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THE RELATIONSHIP BETWEEN TEMPERAMENT AND ANXIETY: MATERNAL  
REPRESENTATIONS OF INFANT DISTRESS AS A MODERATOR

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## ABSTRACT

**Background:** Children with behavioral inhibition, a type of temperament, are more likely to develop anxiety later in life and are more likely to have parents with anxiety disorders, but the genetic and environmental mechanisms of this relationship are not well understood. Parental representations of themselves and their children have been examined in relation to attachment. However, parental representations have not been studied in relation to the development of anxiety or temperament in children. In addition, parental representations of infant distress, specifically, have not been studied in any published research to date. This study, using an adoption design, examines the genetic relationship between temperament and anxiety by measuring distress to novelty in children and anxiety in birth mothers. Maternal representations of infant distress are also examined for a moderating influence on the relationship between temperament and anxiety. **Results:** No relationship was found between child distress to novelty and birth mother anxiety. There were significant relationships between adoptive maternal representations of infant distress and child distress to novelty, but these were entirely explained by the interaction between representations of distress (care) and the presence of birth mother anxiety. When there was no birth mother anxiety, adoptive maternal representations of infant distress were not related to child distress to novelty.

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## **Chapter 1**

### **Introduction**

Anxiety is a complex, multi-dimensional disorder with many factors contributing to its etiology, both genetic and environmental. Anxiety in general is at least moderately heritable (Hettema, Neale & Kendler, 2001; Torgersen, 1983; Eley, Bolton, O'Connor, Perrin, Smith & Plomin, 2003) with some variation in the magnitude of genetic influences for each specific anxiety. Specific types of temperament, such as behavioral inhibition, are more likely to develop into anxiety in adulthood (Hirshfeld, Rosenbaum, Biederman, Bolduc, Faraone & Snidman, 1992; Kagan, Reznick & Snidman, 1987, Kagan & Snidman, 1991; Biederman et al., 1990; Hirshfeld-Becker et al., 2007). Environmental factors likely have a role in the relationship between temperament and anxiety. One possible factor is parental representations of themselves and their children. Previously studied in relation to attachment, these mental representations have not been studied in relation to the development of temperament or anxiety in children (Slade, Grienberger, Bernbach, Levy & Locker, 2005; Benoit, Parker & Zeanah, 1997; Rosenblum, McDonough, Muzik, Miller & Sameroff, 2002; Fonagy, Steele, Morgan, Steele & Higgitt, 1993; van Ijzendoorn, 1995). This study will examine whether maternal representations of infant distress moderate the relationship between parent anxiety and child temperament.

There is some evidence of links between parent internalizing symptoms and child social anxiety. For example, children with social anxiety are more likely to have parents with social anxiety, other anxiety disorders, depression, or an alcohol use disorder (Merikangas, Lieb, Wittchen & Avenevoli, 2003). Some studies suggest that there is a small genetic role in

generalized anxiety disorder (Hettema et al., 2001), while others find no role (Torgersen, 1983).

Both panic disorder and anxiety disorders with comorbid panic attacks have relatively high heritability estimates (Hettema et al., 2001; Torgersen, 1983). Anxiety-related behaviors in children have clear genetic effects, with heritabilities ranging from .39 for separation anxiety, to .50 for general distress and fear, to .64 for shyness/inhibition (Eley et al., 2003). The heritability of anxiety brings into question whether anxiety-related constructs are also genetically related to anxiety.

### **Temperament and anxiety**

Because anxiety symptoms are difficult to assess accurately in young children and infants, many studies examine possible temperamental precursors to anxiety in young children. Temperament remains relatively stable in infancy and childhood and even into adolescence as well as being related to adult personality (Putnam, Ellis & Rothbart, 2001). Relevant to the current report, specific temperamental constructs have been linked with the later development of anxiety symptoms (Kagan & Snidman, 1991; Kagan et al., 1987; Goldsmith & Lemery, 2000). For example, temperamental fearfulness, temperamental shyness, and behavioral inhibition, defined as a shy, quiet, and timid temperament, have been linked to later development of anxiety in a number of studies.

