

The Pennsylvania State University  
The Graduate School  
College of the Liberal Arts

**PARENTAL ANXIETY AS AN ENVIRONMENTAL CONTEXT FOR  
ANXIETY SYMPTOM DEVELOPMENT IN CHILDHOOD**

A Dissertation in  
Psychology  
by  
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Submitted in Partial Fulfillment  
of the Requirements  
for the Degree of  
Doctor of Philosophy

August 2018

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### Abstract

Extensive evidence documents that anxiety tends to aggregate in families, following both a symptom general and specific pattern. However, relatively little is understood about the environmental processes underlying the observed covariation of anxiety within parent-child dyads. In particular, studies examining the association between parental anxiety and parenting behaviors are largely characterized by inconsistent and null findings. These results are often contrasted by accumulating evidence which supports a comparatively robust relationship between children's anxious symptomatology and "anxiety-enhancing" parenting behaviors. In an attempt to better understand the environmental processes associated with the familial aggregation of anxiety symptoms, the proposed study investigated the associations between specific parental anxiety symptoms and parenting behaviors in a sample of adoptive parent-child dyads (n=410). Results of a latent-class analysis (LCA) suggested that parental anxiety symptoms were best characterized by a 5-class solution. Adoptive parents' (AP) membership in the comorbid panic disorder and worry symptoms ("*PD+Worry*") was associated with significantly elevated rates of generalized anxiety disorder (GAD) in adopted children (AC). Significant three-way interaction effects highlight a complex pattern of transactional relations among AP and AC characteristics. Finally, relative contribution of categorical and dimensional indices of parental anxiety to AC anxiety diagnosis was examined, with findings suggesting a greater likelihood of AC anxiety associated with AP membership in *PD+Worry* group and dimensional scores of worry and panic disorder symptoms. Implications of the findings are discussed in the context of previous research that portrayed parent and child anxiety as "competing determinants" of anxiety-enhancing parenting behaviors.

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## ACKNOWLEDGEMENTS

First, I would like to thank Dr. Pamela Cole for her guidance with developing the roadmap of my graduate career and with navigating every aspect of my training experience. It has been a privilege to be able to turn to Dr. Cole for questions, no matter how small or complex. Dr. Jenae Neiderhiser graciously offered opportunities and encouragement for me to pursue this dissertation project and several other projects. Being a part of the EGDS team, under Dr. Neiderhiser's leadership, has been both a tremendous learning opportunity and a fulfilled journey. I also thank Dr. Kristin Buss for her generous mentorship and an introduction to the exciting world of early childhood research. In addition, I thank Dr. Stephanie Lanza for her consultation on this dissertation project. I have been very fortunate to have received continued guidance from my undergraduate mentor, Dr. Kristina Hardy, during each critical juncture of my academic endeavors. I also express my gratitude to Yuko Okado and Micah Mammen for their friendship and refreshing perspectives they brought into the ups and downs of grad school life. This acknowledgement would be incomplete without a special thank you to Dr. Michelle Newman for the *overwhelming* support she has offered, to instill confidence in myself and the path I have chosen. For this I will always be so grateful. Most importantly, I thank my parents, my source of inspiration and motivation, for their love and support. The humility and faithfulness with which they approached parenting convinced me that the study of parenting is a worth-while pursuit.

This project was supported by grant R01 HD042608 from the Eunice Kennedy Shriver National Institute of Child Health & Human Development and the National Institute on Drug Abuse, NIH, U.S. PHS (PI Years 1–5: David Reiss, MD; PI Years 6–10: Leslie Leve, PhD). This project was also supported by grant R01 DA020585 from the National Institute on Drug Abuse, the National Institute of Mental Health and OBSSR, NIH, U.S. PHS (PI: Jenae Neiderhiser, PhD) and R01 MH092118 (PIs: Jenae Neiderhiser and Leslie Leve) from NIMH.

## Chapter 1

### INTRODUCTION

Available evidence suggests that parental anxiety—both clinical and subclinical—may serve as an environmental context in which children’s anxiety symptoms develop and persist (Eley et al., 2015). Anxious children are more likely to have parents and family members (Biederman, Petty, Hirshfeld-Becker et al., 2006) with any form of anxiety (Beidel & Turner, 1997; Weissman et al., 1993) or an identical subtype of anxiety (Fyer, Mannuzza, Chapman, Martin, and Klein, 1995; Reich and Yates, 1988; Stein, Chartier, Lizak, & Jang, 2001). Similarly, it has been estimated that up to 60% of children of anxious parents present with clinically significant levels of anxiety (Ginsburg & Schlossberg, 2002). The presence of a maternal anxiety disorder, in particular, has been associated with a two-fold increase in children’s risk of developing an anxiety disorder by mid-adolescence (McClure, Brennan, Hammen, & Le Brocque, 2001). Higher level of parental anxiety has been linked to poorer response to treatment in anxious children, (Bodden et al., 2008; Kendall, Hudson, Gosch, & Flannery-Schroeder, 2008; Settapani, O’Neil, Podell, Beidas, & Kendall, 2013), suggesting that children’s anxiety is likely to be maintained in the presence of parental anxiety symptoms. Even subsyndromal forms of parent anxiety have been shown to confer risk for anxiety symptom development in children (Fisak, Holderfield, Douglas-Osborn, & Cartwright-Hatton, 2010; Lester, Field, Oliver, Cartwright-Hatton, 2009; Rapee, 2009; Wheatcroft & Creswell, 2010).

The frequent co-occurrence of anxiety symptoms within parent-child dyads is attributable to both genetic (Hettema, Neale, & Kendler, 2001; Merikangas & Pine, 2002) as well as environmental influences, including parenting behaviors (Fisak & Grills-Taquechel, 2007; Gar, Hudson, & Rapee, 2005). It has been theorized environmental processes (e.g. modeling, direct information transfer, parenting) associated with parent anxiety may *shape*



the expression of specific forms of anxiety in children, leading to high rates of concordance between parent and child anxiety disorders (Rapee, 2002). Consistent with this notion, there is some evidence suggesting that parental anxiety (e.g. Lindhout et al., 2005; Turner, Beidel, Roberson-Nay, & Tervo, 2003) is accompanied by parenting behaviors that may increase children's long-term risk for anxiety (Ginsburg & Schlossberg, 2002). However, the link between parental anxiety and specific aspects of parenting behaviors (e.g. parental warmth and control) has been inconsistently supported by the extant literature, with available meta-analyses failing to detect a significant association between parental anxiety and specific-types of parenting behaviors (e.g., van der Bruggen, Stams, & Bögels, 2008). Therefore, the ways in which parent anxiety symptoms relate to parenting remain unclear.

The inconsistent evidence linking parent anxiety and parenting has been compared against research underscoring the relatively robust association between anxiety-enhancing parenting and various characteristics of children (e.g., anxiety, temperament) (e.g., Hudson, Doyle, & Gar, 2009; Tiwari et al., 2008). Implicit in such comparisons is the assumption that the anxiety symptoms of parents and their children are competing determinants or correlates of anxiety-related parenting. Although it is plausible that anxiety symptoms of parents and their children are differentially related to distinct types of parenting, it may also be the case that parent- and child anxiety symptoms at times operate interactively to influence specific parenting behaviors (Creswell et al., 2013). For instance, psychological characteristics of children and parents have long been conceptualized as “co-determinants of parenting” (Belsky, 1984). Relatedly, family systems framework suggest that anxiety symptoms are likely to be reciprocally linked within the family system. That is, characteristics of an individual are theorized to impact the functioning of the family as a whole, even as the feedback generated from the family system further influences the individual's symptoms of anxiety (Hughes & Gullone, 2008).

