawal only for the dysregulated fear group, highlighting attention bias as a

possible conduit between fearful temperament and Social Anxiety Disorder (Morales et. al, 2015).

Moreover, in recent years, researchers have sought to define the neurophysiological underpinnings between attention bias and Social Anxiety Disorder in order to further characterize it and understand its mechanisms. A study by Thai, Taber-Thomas, and Perez-Edgar (2016) examined the neural markers of the behavioral inhibition-anxiety link in children aged 9-12. They carried out this study by examining event-related potentials (ERPs) during measures of attention in order to observe the changes in brain activity associated with threat bias. Automatic attention processes were captured through the P2 and N2 components of ERP, in which P2 is associated with longstanding perceptual processing of emotions, and N2 represents attention control and conflict monitoring towards and away from threat. The results of the study showed an association of N2 and P2 with social anxiety and attention bias, respectively. They found that P2 was associated with decreasing social anxiety symptoms, and that increased attention mobilization is a way to weaken the effects of social anxiety in behaviorally inhibited children (Thai et. al, 2016).

Understanding the current research on dysregulated fear mechanisms and its connection to social anxiety symptoms is necessary to determining early indicators of Social Anxiety Disorder. Research by Mennin et. al (2007) helps to define a dysregulated emotional response and identify four specific markers and their correlation to specific mood/anxiety disorders. Specifically, understanding the unique relationship between heightened emotional intensity, poor understanding of emotions, negative reactivity to one's emotional state, and maladaptive emotional management responses to SAD, is critical to making predictions about fearful temperament in this current study. Research by Buss et. al, (2004) and Kalin et. al (1998),

highlights important findings on the operationalization of fearful temperament, and demonstrates that context-specific freezing provides a strong measure of dysregulated fear response. Finally, determining measures that moderate the link between a dysregulated fear response and SAD is relevant to this current study in order to draw conclusions about the relationship between these variables. Studies performed by Morales et al (2015), and Thai et al (2016), both highlight attention bias towards and away from threat as a possible conduit between dysregulated fear response and Social Anxiety Disorder.

The Present Study

This study aims to identify the individual differences in how children display fearful behavior from toddlerhood to age five, and whether different patterns of behavior predict anxiety during kindergarten. In order to study this, it is important to examine the fear profiles across multiple contexts, including those that are classified as low threat. Children displaying intense fear specifically in low threat scenarios, are considered to have a dysregulated fear profile. It has already been established that a dysregulated fear profile at age two is an early predictor of anxiety at age five. The data for this project was drawn from a two-sample, longitudinal study examining fearful temperament and anxiety risk in children. Participants in Cohort 1 were considered eligible for the study after an 18-month screening for fearfulness/anxiety, however participants in Cohort 2 were not screened for. At age two, fearful behavior was coded across 6 episodes: spider, robot, stranger approach, stranger working, clown, and puppet show. Puppet show was classified as a low threat task and clown was classified as a high threat task. At age five, fearful behavior was coded across two episodes, stranger approach and scary mask.

Stranger approach was classified as a low threat task and scary mask was classified as a high threat task. It was hypothesized that the varying levels of threat across these tasks would elicit varying levels of fear in the participants. If differing levels of fear were observed across these tasks, the second goal was to determine distinct fear profiles at each age, including a dysregulated fear profile. The third and final goal of this study was to understand if the stability of a dysregulated fear profile, that is, when a child displays dysregulated fear at age 2 and age 5, puts them at an increased risk for developing social anxiety symptoms.

Chapter 2

Methods

Participants

Participants for this study were 300, two-year-old children (160 boys, $M_{age}=24.39$ months, $SD_{age}=1.39$) taken from an two-sample, ongoing, longitudinal study on temperament and socioemotional development. The first cohort of children were recruited from a small Midwestern city surrounded by a rural county via newspaper birth announcements. Most of the children were non-Hispanic and white (90.1%), followed by African American (3.6%), Hispanic (3.6%), Asian (1.8%), and Indian American (.09%). The second cohort of children were recruited from a rural region of northeastern United States via mail and phone call after determining their eligibility from public birth announcements and volunteer participant databases. Participants were considered eligible for the study after a screening at 18 months for fearfulness/anxiety (described below). Most of the children were Caucasian (84.1%), followed by African American (5.3%), Asian American (3.3%), Hispanic (2.0%), Indian American (1.0%), and other (3.7%). Family income ranged from <\$15,000 (3.7%) to >\$61,000 (42.2%), with most families (88.7%) earning more than \$30,000 per year.

