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Activity Level as a Moderator of the Relationship between Child and Maternal Anxiety

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ACTIVITY LEVEL AS A MODERATOR OF THE RELATIONSHIP BETWEEN CHILD
AND MATERNAL ANXIETY

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Arts

in

The Department of Psychology

by
Paige M. Ryan
B.A., University of Kansas, 2014
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List of Abbreviations

AD= Anxiety Disorder

ADI= Multidimensional Anxiety Scale for Children Anxiety Disorders Index T-Score

BII= Blood-Injection Injury, Specific Phobia Type

CBCL= Achenbach Child Behavior Checklist Parent Report Questionnaire (Ages 6-18)

DSM-V= Diagnostic Statistical Manual of Mental Disorders- Fifth Edition

GAD= Generalized Anxiety Disorder

GSI= Symptom Checklist 90-Revised, Global Severity Index

MASC= Multidimensional Anxiety Scale for Children

Norwegian Institute of Public Health Twin Panel=NIPHTP

OCD= Obsessive Compulsive Disorder

PD= Panic Disorder

P-Plots= Probability Plots

SAD= Separation Anxiety Disorder

SCL-90-R= Symptom Checklist 90-Revised

Vietnam Era Twin registry=VET

Virginia Adult Twin Study of Psychiatric and Substance Use Disorders=VATSPSUD

Abstract

Anxiety is excessive and impairing for approximately 30% of individuals. Families with anxiety problems tend to pass on those problems to their children, specifically due to a variety of factors: genetics, parenting style, and other environmental risks. On the other hand, promoting behaviors like positive activity scheduling, participation in clubs, and physical activity has been shown to decrease symptoms of anxiety. However, research has yet to focus on this relationship by increasing activity level (e.g., participation in organizations, hobbies, sports). The purpose of this study is to investigate if the relationship between maternal and child anxiety is dependent upon the child's activity level. Participants were extracted from an existing database at Louisiana State University where they previously completed measures on child anxiety, maternal anxiety, and the number of hobbies, clubs, and sports the child participated in. Data was analyzed using three separate moderated hierarchical regression models. It was hypothesized that there would be a positive relationship between child-reported anxiety and mother self-reported anxiety. It was also hypothesized that the relationship between maternal and child anxiety would be most strongly moderated by the child's reported level of sport participation; number of organizations and hobbies were hypothesized to also moderate this relationship. Overall, the relationship between maternal and child anxiety was not significant. For hobbies, data suggested that participating in more hobbies strengthens the relationship between maternal and child anxiety, which was unexpected. For organizations, those who participated in three organizations, compared to other groups, had lower anxiety scores. For three sports, compared to all other levels, the relationship was linear, and slightly less positive than the other levels.

Introduction

Anxiety is a normal, healthy response that serves an adaptive function. However, some people develop severe internalizing problems that meet criteria for a diagnosis of an anxiety disorder; these disorders impact the ability to function properly in several contexts (e.g., family, school, occupation; *DSM-5*; American Psychiatric Association). Today, the lifetime prevalence of any anxiety disorder is estimated to be approximately 30% (Kessler et al., 2012). Those with anxiety disorders usually experience excessive fear, an immediate physical response (e.g., increased heart rate), dysfunctional beliefs, and avoidance that can impair functioning. Thus, in order to better predict who may be at risk for developing these disorders, researchers have focused on the heritability or genetic variability that is present in those with these psychopathologies. In addition, there has been interest in factors in the shared “familial” environment that may impact the manifestation of an anxiety disorder including financial stressors, parent education level, parenting styles, and attachment styles. Lastly, the impact of the non-shared environment is a focus, including the effects of peer influence, social inclusion, and extracurricular activities on the presentation of various psychopathologies. Knowledge of the interaction of these three components is essential to gain understanding about the development, assessment, and treatment of common psychological disorders (Burt, 2009; Shimada-Sugimoto, Otowa & Hettema, 2015).

As a result, this thesis examined possible non-shared factors (e.g., type and level of activity participation) that may influence the relationship between mother and child anxiety. Because the manifestation of anxiety in children is strongly influenced by both genetics and parental factors, maternal anxiety was included as a predictor of child anxiety. The influence of activity participation on child anxiety has also been examined; thus, child activity level was also

considered as an influential predictor. Finally, the interaction between mother anxiety and child activity level was examined in the model.

Studies of Genetic versus Environmental Influence

Family and twin studies often utilize odds ratios to compare prevalence due to family aggregation versus environmental factors. An odds ratio greater than 1.0 signifies that the probability of having the disorder increases within a particular context (e.g., family). Furthermore, these studies may also partition the total variance within the outcome variable or displayed characteristic into four components: additive genetic (a^2), dominant genetic (d^2), shared environment (c^2), and non-shared environment, plus measurement error (e^2) (Shimada-Sugimoto, Otowa & Hettema, 2015). The genetic components are often separated into two distinct sub-components: additive versus non-additive, or dominant. Additive is a summation of dominant genes present, while non-additive involves epigenetics (gene-environment interaction) while assessing strength of alleles that are passed on.

Van der Valk, van den Oord, Verhulst and Boomsa (2003a) completed a longitudinal study and asked parents to report internalizing and externalizing behaviors at age 3, and again at age 7. The authors estimated that the variance in behavior ratings at age 3 was mostly accounted for by genetics (51%); additionally, the shared environment accounted for 30% of the variance and the non-shared environment accounted for 19% of the three year olds' variance of internalizing and externalizing behaviors. By age 7, 52% of the variance in problem behaviors was again due to genetic influence, 32% of the variance in behavior ratings due to the shared environment, and 16% to the non-shared environment. According to the literature, genetics and the familial environment may have a more stable impact in childhood, and non-shared influences

may be more age dependent (Burt, 2009; Burt, McGue, Iacono & Krueger, 2006; Topolski et al., 1999; Turkheimer & Waldron, 2000; van der Valk, van den Oord, Verhulst & Boomsa, 2003a).

Furthermore, depending on whether the child's problems were mostly internalizing or externalizing, the heritability estimates were found to be significantly different. In van der Valk et al (2003b), 50% of the variance in externalizing problems was due to genetics, but only 30% of internalizing problems could be accounted for by genetics. The variance in both internalizing and externalizing ratings was equally accounted for by the shared environment (about 30%; van der Valk et al., 2003b).

Across the literature, the odds ratios and genetic variability estimates are similar for each anxiety disorder, with some variability (Tambs et al., 2009). For example, Hettema, Neale and Kendler's (2001) meta-analysis found somewhat similar levels of heritability and shared environmental factors across multiple types of internalizing disorders such as Panic Disorder (PD), Generalized Anxiety Disorder (GAD), Obsessive-Compulsive Disorder (OCD) and Specific Phobia (see Table 1). Odds ratios calculated from first-degree relative and twin studies conclude that genes largely contribute to the prevalence of anxiety disorders in families. However, the relationship between different anxiety disorders' genetic and environmental influences has some variability. For example, OCD has been found to have higher shared environmental factors than the other disorders, and relatively lower heritability estimates (see Table 1). Furthermore, for GAD specifically, the role of genetics was slightly more complex. One study found that GAD had the highest odds ratio for the shared environment, but only for women. In this case, men were more likely to be strongly impacted by the non-shared environment (Scherrer et al., 2000). Additionally, Beidel and Turner (1997) found that anxious parents were more likely to have anxious children and children of anxious/depressed parents, or

parents with additional psychopathology, usually had more co-morbid disorders. These comprehensive studies illustrate the complex relationship between anxiety, genetics, and the environment.

Heritability Estimates of Anxiety Symptomology

As discussed previously, due to the high prevalence and heritability of anxiety disorders, family and twin studies comprise a large proportion of the literature (Beidel & Turner 1997). Several studies from the Virginia Adult Twin Study of Psychiatric and Substance Use Disorders (VATSPSUD) tested broader models across symptomology. One such analysis examined the relations across a composite of Anxiety Disorders (AD): PD, GAD, Agoraphobia, Social Phobia, and animal and situational specific phobias. The genetic influences on anxiety susceptibility for both sexes were best explained by two additive genetic factors shared across the disorders, with significant disorder-specific genetic risk only for agoraphobia and specific phobias. The first genetic factor loaded most strongly on GAD, PD, and Agoraphobia, while the second loaded primarily on specific phobias. Social Phobia was influenced by both common genetic factors (Hettema et al., 2005). A similar analysis conducted in the Norwegian Institute of Public Health Twin Panel (NIPHTP) identified a common genetic factor that accounted for a large proportion of genetic variance across symptoms of anxiety (heritability 54%) (Middledorp et al., 2005).