As noted above, children who are behaviorally inhibited during early childhood are at a greater risk for developing anxiety later in development (Hirshfeld et al., 1992; Hirshfeld-Becker et al., 2007; Kagan et al., 1987; Kagan & Snidman, 1991). Children with stable and high levels of behavioral inhibition are more likely to develop anxiety disorders than uninhibited children or children who become less inhibited as they age (Hirshfeld et al., 1992; Biederman et al., 1990).

Specifically, 4-year-old children and 6-year-old children assessed as behaviorally inhibited were more likely to have social anxiety five years after the initial assessment (Hirshfeld-Becker et al., 2007). Therefore, there is a relationship between inhibited temperament and anxiety later in life.

The links between behavioral inhibition during childhood and the later development of anxiety may be due, in part, to genetic influences on both constructs. A number of studies have found an intergenerational pattern of associations with a correlation between anxiety disorders in parents and behavioral inhibition in children (Hirshfeld et al., 1992; Rosenbaum et al., 1998; Rosenbaum et al., 1991). For example, children of parents with panic disorder with agoraphobia had higher rates of behavioral inhibition than the control group, with older children showing the strongest relationship (Rosenbaum et al., 1998). Parents of behaviorally inhibited children were also more likely to have multiple anxiety disorders and have had anxiety disorders in their childhoods (Rosenbaum et al., 1991).

What is not clear from this work, however, is how genes and environments may be operating. Specifically, when biological parents are rearing their biological child, there is no way to disentangle genetic from rearing environmental effects. The intergenerational transmission that has been found for anxiety may be due to parents and children sharing genes for anxiety, to parents rearing their children in a particular way that increases a child's risk of developing anxiety via environmental pathways, or to a general parenting environment that increases the risk for anxiety in children. It is also possible that all of these factors may contribute. A behaviorally inhibited child may elicit more protective parenting or more aggression in their siblings, which could therefore increase the child's fear of the unfamiliar.

Many studies support the role of environmental factors in the development of both anxiety and temperament (Hettema et al., 2001; Goldsmith & Lemery, 2000; Eley et al., 2003).

Estimated heritabilities for anxiety disorders are a modest 30-40%, which is lower than heritabilities for disorders like schizophrenia or bipolar disorder and leaves plenty of room for environmental effects (Hettema et al., 2001). Twin studies have attempted to distinguish between environmental and genetic effects in anxiety and temperament. Both shared environmental (nongenetic influences that increase similarity in family members) and non-shared environmental influences (nongenetic influences that account for differences in family members) explain small portions of the variance in child separation anxiety and anxiety-related behaviors such as general distress (Eley et al., 2003). Shared environmental influences are large for temperamental shyness in young children and genetic influences are modest, while in older children genetic influences are larger and shared environmental influences are smaller (Goldsmith & Lemery, 2000). The relationship between symptoms of generalized anxiety disorder and temperament can be explained more by genetic factors than environmental factors, whereas the correlation between separation anxiety and temperament is largely due to a shared environmental effect (Goldsmith & Lemery, 2000). As shown in the literature, there is no clear mechanism yet behind the relationship between anxiety-related temperament and anxiety.

### **Parenting Effects on the Development of Temperament and Anxiety**

Parenting has been found to be a key factor in the development of anxiety. Negative parenting, in general, is slightly related to increased childhood anxiety and accounts for approximately 4% of the variance in childhood anxiety (McLeod, Wood & Weisz, 2007). More specifically, higher levels of parental withdrawal, aversiveness, overinvolvement, overprotection, rejection, and control are associated with more child anxiety (McLeod et al., 2007; Merikangas



et al., 2003). On the other hand, parental warmth and autonomy-granting are associated with less childhood anxiety (McLeod et al., 2007).