Procedure

18-month Screening

The purpose of the 18-month screening was to identify children in the second cohort who had elevated levels of fear, inhibition, and anxiety for the prospective longitudinal study. Two questionnaires, the Infant and Toddler Social and Emotional Assessment (ITSEA) and Toddler Wariness Questionnaire (TWQ) were used for the screening. In order to meet the “high fear” requirement for the study, children had to score at least 1 SD above the mean on at least two of the three following fear-related scales: inhibition to novelty, separation distress, and anxiety/worry. The TWQ was a series of six questions designed to capture parents’ perceptions of their children’s fear in situations that were new, but also fun and engaging. Once again, children who scored at least one SD above the mean on items considered an “out of context” level of fear response for these novel situations were identified and considered to be high fear targets. The six items included: “My child is wary in situations where most children are not.”; “My child is wary in situations that are typically fun for children.”; “My child is wary in new situations even when I am there for support.”; “My child is afraid of many different types of things/situations (e.g., meeting new people/animals).”; “My child actively avoids meeting new people or playing with new things.”; “In new situations (e.g./ meeting a new person), my child tends to become less active than she/he is normally and remains inactive for more than a few minutes”. 121 of the 481 screened children were identified and categorized as high fear (M 1.25, SD = 0.41 for ITSEA inhibition to novelty; M = 1.04, SD = 0.37 for ITSEA separation distress; M = 0.26, SD = 0.21 for ITSEA anxiety/worry; M = 3.98, SD = 1.02 for TWQ) and were invited to participate in the study. (Buss et. al, 2017).

Laboratory Visits

Parents of participants who expressed interest in the study were contacted via phone to obtain verbal consent and to schedule laboratory visits for which their child would participate in

a series of experiments. Parents were then mailed a written consent form and a series of questionnaires to obtain additional information about their child. At age two ($M_{\text{age}}=24.39$ months, $SD_{\text{age}}=1.39$), children participated in a laboratory visit consisting of several novel situations, six of which were designed to elicit fear: puppet show (3 min, object fear), stranger approach (1.5 min, social fear), robot (1 min, object fear), clown (3 min, social fear), stranger working (2 min, social fear), spider (1 min, object fear). For the purposes of the current study, one low- and one high-threat task were used: puppet show and spider. After the final episode, children were given a small prize for their participation, and the parents were thanked.

Children were followed through the spring of their kindergarten year (approx. age 5). In the fall of this year, parents were contacted via phone once again to schedule a visit to the laboratory. At each visit, the participant again completed seven tasks: stranger approach, stranger working, balloon bop, scary mask, playing with lion, tower of patience, and dog barking; several of which were designed to elicit fear. Stranger approach was classified as a low-threat task and scary mask was classified as a high-threat task; both of which were used for the purpose of this study.

Age 2 Puppet Show

Puppet show, a low threat task, was designed to be novel, yet engaging using two friendly puppets to encourage the children's participation. Each participant sat on his or her mother's lap across from a play theatre. A female experimenter entered the room and acted as a puppeteer for two puppets. The puppets engaged in conversation with the child and invited the child to play a game with them. The episode ended after three minutes or after the child approached the puppet. At the end of the episode, the female experimenter exited the room allowing the child to play with the puppets on their own.

Age 2 Spider

Spider was a high-threat task designed to examine novelty and object-related fear. Each participant sat on his or her mother's lap in a corner of the room farthest from the door. Experimenters outside the room moved a remote control spider into the room that moved towards and away from the child. The episode lasted about one minute after which the experimenter entered the room to explain that the spider was just a toy and asked the child if he or she wanted to touch the spider.

Age 5 Stranger Approach

In the stranger approach episode, each participant was left alone in a room to play with toys. After 30 seconds, a male stranger wearing a baseball cap entered the room. The stranger transitioned across the room after a period of 10 seconds until at eye level with the child. The stranger then initiated an interaction by asking the child a comfortable questions designed to elicit a response. After two minutes, the experimenter entered the room to inform the child who the stranger was. If at any point in the episode the child became noticeably upset, the episode was quickly concluded. Stranger approach was designed to be a low-threat task at age five to engage the child in a new interaction with an unfamiliar adult.

Age 5 Scary Mask

In the scary mask episode, each participant was left alone in a room. After 30 seconds, a female experimenter wearing a scary gorilla mask entered the room. After a period of 10 seconds, the experimenter removed the mask and explained that it was just a toy. The experimenter then asked if the child wanted to touch the mask. After two minutes, the experimenter left the room. If at any point in the episode the child became noticeably upset, the episode was quickly concluded. Scary mask was designed to be a high-threat task at age five to

assess the child's inhibition to an unfamiliar situation and risk-taking behavior towards the stranger with the mask.

Measures

Fear Coding

Each episode was filmed from a video camera positioned behind a two-way mirror. The camera was focused on the child's face and body instead of the entire room. The child's behavior during each episode was coded for on a second-by-second basis. Independent teams, who were trained to a minimum of 80% interrater agreement (with $k \geq .70$ for individual behaviors) were responsible for this coding. Facial fear affect was scored using the AFFEX coding system. Through this coding system, fearful expression was coded for based on muscular movement in three regions of the face. Facial expressions indicating fear included raised and drawn together eyebrows, raised or tense eyelids, or an open mouth in which the corners were pulled straight back. Facial fear was coded on a 0-3 scale. A score of "0" indicated no fearful expression. A score of "1" indicated moderate affect in a single area of the face. A score of "2" indicated moderate fearful affect in two areas of the face or strong fearful affect in 1 area of the face. A score of "3" indicated strong fearful affect in at least two regions of the face. Expressions indicating a nervous smile were also coded for facial affect. Bodily fear expressions including reduced activity, fidgeting, self-stimulation, self-touch, and distraction were also coded for. Freezing was identified if the child became rigid in response to the stimuli for more than two seconds. This behavior was kept distinct from an orienting response to initial changes in activity

of the stimuli. Each coder indicated the duration of time for which these behaviors occurred on the coding sheet.