Heritability Estimates of Specific Diagnoses

Panic Disorder. Schumacher and colleagues (2009) gathered data from 19 family and twin studies; overall the familial aggregation of PD had an average odds ratio of 5.0. Several studies using both the VATSPSUD, and the Vietnam Era Twin (VET) registry estimated the variance due to genetics for PD to lie between 30 and 40%, and odds ratios to be between 7 and 17 (Hettema et al., 2001; Maier et al., 1995; Noyes et al., 1986). In addition, as discussed earlier,

one study suggests that children of parents with panic and agoraphobia are more likely have a “behaviorally inhibited” temperament and to develop anxiety disorders. (Hirshfeld et al., 1997).

This topic will be discussed in greater detail later.

GAD. Heritability estimates for GAD were estimated with data from several samples (i.e., VATSPSUD, VET, twin studies) combined in a meta-analysis (Hettema et al., 2001). Results suggest that GAD has an overall heritability of 31.6% and an odds ratio of 6.08 (Shimada-Sugimoto, Otowa, & Hettema, 2015). Odds ratios for GAD were as high as 19.5 and variability estimates ranged from .23 to .37 (Skre et al., 1993; Scherrer et al., 2000).

Specific Phobia. Genetic influences and manifestation of phobias are more variable, depending on the type of phobia (i.e., animal, situational, Blood Injection-Injury (BII)). Fyer and colleagues (1996) reported higher rates of specific phobia in those with relatives with phobias compared to relatives without phobias (31% versus 9%). In families with phobias, it was estimated that 30 to 60% of their individual differences was due to a genetic factor. Van Houtem et al. (2013) performed a meta-analysis on general fear and 10 twin studies on specific phobias. The fear type with the highest heritability rate was animal fear (45%), and among specific phobias, the highest mean heritability was blood-injury-injection phobia (33%). In both studies, the variance in level of fear/severity of the phobia could be largely explained by genetic factors.

Social Anxiety Disorder/Social Phobia. Scaini and colleagues (2014) conducted a meta-analysis on the heritability of Social Anxiety Disorder across 13 samples; estimates ranged from 30-60% for familial contribution. Other studies have found heritability estimates and odds ratios to be large (Fyer et al., 1995; Hettema et al., 2001; Kendler et al., 1992; Stein et al., 1998).

OCD. Additionally, several studies have focused on the heritability of OCD; odds ratios have been estimated to range from .7 to 11 (Black et al., 1992; Fyer et al., 1993; McKeon &

Murray 1987; Nestadt et al., 2000; Pauls et al., 1995). Overall, it seems that OCD is largely determined by environmental factors.

Table 1: Heritability Estimates and Odds Ratios for Anxiety Disorders

Study Name	Study Type	Disorder	a ² Variance (%)	Odds Ratio
Hettema et al. (2001)*	Twin	Panic Disorder	.43	
Noyes et al. (1986)	Family	Panic Disorder		17.3
Mendlewicz et al. (1993)	Family	Panic Disorder		13.2
Schumacher et al. (2011)	Twin	Panic Disorder	.30- .40	5.0
Maier et al. (1995)	Family	Panic w/ or w/o Agoraphobia		7.9
Horwath et al. (1996)	Family	Panic w/ or w/o Agoraphobia		11.0
Fyer et al. (1996)	Family	Panic w/ or w/o Agoraphobia		9.5
Kendler, Neale, Kessler, Heath, & Eaves (1993)	Twin	Panic w/ or w/o Agoraphobia	.39	
Perna, Caldirola, Arancio, & Bellodi (1997)	Twin	Panic w/ or w/o Agoraphobia	73% concordance for MZ twins, 0% for DZ	
Scherrer et al. (2000)	Twin	Panic w/ or w/o Agoraphobia		
Noyes et al. (1986)	Family	GAD		19.5
Mendlewicz et al. (1993)	Family	GAD		8.9
Skre et al. (1993)	Twin	GAD	.23	
Scherrer et al. (2000)	Twin	GAD	.37	

Table 1 continued				
Study Name	Study Type	Disorder	a ² Variance (%)	Odds Ratio
Hettema et al. (2001)	Twin	GAD	.32	
Shimada-Sugimoto, Otowa, & Hettema (2015)*	Twin	GAD	.316	6.08
Stein et al. (1998)	Family	Social Phobia		26.4
Kendler et al. (1992)	Twin	Social Phobia	.30-.40	
Scaini et al. (2014)	Twin	Social Phobia	.27	
Van Houtem et al. (2013)	Twin	Specific Phobia, Situational	.25	
Van Houtem et al. (2013)	Twin	Specific Phobia, BII	.33	
Van Houtem et al. (2013)	Twin	Specific Phobia, Animal	.32	
Fyer et al. (1995)	Family	Specific Phobia		31.0
McKeon & Murray (1987)	Family	OCD		.7
Black et al. (1992)	Family	OCD		2.6
Fyer et al. (1993)	Family	OCD		7.0
Pauls et al. (1995)	Family	OCD		10.3
Nestadt et al. (2000)	Family	OCD		11.7

*averaged across meta analysis

Shared Environmental Risk Factors in Anxiety

Some of the literature suggests that genetic factors may actually be less influential (and less clearly defined) than high-risk shared environmental factors (e.g., low income, familial stressors, caregivers with psychopathology) for certain disorders (e.g., OCD; Burt, 2009; McKeon & Murray, 1987;). Burt (2009) completed a study of heritability estimates across broad diagnostic groups (e.g., mood problems, anxiety problems) and found that anxiety problems exhibited the only significant difference between percent of variance accounted for by the shared environment and genetics; it was estimated that 11% of the variance in anxiety was accounted for in twin studies (reared together) and 31% of the variance explained in adoption studies (reared apart).

The shared environment tends to have a great impact on young children, who spend most of their time with parents and caregivers. The shared environment is even more important if the environment is defined as “high risk” (Burt, 2009). Parental factors such as education, overprotection, temperament, attachment style with the child, and parenting practices all have an influence on how child anxiety manifests (Ollendick & Benoit 2012). Ollendick and Benoit (2012) found five risk factors believed to be important in the development of Social Phobia (now Social Anxiety Disorder): child’s level of “behavioral inhibition” or anxious temperament, parental anxiety, attachment process, information and processing biases, and parenting practices. These factors are not orthogonal, but related in several ways. Behavioral inhibition is thought to be genetic and stable, but can also be further reinforced by parenting practices. Parents who are anxious themselves can place their children on their own path to psychopathology through reinforcement of their fears and worries through avoidance and negative information. Further, while behavioral inhibition and parental anxiety are themselves correlated, both are related to the

attachment between the parents and the child. Insecure attachments often cause children to exhibit more difficult behaviors, facilitating the maintenance of parental anxiety. This may promote the negative relationship between the anxious parents and the child even further, and thus the parents may not be able to teach appropriate coping skills (Ollendick & Benoit, 2012).

Temperament

Rosenbaum and colleagues (1992) also confirmed that children who were defined as “behaviorally inhibited” were more likely to develop anxiety disorders. As discussed previously, they are also more likely to be behaviorally inhibited if a parent had agoraphobia or panic disorder, or both (Hirshfeld et al., 1997; Rosenbaum et al., 1992). These results present again the problem of the high rates of parental psychopathology across children with anxiety disorders; however, this temperamental marker may be able to improve the identification of children at high risk for developing anxiety disorders (Biederman et al., 2001).

Parental Factors

While the literature has postulated that children with anxious parents are more likely to become anxious, Bernstein (2005) brings up an important issue. Bernstein (2005) found that higher levels of maternal phobic anxiety was significantly correlated with higher levels of parent-reported separation anxiety disorder (SAD) in their children, accounting for 19% of the variance. However, phobic mothers endorsed SAD more than did clinicians, suggesting the possibility of maternal informant bias in this specific study and perhaps others in the literature. Nevertheless, the relationship between parent and child anxiety remains likely and parental anxiety can contribute to additional negative outcomes.

Rao and Ram (1984) investigated the impact of parental anxiety alone by matching participants to controls on characteristics such as family size, socioeconomic status, birth order,

education, and parental occupation. The outcome measures included the child's level of happiness and the parent-child relationship. Results showed that more anxious parents had less communication with their child and were more controlling. Thus, the parent-child relationship was also less affectionate, and the child reported more feelings of disappointment and rejection, and unhappiness. These findings suggest that these feelings can even affect the child's ability establish future secure relationships. Additionally, the child was reportedly more withdrawn. This withdrawal actually had a negative impact on their academic and extracurricular activities and contributed to poor social skills, which will be discussed further later.

Waters, Zimmer-Gembeck, and Farrell's (2012) meta-analysis found several studies showing parental style had an affect on child anxiety, but only if the child actually perceived the anxiety of the parent. The studies found that anxious rearing style, including excessive worry and concern about the child's safety and well-being, increases symptoms of anxiety in the child (Grüner, Muris, & Merckelbach, 1999; Muris & Merckelbach, 1998). Fisak and Grills-Taquechel (2007) also argued that parental modeling by relaying negative information and reinforcing avoidant behavior, could be a potential cyclical explanation for the development of child-onset anxiety in children of parents with anxiety. Several studies have found that this theory of parental modeling, particularly for social worries, accounted for increased anxiety in the child (Bruch, Heimberg, Berger & Collins, 1989; Daniels & Plomin, 1985; Paivio, 1964). Turner, Beidel, Roberson-Nay and Tervo, (2003) again focused on parental modeling but also included a factor of parental restriction activities. Families with anxious often displayed their distress during activities that their child engaged in.

