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Early-Emerging Behavioral Inhibition: Contextual and Sex Differences in Linkages with Anxiety Vulnerability

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Abstract

The current study was designed to examine behavioral inhibition (BI) as a risk factor for anxiety disorders and to investigate whether contextual and sex differences moderate the association between BI and anxiety risk. Childhood BI was assessed in a sample of 409 3-year-old children (200 boys, M_{age} = 3.43, SD = .30) using standardized laboratory observations. Parental history of anxiety was assessed using semi-structured clinical interviews. In multivariate models, childhood BI was associated with a maternal history of social anxiety disorder (SAD). Gender was found to moderate the association between BI and maternal history of SAD, as boys', but not girls', BI increased with a maternal SAD history. This relationship was found only when BI was assessed in the context of nonsocial stimuli.

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Early-Emerging Behavioral Inhibition: Contextual and Sex Differences in Linkages with

Anxiety Vulnerability

The construct known as *temperament* can be used to describe the early emerging patterns of behavioral and emotional expression that are stable across time and situations (Thomas, Chess & Birch, 1968; Hayden et al., 2005). Temperament has been explored as a predictor of both normal and abnormal development (Clark & Watson, 1999; Hayden et al., 2005), making it a construct of interest to childhood risk studies for the later development of psychopathology. The temperamental facet known as behavioral inhibition (BI) is of particular interest to researchers investigating internalizing disorders, as BI has been suggested to be a predisposing developmental marker of anxiety and possibly depression (Durbin et al., 2005; Rosenbaum et al., 2000). However, a gap within the BI and anxiety literature currently exists in regard to understanding more specific details needed to create developmental risk profiles for young children. For example, certain assessment contexts may be more relevant to BI as it pertains to anxiety risk, an area that is understood to a lesser degree. In addition to differences in assessment context, sex differences in the magnitude of associations between BI and anxiety disorder risk are not well understood. The current study aims to close the gap within the existing literature, exploring the potential roles that assessment context and sex may play in the association between BI and anxiety risk. Understanding how these variables play a role in the association between BI and anxiety may have important implications in the future development of effective prevention and early intervention strategies for high-risk populations.

The construct of BI refers to an elevated fear response in young children to novelty (Muris et al., 2011; Volbrecht & Goldsmith, 2010), typically examined in social and nonsocial contexts. This response is often expressed through wariness, fear, avoidance, or restrained or low

exploration to unfamiliar people, objects, events, or places (Kagan, 2008). BI has consistently been considered one of the most stable temperamental traits, as longitudinal profiles of children's inhibited behaviors have found that those possessing inhibiting characteristics at a young age are more likely to possess similar characteristics later on (Degnan & Fox, 2007; Fox et al., 2005; Kagan, 2008). Essex and colleagues (2010) conducted a study in support of this finding, examining a community sample of children from birth until grade 9. Using both observational and questionnaire methods, these researchers demonstrated that early levels of BI were significantly associated with high levels of inhibition in adolescence. In addition, BI is moderately heritable, with about 40-70% of the variance accounted for by heritable influences (Hirshfeld-Becker et al., 2004).

In moderation, inhibition can be seen as natural, but in the extreme form, it has the potential to impair functioning. For 3-year-olds, fear of unfamiliar people or places are most often a typical, transient feeling; however, not all experiences of fear, worry and sadness are normative (Marakovitz et al., 2011). Early BI has often been linked with the development of psychopathology, including anxiety (Fox et al., 2005; Rapee et al., 2005; Schwartz et al., 1999), as studies have shown an increased prevalence of anxiety disorders among behaviorally inhibited children (Hirshfeld-Becker et al., 2004). Patterns of anxious behaviors, social withdrawal, negative affect, and lower self esteem are often reported as characteristic of BI and are also symptoms often used to diagnose certain anxiety disorders (Fox et al., 2005). A previous longitudinal study conducted by Beiderman and colleagues (1993) found that children who were initially classified as behaviorally inhibited were more likely to develop anxiety disorders compared to those not initially classified as expressing inhibited behavior. Collectively, previous

research has established BI as an important marker for the later development of anxiety

disorders.

Unlike other temperamental research, work on BI has relied less on questionnaire data

and more on behavioral observation (Aktar et al., 2013; Muris et al., 2011; Olino et al., 2010;

Volbrecht & Goldsmith 2010). This is important, as observational methods allow for direct

access to the social phenomenon under consideration. In addition, numerous limitations have

begun to arise in regards to temperamental research relying solely upon self-report

questionnaires and parental reports. For example, using self-report questionnaires with young

participants may be difficult, especially if surveys are too complicated for young children to

complete (Muris et al., 2011). Furthermore, parental reports of temperament have raised

concerns of shared method variance, and demonstrate only moderate correlations with ratings of

behavioral observations (Emde, Hewitt & Kagan, 2001; Muris et al., 2011). Lastly, several

unique influences on parental descriptions of children's behaviors are absent when standardized

observational assessments occur, including parent personality, parental expectations and biases,

as well as representations of the child's behavior (Emde, Hewitt & Kagan, 2001). The absence of

these influences makes observational measures advantageous, as they are not contaminated by

the preceding circumstances. As a result, behavioral descriptions have become part of the

multimodal method of choice, obtaining data through well-rounded approaches of behavioral

observations and questionnaire methods, including parent reports (Essex et al., 2010; Durbin et

al., 2005; Hayden et al., 2005; Volbrecht & Goldsmith, 2010). Episodes from the Laboratory

Temperament Assessment Battery (Lab-TAB) created by Goldsmith, Reilley, Lemery, Longley

and Prescott (1995) are often used to assess child temperament, as the battery involves

standardized tasks that selectively elicit a range of temperament-relevant behaviors including

inhibitory control, distress, and BI (Hayden et al., 2005; Olino et al., 2010; Volbrecht &

Goldsmith, 2010).

Risk Markers and Anxiety

As previously mentioned, BI is a risk marker for the later onset of anxiety disorders (Fox

et al., 2005; Rapee et al., 2005; Schartz et al., 1999). Identifying vulnerability markers is a key

component in effectively implementing early prevention and intervention strategies.

Vulnerability factors are characterized as inherited or derived from conditions existing prenatally

or during the early years of life, which render a child susceptible to psychopathology following

particular experiences (Kagan, 2008). Risk markers can involve a combination of biological

vulnerabilities and untoward experiences, increasing the probability children will develop

behaviors or emotions that will interfere with one's competence for expected responsibilities. In

order to do so successfully, risk markers must be identified before the onset of a disorder,

making it ideal to determine vulnerabilities in young children (Kagan, 2008).

In order to further validate BI as a risk marker for anxiety disorders, there is a need for

researchers to conduct longitudinal investigations. However, an alternative and less time-

consuming approach involves linking BI with established risk markers for disorder. Within the

current research, the additional risk marker of interest is parental history of anxiety disorder.

Family history is a very well established marker for risk of anxiety, and may reflect both genetic

vulnerabilities as well as environmental risks (Dougherty et al., 2013; Marokovitz et al., 2011;

Rapee, Schniering, & Hudson, 2009). Children whose parents have an anxiety disorder are at

increased risk for developing internalizing problems themselves, with some research indicating

as much as a seven-fold increase in the likelihood of developing anxiety disorders (Turner,

Beidel, & Costello, 1987). Numerous explanations for this association have been presented

within the literature, including poor parental coping skills (Volbrecht & Goldsmith, 2010), children modeling parental behaviors (Hudson et al., 2011), and intrusive or overprotective behaviors (Rubin et al., 2009). Kagan (2008) specified inhibited children are more likely to be born into families in which one or both parents have or previously had an anxiety disorder. More specifically, there is further evidence demonstrating that behaviorally inhibited children who additionally have parents suffering from an anxiety disorder are most vulnerable to develop anxiety disorders (Rosenbaum et al., 2000).

Aktar, Majdandzic, de Vente, and Bogels (2013) recently explored this relationship between BI and parental history of anxiety using structured clinical interviews and observational methods in 122 infants. Aktar and colleagues (2013) particularly looked at the early influences of parental anxiety, expecting 12-month-old infants to show more fear or avoidance if they were highly behaviorally inhibited or if their parents had a lifetime anxiety disorder. Results indicated a significant association between expressed parental anxiety and high infant BI, suggesting infants may be differentially susceptible to anxious parental rearing based on their levels of inhibited behavior. Additionally, Aktar and colleagues found infant fear, but not avoidance, was predicted by infant BI, providing support for the role of the early temperamental trait in the acquisition and learning of fear. However, the presented study did have some limitations; for example, having infant participants made the investigation of gender differences unobtainable, as previous research has concluded that the youngest age sex differences are found within BI is around 3-years-old (Carter et al., 2003; Olino et al., 2013; Zahn-Waxler, Shircliff, & Marceau, 2007). Lastly, the presented research did not look at the possibility of gender or contextual differences as moderating variables between this relationship. The mechanisms involved in the

relationship between BI and parent anxiety are numerous; however, the purpose of the current study is to initially focus on the existence of a relation instead of its potential explanation.