Parent Reports on Social Anxiety in Kindergarten

After the age five visit, parents of participants completed the MacArthur Health Behavior Questionnaire (HBQ). This measure assessed the mental and physical functioning of children (four to eight-years-old) and has been used to identify behavior problems in young children (Armstrong & Goldstein, 2003). This 172-item questionnaire identified the parent's assessment of their child's behavior during the past 6 months. Social inhibition was measured as the average response on a 3-point scale (0 = rarely applies, 1 = somewhat applies, 2 = certainly applies) to items from a social withdraw scale specific to social wariness (e.g. "shy with other children", "shy with unfamiliar adults").

Data Reduction

Fear Composites

A fear composite for each of the two episodes at each age was created for every child. Behaviors that contributed to the fear composite scores were duration of facial fear, duration of bodily fear, and duration of freezing. The facial and bodily codes were transformed into duration scores indicating the amount of time and the intensity that each child displayed the behaviors listed above. The composite was created by taking the mean of the three scores and adjusting for each episode duration. These scores represented a total percentage of episode spent engaging in fearful behavior, which was used to derive behavior profile groups.

Temperament profiles

Latent profile analysis (LPA) was conducted using the fear composite scores to identify subgroups of the toddlers and kindergarteners who displayed certain patterns of fear behavior across the two episodes. Models with 2-4 profiles were fit using MPlus version 7.4 (Muthén & Muthén, 1998-2012). Model selection for each of the age groups was based on the the Akaike information criterion (AIC; Akaike, 1974), Bayesian information criterion (BIC; Schwarz, 1978), sample-size adjusted BIC (Sclove, 1987), and entropy (Celeux & Soromenho, 1996). Model fit is further discussed in the results.

Chapter 3

Results

Age 2 Latent Profile Analysis

Latent profile analysis (LPA) was conducted to determine which profile solution best identified subgroups of toddlers and kindergarteners based on observed patterns of fear behavior across tasks. Model selection at age 2 was based on the model fit information described in Table 1. The AIC, BIC, and adjusted BIC were minimized in the 3-profile solution, compared to the 2-profile solution, and the entropy was acceptable for all models. Upon close examination of the classes, the 3-profile solution extracted participants who displayed high fear across low and high threat scenarios. Because this dysregulated fear group was of interest in the current study, the 3-profile model was selected.

Profile differences in the duration of time that each child displayed fearful behavior during puppet show and spider are shown below in Figures 1 and 2. Toddlers characterized by the Normative Fear Profile (Class 1, N=81) displayed low fear in the puppet show task (Mean fear composite score= 24.969) and high fear in the spider task (Mean fear composite score=67.043). Toddlers characterized with the Moderate Fear Profile (Class 3, N=112) displayed moderate fear in the puppet show task (Mean fear composite score=34.850) and moderate fear in the spider task (Mean fear composite score=33.407). Finally, the Dysregulated Fear (DF) Profile group was characterized by elevated fear levels across all contexts relative to the NF and Moderate Fear groups (Class 2, N=42). These children displayed high fear in the

puppet show task (Mean fear composite score=65.181) and high fear in the spider task (Mean fear composite score=65.441).

Age 5 Latent Profile Analysis

LPA was conducted again for the age 5 visit across two tasks: stranger approach and scary mask. Model selection at age 5 was based on the model fit information described below in Table 2. The 3-profile solution had high entropy and it was selected in order to remain consistent across age groups. This allowed for the determination of participants who switched classes from age 2 to age 5.

Profile differences in the duration of time that each child spent displaying fearful behavior in stranger approach and scary mask are shown in Figures 3 and 4. Kindergarteners classified in the Normative Fear (NF) Profile (Class 1, N=108) displayed low fear in the stranger approach task (Mean fear composite score=6.313) and higher fear in the scary mask task (Mean fear composite score=13.748). Kindergarteners classified in the Moderate Fear Profile (Class 3, N=23) displayed moderate fear in the stranger approach task (Mean fear composite score=45.037) and moderate fear in the scary mask task (Mean fear composite score=17.095). Interestingly, these children displayed a longer duration of fear in the stranger approach task (low threat) than the scary mask task (high threat). Finally, kindergarteners classified in the Dysregulated Fear (DF) Profile (Class 2, N=5) displayed high fear in the stranger approach task (Mean fear composite score=77.509) and high fear in the scary mask task (Mean fear composite score=27.439). Again, it is interesting to note that these children displayed fearful behavior for a longer duration in the stranger approach task than in the scary mask task.