Taken together, despite theoretical and empirical work highlighting the significance of parental anxiety, environmental risk associated with distinct parent anxiety symptoms have not been systematically examined. In order to address this gap in the literature, the present study aimed to: (i) characterize the patterns of anxiety symptom presentation in a non-clinical sample of parents using categorical and dimensional approaches; (ii) examine the concurrent association between anxiety symptoms of adoptive parent-child dyads; and (iii) investigate the possible patterns of transactional relations among parent-child anxiety symptoms, parenting behaviors, and child's temperamental risk for anxiety. Examination of the above questions in genetically related parents and children naturally poses challenges with disentangling the environmental and shared genetic influences. The present study sought to characterize the environmental risk associated with parent anxiety symptoms by examining a sample of adoptive parent-child dyads from the Early Growth and Development Study (EGDS). Specifically, the use of an "adoption-at-birth" design makes it possible to rule out shared genetic influences, as the association between adoptive parent anxiety is attributable to environmental influences (Natsuaki et al., 2014; Rutter et al., 2001, 2006).

### **The Etiological Significance of Parental Anxiety**

According to the etiological models of anxiety, parental anxiety confers both genetic and environmentally influenced risk for the intergenerational transmission of anxiety (e.g. Fisak et al., 2007; Kertz & Woodruff-Borden, 2011; Rapee, 2002; Rapee & Spence, 2004; Ollendick & Hirshfeld-Becker, 2002). Notably, estimates of genetic contributions to anxiety tend to be mild to moderate at best (Hettema, Neale, & Kendler, 2001) and a recent report suggested that environmental, not heritable, influences explain the intergenerational transmission of anxiety risk from parent to adolescent child (Eley et al., 2015). These findings highlighted the importance of identifying the environmental processes that are implicated in the intergenerational transmission of anxiety. Different lines of research

suggested that there are at least three types of environmental risk transmission processes: (1) Parenting behaviors that increase and sustain anxiety risk in the child (e.g., Beesdo et al., 2010; Kiel & Maack, 2012; Nordahl, Wells, Olsson, & Bjerkeset, 2010; Wijsbroek, Hale, Raaijmakers, & Meeus, 2011; Whaley et al., 1999); (2) parent modeling of anxious behaviors, such as behavioral avoidance or worry (e.g., Fisak, Mann, & Heggeli, 2013; Murray, De Rosnay et al., 2008); and (3) verbal transmission of anxious beliefs and threat-related information from parent(s) to child (e.g., Muris, van Zwol, Huijding, & Mayer, 2010; Pass, Mastroyannopoulou, Coker, Murray, & Dodd, 2017).

Of the three processes outlined above, parenting behaviors that lie at the extremes of warmth and control have frequently been shown to increase children's short- and long-term risk for anxiety. It has been hypothesized that parents' anxiety symptoms impair their capacity to respond appropriately to their children and thus result in maladaptive parenting behavioral responses (e.g., over-control, hostility) (McLeod, Wood, & Weisz, 2007; Rapee, 2002, 2009; Rubin et al., 2009; Wood, McLeod, Sigman, Hwang, & Chu, 2003). As an example, observational studies suggest that anxious parents are more likely to endorse anxious beliefs about their children and are also more susceptible to experiencing anxiety during parent-child interactions (Creswell et al., 2013; Turner et al., 2003). In the context of heightened anxiety, parents were observed to be less warm, encouraging, and were more likely to be passive and anxious with their children. Additionally, anxious parents were more likely to promote avoidant behaviors and to model comparatively fewer positive coping behaviors to their children (Murray et al., 2012). Collectively, these parenting behaviors are likely to reinforce children's anxiety responses, restrict opportunities to acquire effective coping strategies, and undermine children's sense of control over self, others, and world (Rapee, 1997).

Although parenting behaviors have been implicated in the environmental

transmission of anxiety risk, previous investigations of the link between parent anxiety and parenting have yielded largely inconsistent findings. A number of studies found a difference in parenting behaviors of anxious and nonanxious control mothers along the dimensions of warmth and control (Creswell et al., 2013; Feldman, 2007; Kendler, Sham, & MacLean, 1997; Murray et al., 2012; Whaley et al., 1999), yet others did not report such differences (Drake & Ginsburg, 2011; Gar & Hudson, 2008; Ginsburg, Grover, Cord, & Ialongo, 2006; Hudson & Rapee, 2001; McClure et al., 2001; Moore, Whaley, & Sigman, 2004; Turner et al., 2003; Whaley et al., 1999; Woodruff-Borden et al., 2002). Moreover, available meta-analytic research failed to detect a robust association between parent anxiety and parenting among school-aged children (van der Bruggen et al., 2008). In contrast, child anxiety has shown a comparatively strong association with anxiety-enhancing or sustaining behaviors, with effect sizes ranging medium to large (van der Bruggen et al., 2008). Together, these findings challenge the longstanding notion that parenting behaviors represent an important mechanism of “direct environmental transmission of anxiety risk.”

In an attempt to interpret the inconsistent findings linking parental anxiety and parenting behavior, a few explanations have been offered: These include (a) poorly specified parent anxiety symptom characteristics (e.g. diagnosis) (b) variability in the operationalization of parenting behaviors (Ginsburg et al., 2006; Murray et al., 2012; van der Bruggen et al., 2008) and (c) variability in methods employed to elicit parent stress or anxiety during parent-child interactions (Murray et al., 2012). These points underscore the importance of considering the contextual factors that influence the association between parent anxiety and parenting behaviors. It is also important to note that anxiety symptoms of parents and those of the children were frequently construed as *competing determinants* of anxiety-enhancing parenting behaviors. Such perspective does not consider the possibility that the characteristics of parents and their children jointly determine parent behavior and

oversimplifies the factors that influence the process of parenting. Transactional models of parenting have called for examination of child characteristics “in the context of” parent characteristics (Belsky, 1984), yet research testing this proposition in relation to parent anxiety has heretofore been limited. In the following section, evidence suggesting parental anxiety symptom as an “environmental context for anxiety risk” is reviewed.

### **Association between Parental Symptom Presentation and Parenting**

Although the association between child anxiety symptom and parenting has received extensive empirical attention (e.g., Greco & Morris, 2002; Hale, Engels, & Meeus, 2006; Spokas & Heimberg, 2009; Wijsbroek et al., 2011), fewer studies have examined the association between specific parental anxiety symptom subtype and parenting. Growing research on parent anxiety does suggest that there may be both symptom-general and symptom-specific patterns of environmental risk (e.g., modeling, parenting behaviors) associated with parental social anxiety disorder, generalized anxiety disorder, and panic-spectrum symptoms (e.g., Pereia, Barros, Mendoça, & Muris, 2014). This line of research has generally focused on disorder-specific learning mechanisms (“modeling anxious behaviors”). For instance, studies utilizing a social-referencing paradigm with stranger-interaction task have found that socially anxious mothers were more likely to demonstrate visible signs of anxiety and to disengage from social interactions and thus increased likelihood that infants would respond to strangers with anxious behaviors immediately following the observation (de Rosnay et al., 2006; Murray et al., 2008; Murray et al., 2012) or even during a follow-up assessment (Aktar et al., 2014). In contrast, Mothers with GAD did not demonstrate similar signs of anxiety or behavioral disengagement during a social-interaction task (Murray et al., 2006). Rather, consistent with the nature of the GAD pathology, behavioral tasks involving uncertainty were found to elicit visible signs of anxiety for mothers with GAD (Murray et al., 2012). Murray and colleagues (2012) concluded that failing to examine distinct anxiety

subtypes may “obscure” the possible disorder-specific patterns of risk.

### **Parenting behaviors associated with social anxiety, worries, and panic symptoms.**

This section reviews research on parenting behaviors linked to three specific anxiety symptom subtypes: Social anxiety, worries, and panic-spectrum symptoms. Although the research reviewed below examined specific parenting behaviors associated with a disorder of interest (i.e., SAD, GAD, PD), very few studies explicitly considered comorbidity among these conditions (e.g., Murray et al., 2012). As such, the extent to which findings are specific to each condition remains unclear.