In summary, parental history of anxiety has been established as a risk marker for the development of anxiety disorders. In addition, previous research has successfully linked child BI to parental psychopathology, suggesting children of parents with a history of anxiety disorders are more likely to have higher ratings of BI in comparison to children of parents without anxiety disorders. However, although a parental history of anxiety marks children's risk for anxiety disorders, not all children of an anxious parent will develop the disorder; researchers must look at additional features in order to better understand risk and apply the needed intervention strategies (Perez-Edgar & Fox, 2005). The current study was interested in determining if child sex plays a role within BI and anxiety risk in order to develop a more detailed risk profile for young children. In addition, the current research was interested in determining if certain task types may be more relevant to BI as it pertains to anxiety risk.

Gender as a Moderator for BI and Anxiety Risk

The literature on preschool gender differences in regards to inhibition and anxiety is somewhat mixed, although most research has suggested girls are found to be more fearful and anxious in comparison to boys beginning in preschool (Carter et al., 2003; Roza et al., 2003). Although fear and anxiety are different from BI, these are related constructs, allowing for the broader literature to be discussed within the given context. Meta-analytical research conducted by Else-Quest, Hyde, Goldsmith & Van Hulle (2006) looked to estimate the magnitude of gender differences of temperament in children ages 3 months to 13 years within 260 articles. Previous research up until the last decade has predominantly used parent reports when measuring childhood BI (Else-Quest et al., 2006), and far less is known about gender differences when

assessed using methods other than parent reports. Using three different measurement approaches, behavioral style, criterial, and psychobiological, Else-Quest and colleagues found girls scored slightly higher on measures of fear and discomfort in comparison to boys. However, Else-Quest and colleagues reported patterns of gender differences and similarities in temperament showed little resemblance to patterns of gender differences in adult personality.

Recent research conducted by Olino, Durbin, Klein, Hayden, and Dyson (2013), suggested gender differences in child and adolescent samples might be attributed to methodological issues instead of developmental levels. Using observational methods alongside parental reports, Olino and colleagues found girls consistently demonstrated significantly higher levels of fear in comparison to boys across all three methods, as well as higher levels of sociability for girls in comparison to boys using observational methods. The preceding results were in congruence with Else-Quest and colleagues' (2006) work, despite using different methodological frameworks. In addition, Olino and colleagues (2013) integrated data from three independent community samples and found consistent findings across samples, enhancing the generalizability of their findings.

It should be noted that the current research is not primarily concerned with whether there are sex differences in BI, although this is a possibility. Instead, the interest of the current research is to explore the more complex relationship gender may hold within the association between childhood BI and anxiety in parents. Assessing the role of gender among the relationship between BI and anxiety may allow researchers to narrow the scope in determining which children are at the highest risk for a later onset of anxiety; information that is of high value to clinicians and early interventionists. However, previous inconsistencies encourage the current research to take an exploratory approach pertaining to gender to determine if parental anxiety

and childhood BI are equally related, regardless of the gender of the child. To our knowledge, this particular research interest has yet to be investigated within the literature.

Assessment Context and BI-Anxiety Risk Associations

Previous research has begun to view BI as a specific risk marker for the development of social anxiety, rather than a general vulnerability for all anxiety problems (Biederman, Hieshfeld-Becker, & Rosenbaum, 2001; Essex et al., 2010; Gladstone et al., 2005; Muris et al., 2011). Kagan (2008) suggests social anxiety is especially salient in Western societies such as our own, as unfamiliar settings are frequently encountered and social acceptance is a primary motive. In a longitudinal study assessing previously inhibited adolescents, Schartz and colleagues (1999) found 61% of participants who were inhibited as toddlers reported social anxiety symptoms, compared to 27% of those who were not considered inhibited earlier in life. Muris and colleagues (2011) found similar results, indicating BI predicted social anxiety over time, but failed to predict other anxiety disorders, internalizing problems, or externalizing problems. The given research may then suggest that when looking at associations between risk factors, the relationship may be greater when children are placed within novel social scenarios involving unfamiliar people, in comparison to novel non-social scenarios involving unfamiliar objects, as higher levels of BI may be elicited within unknown social tasks.

The Current Study

The current study was part of an ongoing longitudinal study, with the current study aimed to provide data on the validity of preschool BI and its relation to parental psychopathology as a risk marker for later onset of anxiety disorders. On the basis of previous temperament literature, several hypotheses were tested. First, it was hypothesized that early child BI would be associated with a parental history of anxiety disorders. More specifically, it was expected that children

would have higher levels of BI when a parent had a lifetime history of anxiety disorders in comparison to children of parents with no known anxiety disorders.

Second, the current research looked to investigate the roles of assessment context and child sex within the association between BI and parental history of anxiety. An exploratory approach was used to investigate the role of gender in the association between BI and parental anxiety disorders, as conflicting results in previous literature may lead to a greater association within either gender. As previously mentioned, research conducted by Olino and colleagues (2013) found girls demonstrated both significantly higher levels of sociability and fear in comparison to boys. Such temperamental traits are opposing characteristics in regards to BI, as one would expect a child high in BI to express high levels of fear and lower levels of sociability. Lastly, based on previous research suggesting a significant association with BI and social anxiety disorders, it was expected that tasks involving social novelty would better predict the association between BI and parental anxiety disorders in comparison to novelty within nonsocial contexts.

The current study added to the existing literature in numerous ways. Previous research has often used self-report measures of BI with smaller sample sizes of older children or adolescents. When looking to identify risk factors, it is necessary to do so before the onset of a clinical disorder. When studying older children, it cannot be determined whether temperamental facets predict the onset of the disorder, as the assessment of temperament may be influenced or confounded by current or previous anxiety disorders. In addition, as previously mentioned, using parent-reports for measuring both anxiety and childhood BI leaves room for potential issues of shared method variance. In order to avoid these limitations, the current research used a large community sample of 3-year-old children, an age where clinical diagnoses of anxiety disorders is rare. Structured clinical interviews alongside parental reports and behavioral observation

methods were used in order to attempt to eliminate issues of shared method variance as well as to gain a well-rounded perspective on childhood inhibition and parental anxiety disorders.

Method

Participants

The current study used data previously collected by the Personality and Emotion Development Lab as part of a larger longitudinal study. Participants were a community sample of 201 boys and 208 girls, ranging from 3 years, 0 months to 4 years, 0 months ($M = 3.43$, $SD = .30$), and their primary caregivers. Families were recruited through a development database as well as flyers posted in local preschools, advertisements on community websites, and friend referrals. Children were excluded from participation if they had previously been diagnosed with a psychological or medical condition, as determined by an initial screening process conducted over the phone. Primary caregivers were predominately the child's mother (93%) and were on average 33.53 years old ($SD = 5.07$). Children were mostly Caucasian (90%), and of average cognitive ability ($M = 111.94$, $SD = 14.32$) as determined by the Peabody Picture Vocabulary Test-Fourth Edition (Dunn & Dunn, 2007). Caregivers additionally participated in a clinical interview, which occurred roughly 30 months after the initial laboratory visit as part of the second phase of the longitudinal study. Families received $220.00 as compensation for the initial lab visit and clinical interviews. Parents were additionally reimbursed if they needed childcare for other children in the family to enable participation in the lab visit or if transportation was needed to the laboratory.

Laboratory Assessment of BI

Each child and a primary caregiver visited the Personality and Emotion Development Lab for a 2-hr observational assessment of temperament, which consisted of 12 episodes from the

Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley

& Prescott, 1995). Before completing the Lab-TAB tasks, parents were given a Letter of

Information and signed consent for themselves as well as their child (see Appendix A). Children

were led through the battery by a female graduate-level student and were videotaped from behind

a one-way mirror for future coding. Tasks were specifically ordered in an attempt to prevent

carry-over effects in that no episode was expected to evoke similar responses consecutively.

Each episode was followed by a brief play break in an area separate from the assessment room to

allow the child to return to a baseline state. The child's caregiver was present within the

assessment room for all but two of the episodes, but was instructed to minimize parent-child

interaction. Caregivers were administered questionnaires to complete during the assessment

period in order to further minimize involvement.

Three of the 12 tasks were specifically designed to assess BI and are described in more

detail below; the other tasks in the Lab-TAB were designed to assess additional temperamental

facets and will not be discussed further.

Risk Room. The child played with novel and ambiguous stimuli while the female

experimenter was out of the room. Items included a cloth tunnel, a small staircase followed by a

mattress, a balance beam, a Halloween mask, and a large black box decorated with eyes and

teeth. After roughly 5 minutes of free play, the experimenter returned and asked the child to

touch or play with each object.

Stranger Approach. The child was briefly left alone in the room while the female

experimenter left to look for toys. A male research assistant then entered the room and spoke to

the child in a neutral voice while gradually walking closer. Mothers were not present within the

assessment room for this episode.

Jumping Spider. The female experimenter entered the room with a container that held a life-like spider sitting on a bed of moss. The spider was attached to a wire that, when pushed, caused the spider to jump. The experimenter invited the child to pet the spider, and when doing so, the experimenter made the spider jump.