Environmental Interventions for Anxious Children with Anxious Parents

Just as high-risk familial environments make the effect of the shared environment more significant, research recently suggests the same effect for the non-shared environment (Asbury, Dunn, Pike, & Plomin, 2003; Burt, McGue, Iacono, & Krueger, 2006). The heredity of anxious behaviors and vulnerability of manifestation of anxiety due to the shared environment both account for a large amount of the variance in anxiety. However, research suggests that the positive impact of the non-shared environment (i.e., peer support, extracurricular activities) may be able to counteract the negative effects of genes and the family environment.

Parental Support

As previously mentioned, high parental anxiety is associated with parental over-control and higher levels of anxiety in the child. In a recent study, children with higher social anxiety were significantly predicted by poor friendship quality and perceived social acceptance (Festa & Ginsburg, 2011). On the other hand, children with parents who offer social support, acceptance and validation, had lower social anxiety (Festa & Ginsburg, 2011).

Extracurricular Activities

Studies on the effect of activity level on mental health have demonstrated some intriguing findings. Overall, for both adults and adolescents, exercise is associated with lower scores on measures of anxiety and depression, while inactivity is associated with higher scores (de Moor, Beem, Boomsma & De Gues 2006; Kirkcaldy, Shephard & Siefen 2002; McHale et al., 2001; Motl, Birnbaum, Kubik & Dishman 2004; Sanders, Field, Diego & Kaplan 2000; Thorlindsson, Vilhjalmsson & Valgeirsson 1990). Sport participation has also been found to have causal improvements on symptoms of depression and anxiety in adults (Fox, 1999; Salmon, 2001; Smits & Otto, 2009; Wipfli, Rethorst & Landers, 2008); exercise also has similar effects to

both empirically supported treatments and antidepressants in adults (DeBoer et al., 2012; Dey, 1994; Phillips, Kiernan & King 2003). Activity level has also been shown to improve psychosocial development, attachment, social skills, competence, and self-esteem in both adults and adolescents (Eccles et al., 2003; Mahoney, Harris & Eccles, 2006; McGee, Williams, Howden-Chapman, Martin, & Kawachi, 2006; McHale et al., 2001; Smith, 2003; Sonstroem, 1997a, 1997b). Specifically in children, Lazaratou et al. (2013) compared adolescents on measures of state and trait anxiety. Results showed that adolescents participating in 11 or more hours per week of extracurricular activities had lower scores on both State and Trait anxiety scales. Furthermore, sport participation has been linked to decreased anger, (Fox, 1999; Salmon, 2001) lower rates of problem behaviors, (Eccles et al., 2003) and may prevent adolescents from exhibiting serious externalizing problems (Collingwood, Sunderlin, Reynolds & Kohl 2000; Duncan, Duncan, Strycker & Chaumeton, 2002; Nelson & Gordon-Larsen, 2006). A study done with middle-school children found that those participating in sports were less shy and withdrawn and had better social skills; organized sport participation may also mitigate symptoms of anxiety, especially for behaviorally inhibited children (Findlay & Copian, 2008). Organized sport participation may provide positive peer interactions in a supervised environment, producing a social support system for those with a stressful family environment.

Interestingly, Dimech and Seiler's (2010) findings demonstrated no differences between low activity and high activity groups on measures of social anxiety, cognitions, and behaviors, with gender as a covariate. However, children engaged in team sports displayed fewer physical social anxiety symptoms (e.g., sweating, blushing) than children involved in individual sports. Dimech and Seiler (2011) then reviewed the past studies conducted and found similar results: while not all measures were statistically significant, children with more hours spent participating

in team sports had lower social anxiety scores.

Activity participation also offers children the chance to succeed in non-academic environments, improve concentration and self-esteem, increase academic achievement and mitigate depressive tendencies (Eccles et al., 2003; Larson, 2000; McHale et al., 2001).

Monshower (2013) also found that inactive study participants were more likely than active ones to have internalizing and externalizing problems. However, more interestingly, the study found that children participating in sports with more social interaction, controlling for activity level, had a better self-image.

Other studies have also examined the relationship between sport participation and anxiety in children more casually. Metsäpelto, Pulkkinen and Tolvanen (2010) examined the possible utility of a three-year school-based intervention program aimed at developing emotional and social skills in early elementary school children. The program began by adding preferred extracurricular activities at school. Results showed that children who had participated in the program had fewer depressive symptoms, internalizing problem behaviors, and social anxiety than the control group. Sport activities have also been shown to directly rehabilitate adolescents with behavior problems (Wilson & Lipsey, 2000). Nonetheless, physical activity remains a neglected treatment in mental health practices (Callaghan, 2004).

Biological Models for Activity Interventions

The positive effects of exercise interventions specifically may be partially explained by changes in the body during exercise, such as a release of endorphins, which naturally improve mood (Steinberg & Sykes, 1985). Other theories suggest that the exposure to anxiety related symptoms (e.g., sweating, heart pounding) during an activity may decrease anxiety sensitivity,

which many people with anxiety experience (Reuther, Davis, Grills-Taquechel & Zlomke, 2011; Smits & Otto, 2009).

Previous research has shown that serotonin production and availability is directly related to anxiety and depression and is often a focus of treatment due to its moderate efficacy (i.e., SSRI's) (Fernandez & Gaspar, 2012; Strawn et al., 2015). Recent studies have also shown that serotonin production increases after exercise in both animal and human models (Bailey, Davis & Ahlborn, 1993; Jacobs & Fornal, 1993). Exercise, therefore, provides a function similar to that of anti-depressants by making more serotonin available.

Additionally, researchers have proposed a biological model to explain the indirect relationship of sport participation and self-esteem. According to the study, regular sport participation typically leads to general physical fitness, improvement in muscle tone, a loss of fat, and an improvement of personal physical abilities (Sonstroem, 1997b). This may further result in enhanced body-image and thus may promote self-esteem. Sonstroem's (1997a) review suggests support for this hypothesis by finding that a positive image of one's physical self is linked to emotional adjustment. Increasing evidence for this hypothesis was uncovered in the Sonstroem (1997b) review, which suggests that physical self-concept was more closely related to exercise than was global self-esteem. Interestingly, most of the improvements in self-esteem from exercise were found in individuals with an initial low self-esteem and fitness level.

Additional research has concluded that the type of activity affects the outcome. For example, Callaghan (2004) found that chronic exercise was more effective in decreasing anxiety than acute exercise. The study also postulated that exercise should last 20 minutes or more to exhibit anxiolytic effects. Although the study suggests that sport participation should not be seen

as a credible alternative to pharmacological therapy, it nevertheless appears to have positive effects that may improve treatment outcomes.

The breadth of activity type has been also been linked to less risky behavior, improved social skills, and broadly, successful development (e.g., academic orientation, interpersonal functioning, well-being; Rose-Krasnor, Busseri, Willoughby & Chalmers, 2006). The frequency and duration of a child's participation in out-of-school activities is associated with higher grades in school (Powell et al., 2002; McHale et al., 2001; Eccles et al., 2003). Conversely, Metsäpelto, Pulkkinen and Tolvanen (2010) also found that the more years that the child participated in their school-based activity program, but not the number of activities or the consistency of participation, the lower internalizing problems and social anxiety was at the end of the program.

Present Study and Rationale

Previous research has focused on the mechanisms responsible for the manifestation and maintenance of anxiety in children and families; further, the positive effect of activity level on psychopathology has also been a more recent focus. The purpose of this study was to bring these two topics together to investigate how the relationship between maternal and child anxiety can change based on the child's estimated level activity (per mother's report).

Hypotheses

Hypothesis 1: Measures of maternal self-reported anxiety and child self-reported anxiety will be positively correlated.

Hypothesis 2: The positive relationship between maternal self-reported anxiety and child self-reported anxiety will decrease as the child participates in a greater number of activities (i.e. 2-3 of sports, hobbies, or organizations participated in).

Hypothesis 3: The positive relationship between maternal anxiety and self-reported child anxiety will decrease as the child's activity level increases, but primarily for children who are active in more sports, rather than organizations or hobbies.