***Social anxiety symptoms.*** Parenting characterized by excessive warmth and high level of behavioral control (e.g., overprotective or oversolicitous parenting) has been established as an environmental risk factor of child social anxiety disorder (Rapee & Spence, 2004). Evidence from prospective (e.g. Rubin, Burgess, & Hastings, 2002) and retrospective longitudinal studies (e.g. Lieb et al., 2000; Spokas & Heimberg, 2008) or prevention research (e.g. Rapee, Kennedy, Ingram, Edwards, & Sweeney, 2010)<sup>1</sup> has provided support to the link between *child* social anxiety disorder and parenting characterized by excessively high levels of warmth and control (e.g., overprotectiveness). In contrast, there is comparatively limited evidence suggesting that parents’ social anxiety symptoms is also accompanied by excessively warm and controlling parenting behaviors. Although a study of preschool-aged children and their mothers reported that maternal shyness was significantly related to higher overprotectiveness (Root, Hastings, & Rubin, 2016), socially anxious mothers of preschoolers were not found to be more overprotective, warm, or intrusive (Murray et al.,

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<sup>1</sup> The prevention program designed for behaviorally inhibited children at putative risk for later social anxiety included a treatment component targeting parental overprotection. Significant reduction in anxiety symptom was documented for children whose parents participated in this program.

2012). In fact, Murray and colleagues (2012) found that socially anxious mothers were less likely to be warm, encouraging, and more passively disengaged during a social challenge task.

In sum, the extant literature does not provide a clear picture of parenting behaviors that may be directly associated with parental social anxiety. Studies of the interpersonal styles associated with adult social anxiety has implicated both warmth/hostility and elements of interpersonal control (“friendly-submissiveness or hostile-dominance”) as prominent interpersonal attributes of socially anxious individuals (Kachin, Newman, & Pincus, 2001). Examination of the associations between parental social anxiety symptoms and parental warmth and control specifically directed to the children may help further elucidate ways in which social anxiety across varying levels of symptom severity may be linked to parenting and child outcomes.

**Worries/Generalized anxiety.** Research examining parenting behaviors associated with parental GAD has likewise been limited. As previously mentioned, Murray and colleagues (2012) noted that maternal GAD was associated with impaired parenting (e.g. low encouragement, low positive modeling, and high promotion of avoidance) when mothers and their children were presented with a task designed to elicit a sense of uncertainty. A study by Kendler and colleagues (1997) also reported that maternal GAD was associated with significantly low level of parental warmth. Similar set of findings were reported for GAD group’s interaction with 10-month old infants. As a group, GAD mothers demonstrated higher levels of control (e.g., verbal commands or prohibitions). Additionally, experimental induction of worries led to a significantly low level of positive affect and reduced responsiveness to infant vocalizations for mothers with GAD.

It is noteworthy that GAD and worry symptoms in youth have also been associated with low parental warmth or its variants (e.g., rejection, coldness, disapproval) (Brown &

Whiteside, 2008; Cassidy, Lichtenstein-Phelps, Sibrava, Thomas, & Borkovec, 2009; Hale et al., 2006; Muris, Meesters, Merckelbach, & Hülsenbeck, 2000). Therefore, different lines of research examining parenting behaviors associated with generalized anxiety—whether in parents or in children—suggest that low parental warmth or rejection may increase or maintain children’s risk for GAD. These findings appear generally consistent with recent evidence documenting that individuals with GAD demonstrate: (a) a preferential tendency to maintain a state of negative affectivity (Newman, Llera, Erickson, Przeworski, & Castonguay, 2013); (b) interpersonal problems typified by cold (Przeworski et al., 2011) and hostile (Deschênes, Dugas, Fracalanza, & Koerner, 2012) attitudes. Further examination is required to understand whether parental GAD may be accompanied by low parental warmth and rejection in parent-child interactions.

**Panic symptoms.** Although there is limited research available on the parenting of parents with panic disorder (PD), available studies tend to suggest greater control, reduced sensitivity, and more critical behaviors for mothers with PD (but see also Weinberg, Beeghly, Olson, & Tronick, 2008). According to one observational study, mothers with PD were more likely to use behavioral control (e.g., low autonomy granting) with their school-age children, whereas nonanxious control group did not demonstrate such association (Challacombe & Salkovskis, 2009). Maternal PD was also found to be associated with higher levels of criticism, reduced sensitivity, and conflict during mother-adolescent dyadic interactions (Schneider et al., 2009). Likewise, mothers with PD were likely to be highly involved but less sensitive with their infants. More specifically, mothers with PD scored significantly lower on measures of sensitivity, described themselves as being more likely to display anger toward children, while being significantly more involved with the infants during the night (e.g. more frequent feeding, less likely to put infant to bed awake, more likely to share a room/bed with infant) (Warren et al., 2003). Together, there is some evidence to suggest that maternal PD is



linked to low warmth and greater behavioral control with children of different age groups; further research is required to examine the nature of impairment associated with parental PD.

### **Identification of Subgroups of Anxious Parents: Consideration of Symptom**

#### **Presentation**

Findings reviewed above suggest that parental anxiety symptom presentation is likely to influence parental behavioral response to children under situations involving possible threat. Furthermore, experimental research has offered evidence that children of anxious parents are likely to observe and even acquire specific types of anxiety-related behaviors through vicarious learning. In the following section, three specific anxiety disorder subtypes (social anxiety, generalized anxiety, and panic spectrum symptoms) that have been found to confer particularly elevated risk for child anxiety in symptom-general (Schreier, Wittchen, Höfler, & Lieb, 2008) or symptom-specific patterns are reviewed (Biederman et al., 2001; Lieb et al., 2000). Social anxiety disorder (also known as social phobia in the DSM-IV-TR) is characterized by an excessive fear of embarrassment and an invariable experience of anxiety in social situations (The Diagnostic and Statistical Manual of Mental Disorders 5<sup>th</sup> ed.; DSM-5; American Psychiatric Association, 2013). Even with a recognition that their fears may be unreasonable, socially anxious individuals engage in overt or subtle forms of avoidance and experience distress in feared situations. In the DSM-5, generalized anxiety disorder (GAD) is defined by persistent, excessive and uncontrollable worry about a range of topics. As a result of worrying, individuals with GAD additionally experience symptoms including sleep or concentration difficulties, restlessness, and muscle tension. Finally, panic attacks are described in the DSM-5 as intense fear reactions that are accompanied by somatic (e.g. *sensations of shortness of breath*) and/or cognitive (e.g. *fear of losing control or dying*) symptoms. These symptoms may occur unexpectedly or expectedly in response to a specific external or internal cue. The discrete, “paroxysmal nature” of the intense and severe

accompanying symptoms distinguish panic attack from general anxiety reactions. Panic attacks frequently co-occur with other anxiety disorders and by definition become “expected” given its connection with a stand-alone disorder (e.g., GAD) (DSM-5; American Psychiatric Association, 2013, p. 213). Panic disorder is generally distinguished from panic attacks by the presence of recurring unexpected panic attacks and by the fear and avoidance that center primarily on the panic attacks that tend to occur “out-of-the-blue.” Currently, identical diagnostic criteria for SAD and panic disorder/panic attacks are applied to children and youth, with the exception of criterion C of GAD diagnosis; whereas three of the six associated physical symptoms (e.g., fatigability, muscle tension) are required for adults, only one somatic symptom is required for children.

#### **Type of parental anxiety symptom presentation and associated child outcomes.**

Research on the familiarity of anxiety indicate that the examination of the type of parental anxiety symptom can inform the degree (Schreier et al., 2008) and the type of risk for anxiety conferred to children (Biederman et al., 2001; Rosenbaum et al., 1992). For example, in their examination of 933 mothers and their adolescent children (14-17 years), Schreier and colleagues (2008) found that each type of maternal anxiety disorder differentially predicted children’s likelihood developing of any form of anxiety (Schreier et al., 2008). The cumulative probability of children developing any form of anxiety disorder by adolescence was highest among children of parents with social anxiety (“social phobia”), followed by GAD, and panic disorder. This study also reported that the hazard ratios—cumulative risk for any anxiety given particular type of maternal anxiety—for children of mothers with social anxiety and GAD disorder differed significantly from that of children with nonanxious mothers. These findings suggest that the presence of parental social anxiety and GAD elevates the risk for anxiety in children.