Coding Procedures. Trained graduate and undergraduate students blind to parents' psychopathology coded the BI tasks. Episodes were divided into 20- or 30-s epochs depending on the nature and length of the task, in which coders rated a series of behavioral and affective codes (Goldsmith, 1995; See Appendix B). Within each epoch, a maximum intensity rating of vocal, facial, and bodily fear was coded on a scale of 0 (*absent*) to 3 (*highly present and salient*). Based on previous research using Lab-TAB episodes (Durbin et al., 2005; Olino et al., 2010; Olino et al., 2013), two BI scales were created. In the first, which tapped BI in a social context, social BI ($\alpha = .57$) was computed as the average standardized ratings of the following: latency to fear (reversed), latency to vocalize, facial, vocal, and bodily fear, still freezing, approach towards stranger (reversed), gaze aversion, and verbal/nonverbal interaction with the stranger (reversed). BI in a non-social context ($\alpha = .92$) consisted of the average standardized ratings of all or a combination of the following: latency to fear (reversed), latency to vocalize, facial, vocal, and bodily fear, latency to touch objects, total number of objects touched (reversed), tentative play, referencing the parent, proximity to parent, referencing the experimenter, time spent playing (reversed), time spent talking (reversed), approach towards spider, avoidance of spider, gaze aversion, and playing with the spider (reversed). All BI tasks exhibited excellent inter-rater reliability (Stranger Approach ICC = .87, Risk Room ICC = .92, Jumping Spider ICC = .91).

Parental Psychopathology

Children's parents were interviewed using the Structured Clinical Interview for *DSM-IV*, Non-Patient Version (SCID-NP; First, Spitzer, Gibbon & Williams, 1996) roughly 30 months after the initial lab visit. Most of the interviews were conducted over the phone, which has been shown to have similar results as face-to-face interviews (Olino et al., 2010). The SCID is one of the most widely used diagnostic interviews, and its reliability and validity have been well documented (Williams et al., 1992). Interviews were obtained from 392(95.6%) mothers and 387 (94.4%) fathers. When parents were unavailable, information was collected from the available parent using the Family History Research Diagnostic Criteria interview guide (FH-RDC; Andreason, Endicott, Spitzer, & Winokur, 1977). Graduate-level students who were not involved in collecting, and did not have access to data on the children, conducted the interviews.

The current study was particularly interested in parental history of anxiety disorders and data was coded dichotomously; parents reporting a lifetime diagnosis of an anxiety disorder were coded with a 2, while parents with no previous diagnosis were given a coding of 1. Kappa for a diagnosis of specific phobia (SP) was 1.0, whereas the percentage of rater agreement for social anxiety disorder (SAD) was 100%. There were no cases of SAD in the sample that were randomly selected for reliability, making it impossible to calculate kappa. As a result, we report two different statistics for reliability of these two diagnoses.

Of the children, 117 (28.6%) had at least one parent with a lifetime history of an anxiety disorder; 21.5% of mothers and 9.5% of fathers had a lifetime anxiety disorder. Previous studies have suggested BI may be more relevant to higher severity disorders, such as social anxiety disorder (SAD) in comparison to less severe disorders, such as specific phobias (SP; Aktar et al., 2014); thus, we specifically looked at SAD and SP. Twenty-three (6.%) mothers and 14 (4.%) fathers met criteria for SAD, whereas 28 (7%) mothers met criteria for SP. Based on the number

of parents who met the criteria for a lifetime diagnosis of an anxiety disorder, the current

analyses looked at maternal and paternal history of SAD and maternal history of specific phobia

(SP); the number of cases of paternal SP were too small for analyses, and are therefore not

discussed further.

Results

Means, standard deviations, and correlations among all variables including demographic

data are presented in Table 1. Social and nonsocial BI were not significantly correlated with a

parental history of SAD or SP. There was a significant correlation between nonsocial BI scores

and social BI scores, but the correlation was low. In addition, there was a significant correlation

between the age of the child and nonsocial BI, suggesting younger children exhibit higher levels

of BI among nonsocial context tasks, a finding consistent within previous literature (Biederman

et al., 2001). Lastly, gender was significantly correlated with social BI, suggesting girls exhibit

higher levels of BI within social contexts in comparison to boys.

The main analyses examined associations between childhood BI and parental history of

anxiety disorders using multiple regression. Analyses including paternal history of SAD

produced no significant results (see Table 2). There was a significant main effect of child gender

within the social novelty context, as girls exhibited higher levels of BI in comparison to boys

(see Table 3); however, there were no other significant main effects or interactions. Analyses

involving maternal history of social anxiety disorder were found to possess significant main

effects and interactions, and will be the focus of proceeding interpretations (see Table 3).

A significant main effect was found for task context, as higher levels of childhood BI

were associated with maternal history of SAD within nonsocial novelty tasks. A significant main

effect was not found within social novelty tasks. Interestingly, the preceding findings go against

hypotheses involving task context, as it was expected that higher childhood BI would be found under social novelty task contexts.

A significant main effect was found for child gender in regards to BI within the nonsocial novelty task, as girls exhibited higher levels of BI within nonsocial novelty tasks in comparison to boys. Pairwise comparisons indicated a significant difference in levels of BI for boys that have mothers with no lifetime history of social anxiety disorder ($M = -.03$, $SD = .02$) and boys with a mother that has a lifetime social anxiety disorder history ($M = .17$, $SD = .10$, p < .05). In addition, there was a significant difference in levels of BI for boys that have mothers with no lifetime history of a social anxiety disorder ($M = -.03$, $SD = .02$), and girls that have mothers with no lifetime history of social anxiety disorder ($M = .03$, $SD = .02$, $p < .05$). Lastly, there is a difference trending significance between boys with mothers that have a lifetime history of social anxiety disorder ($M = .17$, $SD = .10$) and girls with mothers that have a lifetime history of social anxiety disorder ($M = -.06$, $SD = .07$, $p = .05$).

Gender was found to moderate the association between childhood BI within the nonsocial novelty context and maternal SAD history; boys exhibited higher levels of BI within the nonsocial task context when there was a maternal history of SAD in comparison to boys of mothers with no known SAD history. However, for girls, there was no significant association between BI and maternal SAD history (see Figure 1). It is worth nothing there was additionally a significant increment added by this interaction predicting nonsocial BI.

Table 1

Bivariate Correlations of Demographic Data, Parental Anxiety Disorder History, and Childhood

Behavioral Inhibition

	1	2	3	4	5	6	7	8	9
1. Non-Social BI	-								
2. Social BI	.21*	-							
3. Mat. SAD	.02	-.04	-						
4. Mat. SP	.06	.03	.02	-					
5. Pat. SAD	.09	-.01	.02	.06	-				
6. Child Gender	.07	.16**	.08	.02	-.06	-			
7. Child Age	-.14**	-.04	-.06	-.03	.05	.06	-		
8. PPVT Score	.01	.00	-.03	.07	-.02	-.07	.05	-	
9. Family Income	.06	.08	-.13*	-.05	-.02	-.02	.06	.11*	-
Mean	-.00	.00	1.06	1.07	1.04	1.51	3.43	112.00	14.05
Standard Deviation	.28	.33	.24	.26	.20	.50	.30	3.73	1.14

** p <.01; * p < .05. *Note:* Mat. SA = Maternal History of Social Anxiety Disorder, Mat. SP = Maternal History of Specific Phobia, Pat. SA = Paternal history of Social Anxiety Disorder, variables 3-5 coded as 1 = no history, 2 = history, Gender coded as 1 = male, 2 = female, PPVT = Peabody Picture Vocabulary Test, Family income coded as 1=<\$20,000; 2=\$20,000–\$40,000; 3=\$40,001–\$70,000; 4=\$70,001–\$100,000; 5=>\$100,001.

Table 2

Multiple Regression Models of Association Between BI, Child Gender, and Paternal SAD History

Variable	Soc BI and Pat SAD			Nonsoc BI and Pat. SAD		
	B	*SE B*	*t*	*B*	*SE B*	*t*
Child Gender	.04	.19	.19	-.05	.17	-.30
Pat Anx	-.11	.26	-.43	.01	.23	.04
Gender X Anx	.08	.18	.45	.09	.16	.56
R^2		.04			.01	
Adjusted R^2		.03			.01	

** p <.01; * p < .05. *Note:* Gender coded as 1 = male, 2 = female, Pat SAD = Paternal history of social anxiety disorder, coded as 1 = no history, 2 = history, Pat Anx = main effect of paternal history of anxiety, specified within column headings.