Parenting beliefs may affect both child temperament and anxiety. Child temperament is related to compromised parent self-efficacy (Coleman, Trent, Bryan, King, Rogers & Nazir, 2002). Children with difficult temperaments are more likely to have parents with low parenting self-efficacy and negative parenting behaviors (Coleman et al., 2002). Parents of children with separation anxiety disorder also have lower parenting self-efficacy (Herren, In-Albon & Schneider, 2013). In addition, parents of children with separation anxiety disorder and social phobia have more dysfunctional beliefs, such as catastrophizing, related to child anxiety (Herren et al., 2013). However, the directions of these relationships are unclear. For example, parenting behaviors resulting from dysfunctional beliefs and low self-efficacy may contribute to children's anxiety. On the other hand, parents of anxious children or children with difficult temperaments may feel that they are not good parents, resulting in lower self-efficacy.

### **Parental Representations of Themselves and their Infants**

Parental representations are a specific parenting construct that may affect children's development and the parent-child relationship. A mother's representation of her child is comprised of what she thinks of her child as a person as well as what she thinks of herself as a parent, among other factors. This representation changes with time, both during and after pregnancy and as the child reaches developmental milestones (Stern, 1991). These mental representations have been found to affect parenting behaviors as well as the parent-child relationship and the child's emotional regulation (Stern, 1991; Fonagy et al., 1993; Rosenblum et al., 2002).

Maternal representations of her child have been found to be related to the child's attachment. Higher maternal reflective functioning, defined as a greater ability to understand the intentions and feelings behind the child's mental states and resulting behaviors, is associated with secure attachment in children (Slade et al., 2005). Infants' secure attachment is also related to accurate, flexible maternal representations of the infant (Benoit et al., 1997). Children of mothers less able to understand their child's mental states are more likely to be insecurely attached, with mothers of resistant and disorganized children having the lowest levels of reflective functioning (Slade et al., 2005). Maternal representations are clearly linked to the mother-child attachment relationship.

Maternal representations of her children are also related to her children's abilities to regulate their own emotions (Rosenblum et al., 2002). During the Still Face procedure, infants of mothers with disengaged or distorted representations – defined by rejection of the infant's needs and confusion about the infant, respectively – showed less positive affect and consistently displayed more negative affect than infants of mothers with balanced representations (Rosenblum et al., 2002). In other words, joyful and happy maternal representations of the mother-child relationship were associated with less child anger, whereas angry maternal representations were related to greater child anger (Feldman, Dollberg & Nadam, 2011). However, this association was moderated by maternal behavior – mothers with positive representations of their relationship with their child had more positive behaviors, which were related to less child anger. The connections between maternal representations and the attachment relationship and child emotional development are well-established, but the link to other areas of child development are less understood.

The current study specifically examines maternal representations of infant distress, an area that has not been researched. However, infant distress in general has been studied in relation to mother's behavioral responses and to the mother-child attachment relationship (Bell & Ainsworth, 1972; van Ijzendoorn & Hubbard, 2000). A common maternal response to a crying infant is to pick up the baby, which serves to reinforce the attachment relationship between mother and child (Bell & Ainsworth, 1972). Prompt responses to infant's crying are related to more crying in the first year of life as well as insecure-avoidant attachment relationships, possibly because this quick response overstimulates the child and does not allow him to regulate his own negative emotions (van Ijzendoorn & Hubbard, 2000). Though behavioral responses to infant distress are well understood, a mother's mental response – her mental representation – has not been studied.

There is a gap in the research concerning maternal representations of infant distress and whether they have an effect on the relationship between temperament and anxiety. This study, by using a parent-offspring adoption design including adopted children, their birth mothers and their adoptive mothers, can help to clarify how genes and environments contribute to the link between child temperament and anxiety, as well examine if maternal representations are an environmental factor moderating that relationship.