Patterns of symptom-specific transmission were also documented by several studies

(Biederman, Petty, Faraone, et al., 2006; Fyer et al., 1995). For instance, a recent study which examined the specificity of anxiety transmission reported that SAD and GAD were more likely to co-occur in parent-child dyads (Telman, van Steensel, Maric, & Bögels, 2017). Other studies have reported that social anxiety was likely to co-occur in parents and children (Knappe et al., 2009; Merikangas, Lieb, Wittchen, & Avenevoli, 2003), with some evidence that parental social anxiety was associated with the greatest risk for children's social anxiety relative to any other form of anxiety and other types of parental internalizing and externalizing disorders (Lieb et al., 2000). Likewise the presence of parental GAD also significantly predicted both subclinical (Beesdo et al., 2010; Beesdo-Baum et al., 2011) and clinical levels of GAD (Coehlo, Cooper, & Murray, 2007; Newman & Bland, 2006), with the odds ratio being higher for males (Kessler, Brandenburg, et al., 2005). In light of the above epidemiological evidence, examining the patterns in which symptoms of social anxiety, generalized anxiety, and panic attack co-occur within adoptive-parent child dyads may inform whether environmental processes might account for the observed familial aggregation of anxiety.

**The degree of parental anxiety symptom severity and associated risks.** Despite emerging evidence suggesting that subclinical levels of parental anxiety are associated with children's anxious behaviors (e.g., Costa & Weems, 2005; Creswell et al., 2013; Pereira, Barros, Mendonça, & Muris, 2014), the impact of parental anxiety symptom severity on children's anxious symptoms has not been explicitly examined. Most work has compared parents with clinical anxiety and those without or examined community samples of parents presenting with nonspecific anxious traits. Rarely have unselected individuals presenting with symptoms that vary across the full range of symptom severity been examined within a single investigation. As such, the possible effects of parents' subclinical levels of distinct anxiety subtypes on children's risk for anxiety symptom development remains unknown. This gap is

noteworthy as epidemiological studies estimate that a substantial number of individuals experience subthreshold levels of anxiety are also likely to experience significant impairment related to their anxiety symptoms (Carter, Wittchen, Pfister, & Kessler, 2001; Stein, Torgrud, & Walker, 2000).

Lifetime prevalence estimates of any form of anxiety disorder is 29%, with the estimates being higher for individuals of childrearing ages (between 18-59 years with a peak noted for 30-44 years) (Kessler, Berglund, Demler, Jin, & Walters, 2005). Lifetime prevalence estimate of 5.6 % for GAD has been shown to increase by 50-60% with the relaxation of the diagnostic criteria for the minimum symptom duration (Kessler Brandenburg et al., 2005; Ruscio et al., 2007) and by approximately 40% when the excessive worry criterion is not required (Ruscio et al., 2005). When all three diagnostic criteria are relaxed, the lifetime prevalence estimate of GAD increased to 13.7% (Ruscio et al., 2007). It is important to note that a significant proportion of individuals with subthreshold levels of GAD still experience clinically significant disability associated with anxiety and require treatment (Carter et al., 2001). Available research provides some evidence that the presence of the subthreshold level of parental GAD may also serve to enhance risk for anxiety in children. For instance, worries about interpersonal issues (including those about family relations) is the most frequent worry topic for both anxious and nonanxious individuals (Roemer, Molina, & Borkovec, 1997). Parents' worries about child and childrearing ("parenting worries") is one form of such interpersonal worries. In a community sample of parents, subclinical levels of "parenting worries" were found to predict an increase in anxiety in adolescents (Fisak et al., 2012), suggesting that worries that pertain directly to the children might explain the covariation of anxiety within parent-child dyads.

Likewise, studies of social anxiety indicate that the distinction between subthreshold and clinical levels of social anxiety is arbitrary and that many that do not meet the full

diagnostic criteria present with significant role impairment. For example, Ruscio and colleagues (2008) reported that the impairment associated with social anxiety increases linearly with the number of social fears experienced by socially anxious individuals (Ruscio et al., 2008). The same linear pattern between the number of social fears and impairment also held for individuals who fell just below the diagnostic criteria for social anxiety, indicating that there is no clear diagnostic threshold emerging from large epidemiological survey data (Stein et al., 2000). Consideration of subthreshold levels of social fear in parents may inform whether and how environmental risks for social anxiety may operate dimensionally in “normative” samples of parent-child dyads.

Although panic attacks (PA) do not constitute a standalone disorder, the isolated presence of panic attacks does affect approximately 23% of the population (lifetime prevalence estimate) and incur substantial impairment (Kessler et al., 2006). Findings documenting significant impairment and comorbidity associated with PA suggest that PA and PD may exist along a continuum. However, relative risk conferred by parental PA and PD remains virtually unknown. Taken together, extant literature indicates that a substantial number of adults between the ages of 30 and 44 years present with varying degrees of social anxiety, generalized anxiety, and panic attack symptoms. The significant and pervasive role impairment experienced by individuals with subthreshold levels of distinct anxiety subtypes indicates that subclinical symptoms of anxiety may also impair parents’ ability to respond most adaptively to their children in situations that elicit anxiety in parents. The association between symptom severity and impairment in parenting, however, has not yet been examined.

**Comorbidity and symptom overlap.** In considering the findings described above, it is important to note that epidemiological evidence consistently suggests that anxiety is the most prevalent psychiatric condition (Lieb, 2005; Wittchen & Jacobi, 2005), which also presents with high rates of comorbidity (Toft et al., 2005). Findings from a nationally

representative study of adults presenting to primary care settings indicated that over 60% of patients with GAD, PD, or SAD were also likely to present with another form of anxiety (Toft et al., 2005). Similarly, preschool-aged children seen in primary care settings show high rates of comorbidity across common anxiety disorders, suggesting that comorbidity may be a norm rather than an exception for anxiety disorders (Franz et al., 2013). As a consequence, there has been a growing interest in characterizing unique patterns of diagnostic comorbidity across multiple anxiety disorders. For instance, using the data from the National Comorbidity Survey, Kessler and colleagues (2005) have taken a data-driven approach (latent class analysis (LCA)) to identify distinct diagnostic subgroups. This study noted that anxiety disorders were prominently represented in four of the seven multivariate disorder classes. For example, social anxiety, GAD, and panic disorder were jointly featured in at least three classes but in one class, only social anxiety (without GAD or PD) was represented. Yet other studies have compared diagnostic pairs (e.g., PD+GAD) to their non-comorbid counterparts (e.g., Newman, Shin, & Zuelling, 2016) or to those with other comorbid combinations (e.g., PD+SAD) (Norton & Chase, 2015). These findings suggest that diagnostic comorbidity is associated with greater impairment and highlight the importance of taking a nuanced approach to explore the symptomatic differences across comorbid groups (i.e., primary GAD with secondary PD vs. primary PD with secondary GAD) (Norton & Chase, 2015). Given these findings, it is unsurprising that comorbid anxiety disorders in parents has been identified as a risk factor for anxiety and behavioral inhibition in children (Rosenbaum et al., 1992). Furthermore, there is also some evidence indicating that comorbid anxiety may be accompanied by greater impairment than anxiety disorders that occur in isolation (Kessler et al., 2006). It may be possible that distinct symptom subgroups that emerge from data-driven approaches are associated with differential patterns of environmental risk for child anxiety. More specifically, in addition to examining the independent effects of distinct types of

parental anxiety, it is also important to consider the ways in which multiple anxiety subtypes (combinations of social anxiety, GAD, and panic symptoms) co-occur and interactively influence parenting behaviors.

A logical extension of the extant literature would be to examine the co-occurrence of various types of anxiety symptoms—rather than a primary diagnosis—in individuals presenting with varying levels of anxiety. Despite evidence suggesting that a) distinct forms of anxiety present a contextual risk for children, b) subthreshold level of each disorder may be accompanied by significant impairment and distress, and that c) multiple anxiety disorders tend to co-occur, no study to date has examined the pattern of co-occurrence of social anxiety, generalized anxiety, and panic disorders at the symptom level. Thus, available studies on parental anxiety have only considered parents that belong to distinct diagnostic groups without considering the heterogeneity that exists in the symptom presentation. This represents an important gap in the literature, given increasing evidence which indicates that nonanxious individuals' behaviors that correspond to distinct types of anxiety (e.g. social anxiety, worry, specific fear) do in fact influence children's anxious behaviors (e.g. de Rosnay et al., 2006; Remmerswaal, Muris, & Huijding, 2013). In particular, there has been a growing interest in identifying parental characteristics (e.g. parental anxious cognitions) that may mediate the linkage between parent anxiety and child anxiety (Wheatcroft et al., 2007). Characterizing parents based on their anxious symptom profiles—specific symptom clusters, degree of severity—may advance the extant literature by examining how normative variation of anxiety symptoms might also predict specific risk for anxiety in children.