Table 3

Multiple Regression Models of Association Between BI, Child Gender, and Maternal Anxiety Disorder History

Variable	Soc BI and Mat SAD			Nonsoc BI and Mat. SAD			Soc BI and Mat SP			Nonsoc BI and Mat SP		
	B	*SE B*	*t*	*B*	*SE B*	*t*	*B*	*SE B*	*t*	*B*	*SE B*	*t*
Child Gender	.21	.16	1.32	.35	.13	2.62**	.33	.14	2.33*	.12	.13	.89
Mat Anx	.05	.25	.19	.49	.21	2.31**	.33	.20	1.62	.10	.19	.53
Gender X Anx	-.08	.15	-.54	-.29	.12	-2.35*	-.19	.13	-1.5	-.06	.12	.55
R^2	.04			.02			.04			.01		
R^2 change due to interaction	.00			.01*			.03			.01		

** $p < .01$; * $p < .05$. *Note:* Gender coded as 1 = male, 2 = female, Mat. SAD = Maternal history of social anxiety disorder, Mat. SP = Maternal history of specific phobia, coded as 1 = no history, 2 = history, Anx = main effect of maternal history of anxiety, specified within column headings.
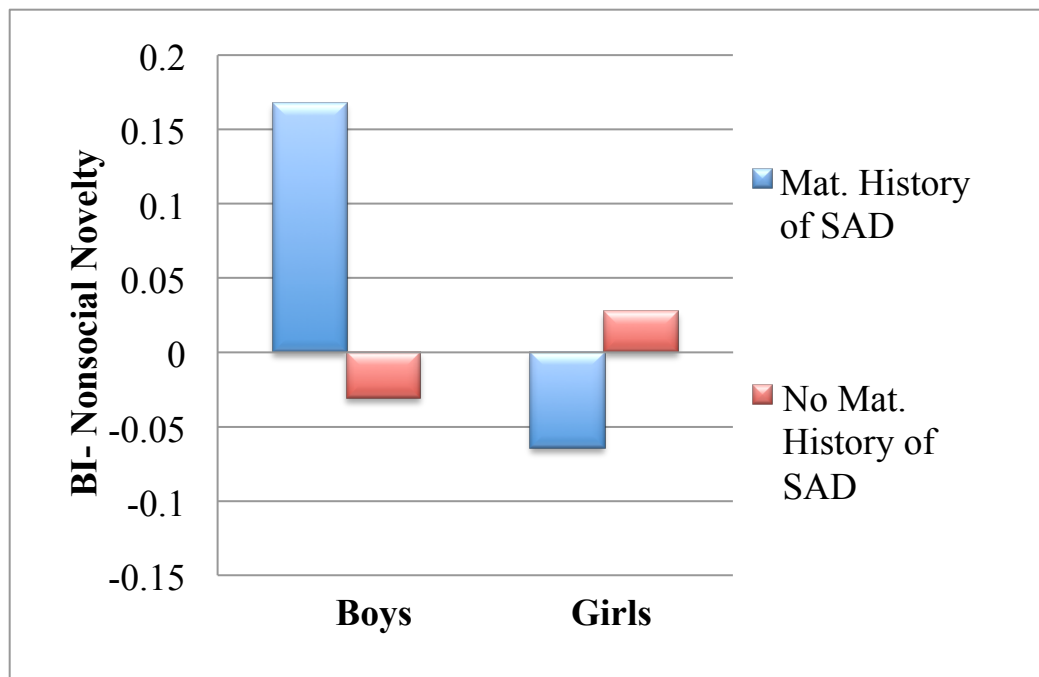

Figure 1. Relation between childhood behavioral inhibition (BI) and maternal history of social anxiety disorder (SAD) as a function of child sex within a non-social novelty context.

Discussion

The primary goal of the current study was to examine childhood BI as a risk marker for anxiety disorders. Specifically, I examined whether childhood BI was associated with a parental history of anxiety disorders, and whether child gender and assessment context played a role within the association between BI and risk using laboratory observational assessments and semi-structured clinical interviews. Consistent with hypotheses, childhood BI was found to be associated with parental history of anxiety, specifically maternal history of SAD, within the nonsocial novelty task context. Further, the association between BI and anxiety was moderated by gender, as boys', but not girls' BI increased with the presence of a maternal SAD history. However, this relationship was only found when BI was assessed in the context of nonsocial stimuli, a finding inconsistent with initial hypotheses.

The current results are consistent with the body of literature suggesting more severe forms of parental anxiety disorders, especially in mothers, may be associated with higher levels of childhood BI (Aktar et al., 2014). Maternal history of SAD was the only anxiety disorder history model with significant effects, which may indicate a differential potency of prediction of early temperamental predisposition on BI. A meta-analysis conducted by Connell and Goodman (2002) provided evidence that children's internalizing problems were more closely related to the presence of psychopathology in mothers than in fathers for young children. Connell and Goodman (2002) note that researchers should not remove paternal psychopathology from the study of children's later anxiety risk, as the magnitude of paternal effects of certain disorders may change over the course of a child's life; however, the presented research may allow clinicians to develop further developmental risk profiles for young children, especially boys, around more severe cases of maternal anxiety disorders.

Gender was found to play a role in the association between BI and anxiety risk, as boys',

but not girls', BI was higher when there was a maternal history of SAD. Seeing as the majority

of studies suggest females are at greater risk for anxiety disorders in comparison to males (Carter

et al., 2003; Roza et al., 2003), this may say more for boys who do in fact exhibit inhibited

behavior. Girls are still seen to be at greater risk for the development of anxiety disorders, but

this may not be accountable to BI; there are numerous other risk factors that may then account

for anxiety risk in females including but not limited to neurobiological factors, stressful life

events, and peer relations (Feng, Shaw, & Silk, 2008).

BI may in turn be more pathogenic for boys in comparison to females within preschool

age groups, as the much lower frequency may be indicative of higher intensity for those existing

cases. It had been previously suggested that the differences in BI might reflect differences in

cultural expectations and socialization patterns; inhibition may be considered more appropriate

in girls than in boys, where for boys it is more likely to be discouraged than reinforced (Essex et

al., 2010; Kerr, Lambert, Hakan, & Kackenberg-Larsson, 1994). For example, in most societies,

quiet, fearful, and dependent characteristics are behaviors considered normative for girls,

increasing the likelihood that expressions of inhibition in girls will be accepted as normative and

encouraged (Keenan & Shaw, 1997). Furthermore, research on internalizing problems in children

have suggested girls' early problem behaviors are more often channeled into internalizing

problems, making boys who exhibit anxiety risk a more unique population (Feng, Shaw, & Silk,

2008). Most societies find overactive, aggressive, and deviant behaviors as normative for boys,

while fearful and shy behaviors are not (Keenan & Shaw, 1997). The existence of fearful

behaviors within boys then goes against sex-stereotyped behaviors, which may make their

existence more problematic and pathogenic for anxiety risk. This may seem especially

anomalous for boys who exhibit inhibited behavior under the context of nonsocial novelty, as was found within the current study; one may not expect boys to be inhibited during tasks involving a cloth tunnel, a mattress, a Halloween mask, or a spider, all objects found within the nonsocial novelty tasks. Thus, girls and boys may follow divergent pathways in the development of anxiety, which may suggest the current findings present a pathway more serious and chronic for internalizing problems for boys in comparison to girls.

There is previous evidence that additionally suggests boys may be more vulnerable than girls to the effects of suboptimal caregiver environments that may result from parental psychopathology, particularly in early childhood (Feng et al., 2008). Although the current study did not particularly look at caregiving styles, one can speculate its potential role within the current findings. For example, previous studies have found significant associations between maternal unresponsiveness during infancy and problem behavior during preschool periods for boys, but not in girls (Martin, 1981; Shaw et al., 1998). This may be suggestive of higher vulnerability to individual differences in caregiving quality associated with anxiety for boys, which may partially explain why the association between maternal SAD and childhood BI was only found to influence boys.

More generally speaking, there have been numerous mechanisms proposed in an attempt to explain the linkage between parental anxiety disorders and childhood BI. For example, there is evidence to suggest that a genetic or biological mechanism may run in families that places children of anxious parents at higher risk for later anxiety outcomes (Dougherty et al., 2013; Rapee, Schniering & Husdon, 2009). Furthermore, there is the potential influence of parenting in anxious parents that shapes childhood inhibition, as presented in the preceding paragraph. However, and potentially more importantly, there may be child-to-parent effect that may play a

role in inhibition.

Theorists within the field of anxiety research have additionally posited an interactional dyadic relationship between parental anxiety and child anxiety risk; just as parental anxiety may affect how the child behaves, children's levels of anxiety or inhibited behavior may have an impact on how the parent behaves. For example, parental overcontrol may convey to children that he or she is incapable of handling novel or challenging scenarios (Hudson & Rapee, 2004). Reducing a child's exposure to novelty may inhibit the development of coping strategies and sense of control, potentially raising the risk for anxiety disorder (Moore, Whaley, & Sigman, 2004). Conversely, children with inhibited temperaments may have some effect on parents' behavior, as Moore and colleagues (2004) found parents of children with anxious temperaments granted less autonomy to their children regardless of their own anxiety status; these reactions may in turn elicit parenting behaviors that can potentially maintain or alter the child's behaviors. Although it seems sufficient to speculate most of the parents within the current study met diagnostic criteria for anxiety before their children were born, this interrelationship may have an important role in how both the child and the parent behaves, and should be researched further. Obtaining a better understanding of the relationship between characteristics and parent or child anxiety status or risk can help inform theory on how relationships unfold in families affected by anxiety.