Method

Participants

Data has been continuously collected from the Louisiana State University Psychological Services Center (LSU PSC) by graduate student clinicians (including this author) throughout psychoeducational testing services. Participants (N=118) were variable in age, race, and gender (see Table 2). This study used only mothers' self-reported anxiety and reported child activity level to maintain reporter consistency. Participants were excluded from the study based on the following criteria (see Measures section for descriptions of the instruments used):

1. Rater of the SCL-90-R (only mothers were included)
2. Rater of the CBCL (only mothers were included)
3. CBCL Form Type (only ages 6-18 were include due to the likelihood of participation in activities in this age group)
4. Missing measures (deleted listwise)
5. Missing criteria by item (greater than 20%) on the SCL-90-R modified GSI (Derogatis, Rickels & Rock, 1976)

Measures

Symptom Checklist 90-Revised (SCL-90-R; Derogatis, 1994). The SCL-90-R is a 90 item self-report measure used for assessment of psychopathology for ages 13 and older. The form includes a five-point Likert scale (0=not at all, 1= a little bit, 2= sometimes, 3= quite a bit 4=extremely) and nine subscales. The nine subscales include Somatization (e.g., headaches), Obsessive-Compulsive (e.g., worried about sloppiness or carelessness), Interpersonal Sensitivity (e.g., feelings being hurt easily), Depression (e.g., crying easily), Anxiety (e.g., feeling fearful), Hostility (e.g., shouting or throwing things), Phobic Anxiety (e.g., feeling afraid to leave the

house alone), Paranoid Ideation (e.g., feeling most people cannot be trusted), and Psychoticism (e.g., hearing voices others cannot hear). Additionally, three indices give information about overall distress (Global Severity Index, GSI), intensity (Positive Symptom Distress Index, PSDI) and number of symptoms (Positive Symptom Total, PST). Scores range from a T score of 30 to 80, including a cut-off score (T-score of 70) that may indicate the presence of a significant impairments or a disorder.

The reliability of the SCL-90-R has been determined to be good. Specifically, the internal-consistency reliability coefficients for each of the nine symptom subscales, for both psychiatric outpatients and non-patients are also adequate ($\alpha = .77-.90$; Derogatis, Rickels & Rock, 1976; Horowitz, Rosenburg, Baer, Ureno, & Villasenor 1988). Test-retest reliability was estimated to be good for samples tested twice within a one week time period (interclass correlation coefficients .80 and .90) (Derogatis, Rickels & Rock, 1976). Convergent-divergent validity was also satisfactory, for various measures, ranging from .40 to .75 (Wiggins, 1969; Tyron, 1966). Furthermore, factor invariance for each item was above .3, suggesting generalizability for the samples (Derogatis & Cleary, 1977b). The internal consistency for this study was determined to be excellent ($\alpha = .96$).

Multidimensional Anxiety Scale for Children (MASC). The MASC is a self-report questionnaire for children that includes 39 items across four scales, three of which include two subscales each. The scales include: physical symptoms, harm avoidance, social anxiety, and separation anxiety (e.g., I try to stay near my mom and dad). The associated subscales include tense/restless (e.g., I feel tense or uptight) and somatic/autonomic (e.g., my heart races), perfectionism (e.g., I try to do everything exactly right) and anxious coping (e.g., If I get scared, I let someone know right away), humiliation/rejection (e.g., I have trouble asking other kids to

play with me) and public performance (e.g., I get nervous if I have to perform in public). The questionnaire also uses a Likert scale to assess symptom pervasiveness (0=Never True about me, 1= Rarely True about me, 2= Sometimes True about me, 3= Often true about me). Scores range from a T-score of 25 to 90. The MASC also includes a Total Score as well as an Anxiety Disorders Index T-score (ADI) that represent those at risk for anxiety disorders. Research findings suggest that females may exhibit more anxiety than males, resulting in gender, as well as age norms for the MASC (March, Parker, Sullivan Stallings & Conners, 1997). The internal consistency for this study was determined to be good ($\alpha=.84$).

Test-retest reliability for the MASC total score was estimated to be adequate at three weeks and good at three months (interclass correlations coefficient .646 for three weeks, .874 at three months). Internal consistency has been estimated to be adequate for all subscales ($\alpha= .74-.93$) (Grills-Taquechel, Ollendick, & Fisak, 2008). Convergent validity was estimated to be .633; additionally, the MASC was not significantly correlated with the *Child Depression Inventory (CDI)* and the *Ages and Stages Questionnaire (ASQ)* (March, Parker, Sullivan Stallings & Conners, 1997).

Achenbach System of Empirically Based Assessment (ASEBA)-Child Behavior Checklist (CBCL; school age checklist, 6-18; Achenbach & Edelbrock, 1981). The CBCL is a 113-item parent-report measure of internalizing and externalizing behavior problems in children. Each item uses a Likert scale to estimate severity (0= Not True, 1= Somewhat or Sometimes True, 2= Very True or Often True). The CBCL is composed of a Competence Scale, a Syndrome Scale, and a DSM-oriented scale, each containing several subscales. The Competence scale is composed of three subscales: Activities, Social, and School. The activities subscale includes the number of sports, jobs and hobbies the child participates in. The Social subscale accounts for the

number of organizations the child participates in, as well as number of friends, time with friends, and behavior with others. The School subscale accounts for special services received, school problems, and grade retention. The Syndrome scale includes a total problems scale, two broad ratings of internalizing and externalizing problems, and eight subscales (somatic complaints, social problems, withdrawn, anxious/depressed, thought problems, attention problems, rule-breaking behavior, and aggressive behavior). The six *DSM*-Oriented scales include affective problems, anxiety problems, somatic problems, attention deficit/hyperactivity problems, oppositional defiant problems, and conduct problems. Raw scores, T-scores, and percentiles are available for all scales. The Total Problem score is the sum of scores on all 120 items. Scores at or above the 98th percentile (T-score of 70 or above) are considered clinically significant. Scores in this range represent the frequency and intensity comparable to a diagnosis of a disorder. Scores from 63-69 are considered the Borderline range. Age, gender, and group norms are also available. The estimated internal consistency reliability for the CBCL was generally good for all scales. Coefficient alpha (α) ranged from .55-.90 for Competence scales and .71-.97 for Syndrome scales. For this study, coefficient alpha was .65 for number of hobbies, organizations, and sports. Reliability of test-retest was estimated to be very good (interclass correlation coefficient: .952 for the behavioral items, .974 for the competence items). For scale scores, the one-week test-retest ranged from .61 to .98 (Achenbach & Edelbrock 1981). Correlations for internalizing and externalizing scales determined good validity $r = .71$ to $.92$ when compared to other measures (Achenbach & Edelbrock 1981).

Procedure

Permission to collect the data from comprehensive psychoeducational assessments was obtained from the Louisiana State University Institutional Review Board and has been

continuously renewed and approved since 2006. For the current study, a subset of the data is being used. Information for this part was gathered via questionnaires completed by parents and children at the university clinic while receiving testing services by trained graduate student clinicians (See Appendix A). The data was collected across three or more testing sessions, approximately three hours each. All participants completed the consent and child assent prior to completing any questionnaires. After completing consent and assent, the mother and the child completed the measures independently from each other. The measures took about fifteen minutes for the mother to complete and ten minutes for the child to complete. Children or mothers with considerable reading difficulties were read the questionnaires. All participants had the opportunity to ask questions during the completion of the measures to ensure full understanding. Demographic information was also collected.

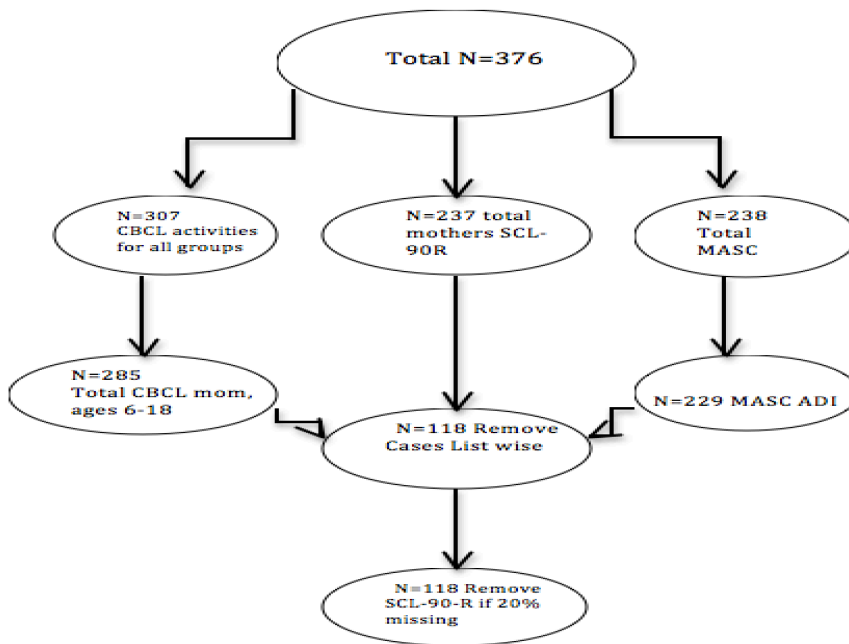


Figure 1. Participant Flow Chart

Table 2: Sample demographics

	Age (<i>M, SD</i>)	Gender	Race
Children	10.73 years, 2.57 years	54% Male (63) 45% Female (53)	70% Caucasian (83) 11% African American (13) 1% Hispanic (1) 1% Asian (1) 17% Other/Missing (20)
Mothers	40.73 years, 6.51 years	100% Female 0% Male	