#### Hypotheses:

- Anxiety in birth mothers will be positively correlated with distress to novelty temperament in adopted children
- More negative adoptive mother representations of infant distress will be correlated with increased distress to novelty in adopted children

- Children who have both birth mothers with anxiety and adoptive mothers with negative representations of infant distress will have the highest levels of distress to novelty

## Chapter 2

### Methods

#### Participants

The Early Growth and Development Study (EGDS) is comprised of 561 sets of adopted children, their adoptive parents, and their birth parents (Leve et al., 2013). Infants in the study were adopted by nonrelatives within three months after birth. The median age at which children were adopted was 2 days ( $SD = 12.45$ ; range = 0-91 days). This study used data from Cohort II only, which has a sample size of 200 families. The analytic sample included 183 linked families who had complete data for all participants on all of the measures used (children, adoptive mothers, and birth mothers). Because the focus of the study is on maternal representations only, data from birth mothers and adoptive mothers were used.

#### Measures

##### *Birth Mother Anxiety*

The presence or absence of anxiety in birth mothers was measured using the Composite International Diagnostic Interview (CIDI) – Long Form (Kessler & Üstün, 2004). A composite variable combined data for meeting lifetime criteria for social phobia, agoraphobia, generalized anxiety disorder and separation anxiety disorder. The data were scored on a 0-1 scale, with 1 being any of the above disorders were present in the birth mother and 0 being no anxiety present.

### *Child Temperament*

The adopted child's temperament was assessed with the Infant Behavior Questionnaire (IBQ; Rothbart, 1981) ( $\alpha = 0.87$ ). The IBQ is used to measure temperament in infants ages three to 12 months. Adoptive mothers filled out the questionnaire when the child was nine months old. This study focused specifically on fear temperament in children, called distress to novelty in the IBQ. Distress to novelty is defined as an infant having distressed or startled reactions to changes in stimulation and new physical objects or social stimuli, as well as showing an inhibited approach to novelty. Adoptive mothers ranked their child's distress to novel stimuli on a 6 point scale, ranging from "never" to "almost always." High scores represent greater distress to novelty.

### *Maternal Representations of Infant Distress*

Adoptive mother's representations of their infant's distress were measured when the adopted children were nine months old using a newly developed questionnaire (Woodhouse, Rodenberg, Halcrow & Cassidy, 2005; Woodhouse & Cassidy, 2008). This measure consisted of 25 items rated on a five-point scale, ranging from "disagree strongly" to "agree strongly." These items reflect what mothers think their infants would be saying about them—such as, "Mommy, I'm mad at you," or "Mommy, I'm trying to make your life difficult"—during a period where the infant was crying for a long time without settling down.

There are three factors of the Parental Representations of Infant Distress measure – willful, critical, and asks for/appreciates care. Higher scores on items related to representations of the infant as willful, such as "Mommy, I'm trying to be difficult," imply that the mother thought the baby was deliberately being difficult ( $\alpha = .84$ ). Mothers who had higher scores on items related to representations of the child as critical, for example, "Mommy, I wish you were a

better mom,” believed the child to be critical and disapproving of their parenting ( $\alpha = .80$ ).

Mothers who see their child as the perfect baby who appreciates what they do had higher scores on items related to representations of the child as asking for/appreciating care ( $\alpha = .70$ ). A sample asks for/appreciates care item is “Mommy, even though I’m upset, you’re helping me.”

### **Data Analysis**

Data analyses were conducted to examine genetic (birth mother anxiety), environmental (adoptive maternal representations of infant distress), and gene x environment (GxE) interaction effects on child temperament (distress to novel stimuli). Two multiple regression analyses were conducted in SPSS. The first model analyzed the main genetic and environmental effects – birth mother anxiety, adoptive maternal representations of infant distress (critical), adoptive maternal representations of infant distress (willful), and adoptive maternal representations of infant distress (care). The second model added in the GxE interaction effect. Lastly, a post-hoc analysis determined the direction of a relationship between genetic and environmental factors.

## Chapter 3

### Results

Table 1 shows the results from the regression predicting child distress to novelty from birth mother anxiety and the three factors of adoptive mother representations of infant distress ( $F_{4, 153} = 2.743, p < 0.05$ ). A significant association was found between AM representations of infant distress (care) and child distress to novelty ( $\beta = .17, p < 0.05$ ). A significant association was also found between AM representations of infant distress (willful) and child distress to novelty ( $\beta = .18, p < 0.05$ ). There was no significant association between BM anxiety and child distress to novelty, indicating no direct genetic influences on child distress to novelty from BM anxiety.