Profile Stability Analysis

Cross tabulation analysis was performed between profiles at age 2 and age 5 (N=123) in order to determine if participants remained in the same fear profile group over time, and to specifically identify participants displaying stability in the dysregulated fear profile. Results are displayed in Table 3. 33 of the 39 participants who were in the Class 1 NF Profile at age 2 remained in the same class at age 5. Only 14 of the 67 participants who were in the Class 3 Moderate Fear Profile at age 2 remained in this class at age 5. 52 of these participants moved to the Class 1 NF Profile at age 5, supporting the idea that these children were able to better regulate their fear as they got older. Of the 17 participants who were classified under the Class 2 DF Profile at age 2, only 1 of these participants remained in this class at age 5. 13 of these participants moved to the Class 1 NF Profile at age 5. The one participant who remained in the DF group from age 2 to age 5 was the population of interest for this study. However, accurate predictions about social anxiety in the dysregulated fear group cannot be made with such a small sample size. Therefore, predictors of social anxiety at kindergarten were examined under the context of each age group separately as described in the following section.

Relations among Fear Dysregulation and Reported Anxiety

In order to determine if dysregulated fear at age 2 or age 5 better predicted social anxiety at age 5, the analysis of variance between the fear profiles and parent-reported social withdrawal, social inhibition, and asocial interaction with peers at each age was examined. The results are summarized in Table 4 and the descriptive statistics among study variables are summarized in Table 5. The association between dysregulated fear and these three reported measures was

marginally significant, $p < 0.2$, at age 2 and age 5. The association between dysregulated fear and social withdrawal was statistically significant, $p < 0.05$, at age 2, but not at age 5. These results support the idea that age 2 fear profiles may better predict social anxiety at age 5 than age 5 fear profiles. This can be visualized by examining Figures 5 and 6. At age 2 (C3Ph1), social withdrawal is more strongly associated with the dysregulated fear profile than either of the other classes. At age 5 (C3Ph3), social withdrawal is still most strongly associated with the dysregulated fear profile, however it is not as clearly distinguished from the other two classes as it is at age 2. This suggests that displaying dysregulated fear at age 2 may best predict social anxiety symptoms at age 5.

Table 1: Fit of latent profile analysis models of 24-month fearful behavior

	2-Profile	3-Profile	4-Profile
Information Criteria			
AIC	4210.063	4205.976	4203.726
BIC	4234.28	4240.572	4248.701
Adjusted BIC	4212.093	4208.876	4207.496
Entropy	0.674	0.616	0.674

N=235. The latent profile analysis model was determined using the two fear composites for each child representing the proportion of time the child displayed fearful behavior in the puppet show and spider episodes. Final model selection is shown in bold.