Preliminary Analyses

Prior to conducting the primary analyses, the data was examined and tested to determine its completeness and suitability for the primary analyses. In addition, preliminary analyses were conducted to determine if any unexpected variables (e.g., demographic variables) could potentially affect the outcome of the main study analyses and need to subsequently be taken into consideration. For missing data, the mean of all items (i.e., for each case) was substituted for 4 cases in which a total of 7 individual items were missing from the completed form (Hawkins & Merriam, 1991). Listwise deletion was not considered to preserve power. Due to the low rate of total missing data points, regression, expectation maximization, and multiple imputation were not considered for simplicity. Mean substitution reduces variability and standard deviations, as well as the correlations; however, due to the limited use in this sample, the overall impact was determined to be relatively small (Tabachnick & Fidell, 2013). Additionally, bivariate correlations were conducted to examine any effects of age on each variable. Age was significantly negatively correlated with number of sports ($r=-.189$; $p=.046$), but no other variable in the model. No other significant differences were found. Mann-Whitney tests were conducted to determine if there are

significant differences in race/ethnicity, specifically whites versus non-whites, on activity level and child anxiety. Ethnicity was first recoded into a dichotomous variable; Mann-Whitney tests found that no significant differences were found across ethnicity and child anxiety ($p=.974$), number of hobbies ($p=.221$), or organizations ($p=.286$). However, significant differences were found across ethnicity and number of sports ($p=.009$). Further analysis (e.g., bivariate correlation) found that children were significantly less likely to be involved in more sports if they were defined as non-white ($r=-.279$; $p=.007$). No significant differences across ethnicity for any other variables were found. *T*-tests were conducted to determine differences by gender of the child on activity level and child anxiety. No significant differences were found across activity types (sports, $p=.863$; hobbies, $p=.322$; organizations, $p=.318$) or child anxiety ($p=.836$) across gender.

Table 3: Descriptive Statistics of Variables

	MASC ADI T- score	SCL-90 GSI mean raw score	Number of Sports	Number of Hobbies	Number of Organizations
Mean	47.69	2.32	2.29	2.32	1.23
SD	10.74	.401	.94	.90	1.07
Variance	115.26	.16	.89	.82	1.15
Range	42	1.97	3	3	3
Minimum	25	0	0	0	0
Maximum	67	1.97	3	3	3
Skew	-.121	-1.51	-1.13	-1.21	.278
Kurtosis	-1.06	2.25	.19	.55	-1.21

The following assumptions were tested to determine if use of the model is appropriate and valid. The assumption of multicollinearity assesses relationships among multiple predictors; when this assumption is violated, estimations of the unique contribution of predictors cannot be determined because the predictors are highly related. Bivariate correlations between predictors

were conducted to assess multicollinearity. No correlations were close to surpassing the criterion of .80 set by Field (2009); thus the assumption was not violated. The assumption of homoscedasticity was examined by producing scatter plots. Further, the variance of the residuals was constant at each level of the predictors and thus, the assumption of homoscedasticity was not violated. The residual error of each case (that cannot be predicted by the model) is assumed to be independent of all other cases. Again, if they are related, additional variables may be determining the variance, and further analyses should be examined. The Durbin-Watson test assessed the correlation between or independence of errors between adjacent observations. The Durbin-Watson estimate was between one and three for each model, suggesting independence of errors (Field, 2009). Normality Probability-Plots (P-Plots) and Histograms were used to determine the degree of normality achieved by the errors in variables in the model (Field, 2009). Number of sports was not normally distributed; only about 7% of respondents reported that their child participates in zero sports, 25% reported participating in two sports, and about 55% of respondents reported their child participates in three sports. Number of hobbies was also not normally distributed; approximately only 6% of participants reportedly participate in zero hobbies, while 27% participate in two hobbies and 55% of respondents reportedly participate in three hobbies. Number of organizations was, for the most part, normally distributed, however, it was slightly positively skewed. The outcome measure (child anxiety; MASC ADI) was normally distributed, and thus the normality assumption was not violated.

Primary Analyses

Three separate hierarchical moderated multiple regression models were conducted, one for each type of activity reported by mothers on the CBCL (number of hobbies, sports, organizations). Number of organizations was dummy coded into three separate variables, with 0

as the comparison group, then regressed as normal. Number of sports and hobbies was dummy coded into two separate variables, with the zero or one activities group as the comparison group, then regressed as normal; participation in zero and one activities were collapsed into one group because of the small number of cases reporting participation in zero sports or hobbies. On the SCL-90-R, the Global Severity Index (GSI) measures overall distress across symptom clusters. Because the SCL-90-R has no broad scale of anxiety, creation of one was necessary for this study to capture anxiety symptomology more continuously and globally. Thus, the mothers' self-reported anxiety was calculated using a new, modified GSI, demonstrated by Starcevic, Bogojevic and Marinkovic (2000). The mean of the total raw score from several subscales on the SCL-90-R (Somatization, Obsessive-Compulsive, Anxiety, and Phobic Anxiety) was entered as the predictor variable. The child's self-reported anxiety, as measured by the MASC ADI T-score was entered as the outcome variable. Each activity type was then entered as a second predictor in step one in each of the models. Subsequently, an interaction term (the product of the activity type and mother's self-reported anxiety) was entered for each model, as an additional predictor in step two of the model. A Bonferroni correction was utilized to adjust for inflation of Type I error ($p < .016$; Curtin & Schulz, 1998).

This study further utilized the Friedrich (1982) z-score method for estimating more accurate standard solutions for multiple regression models with interactions, by converting all variables to z-scores. New standardized scores were then calculated by computing the product of the z-score of the variable and the mean of the variable. Subsequently these scores were regressed as usual; the new unstandardized solution from the output was used as the correct standardized solution. Then, centering of predictors was utilized to protect from causing multicollinearity (Aiken, West, Pitts, Baraldi, & Wurpts, 2013). Regression line graphs were

produced in R Commander to visually analyze the moderation across each level of participation (0, 0/1, 1, 2, and 3); one plot was produced for each level activity (sports, hobbies, and organizations).

A priori diagnostic analyses utilized several statistics to determine the quality of the model. The criteria for acceptable case diagnostics were set based on Field (2009; Standardized Residual= <3 , Average Leverage= $<.078$, Mahalanobis distance= <15 , Cook's D= <1 , DFBeta= $<.1$, DFFit= <1 , Covariance Ratio=1.08-.91). These statistics were considered for outliers and other data points that influence the model more than would be expected for the data. If these statistics determined that the model does not fit the data well, the model may be impacted by a small number of cases and not reflective of the data as a whole. Leverage was considered for certain values thought to be outliers (more than 3 standard deviations from the mean of the outcome variable). Leverage was estimated to observe the influence of the true value over the predicted value and to determine if any specific values carry too much influence over the model. Mahalanobis distance (related to leverage, but on a different scale) was also used to determine the influence of individual cases; it measures the difference from all of the means of all variables. Influential values (a product of leverage and discrepancy) were estimated using Cook's D; this statistic determines which cases, if removed, change the total model significantly.

DFBeta was used to determine the effect on the beta coefficients individually; this determined the effect of individual predictors, while other predictors were held constant. The assumption of generalization illustrates the ability of the conclusions of this model to translate to other samples. When the assumption is not met, the conclusions must be restricted to this sample, and interpret them with caution. To estimate how generalizable this sample is to others, DFFit also was used to determine the difference between the predicted value and the adjusted

predicted value based on the specific sample. DFFit is known as another measure of influence. The Covariance Ratio was produced to further estimate the degree that a specific case influences, specifically, the variance of the regression model. Scatter plots were also used to examine outliers, leverage and influence. Tolerance, another measure of multicollinearity, was also used in this study; when this assumption is violated, estimations of the unique contribution of predictors cannot be determined. Tolerance specifically assesses the relationship among predictors, which was estimated using $1/VIF$ (variance inflation statistic), the reciprocal of tolerance. Case Diagnostics (Standardized residuals, Mahalanobis Distance, Leverage, Cook's D, DFFit, DFBeta, Covariance Ratios) determined that there were no significantly influential outliers. The VIF statistic found no values that suggested violation of the multicollinearity assumption. Lastly, scatter plots were generated displaying the standardized predicted value by the residual; the plots determined that all models were linear, and thus likely to generalize beyond our sample.

Results

Age in years was significantly negatively correlated with number of sports ($r=-.189$; $p=.046$), but with no other variable in the model. Significant differences were also found across ethnicity for number of sports participated in ($p=.009$). Further analysis (e.g., bivariate correlation) found that children who were defined as non-white were significantly less likely to be involved in more sports ($-.279$; $p=.007$). Approximately 15% of the children in this sample defined themselves as non-white.