Table 2 shows the results after the addition of the gene-by-environment interaction effects to the model ( $F_{7, 150} = 2.144, p < 0.05$ ). None of the covariates from the first analysis remained significant. The relationship between child distress to novelty and both AM representations of infant distress (willful) and AM representations of infant distress (care) were no longer significant. The interaction between BM anxiety and AM representations of infant distress (care) significantly predicts child distress to novelty and entirely explains the previous relationship between AM representations of infant distress (care) and child distress to novelty ( $\beta = .21, p = 0.05$ ).

A post-hoc analysis determined the direction of the GxE interaction (Figure 1). Frequencies were entered into the regression equation to predict scores for child distress to novelty. A higher score on the care factor of Parental Representations of Infant Distress,



indicating stronger representations, interacted with the presence of BM anxiety to predict higher levels of child distress to novelty. When the birth mother had no anxiety disorders, AM representations of infant distress (care) were not related to child distress to novelty.

## Chapter 4

### Discussion

The purpose of this study was to examine the potential relationship between child distress to novelty and birth parent anxiety and whether adoptive maternal representations of infant distress moderate that relationship. Contrary to expectations, no genetic relationship was found between distress to novelty and anxiety. However, as predicted, birth mother anxiety and adoptive maternal representations of infant distress did interact to relate to higher levels of child distress to novelty.

The first finding of this study shows that maternal representations of the child as being critical of them are related to distress to novelty temperament in the child. Parents may interpret their children's distress to novel stimuli as criticism of their parenting. On the other hand, children may have a fear of new stimuli because the parents' representations of their children as critical may affect their parenting behaviors. They may act more harshly and negatively toward the child, causing him or her to be more fearful of the unexpected.

Maternal representations of their child as appreciating care were also related to distress to novelty in children. The mothers' expectations of their child to appreciate them may elicit the distress to new stimuli in the children, likely through a moderating factor of parenting behavior. When parents' high expectations are violated, they may become angry or disappointed and treat the child accordingly. Children may react to potentially unstable parenting by becoming more fearful of novelty.

However, previous research shows that children of mothers who perceive them in a highly positive way in fact behave more positively four months later (Pauli-Pott, Mertesacker, Bade, Haverkock & Beckmann, 2003). According to this research, children whose mothers see

them as more positive would be more likely to have positive emotional reactions later in life, rather than showing distress to novelty. Another potential explanation of the relationship between child distress to novelty and maternal representations of the infant as appreciating care is that children with a distress to novelty temperament may be more likely to be seen as the perfect child by their parents. Parents may not view the distress as a negative or may feel that a child who is distressed more often appreciates their care more than a child who is not as distressed by new stimuli.

This study found no relationship between child distress to novelty and birth mother anxiety, suggesting that there is no genetic link between the two. Previous research found that behaviorally inhibited children, a temperament measure similar to distress to novelty, were more likely to have anxious parents (Biederman et al., 1990; Hirshfeld et al., 1992; Hirshfeld-Becker et al., 2007; Kagan et al., 1987; Kagan & Snidman, 1991). However, the present study's finding does not contradict with the literature – previous studies were with birth parents and birth children, while this study separated the genetic and the environmental effects. The addition of the current finding that child distress to novelty is not related to birth parent anxiety suggests that the relationship between these two factors is more environmental than genetic.

The main finding of this study is that the interaction between birth mother anxiety and the level of adoptive maternal representations of infant distress predicts the level of child distress to novelty. This finding entirely explains the relationship between maternal representations of their infant as appreciating care and child distress to novelty, suggesting that there is no direct effect of this maternal representation on child distress to novelty. Instead, stronger adoptive maternal representations of the child as appreciating care and the presence of birth mother anxiety affect each other to be associated with greater child distress to novelty.