Figure 1: Age 2 Puppet Show Latent Profile Analysis

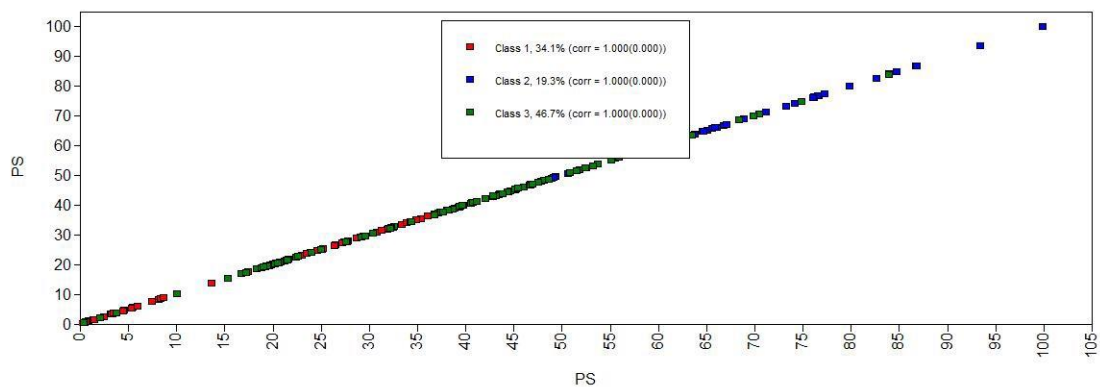


Figure 2: Age 2 Spider Latent Profile Analysis

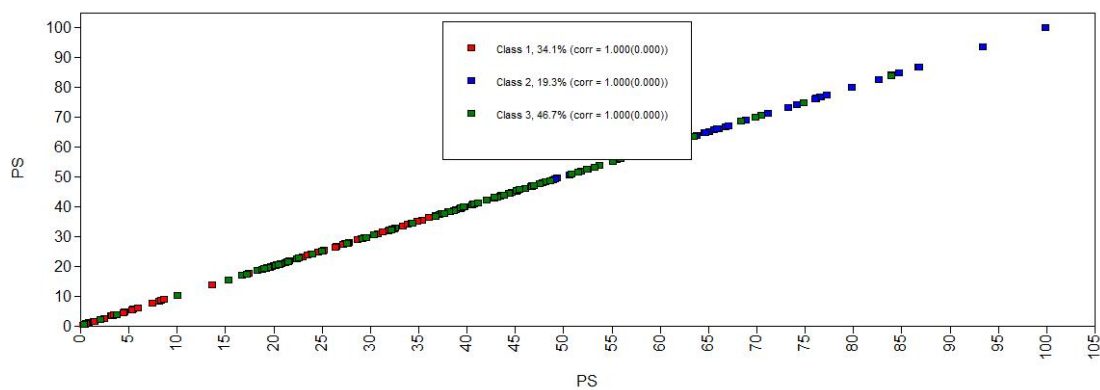


Table 2: Fit of latent profile analysis models of 5-year-old fearful behavior

	3-Profile
Information Criteria	
AIC	2115.954
BIC	2145.081
Adjusted BIC	2113.446
Entropy	0.962

N=136. The latent profile analysis model was determined using the two fear composites for each child representing the proportion of time that each child displayed fearful behavior in the stranger approach and scary mask episodes.