The relationship between reported number of sports, maternal anxiety, and child anxiety was not significant, however there was a small effect size. For sports, Model 1 (maternal anxiety and number of sports) did not explain a significant proportion of the variance in child anxiety [$F(3, 114)= 2.218, p=.09; R^2=.058$]. For Model 1, mother anxiety ($p=.088$), three sports ($p=.076$), and two ($p=.542$) reported sports were not statistically significant. Model 2 did not explain a significant proportion of the variance and there was no significant F change from Model 1 to Model 2, [$F(5, 112)= 2.161, p=.064; R^2=.092$; see Table 3 for details]. However, for Model 2, three sports alone was a statistically significant predictor of child anxiety ($p=.013$). The relationship between reported number of hobbies, maternal anxiety, and child anxiety was not significant, however there was a small effect size. For hobbies, Model 1 (maternal anxiety and number of hobbies) did not explain a significant proportion of the variance in child anxiety [$F(3, 114)= 2.945, p=.036; R^2=.076$]. For Model 1, mother anxiety ($p=.042$), three hobbies ($p=.021$), and two ($p=.04$) reported hobbies were not statistically significant. Model 2 explained a significant proportion of the variance and but there was not a significant F change from Model 1 to Model 2 (interaction between maternal anxiety and hobbies) [$F(5, 112)= 3.016, p=.01; R^2=.084$; see Table 4 for details].

Table 4: Sports as a Moderator on the Relationship Between Maternal and Child Anxiety

		B	SEB	β	R	R ²	R ² Change
Model 1					.241	.058	.058
	Maternal Anxiety	4.535	2.632	.164			
	Number of Sports=3	-4.865	2.713	-.220			
	Number of Sports=2	-1.934	3.162	-.076			
		B	SEB	β	R	R ²	R ² Change
Model 2					.304	.092	.034
	Maternal Anxiety	2.351	1.109	.196*			
	Number of Sports=3	-7.860	3.119	-			
	Number of Sports=2	-4.583	3.493	.355**			
	Interaction between Sport=3 and Maternal Anxiety	-21.113	11.618	-1.312			
	Interaction between Sport=2 and Maternal Anxiety	-24.503	12.238	-1.201*			

*p<.05 **p<.016

¹ B coefficients are standardized

Table 5: Hobbies as a Moderator on the Relationship Between Maternal and Child Anxiety

		B	SEB	β	R	R ²	R ² Change
Model 1					.275	.076	.076
	Mother Anxiety	5.304	2.582	.192*			
	Number of Hobbies=3	6.655	2.851	.301*			
	Number of Hobbies=2	6.593	3.171	.268*			
Model 2					.354	.125	.050
	Maternal Anxiety	5.693	2.498	.206			
	Number of Hobbies=3	5.752	2.830	.260*			
	Number of Hobbies=2	5.487	3.152	.223			
	Interaction between Hobbies=3 and Maternal Anxiety	15.750	6.413	.925*			
	Interaction between Hobbies=2 and Maternal Anxiety	11.337	7.582	.534			

*p<.05

*p<.016

¹ B coefficients are standardized

Table 6: Organizations as a Moderator on the Relationship Between Maternal and Child Anxiety

		B	SEB	β	R	R ²	R ² Change
Model 1					.166	.020	.020
	Mother Anxiety	4.382	2.695	.159			
	Number of Organizations=3	.285	2.797	-.015			
	Number of Organizations=2						
	Number of Organizations=1	1.010	2.729	.040			
		-.461	3.253	.015			
Model 2					.267	.071	.044
	Mother Anxiety	3.671	2.249	.305			
	Number of Organizations=3	1.084	3.472	.035			
	Number of Organizations=2	1.027	2.737	.041			
	Number of Organizations=1						
		1.088	2.801	.042			
	Interaction between Organizations=3 and Mother Anxiety	-11.933	6.709	-.584			
	Interaction between Organizations=2 and Mother Anxiety	-2.258	6.969	-.107			
	Interaction between Organizations=1 and Mother Anxiety	6.531	9.205	.277			

*p<.05

*p<.016

¹ B coefficients are standardized

For organizations, Model 1 (maternal anxiety and number of organizations) did not explain a significant proportion of the variance in child anxiety [$F(4, 114) = .758, p = .555; R^2 = .028$]. For Model 1, mother anxiety ($p = .102$), three organizations ($p = .887$), two organizations ($p = .712$), and one reported organizations ($p = .919$) were not statistically significant. Model 2 did not explain a significant proportion of the variance and there was no significant F change from Model 1 to Model 2 (interaction between maternal anxiety and organizations) [$F(7, 112) = 1.143, p = .342; R^2 = .071$ see Table 5 for details]. For Model 2, mother anxiety ($p = .061$) and three ($p = .045$) and two ($p = .085$) reported hobbies were not statistically significant. The interactions between three hobbies ($p = .016$) and two hobbies ($p = .138$) and maternal anxiety were not significant. The relationship between reported number of organizations, maternal anxiety, and child anxiety was not significant.

Discussion

Contrary to expectations, the relationship between each reported number of sports, maternal anxiety, and child anxiety was not significant. For sports, Model 1 (maternal anxiety and number of sports) did not explain a significant proportion of the variance in child anxiety. However, while Model 2 (interaction terms) did not explain a significant proportion of the variance and there was no significant F change from Model 1 to Model 2, participation in three sports alone was a significant predictor of Model 2. The relationship between each reported number of hobbies, maternal anxiety, and child anxiety was not significant. For hobbies, Model 1 (maternal anxiety and number of hobbies) did not explain a significant proportion of the variance in child anxiety. Model 2 did explain a significant proportion of the variance, but there was no significant F change from Model 1 to Model 2 for hobbies. For organizations, Model 1 (maternal anxiety and number of organizations) did not explain a significant proportion of the variance in child anxiety. Model 2 did not explain a significant proportion of the variance and there was no significant F change from Model 1 to Model 2 for organizations.

The tables also display beta weights (β) for each variable and each represents the difference between participants that endorsed that category versus the reference group (no or 1 activities for sports and hobbies and no activities for organizations). Further analysis of the beta weights revealed some interesting information about the difference between the variable and the reference group. For sports, children reportedly participating in three sports were, on average, .22 standard deviations lower on the anxiety measure (MASC ADI) than children participating in one or no sports. Children participating in two sports were, on average, .076 standard deviations lower on anxiety than children participating in one or zero sports. For hobbies, children reportedly participating in three hobbies were, on average, .098 standard deviations higher on

child anxiety than children participating in zero or one hobbies. Further, children participating in two hobbies were about .074 standard deviations higher on child anxiety. For the organizations model, children reportedly participating in three organizations were, on average, .035 standard deviations higher on child anxiety than children participating in no organizations. Children participating in two organizations were .041 standard deviations higher on child anxiety than children participating in no organizations. Finally, children reportedly participating in 1 organization were, on average, .042 standard deviations higher on child anxiety than children participating in no organizations. This information somewhat follows with previous research in that children who are active in sports are more likely to have lower scores on internalizing measures (Monshower, 2013; Dimech & Seiler, 2010).

Visual analysis of scatter plots can determine where specific differences are across each activity group and if the differences change across maternal anxiety (rather than “on average”). For sports, children reportedly participating in zero or one had a strong positive linear trend of increasing maternal anxiety and child anxiety. For children participating in two sports, the relationship between maternal and child anxiety was only slightly positive. In fact, this group actually had a stronger moderating effect than three sports. For organizations, visual analysis of the scatter plot also suggested changes in the relationship across level of maternal anxiety. For participation in three organizations compared to all other levels, there was a strong positive linear relationship between child anxiety and maternal anxiety.

For participation in two organizations or zero organizations compared to all other levels, the trend was slightly less positive (compared to participation in three organizations), but still increasing in trend across maternal anxiety and child anxiety compared to all other levels. For one organization compared to all other levels, when maternal anxiety was low, the self-reported

child anxiety was slightly higher compared to other groups. However, as maternal anxiety increased, the level of child anxiety actually had a strong moderating effect. This group had the strongest moderating effect.