### **The Present Study**

The primary objective of the proposed study was to examine the environmental risk associated with parental anxiety symptoms by investigating: (1) patterns of co-occurring anxiety symptoms within adoptive parents and their children and (2) transactional relations

among anxiety symptoms—of parents and their children—and specific parenting behaviors that have been found to increase and sustain children’s risk for anxiety. To understand the potential symptom-specific associations between parent anxiety and parenting, parent anxiety symptoms were characterized categorically and dimensionally. First, latent class analysis (LCA) was carried out to identify subgroups of parents presenting with categorically distinct symptom profiles. Next, to better understand the environmental risk associated with specific anxiety symptoms, the interactive relations among dyadic anxiety and parenting were examined via a series of moderation analyses. Examination of the above questions using a sample consisting of adoptive parent-child dyads makes it possible to draw specific inferences about the environmental—as opposed to genetic—influences that may explain aggregation of anxiety within parents and their children. Additionally, the association between maternal anxiety and parenting behaviors has been found to be moderated by children’s temperamental vulnerability to anxiety (e.g., Hirshfeld et al., 1997). The present study examined two temperamental constructs that have been shown to confer risk for childhood anxiety disorders: infant “negative temperament” encompassing low soothability and fussiness and toddler “fearful temperament” capturing inhibition and social fear in novel situations. Infant negative temperament—broadly characterized by difficulty with being soothed, fussiness, or irritability—has been described as an earliest form of developmental antecedent of anxious vulnerability, including behavioral inhibition (Rubin, Coplan, & Bowker, 2009). Recent evidence has also implicated chronic irritability in children of preschool as a potential developmental antecedent of child anxiety diagnoses including generalized anxiety disorder (GAD) or separation anxiety disorder (Dougherty et al., 2015). Furthermore, irritability has been shown to be among the most common associated symptoms of youth GAD (Comer et al., 2012; Pina, Silverman, Alfano, & Saavedra, 2002) and a risk factor for GAD in adulthood (Stringaris et al., 2009). For the above reasons, infant negative



temperament was examined as a general risk factor that may not only predispose adopted children to symptoms that cut across all anxiety disorders (Barlow, 1988) but also as one that has a strong potential to impact parenting behaviors (Rubin et al., 2009) and parent symptoms (Rubin et al., 2009). Finally, the present study sought to examine whether the environmental risk associated with parent anxiety was best captured by the categorical or dimensional indices of AP anxiety symptoms. Dimensional symptom scores for three types of anxiety symptoms—social anxiety, generalized anxiety, panic symptoms—were considered, given the high environmental risk associated with each symptom cluster (Schreier, 2008).

***Aim 1: Categorical and Dimensional Characterization of Parent Anxiety Profile: Symptom subtypes, severity, and comorbidity.***

**Hypothesis 1.** The present study took an exploratory, data-driven approach to identify distinct subgroups of parents based on their social anxiety, generalized anxiety, and panic-spectrum symptoms. On the basis of the results of a previous study that used the LCA approach to examine the multivariate comorbidity among 19 DSM-IV disorders (Kessler, Chiu et al., 2005), it was hypothesized that the following classes may result from the analysis: (a) a class including a large proportion of the participants presenting with low levels of anxiety symptoms; (b) at least one class characterized by comorbid symptoms of social anxiety, panic symptoms, and generalized worries ;(c) a class with comparatively high representation of the symptoms of social anxiety with low levels of generalized anxiety and panic spectrum symptoms; and (d) a class with predominant presentation of worry symptoms associated with generalized anxiety disorder.

***Aim 2: Estimation of Concurrent Relations between AP Anxiety and AC Anxiety Diagnoses.***

**Hypothesis 2.** Extant literature suggests that symptoms of social anxiety, worries, and panic-spectrum symptoms tend to aggregate in biological parent-child dyads, following both

symptom-specific and symptom-general patterns. Given that the three anxiety symptom subtypes show particularly high rates of any AC anxiety diagnosis (Schreier et al., 2008) and are likely to be comorbid, it was hypothesized that AP membership in latent classes with elevated worry, social anxiety, or panic symptoms would be associated with an elevated risk for AC anxiety diagnoses (i.e., generalized anxiety disorder, social anxiety disorder, separation anxiety disorder, presence of any hybrid anxiety disorder). Additionally, based on research suggesting that exposure to specific types of parental anxiety may underlie documented patterns of symptom-specific aggregation of anxiety symptoms (e.g., social fear, worries) within parent-child dyads, it was hypothesized that the presence of parental worry and social anxiety symptoms would be associated with elevated rates of GAD and SAD in adopted children.

***Aim 3: Examination of Relations among AP Anxiety, AC Anxiety diagnoses, and Parenting: Temperament as a Potential Moderator***

**Hypothesis 3a-AP Anxiety and Parenting:** The present study is one of the first investigations to examine the relations among parenting behaviors and distinctive types of parent anxiety symptom clusters. Although prior research that employed heterogeneous subgroups of anxious parents did not find evidence of a robust association between parent anxiety and parenting behaviors, it was hypothesized that distinct subtypes of parent anxiety symptom clusters would show differential patterns of relations with parenting behaviors. Taking a largely exploratory approach, it was hypothesized that parent anxiety symptoms would be broadly associated with less warmth and higher levels of hostility. It was also hypothesized that anxiety symptom severity (e.g., high comorbidity) would adversely impact parenting behavior, as evidenced by less involved or inconsistent parenting.

**Hypothesis 3b-Interactions among AP Anxiety and AC Characteristics**

Children's dispositional characteristics (i.e., anxiety, temperament) have been shown to influence parents' perception of children's anxious vulnerability and various aspects of parenting behaviors (e.g., Hudson, Comer, & Kendall, 2008; Kiel & Buss, 2010; Rubin, Nelson, Hastings, & Asendorpf, 1999). Consistent with the transactional models of child anxiety risk (e.g., Kertz & Woodruff-Borden, 2011), it was hypothesized that anxiety symptoms of parents and children would interactively relate to AP parenting behaviors. Additionally, children's temperamental vulnerability to anxiety was conceptualized as a risk factor that would moderate the environmental risk (i.e., parenting behaviors) associated with child anxiety. Infant negative temperament (e.g., fussiness/irritability) and toddler fearful temperament were examined as additional moderators of the link between AP anxiety and parenting (Rubin, Coplan, & Bowker, 2009).

***Aim 4: Comparison of Categorical and Dimensional Representation of AP***

***Anxiety: Links to AC Anxiety Diagnoses***

**Hypothesis 4:** The present study took an exploratory approach to examine the whether categorical and dimensional measures of AP anxiety (social anxiety, generalized anxiety symptoms, and panic-spectrum symptoms) show differential relations with AC anxiety diagnoses.

## Chapter 2

### METHOD

#### Sample

The present study examined the data on adoptive parent-child dyads from the Early Growth and Development Study (EGDS), a longitudinal prospective study of two cohorts of 561 adopted children (57.2% male) and their adoptive and birth parents (Leve et al., 2013). Data collection for Cohort II began approximately 4-5 years after the first three waves of the Cohort I data collection. Participants were recruited via adoption agencies across 15 states, over the span of approximately 7 years, if the following inclusion criteria were met: a) domestic adoption b) placement within 3 months postpartum c) adoption by families with no biological relation to child d) absence of known medical conditions (e.g. prematurity) and e) parental ability to understand English at the 8<sup>th</sup>-grade level.