Figure 3: Age 5 Stranger Approach Latent Profile Analysis

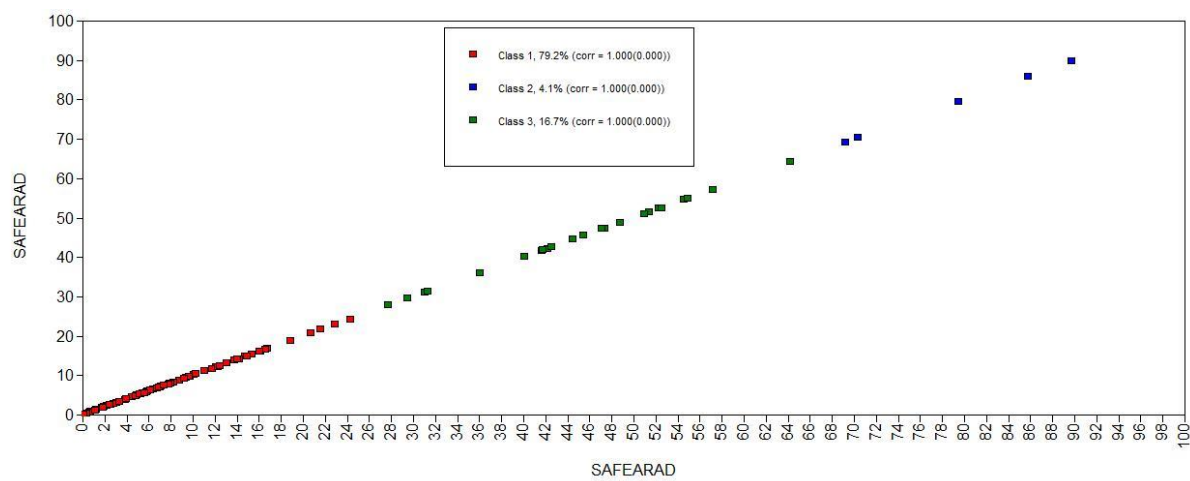


Figure 4: Age 5 Scary Mask Latent Profile Analysis

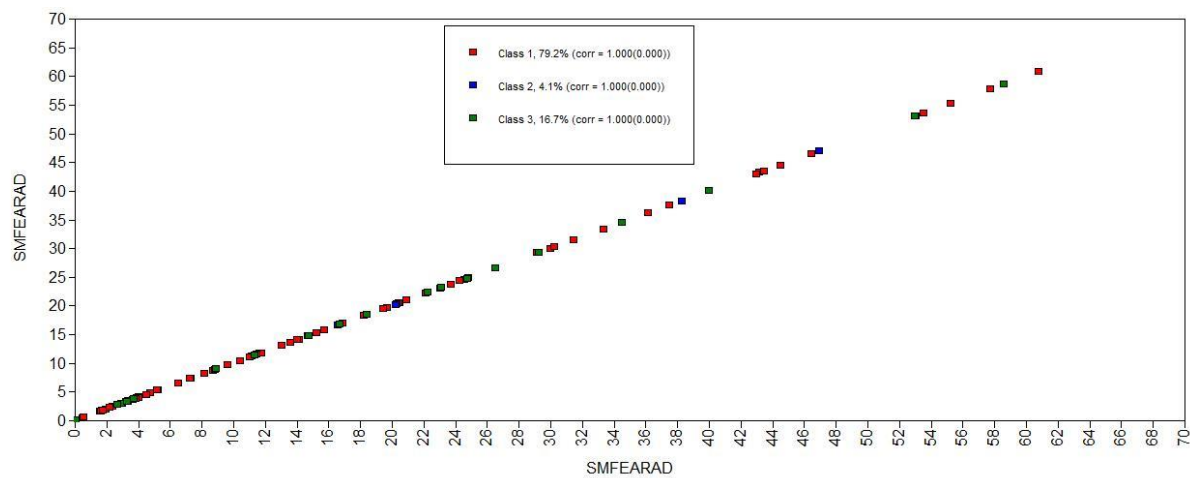


Table 3: C3Ph1 * C3Ph3 Crosstabulation

		C3ph3 (Age 5)			Total	
		1.000	2.000	3.000		
C3ph1 (Age 2)	1.000	Count	33	2	4	39
		Expected Count	31.1	1.3	6.7	39.0
		% within C3ph1	84.6%	5.1%	10.3%	100.0%
		% within C3ph3	33.7%	50.0%	19.0%	31.7%
		% of Total	26.8%	1.6%	3.3%	31.7%
	2.000	Count	13	1	3	17
		Expected Count	13.5	.6	2.9	17.0
		% within C3ph1	76.5%	5.9%	17.6%	100.0%
		% within C3ph3	13.3%	25.0%	14.3%	13.8%
		% of Total	10.6%	0.8%	2.4%	13.8%
	3.000	Count	52	1	14	67
		Expected Count	53.4	2.2	11.4	67.0
		% within C3ph1	77.6%	1.5%	20.9%	100.0%
		% within C3ph3	53.1%	25.0%	66.7%	54.5%
		% of Total	42.3%	0.8%	11.4%	54.5%
Total		Count	98	4	21	123
		Expected Count	98.0	4.0	21.0	123.0
		% within C3ph1	79.7%	3.3%	17.1%	100.0%
		% within C3ph3	100.0%	100.0%	100.0%	100.0%
		% of Total	79.7%	3.3%	17.1%	100.0%

Table 4: Analysis of Variance among Study Variables

	N	Social Withdrawal			Social Inhibition			Asocial with Peers		
		Sum of Squares	F	Sig.	Sum of Squares	F	Sig.	Sum of Squares	F	Sig.
Age 2	62	0.496	3.314	0.044*	0.789	2.109	0.132	0.375	2.34	0.107
Age 5	62	0.308	2.055	0.139	0.623	1.665	0.199	0.227	1.419	0.139

Note: * denotes significance at the $p < 0.05$ level

Table 5: Class Profile Statistics among Study Variables

	Profile	N	Social Withdrawal		Social Inhibition		Asocial with Peers	
			Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Age 2	1	53	0.4224	0.26427	0.8302	0.52143	0.2233	0.24228
	2	24	0.5509	0.38834	0.9167	0.56679	0.3681	0.35773
	3	75	0.4163	0.29175	0.6489	0.46465	0.3	0.27672
Age 5	1	89	0.4164	0.28539	0.7041	0.47789	0.2753	0.28215
	2	5	0.6	0.38968	1.0667	0.43461	0.3667	0.39791
	3	21	0.5767	0.22116	0.8889	0.43885	0.3058	0.25066