Lastly, the presented findings can offer information of applicable value to clinicians executing prevention and early interventions for those at risk for anxiety disorders. Early interventions work to provide treatment for a problem early in its development, potentially before it meets the criteria for a diagnosis (Rapee et al., 2009). The given research can aid in obtaining a more selective intervention process, as clinicians can further target higher-risk

populations. It appears as though boys with mothers that have an SAD history are placed at higher risk for the later onset of anxiety based on increased levels of BI, a relationship not found among female participants. Clinicians may then be able to select this population for implementing preventative strategies in order to work at decreasing the probability of later anxiety outcomes. In addition, creating specified intervention programs for parents with a history of anxiety, particularly mothers with SAD history, during their child's infant years may additionally aid in preventing higher levels of BI later on, further decreasing anxiety probability.

Strengths and Limitations

This study has several significant strengths. To our knowledge, this is the first study to examine the roles of assessment context and gender differences within the association between BI and parental anxiety history in a large, unselected community sample of preschoolers. Given that the current study assessed 3-year-old children, an age where clinical diagnoses of anxiety disorders is extremely rare there is less concern for the influence of confounding current or previous anxiety disorders that may exist when study older populations. The use of a large unselected community may additionally permit greater generalization of results.

The present study also had several limitations. First, the reliability of the social novelty task was rather low, which may have limited the ability to detect main effects and interactions within this assessment context. The social novelty context was additionally only based on one task, meaning fewer items were on the scale and the context of assessment was limited to a single episode. As previously noted, seeing as the social component of BI may be of particular importance in the development of social anxiety disorders (Essex et al., 2010; Muris et al., 2011), further research within the field of social BI assessment is necessary. Increasing the statistical power within the social novelty task, as well as the number of tasks that constitute social novelty,

may aid in developing a better understanding towards the role of assessment context, as well as its function within BI-anxiety risk associations. Second, the sample was largely White and middle class; further work is needed in order to examine BI and anxiety risk in more diverse populations. Third, few parents met diagnostic criteria for some of the individual anxiety disorders, making some specific anxiety disorder analyses difficult. Although the sample size was large, it would be of benefit for future research to increase the sample size in order to increase the probability of parental anxiety disorders, or recruit participants from adult clinical populations. Lastly, the cross-sectional nature of the current study limits the interpretations about the directionality of the observed relations. Seeing as the given study was part of an ongoing longitudinal study, further longitudinal research is possible and recommended; only longitudinal follow-up can establish that BI predicts the actual onset of an anxiety disorder.

Future Directions and Conclusion

As previously mentioned, extending the current study longitudinally would be recommended in order to further validate the findings and better understand the direction of BI and anxiety risk. Second, further examination of the influence of additional genetic and environmental such as early traumatic experiences or peer rejection (Volbrecht & Goldsmith, 2010), on both the outcome and predictor variables would be of value to continue developing a more detailed profile of risk. Third, there is the potential for the lower frequency of BI among males to become more pathogenic in comparison to females. Further extension of the preceding idea would be highly valuable for early intervention programs.

In conclusion, achieving a comprehensive understanding of the factors that lead a child to develop anxiety disorder is of high value to clinicians and psychologists today. However, the transition from inhibition to disorder across development will depend on the complex interplay

between numerous factors that goes beyond the reach of the current study. Collectively, several

likely risk factors and their interrelationships are beginning to achieve some agreement in

working towards a specified developmental risk profile for young children. The temperamental

facet of BI likely has a central component within this risk profile, while interacting with other

vulnerability markers. In the case of parental psychopathology, we can see an association

between childhood BI and maternal SAD, placing children of mothers with internalizing

disorders, such as anxiety, at increased risk. Additional aspects can modify and shape this risk

relationship, as the current results suggest boys may be more vulnerable to the existence of

maternal SAD, thereby leaving the child more vulnerable to the later development of anxiety

disorder. Though further longitudinal research is needed, early prevention and intervention

strategies can take the given information and work to specify programs for high-risk populations

aimed at reducing the risk of anxiety disorders. Preventions strategies prior to early childhood

might target mothers with SAD history with sons in order to try and reduce potential levels of BI

and risk for anxiety.

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Appendix A

Letter of Information—<u>Parent Consent for Self</u>

Project Title: Gene-Environment Interplay and the Development of Child Temperament

Investigators: Elizabeth P. Hayden, Ph.D., Shiva Singh, Ph.D., Kathleen Hill, Ph.D., Xinyin

Chen, Ph.D.

<u>Introduction</u>
You are being invited to participate in a research study. The purpose of this letter is to provide you with the information you need to make an informed decision on participating in this research.

<u>Purpose of this study</u>
The purpose of this study is to examine whether genes and environments influence the development of childhood emotions.

<u>Procedures for the study</u>
The study involves several parts that occur at different time points. When you begin the study, you will be asked to complete paper-and-pencil measures of your child's behavior and moods. We will also ask you to complete paper-and-pencil measures about your personality and behavior, your home life, and your parenting behaviors. If appropriate, we will also ask you to complete paper-and-pencil measures about your child's coparent's personality and parenting behaviors.

Approximately 15 months later, an interviewer will interview you **or** your child's coparent about any life events occurring in your family since entering our study. At approximately 30 months after beginning the study, an interviewer will again interview you **or** your child's coparent about new life events experienced since the last interview, and will interview you about any problems you may have had with emotional, behavioral, or substance use problems. You will also be asked to complete another packet of questionnaires on your child at that time.

The report measures will take approximately 1 hour to complete, and will be collected either during your child's laboratory visit and/or on your own while at home. The life events interview takes about 45 minutes for most people to complete, although some people take more time and others take less. The interview about emotional, behavioral, and substance problems takes approximately 1 ½ hours for most people to complete, although this also varies. These interviews can be completed at our research lab, in your home, or over the telephone, depending on which is most convenient for you.

<u>Risks associated with this study</u>
While answering some of the questions on the self-report and interview measures, you may feel sad or upset. If this happens, the interviewer will discuss these feelings with you. We can also provide you with a referral to a local mental health care provider. However, in our experience,

answering these questions does not distress most study participants. You can also decline to answer any questions you do not wish to answer.

Benefits
There are no known benefits to you from participating in this study. However, your participation may help us develop a better understanding of how specific genes and environments influence child emotional development.

Compensation and Costs
You will be compensated with a payment of **$55** for your completion of the baseline packet of questionnaires. This payment will be prorated if you do not complete all the questionnaires. Compensation for completing the two life events interviews at 15- and 30-month follow-up consists of a payment of **$45** for each (**$90** total to either you or your child's coparent). You will be compensated with a payment of **$60** for completion of the interview concerning past problems with emotional, behavioral, and substance use problems at 30-month follow-up. You will also be compensated for any expenses associated with study participation (e.g., parking, babysitting, taxi cabs to the laboratory). For the packet of questionnaires on your child's behavior which we will ask you to complete at 30-month follow-up, you will receive a payment of **$15**.

Participation
Participation in this study is voluntary. You have the right to be given all important information about the study and what you will be asked to do, and you should only agree to take part if you are satisfied that you know enough about the study procedures. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time. However, withdrawal of your participation does not necessarily include withdrawal of any data compiled on you up to that point. You will not be eligible to participate if you do not speak English well enough to complete our assessment procedures.

Confidentiality
We will strive to ensure the confidentiality of your research-related records. Your research records will be stored in a locked cabinet in a secure office, and computer files containing study data will be stored on password protected computers. We will not share data with any other researchers without first removing identifying markers. When we publish results of the study, your name will not be used. Absolute confidentiality cannot be guaranteed as we may have to disclose certain information under certain laws.

Duration of the study and enrollment
Approximately 400 families will participate in this study. Data will be collected for this project over the next five years.

Contact information
If you have any questions about this study, contact Dr. Elizabeth Hayden via email at ehayden@uwo.ca or via telephone at (519) 661-3686.

If you have questions about the conduct of this study or your rights as a research subject, you may contact the Office of Research Ethics, The University of Western Ontario, by telephone at (519) 661-3036 or by e-mail at ethics@uwo.ca.

You do not waive any legal rights by signing the consent form.

Research Consent Form

Project Title: Gene-Environment Interplay and the Development of Child Temperament

Investigators: Elizabeth P. Hayden, Ph.D., Shiva Singh, Ph.D., Kathleen Hill, Ph.D., Xinyin

Chen, Ph.D.

I have read the Letter of Information, have had the nature of the study explained to me, and I agree to participate.

Research Participant:_____

Signature: _____

Date: _____

Person Obtaining Informed Consent:_____

Signature: _____

Date: _____

Letter of Information—<u>Parent Consent for Child</u>

Project Title: Gene-Environment Interplay and the Development of Child Temperament

Investigators: Elizabeth P. Hayden, Ph.D., Shiva Singh, Ph.D., Kathleen Hill, Ph.D., Xinyin

Chen, Ph.D.

Throughout this document, the pronouns 'you' and 'your' should be read as referring to the participant rather than the parent/guardian/next of kin who is signing the consent form for the participant.

<u>Introduction</u>
You are being invited to participate in a research study. The purpose of this letter is to provide you with the information you need to make an informed decision about participating in this research.