Children's average age at the time of adoption was 6.2 days (SD=12.45). The ethnicity of the children consisted of 55.6% Caucasian, 19.3% multi-racial, 13% African American, 10.9% Latino, and less than 1% of the sample included Asian or American Indian children. Participating adoptive parents were designated as adoptive parent 1 (AP1; primarily mothers) or adoptive parent 2 (AP2; primarily fathers). The adoptive families included 41 same-sex parent families (same sex adoptive fathers=18, same sex adoptive mothers=23). At the time of the adopted child's birth, the mean ages of adoptive parents were 37.5 (AP1) and 38.3 (AP2) years. The majority of adoptive parents were Caucasians (AP1=91.8%, AP2=90.4%). Approximately half of the adoptive households reported the minimum annual income of \$10,000 and more than 70% of adoptive parents had attained a college (AP1=48.6%; AP2=44.3%) or a graduate degree (AP1=38.2%; AP2=33.9%). More detailed information on the recruitment process and demographic information of the full EGDS sample can be found elsewhere (Leve et al., 2013).

The present study examined data on 410 adoptive parents (mothers=389) and their children (female=186) across three waves of assessment, child ages 9 months through 7.4 years. The analytic sample consisted of families that completed the structured diagnostic interview of parent psychological symptoms (CIDI, described below). The first assessment (T1) was completed when children were approximately 9-months of age (mean age = 9.07, SD = 1.35). Parents also provided a rating of temperamental fearfulness at child age 18 months (mean age = 17.9, SD= 1.44) (T2). During middle childhood (T3), diagnostic interviews (CIDI and PAPA) and parent-administered rating scales (parenting) were completed, when Cohort II children were approximately 6 years (n = 149, mean age = 6.14 years, SD = 0.26) and Cohort I children were approximately 8 years (n = 261, mean age = 8.14 years, SD = 0.28).

## **Procedure**

**Parental anxiety.** Adoptive parents' symptoms of social anxiety, generalized anxiety, and panic attack were assessed by using the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI; Kessler & Üstün, 2004; World Health Organization, 1990). The CIDI is a comprehensive, fully structured diagnostic instrument designed to be administered by trained lay interviewers to generate diagnostic information consistent with the criteria from the Diagnostic and Statistical Manual of Mental Disorders-IV Fourth Edition (DSM-IV) and the International Classification of Diseases (ICD-10). Good concordance between the CIDI and the structured clinical interview for DSM-IV (SCID) has been demonstrated in the recalibration sample of the National Comorbidity Survey Replication (NCS-R) (Kessler et al., 2004). In this study, the Computer Assisted Personal Interviewing model (CAPI) version of the CIDI was used. The CAPI was designed to minimize errors in the administration and the scoring stages. Modifications reflected in the version of the CIDI used for this study were specifically aimed at providing detailed

information about subthreshold levels of disorders (e.g. age of onset and contextual factors associated with discrete panic attack episodes, assessment of complete GAD module for individuals that do not meet the duration requirement) (Kessler et al., 2004). The CIDI uses a stem-and-branch logic that presents sets of stem questions to sequentially screen out individuals who are unlikely to meet the diagnostic criteria. The modules for social phobia, generalized anxiety, and panic attacks were administered to a subset of individuals who endorsed the initial screener items for each disorder.

**Child anxiety.** Children's anxiety symptoms and diagnoses were assessed using the Preschool-Age Psychiatric Assessment (PAPA) at T3. The PAPA is an interviewer-based diagnostic instrument designed to be administered to the primary caregiver of children between age 2 and beyond (Egger, Ascher, & Angold, 1999). The PAPA generates categorical and dimensional diagnostic information that are consistent with the criteria from the DSM-IV and the Diagnostic Classification of Mental Health Disorders of Infancy and Early Childhood (DC: 0-3). Good test-retest reliability and construct validity have been established for the PAPA (Egger & Angold, 2004; Egger et al., 2006). Following the recommendations provided by the authors of the instrument, master raters reviewed the reliability of 15% of the interviews by completed by interviewers trained to achieve a minimum of 90% on a performance criteria. Coding for all completed interviews was also reviewed by a master coder. Four types of anxiety diagnoses classifications were considered in this study: generalized anxiety disorder ("GAD"), social anxiety disorder ("SAD"), separation anxiety disorder, and a broader category of "hybrid anxiety disorder," which represented the presence of GAD, SAD, separation anxiety disorder, specific phobia, or PTSD (Task Force on Research Diagnostic Criteria: Infancy and Preschool, 2003).

**Parental warmth and hostility.** At T3, adoptive parents reported on their own warmth and hostility toward the child on the Iowa Family Interaction Rating Scale (Melby &

Conger, 2001). This 18-item questionnaire is comprised of warmth [‘help child do something that was important to him/her’] and hostility [‘criticize child or child’s ideas’] scales. Internal consistency estimates were found to be acceptable (Warmth:  $\alpha=.81$ ; Hostility:  $\alpha=.84$ ).

**Parenting behaviors.** Adoptive parents completed the Alabama Parenting Questionnaire (APQ; Shelton, Frick, & Wooton, 1996) at T3. The involvement subscale was examined as a measure of parental control over child’s daily functioning [‘You ask your child what his/her plans are for the coming day’] and as a proxy of impairment (e.g., parental disengagement) that may be associated with parental anxiety [‘You volunteer to help with special activities that your child is involved in (such as sports, boy/girl scouts, church youth groups)’]. Additionally, the inconsistent discipline subscale was also examined as a factor that may increase children’s risk for anxiety and reflect the degree of impairment associated with parent anxiety. The six-item scale included items such as [‘you feel that getting your child to obey you is more trouble than it’s worth,’] and [‘the punishment you give your child depends on your mood.’] Internal consistency estimates for both subscales were acceptable (Involvement:  $\alpha=.71$ ; Inconsistent discipline:  $\alpha=.61$ ).

**Infant negative temperament.** An abridged version of the Infant Characteristics Questionnaire (ICQ; Bates, Freeland, & Loundsbury, 1979) was completed by adoptive parents at T1 to assess infant fussy/negative temperament [‘How difficult is your baby to soothe?’ ‘How many times per day, on average, does your baby get fussy and irritable for either short or long periods of time?’]. Higher scores indicated more negativity ( $\alpha =.81$ ).

**Toddler fearful temperament.** The Social Fearfulness subscale (19-items) of the Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith, 1996), completed by the adoptive parents when children were approximately 18-months of age (T2), was used to assess adoptive children’s inhibition and fear of novel situations ( $\alpha =.87$ ).

**Covariates.** To account for potentially confounding effects of child and parent

characteristics, covariates were included in all analyses that included latent class membership as a predictor variable.

*Child Age.* AC age at T3 was computed in months.

*Child Sex.* AC sex was coded as 1 (male) or 2 (female).

*Child Age.* \_Child age was calculated at T3.

*AP Sex.* AP Sex was coded as 1 (male) or 2 (female).

*Perinatal Complications.* Based on the McNeil-Sjostrom Scale for Obstetric Complications (Kotelchuck, 1994; McNeil, Cantor-Graae, & Sjostrom, 1995) an index of perinatal risk was created (Marceau et al., 2016). The total pregnancy complication scale comprised of items including the age of biological mother, pregnancy difficulties, toxin exposure, substance use, labor and delivery difficulties, and neonatal complications based on a “best score” obtained from prenatal care and delivery records and birth mother self-reports.

### **Statistical Analyses**

Main analyses proceeded in four stages: First, latent class analysis (LCA) was used to identify subgroups of parents on the basis of their symptoms of social anxiety, generalized anxiety/worries, and panic. A series of LCA models with 1 through 9 classes were compared on the basis of the following indices: the Akaike information criterion (AIC; Akaike, 1974), Bayesian information criterion (BIC; Schwarz, 1978), adjusted BIC (a-BIC; Sclove, 1987),  $G^2$  fit statistic, entropy  $R^2$  statistic (Celeux & Soromenho, 1996), and solution stability. The posterior probabilities resulting from the LCA model were then used to make class assignments for each parent. Second, the association between parents’ latent class membership (T3) and child anxiety diagnoses (T3) was examined using a series of ordinary least squares regression and logistic regression models. Latent class membership (n-1 dummy-coded variables to represent membership in one of the n latent classes) was specified as a predictor variable. Third, AP latent class membership and AC anxiety diagnoses were



examined as covariates of T3 parenting behaviors, using ordinary least squares regressions. Possible interaction effects were also tested by specifying AC anxiety diagnoses or AC temperament as moderators of the association between AC latent class membership and parenting. Finally, three-way interaction effects that included both AC anxiety and AC temperament as moderators were examined. Posterior probabilities for class membership were again used to create a latent, dummy-coded predictor variable for tests of statistical interaction. As these tests involve multiple comparisons of models testing potential interaction effects, the Benjamini-Hochberg procedure was employed to adjust the *p*-values (Benjamini & Hochberg, 1995). Only those interaction effects that were significant at the adjusted *p*-value following the adjustments were tested graphically; to facilitate interpretation, binary and continuous moderators were plotted along the x-axis. Finally, dimensional scores of three anxiety symptom subtypes (social anxiety, generalized anxiety, and panic disorder) were computed. The relative contribution of dimensional and categorical (LCA) measures of parent anxiety to child anxiety diagnosis was examined via a series of binary logistic regression models. LCA was completed using the SAS Proc LCA (Lanza, Dziak, Huang, Wagner, & Collins, 2013). All other analyses, including imputation of the missing data, were completed in the R computing environment.