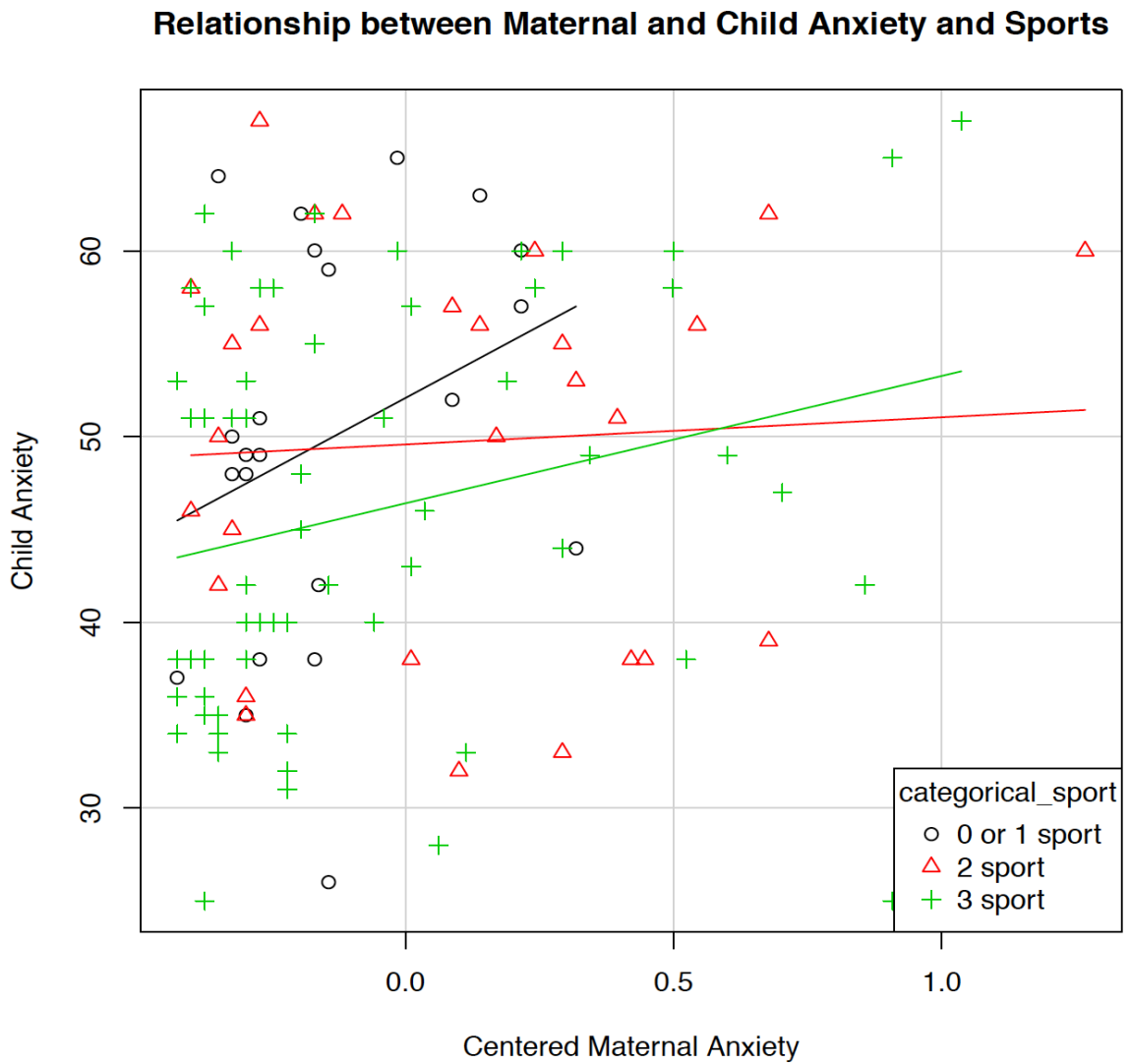


Figure 2. Scatter Plot of Sports as a Moderator on the Relationship Between Maternal and Child Anxiety

Relationship between Maternal and Child Anxiety and Organizations

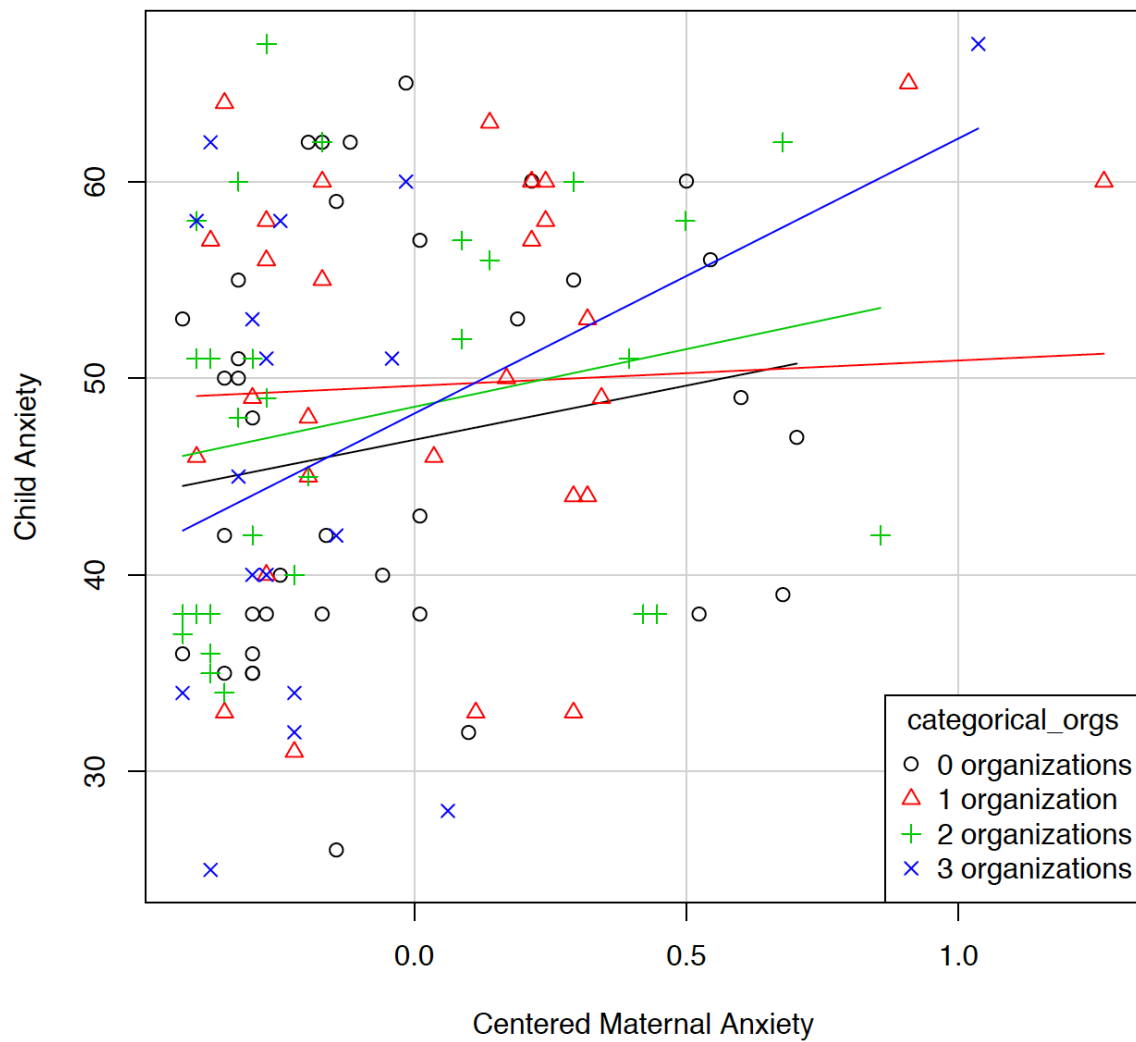


Figure 3. Scatter Plot of Organizations as a Moderator on the Relationship Between Maternal and Child Anxiety