Figure 5: Age 2 Social Withdrawal

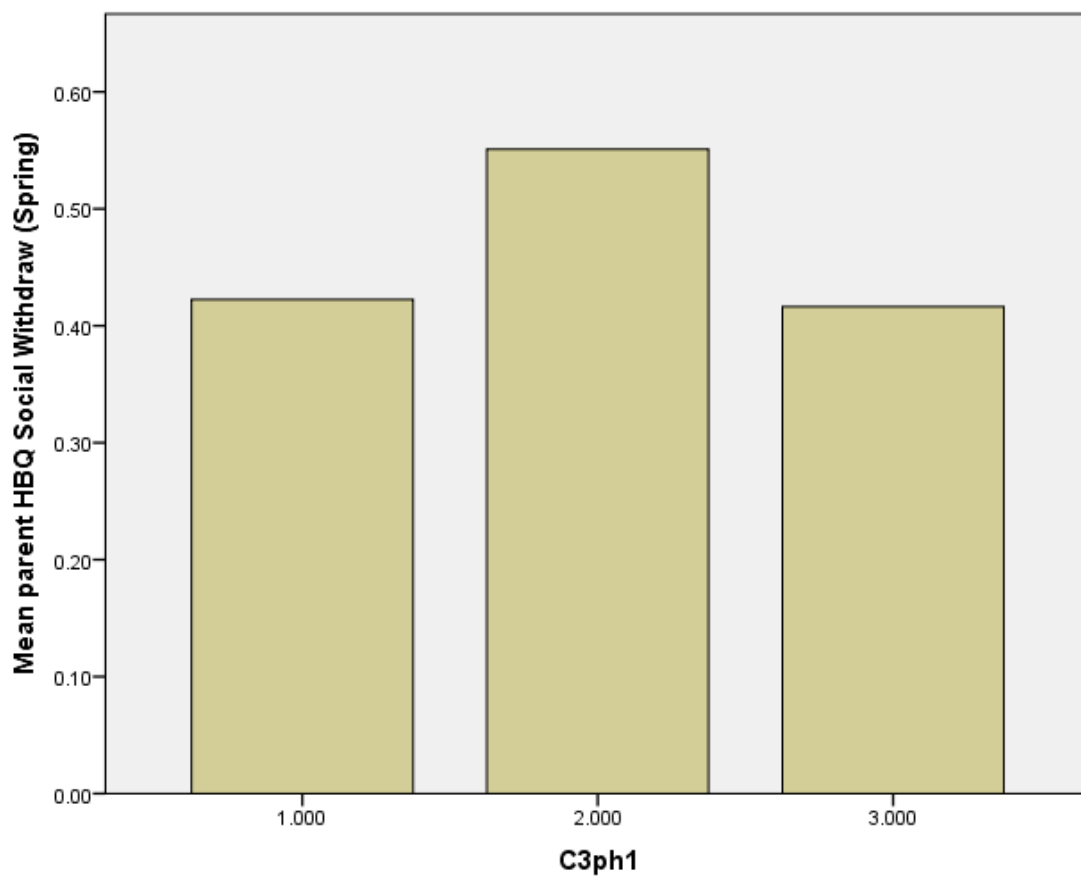
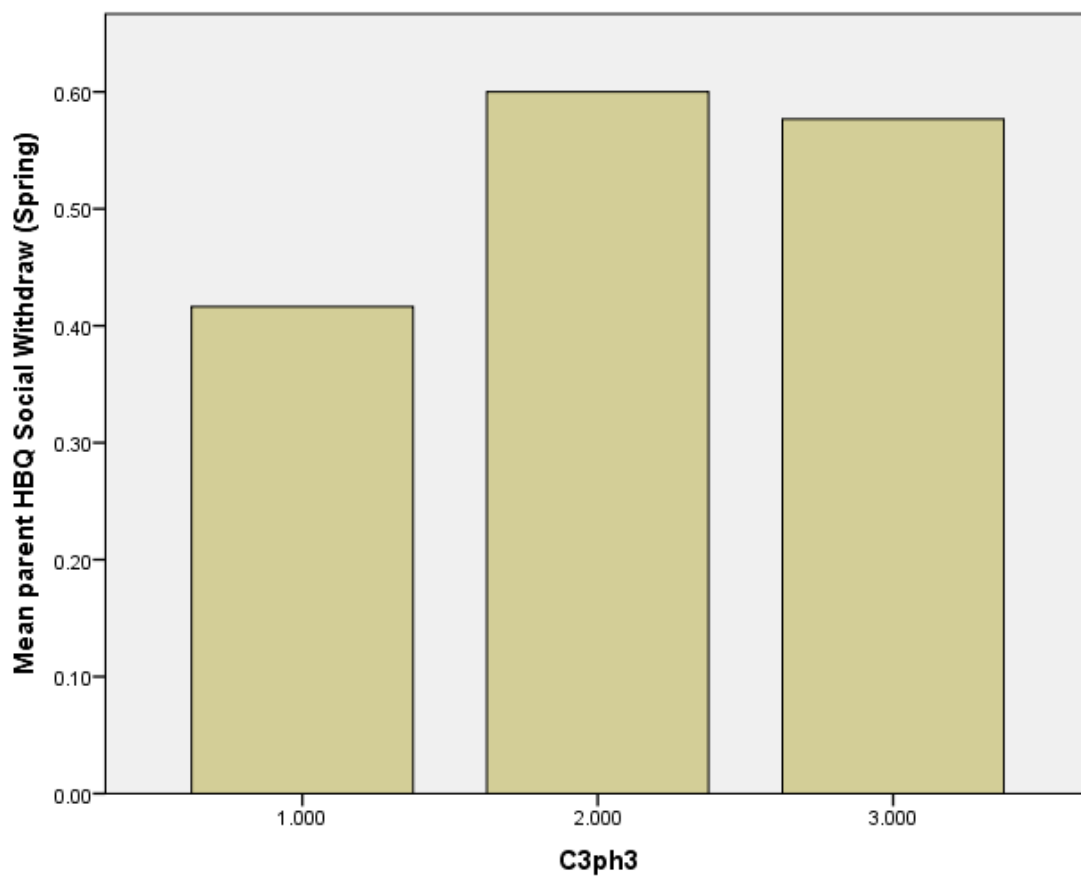