<u>Purpose of this study</u>
The purpose of this study is to examine whether genes and environments influence the development of childhood emotions.

<u>Procedures for the study</u>
Your participation in this study involves multiple steps. The first step is participation in a laboratory visit. During this visit, you will participate in a series of standardized tasks designed to elicit emotional reactions. These tasks are designed to simulate situations that children encounter in everyday life, and will be videotaped for future coding of your behavior and emotional responses. To elicit frustration, some of these tasks involve deception (e.g., after being shown an exciting toy, it will be locked in a box. You will be asked to try to open the lock with a set of keys that don't work, before finally getting to play with the toy). Parents will participate in some of these tasks with you, and will also be videotaped. A complete description of all tasks will be given to you.

During this initial visit, we will obtain a sample of your DNA (genetic information). This procedure will entail you or a member of our staff gently rubbing the cheek inside your mouth with a cotton swab similar to those used to clean the ear. Two swabs will be used to ensure that usable cells are obtained.

During the second part of the study, you will participate in a set of tasks in your home. These tasks entail you and your parent interacting with toys and a book. The purpose is to examine how you and interact with one another in these everyday situations. Also during the home visit, you will be given a matching task to complete, but will not be given sufficient time to complete the task. To see how you respond to this task, we will use a kit to collect saliva samples for cortisol (stress hormone) analysis. This procedure is remarkably easy because cortisol can be measured by obtaining small samples of saliva. To get a saliva sample, we have you eat a few grains of sugar sweetened KoolAid[tm]. This makes the saliva flow and makes the sampling pleasant. You then mouth a cotton dental roll (the kind your dentist uses) until it is wet with

saliva. This usually takes approximately 1 minute. You will be asked to provide 6 samples total (one prior to, and the rest after, the matching task). So you will not feel bad about failing to complete the matching task, at the conclusion of the task, the experimenter will say that she accidentally brought a matching puzzle for older children. All these tasks will be videorecorded for future coding.

In approximately 30 months, we will contact you to request that you participate in another laboratory visit very similar to the first, during which you will again participate in a set of new tasks designed to measure emotional behavior. At that time, you will be given a complete description of all the new tasks.

Each of the lab visits will take approximately 2 hours to complete, and will take place in the Department of Psychology at the University of Western Ontario. The home visit will take approximately 2 hours to complete. Your participation in this study takes approximately six hours total.

Risks associated with this study
Some of the laboratory tasks are designed to elicit negative emotional responses, such as disappointment or frustration. These tasks are designed to resemble "real-life" situations that most children encounter routinely (e.g., having to wait to play with an exciting toy), and do not typically elicit extreme emotional reactions. If you were to become more than mildly upset, we would end the procedure immediately. The likelihood of this happening, in our experience, is very rare. Also, all tasks are designed to have a positive ending (e.g., children get to play with the exciting toy after a few minutes). You or your parent can also ask us to skip any task you think will cause more than temporary, slight distress.

Regarding the cortisol assessments, when children put anything in their mouths, there is always a risk of choking. We will ask you to remain seated during the saliva collection, and we will remove the cotton roll that you chew during sampling. This same procedure has been used in other laboratories with hundreds of children without any mishap.

Benefits
There are no known benefits to you from participating in this study. However, your participation may help us develop a better understanding of how specific genes and environments influence child emotional development.

Compensation and Costs
For your participation in the lab visits, you will be compensated with a payment of **$100** for each visit (**$200** total). You will receive a payment of **$90** for your participation in the home visit components of the study (i.e., the matching task and the parent-child interaction task). You will also be compensated for any expenses associated with study participation (e.g., parking, taxi cabs to the laboratory). You will receive a copy of the DVD of the laboratory visits, and you will receive several small toys and several stickers.

Participation

Participation in this study is voluntary. You have the right to be given all important information about the study and what you will be asked to do, and you should only agree to take part if you are satisfied that you know enough about the study procedures. You may refuse to participate or withdraw from the study at any time. However, withdrawal of your participation does not necessarily include withdrawal of any data compiled on you up to that point. You will not be eligible to participate if you have a medical or psychiatric condition that would prevent you from participating in our assessments, or if you do not speak English well enough to complete our assessment procedures.

Confidentiality

We will strive to ensure the confidentiality of your research-related records. Your research records will be stored in a locked cabinet in a secure office, and computer files containing study data will be stored on password protected computers. Videorecorded data will be viewed only by members of the research team. DVDs will be erased at your request at any time. We will not share data with any other researchers without first removing identifying markers. When we publish results of the study, your name will not be used. We will store your DNA indefinitely, unless you ask us to destroy it. Absolute confidentiality cannot be guaranteed as we may have to disclose certain information under certain laws.

Duration of the study and enrollment

Approximately 400 children will participate in this study. Data will be collected for this project over the next five years.

Contact information

If you have any questions about this study, contact Dr. Elizabeth Hayden via email at ehayden@uwo.ca or via telephone at (519) 661-3686.

If you have questions about the conduct of this study or your rights as a research subject, you may contact the Office of Research Ethics, The University of Western Ontario, by telephone at (519) 661-3036 or by e-mail at ethics@uwo.ca.

You do not waive any legal rights by signing the consent form.

Research Consent Form

Project Title: Gene-Environment Interplay and the Development of Child Temperament

Investigators: Elizabeth P. Hayden, Ph.D., Shiva Singh, Ph.D., Kathleen Hill, Ph.D., Xinyin

Chen, Ph.D.

I have read the Letter of Information, have had the nature of the study explained to me, and I agree to participate.

Name of Research Participant (child):_____

Name of Parent or Guardian:_____

Signature of Parent: _____

Date: _____

Person Obtaining Informed Consent:_____

Signature: _____

Date: _____

Appendix B
LAB-TAB CODING MANUAL

1. Risk Room

Phase I (child alone):

Start time: Begin coding as soon as the child enters the room*.*
Stop time: Stop coding when the experimenter returns.

A. **Time of first <u>definite</u> fear response:** note the time (including secs) of the first
DEFINITE fear response (definite = either a 1 or higher is coded for fearful affect or distress
vocalization OR a 2 or higher is coded for postural/bodily fear).

B. Watch entire episode through once to record the time at which each object was first
touched.
Objects touched: record start time for the beginning of the episode, and the counter time
when the object is <u>first</u> intentionally touched. Objects must be intentionally (not
accidentally) touched, which can include exploration, rather than obvious playing.

C. Verbalizations
Time of first verbalization: record the counter time at which the child makes his/her
first verbalization, which can take any tone of affect or content.

D. *Phase I scoring:*
Fearful Affect: rate the peak intensity of fearful/wary facial expression that occurs during
the epoch
         0 = no facial region shows codeable fear movement
         1 = fear expression is ambiguous or is of low intensity; fear is evident in only one
facial
                  region (i.e., brows raised in distress)
         2 = fear expression is definitely present in at least 1 facial region (i.e., brows raised
and
                  drawn together, upper eyelids raised)
         3 = fear expression is definitely present in both facial regions (i.e., brows raised and
                  drawn together, upper eyelids raised to show whites of eyes, corners of
         mouth
                  opened and drawn back)

Bodily Fear: rate the peak intensity of fearful bodily expression that occurs during the
epoch.
         0 = child's body never reflects fear or weariness
         1 = child's body reflects low intensity fear or weariness (e.g., cautious or wary gait;
                  slight tension; nervous twitching, hand tapping, foot swinging, etc.;
                  diminished activity level)
         2 = child's body reflects moderate intensity fear or weariness or the display

lasts a majority of the epoch (e.g. slight defensive body posture; fearful
tension)
3 = child's body reflects high intensity fear or weariness (e.g., definite defensive
body
posture, jumping back in fear)

Tentative play: rate the peak intensity of hesitancy the child exhibits during the epoch;
hesitancy is reflected by both wariness and physical cautiousness. Take into account the
level of boldness vs. inhibition in the child's play, particularly the manner of their approach
towards objects and the quality of their play with the objects
0 = no hesitancy; child readily engages in play with objects with <u>no</u> pauses to
examine
objects, <u>AND</u> expresses <u>no</u> wariness when in contact with objects -- child
plays boldly
1 = slight hesitancy; child examines object or pauses briefly (i.e., 2-5 secs) <u>before</u>
playing
with it, but then does <u>not</u> express wariness while in contact with the object
2 = moderate hesitancy, as indicated by any of the following: child pauses 6 or more
secs
<u>before</u> playing with an object, or expresses wariness while in contact with
the object, or clearly avoids an object
3 = extreme hesitancy; child does <u>not</u> explore or touch objects at all, but may look at
or
point to objects

References parent: the peak/max degree to which child references parent before
engaging with a toy
0 = child does <u>NOT</u> comment to or glance toward the parent before engaging
1 = child looks to, or directs comment or question to parent <u>before</u> engaging with a
toy
2 = child asks for permission or seeks reassurance from parent <u>before</u> engaging with
a toy

Proximity to parent: <u>Closest</u> physical proximity of the child relative to the parent; this
rating should reflect solely the child's physical distance from their mother, regardless of
why the child is close to their mother.
0 = greater than one foot/arm's length from parent
1 = within one foot/arm's length from parent
2 = clinging to parent (clutching parent's body, sitting in parent's lap, burying head
in
parent's body).