**Missing data.** Of the 410 parent-child pairs with complete CIDI data, less than 8% of families had missing data on study variables: T1 negative temperament (*n* = 17; 4.1%); T2 fearful temperament (*n* = 55; 13%); T3 PAPA interview data (*n*=17; 4.1%); T3 Parenting variables (*n*=30-31; 7.3-7.6%). Missing data were imputed using the Multiple Imputation by Chained Equations (MICE) method (van Burren & Groothuis-Oudshoorn, 2011). Comparison of the complete case analysis and estimates based on pooled estimates were not found to differ. As such, pooled estimates of the imputed data are reported.

## Chapter 3

### RESULTS

#### Preliminary Analyses

Descriptive statistics and correlations among key study variables are presented in Tables 1 and 3. Frequency of lifetime anxiety diagnoses for adoptive parents and their children are presented in Table 2 and comorbidity among the conditions are displayed in the form of Venn diagrams in Figures 1A & 1B. Lifetime prevalence estimates for AP GAD, SAD, and PD in APs were 6.6%, 8.3%, and 4.6% respectively. As expected, rates of panic attacks were comparatively higher (28.8%). Approximately 19.5% of AC met the diagnostic criteria for GAD, 11% met the criteria for social anxiety diagnosis, and 13.4% presented with separation anxiety disorder. When all anxiety disorders and PTSD criteria were considered, approximately 28.5% were likely to be diagnosed with a form of “hybrid anxiety disorder.”

**Step 1: Latent class analysis.** Prior to the LCA, diagnostic symptom data obtained from the CIDI were reduced on the basis of their diagnostic and conceptual significance. 11 indicators (one three-level and 10 binary variables) that correspond to the DSM criteria were created (Table 4). Over 50% of the parents endorsed subclinical panic symptoms, although less than 20% of the sample perceived that these symptoms occurred “out-of-the-blue” or were accompanied by impairment lasting one month or longer. Models with one to nine latent classes were compared to select the model that provided the optimal fit and parsimony. Table 5 provides a summary of the model fit indicators. As the first step, model identification was examined using the percentage of solutions that converged to the maximum likelihood value; solutions that converged for at least 10 percent of the 1000 starting values were considered well-identified (Lanza & Bray, 2010).

Table 1. Descriptive Statistics for Key Study Variables

		Mean	SD	Min	Max		
<b>AP Characteristics</b>							
	Age	44.6	5.78	30.63	65.14		
	Female (%)	389	95%	---	---		
<b>AC Characteristics</b>							
	Age	7.41	1.00	7.41	7.92		
	Female (%)	186	45.4%	---	---		
<b>AP Dimensional Scores (T3)</b>							
1	3.62	3.83	0	3.39	3.39		
2	3.02	4.84	0	3.10	3.10		
3	3.31	3.53	0	2.55	2.55		
<b>AP Parenting Behaviors (T3)</b>							
		Mean	SD	Min	Max	Absolute Min	Absolute Max
4	Involvement	41.5	0.48	21	50	6	50
5	Inconsistent Discipline	12.3	0.49	6	21	6	30
6	Warmth	38.26	3.71	24	42	6	42
7	Hostility	10.75	3.11	5	24	5	35
<b>AC Temperament (T1, T2)</b>							
8	Negative Temperament (9mo)	18.68	5.47	6	33	7	42
9	Fearful Temperament (18-mo)	3.84	0.95	1.57	5.71	1	7

Table 2. Frequency of DSM AP and AC Lifetime Anxiety Diagnoses

<b>Parent CIDI DSM Diagnoses</b>	Frequency	Percent
Generalized Anxiety Disorder	27	6.6%
Social Anxiety Disorder	34	8.3%
Panic Attack	118	28.8%
Panic Disorder	19	4.6%
<b>Child PAPA DSM Diagnoses</b>		
Generalized Anxiety Disorder	80	19.5%
Social Anxiety Disorder	45	11.0%
Separation Anxiety Disorder	55	13.4%
Any Hybrid Anxiety Disorder	117	28.5%

Table 3. Bivariate Correlations among Key Study Variables and Covariates

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>AP Dimensional Scores (T3)</b>																	
1	Worry	---															
2	Social Anxiety	.22***	---														
3	Panic	.29***	.13**	---													
<b>AP Parenting (T3)</b>																	
4	Involve	-.11*	-.16***	-.15***	---												
5	Inconsistent Discipline	.15***	.06	.05	-.16***	---											
6	Warmth	-.06	-.12*	-.03	.49***	-.19***	---										
7	Hostility	.11*	.12*	.08	-.18***	.32***	-.27***	---									
<b>AC Temperament (T1, T2)</b>																	
8	Negative Temp	.10*	.09	.04	-.14**	.15**	-.18***	.28***	---								
9	Fearful Temp	-.04	.06	-.08	.07	.02	-.01	.06	.11*	---							
<b>AC Anxiety (T3)</b>																	
10	GAD	.16***	.10*	.16***	-.001	.04	-.05	.10	.16***	.07	---						
11	SAD	.04	.002	.03	.03	.06	-.01	.03	-.06	.01	.34***	---					
12	Sep Anx	.07	.004	.08	.004	-.01	.05	-.02	.08	.02	.34***	.36***	---				
13	Hybrid Anx	.14**	.07	.10*	-.02	.07	-.11*	.15***	.13*	.08	.77***	.53***	.45***	---			
<b>Covariates</b>																	
14	Age	-.02	.05	.03	.08	.06	-.04	-.05	-.10	.15***	.11*	.04	-.06	.06	---		
15	Perinatal Comp	-.07	.04	-.06	-.04	-.07	-.05	-.08	-.09	-.03	<.001	-.05	-.03	-.02	.04	---	
16	AC Sex	.05	-.02	.10	.01	-.08	-.01	-.06	-.07	.005	-.001	.04	-.04	-.02	.01	.04	---
17	AP Sex	.06	.04	.06	-.01	.01	.04	.06	.13**	.12*	.005	.01	.06	.05	-.01	-.11*	.01

Note. Temp = Temperament; GAD= Generalized anxiety disorder; SAD= Social anxiety disorder; Sep Anx = Separation anxiety disorder; Hybrid Anx = Presence of any AC hybrid anxiety diagnosis; Perinatal Comp = Perinatal complications. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .005$ .

Table 5 provides a summary of the model fit indicators. As the first step, model identification was examined using the percentage of solutions that converged to the maximum likelihood value; solutions that converged for at least 10 percent of the 1000 starting values were considered well-identified (Lanza & Bray, 2010). Based on this criterion, identification of classes 6-9 was viewed inadequate. Of the remaining solutions, the 5-class solution demonstrated the best fit to the data, according to the fit indices considered in this study (i.e., AIC, BIC, a-BIC,  $G^2$  fit statistic, entropy  $R^2$  statistic). The resulting 5-class solution also provided a superior interpretability, as the distinctions among different symptom clusters were better defined (e.g., Class 3: *Worry-only* vs, Class 5: *PD+Worry*). Furthermore, the solution included profiles (i.e., Class 2: *Social anxiety*, Class 5: *PD+Worry*) which had been distinguished by a previous study on the basis of latent class approaches (e.g., Kessler, Chiu, et al., 2005) or profile-specific developmental trajectories (e.g., Newman et al., 2016) and clinical presentations (e.g., Norton & Chase, 2015). As such, the 5-class model was selected as the optimal latent class solution.