Relationship between Maternal and Child Anxiety and Hobbies

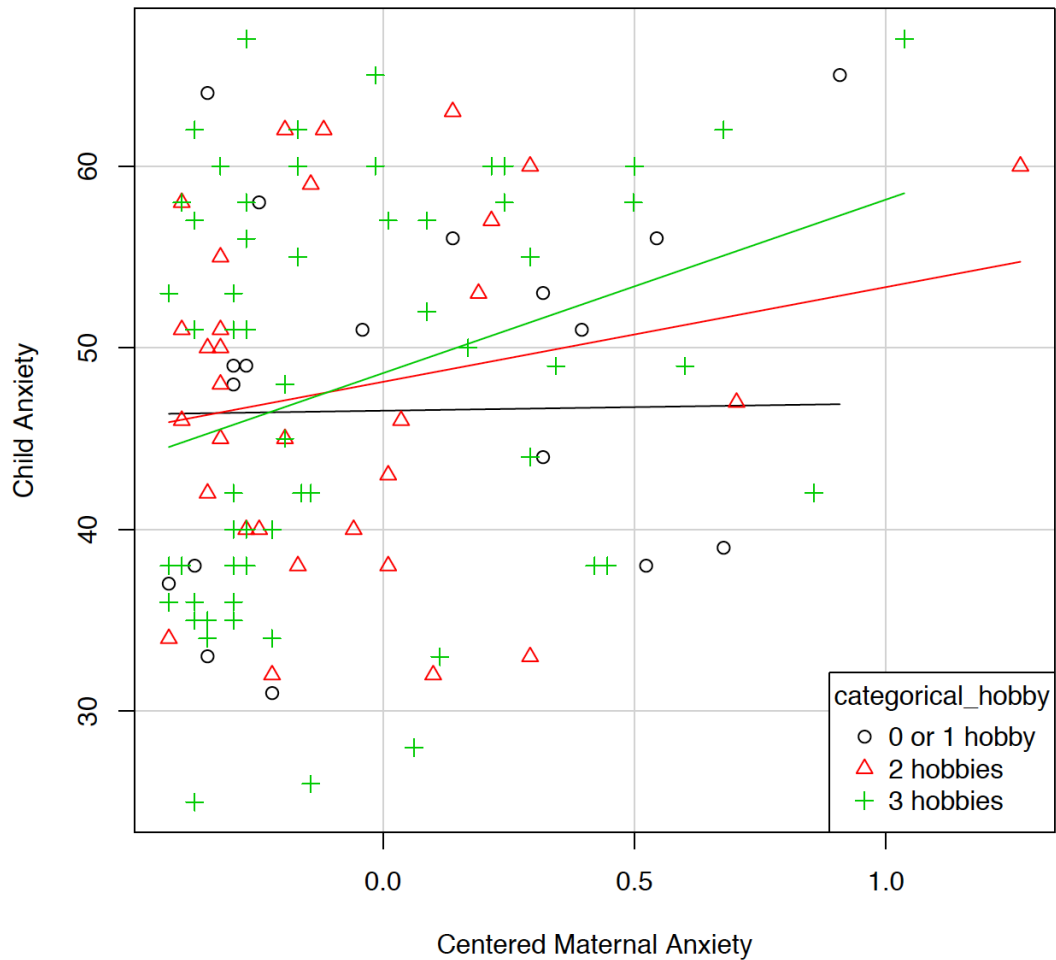


Figure 4. Scatter Plot of Hobbies as a Moderator on the Relationship Between Maternal and Child Anxiety

For hobbies, an unexpected relationship was found. Children participating in three or two hobbies compared to other levels actually had, on average, higher scores on anxiety measures across maternal anxiety compared to children participating in fewer (zero or one) hobbies, across all levels of maternal anxiety. One possible explanation for this finding was that over 50% of mothers reported that their child participates in three hobbies, and the vast majority of mothers reported that their child participates in two or more hobbies. This skewed distribution could

partially explain why this unexpected effect was found. It is also possible that engaging in three or more hobbies on a regular basis significantly increases the amount of stress the child experiences. Engaging in three or more hobbies may result in several of confounding variables influencing anxious symptoms. For example, being unable to perform adequately at all three hobbies, having limited time to engage in other required activities (e.g., homework), reduced unstructured playtime with friends (especially if the hobbies are more solitary), and/or reduced amounts of sleep, may further exacerbate anxious symptoms.

Participation in sports appears to be, relatively, the most potent mitigator of anxiety symptoms overall; this may be due to the activation of biological mechanisms (e.g., endorphins, increased serotonin availability) as well as a likely increase in peer interaction, when compared to participation in hobbies and organizations (Bailey et al., 1993; Jacobs & Fornal, 1993; Steinberg & Sykes, 1985). Overall, however, it seems that more research is necessary to fully determine if general activity participation alone is a predictor of anxiety in children, while controlling for other relevant variables, as existing literature has suggested as a possibility (Fox, 1999; Salmon, 2001; Smits & Otto, 2009). The efficacy that activity level has as a moderator of parental psychopathology and child anxiety should be also further examined.

Data for this sample specifically suggested that the number of activities a child participates in depends on the age of the child, with younger children participating in significantly more sports and hobbies. One reason for this finding could be that younger children are often placed in more extracurricular activities because parents have greater control over the child's environment when the child is younger, compared to when they are older. This finding suggests another possible direction for future research that was not specifically examined in this study. Future research should include factors that are related to a decrease in a child's activity

level longitudinally. Research should further examine if anxious mothers spend less time on child-centered activities when the child is young (e.g., playing at the park with their child) and if chronic maternal anxiety is associated with further decreased activity level in their children as they approach adolescence. If so, the effect of maternal anxiety could exacerbate the child's risk of developing anxious symptoms via decreased extracurricular involvement/withdrawal and access to reinforcing activities. Significant differences were also found across ethnicity for number of sports participated in. Further analysis found that children who were defined as non-whites were significantly less likely to be involved in more sports. Perhaps the limited non-white sample skewed the data or that ethnic minorities truly do participate less in sports due to lack of access or parental limitations. More research is needed to confirm if these relationships (e.g., effects of age and race) extend to other samples, rather than just this one, which was largely dominated by whites and generally younger children. If these findings are replicated, future research should consider these variables as additional variables to be included, as well as investigate theoretical reasons why this relationship might occur. These variables (e.g., race, age) could potentially mediate or moderate the effect of activity level or number of activities on the relationship between maternal and child anxiety, allowing for more variance in this complex relationship to be explained.

This study has several limitations. As indicated by the scatter plot for hobbies, the opposite trend was observed compared to what was hypothesized: children who participated in more hobbies were associated with higher self-reported child anxiety and higher self-reported mother anxiety. On the other hand, children who participated in fewer activities had lower scores on the anxiety self-report measures. Again, since this sample exhibited a skewed distribution in the number of hobbies reported, more research should be done in this area to hypothesize why

the effect was found and if the relationship can be demonstrated by other researchers. Further, the sample for this study included several highly anxious youth because the sample was specifically gathered for the purposes of studying anxious children. Perhaps, this sample was higher in anxiety (as well as hobby participation) than other samples that do not specifically screen for child anxiety. These factors could have biased the results of the models, thus, further research should attempt to use a more representative sample with more equivalent activity level groups and ensure that a similar proportion of those with problems with anxiety has been seen in other clinical/community samples. Also, including only mother-reported hobbies, organizations, and sports may introduce additional confounds, specifically socially desirable responding or subjective responding. Bernstein, Laynea, Egana, and Nelson (2005) found that higher levels of maternal phobic anxiety was significantly correlated with higher levels of parent-reported separation anxiety disorder (SAD) in their children, accounting for 19% of the variance. However, phobic mothers endorsed SAD more than did clinicians, suggesting the possibility of maternal informant bias in this specific study. Research may consider gathering information on fathers' level of anxiety as well, to ensure that participants with high anxiety are not mistakenly categorized as low because only one parent's report was included. Again, while study focused on only maternal anxiety as a predictor of child anxiety, research has shown that, parental psychopathology in general can also lead to problems with anxiety in the children (Drake & Kearney, 2008). Including parental psychopathology in general may make results more easily generalized to real-world situations, and even though this may bring confounds, it would allow researchers to analyze more complex, hierarchical relationships.

Additionally, simply evaluating the number of activities the child participates in leaves many unanswered questions. Thus, these results should be interpreted with caution. For example, information about the number of hours per week the child engaged in the activity and level of physiological arousal (e.g., moderate versus vigorous) during the activity was not available for this study. Previous research has, again, theorized that these variables may be a factor in the efficacy of activity scheduling treatments (Eccles et al., 2003; McHale et al., 2001; Wipfli, Rethorst, & Landers, 2008). Furthermore, the quality and meaningfulness of the activity to the child was not assessed. Waters and Moore (2002) found that adults participating in more meaningful leisure activities experienced less negative impact and psychological distress. Future research should assess if increased meaningfulness of the activity may strengthen the negative relationship between activity participation and anxiety. In sum, the literature should focus on inclusion of more specific information about activity participation and how such variables impact level of anxiety. More longitudinal studies on physical and extracurricular activity should be conducted to determine if and when age, race, parental psychopathology are important in increasing or decreasing activity level, and the impact this has on anxiety. Furthermore, it is important to gain more information as to how long these effects last, if any, and factors that may be impeding or producing a specific response. These studies can provide a more developmental perspective on anxiety disorders and other psychopathologies. Lastly, researchers should continue to attempt randomized-clinical trials, including participants with various psychopathologies and levels of risk for developing psychopathologies (e.g., family history), to further examine the efficacy of activity level as an intervention.

In conclusion, future research should focus on examining activity participation and activity scheduling as a treatment of anxiety more closely to determine its efficacy and effectiveness. Activity scheduling as a treatment component for internalizing problems has many practical qualities. For example, activity scheduling can be individualized to the client, offers diversity, and is cost effective when compared to other alternatives (e.g., pharmacological, extended psychological treatment). Activity scheduling can be implemented immediately and fairly easily by parents and clinicians without training. It is enjoyable for children and their parents and has evidence to support it as a factor to bolster self-esteem, improve peer relationships, and increase academic achievement (Claessens et al., 2015; Gagne et al., 2013; Trapolini et al., 2007). It also gives the child the chance to enjoy a stress-free environment away from family stressors, a factor which may be particularly important for children with anxious parents. Thus, physical and extracurricular activity's many advantages makes its further examination all the more important.

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Vita

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