Fearful/Wary Questions/Comments: any comments or questions that indicate fear
(taking into
account both tone of voice and content) , such as: "I don't like this", "That is scary".
0 = child did not make an utterance of this kind during the epoch

    1 = child makes a low intensity fear or wariness verbalization
    2 = child makes a moderate/high intensity fear or wariness verbalization

Amount of time talking: the overall amount/duration of verbalizations made by the child
    0 = child does not speak
    1 = child makes a brief utterance (e.g., "ooh"/"Ah", incomplete sentences)
    2 = child makes an extended/complete utterance (e.g., child states a full sentence)

Time spent playing: degree to which the child engaged in purposeful manipulation, exploration, or symbolic interaction (e.g., talking to an object) with the objects
    0 = child did not play with any toys during the epoch
    1 = child played with toys for less than half of the epoch
    2 = child played with toys for more than half of the epoch
    3 = child played with the toys for the entire epoch

Sad affect: code the highest intensity sad affect that occurs during the epoch
    0 = <u>NO</u> facial region shows codeable sadness movement
    1 = droopy cheeks; slightly downturned mouth; slight raising of inner corners of
            eyebrows; or, expression is fleeting
    2 = definitely downturned mouth or definite raising of inner corners of eyebrows
    3 = both definitely downturned mouth *and* definite raising of inner corners of
eyebrows

Phase II (child & experimenter)

Start time: when experimenter returns
Stop time: after experimenter and child leave the room

   A. **Time to comply**: note the time, in seconds, at which the experimenter first asks the
       child to participate in an activity (time when request is completed), then note the
       time in seconds at which the child touches the object. If child fails to touch the
       object, record the time of next request.

   B. Phase 2 Scoring:

NOTE: do NOT code an epoch if less than 10 seconds in length.

Noncompliance: rate the peak intensity of noncompliant/oppositional behavior; include responses to the experimenter's requests to stand in a certain position, as well as to touch objects
    0 = child complies readily with experimenter's requests, with <u>NO</u> signs of opposition
    1 = child requires prompting (2 or more requests) from the experimenter to engage
in the
            requested activity, or exhibits <u>mild</u> opposition through facial, postural, or
        verbal

signs (i.e., ignores, shuffles feet, or says "no" in a neutral tone of voice); child
eventually complies

2 = child requires prompting (2 or more requests) to engage in the requested
activity,

AND exhibits moderate opposition through facial, postural, or verbal signs
(i.e.,

child grimaces strongly, crosses arms defiantly, or says "no" or some other
verbalization in an angry or whining tone of voice); child eventually complies
with the request, but compliance may not be complete.

3 = child requires prompting (more than 2 requests) to engage in the requested
activity,

AND exhibits strong opposition through facial, postural, or verbal signs (i.e.,
child runs away, shakes head violently, refuses verbally to comply with task,
or

may engage in other activities); child eventually complies with the request,
but compliance may not be complete

4 = child exhibits strong signs of opposition, AND does NOT comply with the request

References experimenter: the peak/max degree to which child references experimenter
before complying with the request; should clearly reflect wariness/fear, rather than merely
noncompliance

0 = child does NOT comment to or glance toward the experimenter in a timid
manner

before complying

1 = child questions the experimenter regarding the request before complying, or
clearly

looks again at the experimenter before complying (even though it is obvious
they

understand the request); child obviously seems timid about or is reluctant to
engage in the requested behavior

Fearful/Wary Questions/Comments: note the peak intensity of any comments or
questions that indicate fear (taking into account both tone of voice and content) , such as: "I
don't like this", "That is scary".

0 = child did not make an utterance of this kind during the epoch

1 = child makes a low intensity fear or wariness verbalization

2 = child makes a moderate/high intensity fear or wariness verbalization

Fearful Affect: rate the peak intensity of fearful/wary facial expression that occurs during
the epoch

0 = no facial region shows codeable fear movement

1 = fear expression is ambiguous or is of low intensity; fear is evident in only one
facial

region (i.e., brows raised in distress)

2 = fear expression is definitely present in at least 1 facial region (i.e., brows raised and

> drawn together, upper eyelids raised)

3 = fear expression is definitely present in both facial regions (i.e., brows raised and
> drawn together, upper eyelids raised to show whites of eyes, corners of mouth
> opened and drawn back)

Bodily Fear: rate the peak intensity of fearful bodily expression that occurs during the epoch.

0 = child's body never reflects fear or weariness

1 = child's body reflects low intensity fear or weariness (e.g., cautious or wary gait;
> slight tension; nervous twitching, hand tapping, foot swinging, etc.;
> diminished activity level)

2 = child's body reflects moderate intensity fear or weariness intensity or the display
> lasts a majority of the epoch (e.g. slight defensive body posture; fearful
> tension)

3 = child's body reflects high intensity fear or weariness (e.g., definite defensive body
> posture, jumping back in fear)

Tentative play: rate the peak intensity of hesitancy the child exhibits during the epoch; hesitancy is reflected by both wariness and physical cautiousness. Take into account the level of boldness vs. inhibition in the child's play, particularly the manner of their approach towards objects and the quality of their play with the objects

0 = no hesitancy; child readily engages in play with objects with <u>no</u> pauses to examine
> objects, <u>AND</u> expresses <u>no</u> wariness when in contact with objects -- child plays
> boldly

1 = slight hesitancy; child examines object or pauses briefly (i.e., 2-5 secs) <u>before</u> playing
> with it, but then does <u>not</u> express wariness while in contact with the object

2 = moderate hesitancy, as indicated by any of the following: child pauses 6 or more secs
> <u>before</u> playing with an object, expresses wariness while in contact with the object,
> or clearly avoids an object

3 = extreme hesitancy; child does <u>not</u> explore or touch objects at all, but may look at or
> point to objects

References parent: the peak/max degree to which child references parent before engaging with a toy

0 = child does <u>NOT</u> comment to or glance toward the parent before engaging

1 = child looks to, or directs comment or question to parent <u>before</u> engaging with a toy

2 = child asks for permission or seeks reassurance from parent <u>before</u> engaging with a toy

Proximity to parent: the <u>CLOSEST</u> physical proximity of the child relative to the parent; this rating should reflect solely the child's physical distance from their mother, regardless of why the child is close to their mother.

0 = greater than one foot/arm's length from parent

1 = within one foot/arm's length from parent

2 = clinging to parent (clutching parent's body, sitting in parent's lap, burying head in

parent's body)

Sad affect: code the highest intensity sad affect that occurs during the epoch

0 = <u>NO</u> facial region shows codeable sadness movement

1 = droopy cheeks; slightly downturned mouth; slight raising of inner corners of
eyebrows; or, expression is fleeting

2 = definitely downturned mouth or definite raising of inner corners of eyebrows

3 = both definitely downturned mouth *and* definite raising of inner corners of eyebrows

4. STRANGER APPROACH

Start time: begin coding when the experimenter and child enter the room

Stop time: end coding when the child leaves the room

A. **Time of first fear response:** Note the time (including secs) from the time when the experimenter leaves the room to the first actual moment of a <u>definite</u> fear response (the first epoch is which a 1 or higher is coded for fearful affect or distress vocalizations, or a 2 or higher is coded for postural fear).

B. **Time of first vocalization:** Note the time (including secs) from time when the stranger enters the room to the first vocalization, which can take any tone of affect or content.

C.

Fearful Affect: rate the peak intensity of fearful/wary facial expression that occurs during the epoch

0 = no facial region shows codeable fear movement

1 = fear expression is ambiguous or is of low intensity; fear is evident in only one facial

region (i.e., brows raised in distress)

2 = fear expression is definitely present in at least 1 facial region (i.e., brows raised and

drawn together, upper eyelids raised)
3 = fear expression is definitely present in both facial regions (i.e., brows raised and
      drawn together, upper eyelids raised to show whites of eyes, corners of
mouth
      opened and drawn back)

Postural Fear: rate the peak intensity of fearful bodily expression that occurs during the epoch.
      0 = child's body never reflects fear or weariness
      1 = child's body reflects low intensity fear or weariness (e.g., cautious or wary gait;
            slight tension; nervous twitching, hand tapping, foot swinging, etc.;
      diminished
            activity level)
      2 = child's body reflects moderate intensity fear or weariness intensity or the
display
            lasts a majority of the epoch (e.g. slight defensive body posture; fearful
      tension)
      3 = child's body reflects high intensity fear or weariness (e.g., definite defensive
body
            posture, jumping back in fear)

Still/Freezing: total duration of Still/Freezing (in seconds). Duration of freezing is defined as a marked decrease in activity (>2 secs) with little or no movement, with or without any indication of muscular tension.