Figure 6: Age 5 Social Withdrawal



Chapter 4

Discussion

Social Anxiety Disorder (SAD) is associated with significant distress and impairment in adulthood, leading to lower levels of attainment in work, education, and relationships (Kashdan & Herbert, 2001). In contrast to many other anxiety disorders, SAD is typically diagnosed at a young age and symptoms have been shown to appear as early as preschool (Pine, 2007). Because of its prevalence in children and adolescents, there is an imperative need to predict who is at risk for developing pediatric SAD. It was previously established that a dysregulated fear profile at age 2 was an early predictor of social anxiety at age 5 (Buss et. al, 2013). The purpose of this study was to identify individual differences in how children display fear from age 2 to age 5, and to determine if observable patterns of fear behavior, specifically stable dysregulated fear, affected the severity of social anxiety symptoms in kindergarten. Our analyses revealed three distinct fear profiles at each age group: (1) Normative Fear Profile (low level of fear in low threat tasks, and high level of fear in high threat tasks), (2) Moderate Fear Profile (moderate level of fear across all tasks), and (3) Dysregulated Fear Profile (high level of fear across all tasks). However, due to the small sample of children displaying stable dysregulated fear, this profile could not be used to accurately predict out social anxiety in kindergarten. Instead, the analysis of variance between the fear profiles and parent-reported social anxiety symptoms at each age was determined separately, and it was revealed that age 2 dysregulated fear best predicted social anxiety symptoms in kindergarten.

Age 2 Latent Profile Analysis revealed that fearful behavior duration in puppet show (low threat) and spider (high threat) could accurately determine three distinct fear profile groups. As expected, in the Normative Fear Profile, children were not as fearful during the low threat

task, but got progressively more fearful during the high threat task and were not able to regulate their fear behavior. In the Dysregulated Fear Profile, children displayed heightened levels of fear across both episodes, highlighting their inability to regulate their fear in social scenarios. Nonetheless, they still displayed a longer duration of fear in the high threat task compared to the low threat task. This was not the case with the Age 5 Latent Profile Analysis. While children classified in the Normative Fear Profile displayed slightly higher fear in the high threat context (scary mask) than the low threat context (stranger approach), children in the Moderate Fear Profile and the Dysregulated Fear Profile actually displayed a greater duration of fear in the low threat context compared to the high threat context. To consider why this may have occurred, it is helpful to examine what occurs during each of these tasks. In the scary mask task, a stranger is standing in a corner wearing a scary gorilla mask and does not speak to the child for the first 10 seconds of the episode. However, after this, the stranger removes the scary mask, and allows to child to free play with the masks in a less intimidating way for the remaining duration of the episode. In contrast, during stranger approach, the stranger remains at a reasonable distance from the child and asks them questions for the entire duration of the episode without any free play. Therefore, even though the scary mask task elicited greater fear intensity than the stranger approach task, the fear composites were solely determined by fearful behavior throughout total duration of the episode, and it could be argued that the portion of the scary mask task that elicited the most fear was only a portion of the whole task. This suggests that examining the profiles with intensity of fear behavior alone, or in combination with duration of fear, may provide a better indicator of the dysregulated fear profile.

While the original aim of this study was to determine if the stability of a dysregulated fear profile from age 2 to age 5 was the best predictor of kindergarten social

anxiety, cross tabulation analysis revealed that only one child remained in the Dysregulated Fear Profile from age 2 to age 5. Therefore, any predictions about social anxiety from this group would be inaccurate. The lack of children displaying the stable dysregulated fear profile can be attributed to the fact that as children get older, they get better at regulating their emotions in highly threatening situations. In this study, there were 17 children in DF at age 2. However by age 5, there were only 4 children in the DF profile. Instead of using the stability of the DF profile to predict social anxiety symptoms, we decided to examine if social anxiety symptoms in kindergarten was best predicted by age 2 or age 5 dysregulated fear profiles. Because the analysis revealed that parent-reported social withdrawal (one of the social anxiety measures) was only significantly correlated with age 2 dysregulated fear, it was concluded that age 2 fear profiles are better predictors of social anxiety than age 5 profiles. This can be explained by the fact that at age 5, children are better at regulating their emotions in social scenarios. Even if they do feel threatened, they can behave in a way that makes it appear that they are not fearful. In contrast, at age 2, children react directly to their environment with very little regulation. These results suggest that it may be best to examine preschool fear profiles instead of kindergarten fear profiles when designing intervention programs for SAD.

Limitations and Future Directions

One limitation in this study was that the age 5 scary mask task may not have elicited the fearful behavior in the participants that it intended to because although the task caused an increase in fear intensity, the duration of the entire episode was not entirely fearful. Future

studies should incorporate intensity of fear when composing fear composite scores in order to account for this.

Another limitation of this study was that the original hypothesis could not be accurately examined because of the small population of children who displayed a stable dysregulated fear profile across age groups. Because children get better at regulating their fear as they get older, it is more difficult to identify children with a stable dysregulated fear profile. Future studies should look into increasing the sample size and drawing from a more diverse participant population in order to increase the likelihood of identifying children with a stable dysregulated fear profile.

Chapter 5

Conclusion

Although conclusions about the original hypothesis regarding the stability of the dysregulated fear profile could not be determined, the findings of this study may be useful to in predicting pediatric SAD symptoms because they suggest that age 2 fear profiles better predict kindergarten social anxiety than age 5 fear profiles. Additionally, the results of this study suggest that examining both fear duration and fear intensity are necessary to identify children with the dysregulated fear profile and consequently those children more at risk for social anxiety at kindergarten.

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