This could potentially be an evocative gene-environment correlation – a child has a genetic predisposition to anxiety and anxiety-related behaviors, causing their adoptive parents to have more representations of the child as appreciating care. The adoptive mother may perceive the child as more anxious, either because of the child's genetic predisposition or because of knowledge of the birth mother's anxiety, believe the child needs more care, and believe the child, when distressed, asks for their care and appreciates it to a greater extent than if the child did not have a birth mother with anxiety.

This study has several limitations. First, adoptive mother anxiety was not examined. The association between adoptive mother representations of infant distress and child distress to novelty could be due to an environmental transfer of the adoptive mother's anxious behaviors. Second, the sample size, though larger than that of several previous studies examining child temperament and parent anxiety (Rosenbaum et al., 1988; Biederman et al., 1990; Rosenbaum et al., 1992; Hirshfeld et al., 1992), was still relatively small. In addition, parenting behaviors that likely moderate the relationship between maternal representations of infant distress and child temperament were not examined. Finally, with such a tentative link between temperament and anxiety in previous research, examining the moderation of maternal representations of infant distress on the relationship between birth parent anxiety and child anxiety, rather than child temperament, may be a more direct way to assess the links with child anxiety. However, at the time of data analyses, the children were too young for accurate measures of anxiety.

Despite these limitations, the present study adds to the research on the links between child temperament and parental anxiety. These results suggest that genes and environments operate together to influence child temperament. In addition, this study not only examines a relatively new and unstudied measure, Parental Representations of Infant Distress, but it shows

that a mother's representations of her child when he or she is distressed could be related to child development at a very early stage. Further research that examines the effect of maternal representations of infant distress on parenting behaviors and on other aspects of child development would do more to bring the importance of those representations to light.

## Tables and Figures

**Table 1**

*Regression Model Predicting Child Distress to Novelty from BM Anxiety as Genetic Risk and AM Representations of Infant Distress as Environmental Risk*

Variable	$\beta$	<i>SE</i>	<i>p</i>
BM Anxiety	.07	.10	.37
AM Representations of Infant Distress – Care	.17*	.05	.037
AM Representations of Infant Distress – Willful	.18*	.05	.041
AM Representations of Infant Distress – Critical	.10	.05	.27

\* $p < .05$ , \*\* $p < .01$

**Table 2**

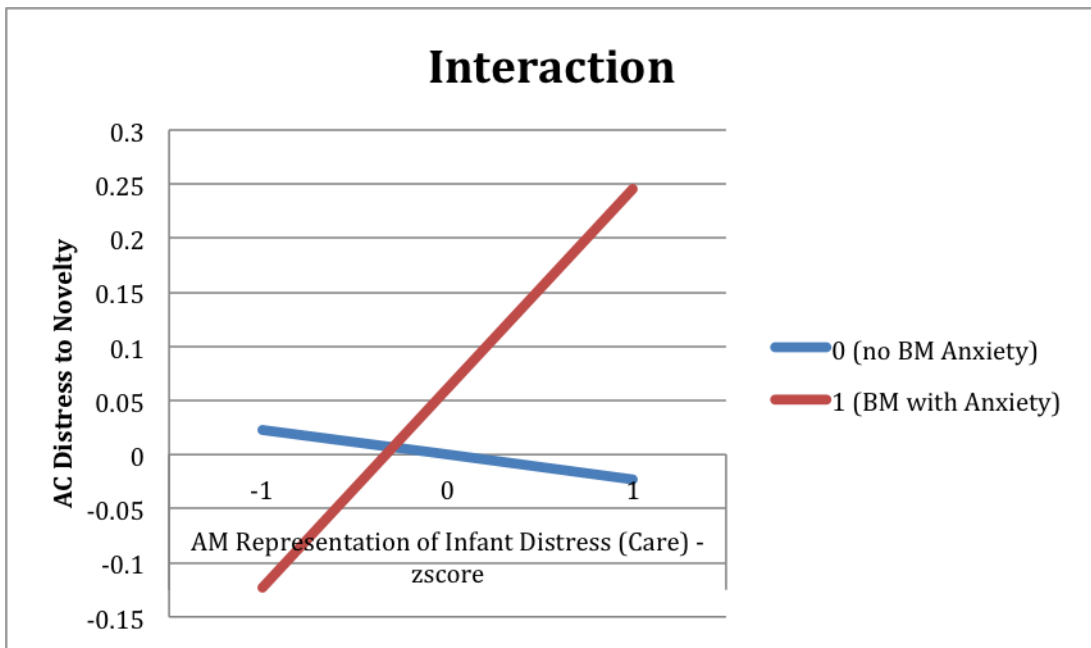
*Regression Model Showing the Interaction Effects of BM Anxiety and AM Representations of Infant Distress on Child Distress to Novelty*