Distress vocalizations: rate the peak intensity of distress vocalizations that occur during the epoch
      0 = NO distress vocalizations
      1 = mild distress vocalizations that are ambiguous in nature
      2 = distress vocalizations that indicate some fear or sadness, either through the
content or
            intonation, (e.g., "Who are you?", "Where's my mommy?", or nervous
      laughter)
      3 = vocalizations that indicate clearly fearful or sad overtones, either through
content or
            intonation (e.g., "don't come closer", "I want my mommy")

Approach: rate the peak intensity of approach behaviors (any behavior initiated by the child to decrease the distance between himself and the stranger). If the child continues to face toward the stranger in subsequent epochs, s/he should continue to be coded a 1. Similarly, if the child stays within 3 feet of the stranger during subsequent epochs, s/he should continue to be coded a 3.
      0 = NO approach behaviors
      1 = child's body faces toward the stranger, or child goes hesitantly toward the door
after

the knock

2 = child takes 1or 2 <u>hesitant</u> steps toward the stranger, or goes boldly toward the door

after the knock

3 = child takes 1 or 2 <u>non-hesitant</u> steps toward the stranger, <u>or</u> initiates some action to

get within close proximity to the stranger (i.e., walks right up to the stranger)

NA > code for epochs when the stranger is absent

Avoidance: rate the peak intensity of avoidance behaviors (behaviors initiated by the child to maintain or increase the distance between himself and the stranger). If the child is coded a 1 for one epoch, then continues to be turned away during the following epochs, s/he should continue to be coded a 1. Code similarly for 3 codes - if the child continues to stay at the far corner of the room, continue to code the child a 3.

0 = child exhibits <u>NO</u> avoidance -- child stands in place or approaches the stranger

1 = low avoidance -- child's body faces away from the stranger

2 = moderate avoidance -- child takes 1 or 2 steps away from the stranger

3 = high avoidance -- child takes more than 2 steps away from the stranger, possibly going to the far corner of the room, or moving to the parent or experimenter (when present)

NA > coded for epochs when the stranger is absent

Gaze aversion: rate the peak intensity of gaze aversion that occurs during the epoch

0 = <u>NO</u> gaze aversion

1 = child glances down or away from the stranger in a deliberate attempt to avoid eye

contact (i.e.,only darting glances toward stranger)

2 = child makes <u>NO</u> eye contact with the stranger at all during the epoch

NA > coded for epochs when the stranger is absent

Verbal/nonverbal interaction: the peak quality of the child's verbal responses to the stranger

0 = child does <u>NOT</u> respond to questions or initiate conversation with stranger

1 = child makes neutral or eager responses to questions, either verbally or nonverbally

(i.e., nodding in response to a question), but does <u>NOT</u> initiate conversation with

stranger

2 =child initiates conversation with stranger, or elaborates on a response

NA > coded for epochs when the stranger is absent

Angry affect: rate the peak intensity of angry facial affect that occurs during the epoch

0 = <u>NO</u> facial region show codeable facial anger movement

1 = anger expression is ambiguous or of low intensity; expression is present only in 1

facial region (i.e., furrowed brows, narrowed eyes, or tense/squarish mouth)

2 = anger expression is definitely present in 1 facial region (i.e., furrowed brows, or
    tense/squarish mouth)
3 = anger expression is definitely present in both facial regerions (i.e., furrowed
brows,
    narrowed eyes, and angular/tense mouth)

Sad affect: code the highest intensity sad affect that occurs during the epoch
0 = <u>NO</u> facial region shows codeable sadness movement
1 = droopy cheeks; slightly downturned mouth; slight raising of inner corners of
    eyebrows; or, expression is fleeting
2 = definitely downturned mouth or definite raising of inner corners of eyebrows
3 = both definitely downturned mouth *and* definite raising of inner corners of
eyebrows

8. Jumping Spider

This episode is divided into four trials. Each trial begins as the experimenter <u>begins</u> to say "go ahead and pet the spider" or otherwise asks or explicitly prompts child to pet the spider. If child does not take his/her hand out of the cage before experimenter makes spider jump a second, third or fourth time, trials begin when experimenter makes spider jump. "After effects" are noted when the experimenter begins to request that child touch the spider, and lasts until child begins to operate the spider alone.

Variables to be scored:

    a. Latency to fear response
    b. Intensity of fear expression
    c. Intensity of vocal distress
    d. Intensity of bodily fear
    e. Approach
    f. Withdrawal
    g. Gaze Aversion
    h. Startle
    i. Plays with spider
    j. Verbalizations

a. **Time of fear response**: **Time of first <u>definite</u> fear response:** note the time (including secs) of the first DEFINITE fear response (definite = either a 1 or higher is coded for fearful affect or distress vocalization OR a 2 or higher is coded for bodily fear). Code as "9999" if no fear response occurs.

b. **Intensity of fear expression**: Peak intensity of fear or fear blends is noted in each epoch using affect descriptions and rated on the following scale:

    0 = No facial region show codeable fear movement.

1 = Only one facial region shows codeable movement, identifying a low intensity fear, or expression is ambiguous.
2 = Only 2 facial regions show codeable movement, or expression in one region (e.g., brows) is definite.
3 = An appearance change occurs in all 3 facial regions, or coder otherwise has impression of strong facial fear.

c. **Intensity of vocal distress***: Peak intensity of vocal distress is noted in each epoch and rated on the following scale:
0 = No distress vocalizations.
1 = Mild vocalizations that may be difficult to identify as hedonically fearful.
2 = Vocalizations that indicate some fear. For example, nervous laughter or fearful interjections such as "oh".
3 = Scream or loud, fearful interjection. For example, "no!" or "whoa!"

*note that some vocalizations in the episode will not be fear related.

d. **Intensity of bodily fear**: Peak intensity of bodily fear (changes in body position or body movement) is noted in each epoch and rated on the following scale:
0 = Very low bodily fear, no sign of bodily fear.
1 = Low bodily fear. Decreased activity; an apparent or sudden decrease in the activity level of child. For example, child sitting still for a few seconds after petting spider.
2 = Medium bodily fear. Bodily tensing: visible tensing of muscles such as drawing back of shoulders, tensing chords in neck.

e. **Approach**: Presence of approach behaviors is noted in each epoch and rated on the following scale:
0 = Touches spider with no hesitation.
1 = Hesitates for one or two seconds before touching spider.
2 = Hesitates for three to five seconds before touching spider.
3 = Does not touch spider.

f. **Withdrawal**: Peak intensity of withdrawal behaviors is noted in each epoch and rated on the following scale:
0 = Very low withdrawal, child sits in place or makes minute movements away from spider.
1 = Low withdrawal, child pulls back in chair slowly, or makes some movement away from spider.
2 = Medium withdrawal, child turns/twists away from spider and/or pulls back from spider.
3 = High withdrawal, child moves away from table and/or jumps away from spider.

g. **Gaze Aversion**: Peak intensity of gaze avoidance is noted in each epoch and rated on the following scale:
0 = No aversion

1 = Briefly averts gaze.
2 = Averts gaze for two to three seconds or focuses on object other than spider for two or three seconds.
3 = Averts gaze for nearly all of the time between experimenter's requests to pet spider, or focuses on object other than spider for most of time between experimenter's request.

h. **Startle**: Presence of startle response is noted during each epoch. (1 = present, 0 = not present)

i. **Play with spider**: It is noted whether or not child plays with spider when given the opportunity to do so at end of 4th trial. (e.g., moves the spider or touches it) (yes = 1; no = 0)

j. **Verbalizations**: It is noted whether or not child vocalizes during episode (check box if child verbalizes).

BI: Jumping Spider

Subject # _____
Coder: _____
Date: _____

Start time: _____

Time of first fear response: T1_____ T2_____ T3 _____ T4 _____

Scoring Intervals

Trial Number	1	2	3	4	After Effects
Time (begin/end)					
Peak Intensity of fear expression (0 -3)					
Peak Intensity of vocal distress (0-3)					
Peak intensity of bodily fear (0-2)					
Approach (0-3)					
Peak intensity of withdrawal (0-3)					
Gaze Aversion (0-3)					
Startle 1 = yes; 0 = no					
Spider jumped 1 = yes; 0 = no					

Child plays with spider when given the opportunity: YES   NO

Verbalizations: note whether child verbalizes or not during episode: YES   NO

Coder Initials: ☐☐

**Stranger Approach
Episode #4**

ID ☐☐☐☐

Date ☐☐ / ☐☐ / ☐☐☐☐
M   D   Y

Child's Sex   O Male   O Female

Start time: ☐☐ : ☐☐ : ☐☐
           H   M   S

Time when E says that she will leave the room: ☐☐ : ☐☐ : ☐☐

Time when S enters room: ☐☐ : ☐☐ : ☐☐

End time: ☐☐ : ☐☐ : ☐☐

Time of first definite fear response ☐☐ : ☐☐ : ☐☐

Time of first vocalization ☐☐ : ☐☐ : ☐☐

Epochs are 20 secs in duration

Time (min/sec)												
Fearful affect												
Postural fear												
Still/Freezing												
Vocal Fear												
Approach												
Avoidance												
Gaze Aversion												
Verbal/nonverbal interaction												
Angry affect												
Sad affect												