Variable	$\beta$	SE	p
BM Anxiety x AM Representations (Willful)	0	.12	1.0
BM Anxiety x AM Representations (Critical)	.10	.12	.41
BM Anxiety x AM Representations (Care)	.21*	.10	.05
BM Anxiety	.07	.10	.37
AM Representations of Infant Distress – Willful	.15	.06	.15
AM Representations of Infant Distress – Critical	.05	.07	.66
AM Representations of Infant Distress – Care	.04	.06	.72

\*p<.05, \*\*p<.01

**Figure 1**

*Effect of the Interaction between BM Anxiety Presence and Level of AM Representations of Distress (Care) on the Level of Child Distress to Novelty*





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Woodhouse, S. S., Rodenberg, M. S., Halcrow, S., & Cassidy, J. (2005). Maternal representations of infant distress: Relations with maternal self-efficacy and perceptions of infant temperament. Poster session presented at the biennial meeting of the Society for Research in Child Development, Atlanta, Georgia.

## ACADEMIC VITA

Julia Shaner  
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### Education

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**Pennsylvania State University – University Park, PA** Expected graduation May 2015  
Schreyer Honors College  
Major: Bachelor of Science in Psychology; focus in Neuroscience  
Minor: Biology

**Central Bucks High School South – Warrington, PA** 2008-2011

### Honors & Scholarships

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Dean's List 2011-present  
    Pennsylvania State University

Miles Killmer Scholarship 2011-present  
    Schreyer Honors College

Academic Excellence Scholarship 2011-present  
    Schreyer Honors College

Society of Women Engineers Certificate of Merit in Science and Mathematics 2011  
    Central Bucks High School South

English Department Award 2011  
    Central Bucks High School South

Bryn Mawr College President's Book Award 2010  
    Central Bucks High School South

### Research Experience

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**Research Assistant** August 2013-present  
    Pennsylvania State University  
    Department of Psychology  
    Early Growth and Development Study

#### **Responsibilities:**

Code observational videos; train new research assistants in the coding system and computer program; attend weekly lab meetings; present thesis findings

## **Volunteer Experience**

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**Endoscopy Department Volunteer** November 2014-present  
Mount Nittany Medical Center

**Responsibilities:**

Transport patients; assist nurses; deliver samples to histology lab; clean beds; restock shelves

**Guest Services Volunteer** September 2014-November 2014  
Mount Nittany Medical Center

**Responsibilities:**

Escort patients to different areas of the hospital

**Member of Springfield FTK benefitting Penn State Dance Marathon** 2011-present  
Pennsylvania State University

**Responsibilities:**

Raise money for the Four Diamonds Fund; Organize activities and fundraisers

## **Work Experience**

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**Research Assistant** June 2014-present  
Pennsylvania State University  
Department of Psychology  
Early Growth and Development Study

**Responsibilities:**

Code observational videos; train new research assistants in the coding system and computer program

**Intern** 2010-present  
Millennium Medical Education Resources

**Responsibilities:**

Put relevant information from online medical textbooks into brochures for pharmaceutical clients; manage Amazon sale of textbooks; flag textbooks for relevant drug names and information; organize and digitize financial records; research current and potential pharmaceutical products to increase client base