***Interpretation of the latent classes.*** Class prevalence rates—relative size of each latent class—and item response probabilities for each response category are summarized in Table 6 (and Figure 2). To facilitate interpretation, item-response probabilities were bolded if: (a) the selected item represented the presence (as opposed to the absence) of an anxiety symptom; and (b) if the response probability exceeded .5 (i.e., over 50% of the class endorsed the symptom). Item response probabilities for the first class (35%) consistently indicated a minuscule probability of endorsing anxiety symptoms. This pattern was viewed as a normative variation in anxiety level and the class was labeled “*Low anxiety*.” It is noteworthy that all remaining classes showed moderate to very high endorsement rates for panic symptoms (e.g., fast beating heart, dizziness, shortness of breath).

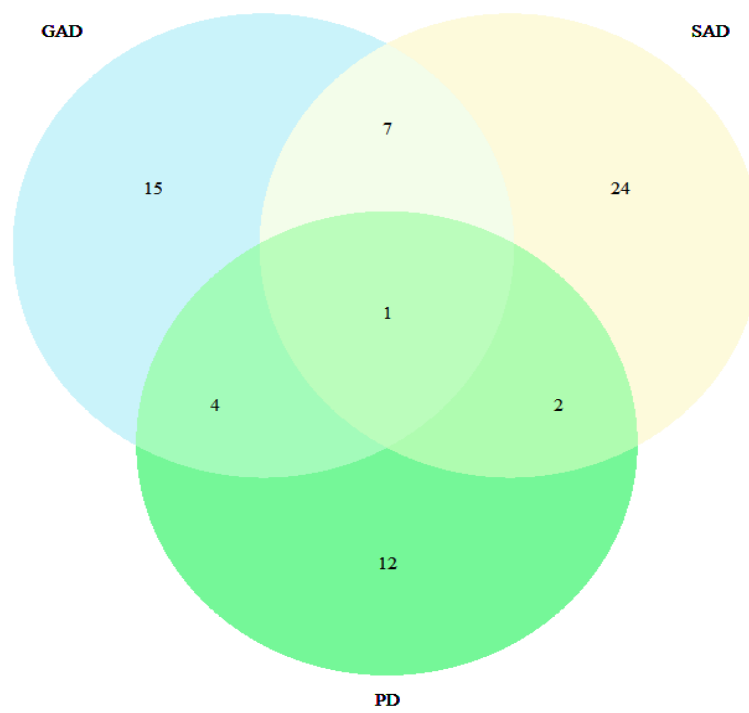


Figure 1A. Frequency of Diagnostic Combinations of AP Lifetime Anxiety Disorders

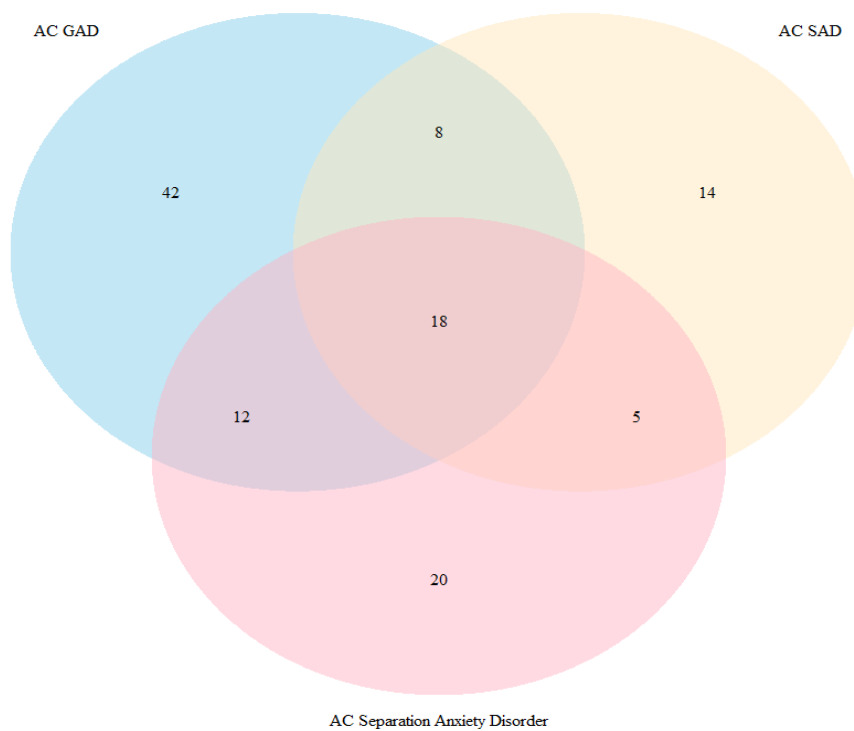


Figure 1B. Frequency of Diagnostic Combinations of AC Anxiety Disorders

Table 4. Proportion of AP Endorsing Each Anxiety Symptom

Variable	Frequency (valid %)
<b>Panic Symptoms</b>	
<i>Time to peak</i>	
Level 1: Absence of panic attacks	180 (43.9%)
Level 2: Panic attack not reached within 10 minutes	108 (26.3%)
Level 3: Panic attack reached within 10 minutes	122 (29.8%)
<i>Count of panic symptoms</i>	
Level 1: Fewer than 4 symptoms	195 (47.6%)
Level 2: 4 or more symptoms present	215 (52.4%)
<i>Expected vs. unexpected panic attacks</i>	
Level 1: Absence of unexpected panic attacks	338 (82.4%)
Level 2: Presence of unexpected panic attacks	71 (17.3%)
<i>Impairment lasting 1 month or longer</i>	
Level 1: Absence of worries or change in behavior	344(83.9%)
Level 2: Presence of worries or change in behavior	66 (16.1%)
<b>Social Anxiety Symptoms</b>	
<i>Marked and persistent social fear</i>	
Level 1: Absence of social fear	240 (58.5%)
Level 2: Presence of social fear	170 (41.5%)
<i>Somatic and behavioral symptoms associated with social fear</i>	
Level 1: Absence of symptoms	341 (83.2%)
Level 2: Presence of symptoms	69 (16.8%)
<i>Social avoidance</i>	
Level 1: Absence of avoidance	338(82.4%)
Level 2: Presence of avoidance	72(17.6%)
<i>Duration (symptoms lasting at least 1 year)</i>	
Level 1: Absence of symptoms lasting 1 year	339(82.7%)
Level 2: Presence of symptoms lasting 1 year	71(17.3%)
<b>Generalized Anxiety Symptoms</b>	
<i>Excessive worries</i>	
Level 1: Absence of excessive worries	238(58%)
Level 2: Presence of excessive worries	172(42%)
<i>Uncontrollable worries</i>	
Level 1: Absence of uncontrollable worries	292(71.2%)
Level 2: Presence of uncontrollable worries	118(28.8%)
<i>Worries accompanied by somatic symptoms</i>	
Level 1: Absence of worry-related somatic symptoms	335(81.7%)
Level 2: Presence of worry-related somatic symptom	75(18.3%)

Table 5. Model Fit Statistics and Selection Criteria for Latent Class Analyses for 1-9 Classes

No. of classes	Log-likelihood	G <sup>2</sup>	DF	AIC	BIC	a- BIC	Entropy	% seed
1	-2657.19	2199.26	3059	2223.26	2271.46	2233.38	1	100
2	-2272.70	1430.29	3046	1480.29	1580.69	1501.36	0.99	33.2
3	-2008.80	902.49	3033	978.49	1131.11	1010.53	0.99	78.4
4	-1922.87	730.63	3020	832.63	1037.46	875.63	0.96	18.2
<b>5</b>	<b>-1859.75</b>	<b>604.40</b>	<b>3007</b>	<b>732.40</b>	<b>989.43</b>	<b>786.35</b>	<b>0.96</b>	<b>13.1</b>
6	-1801.10	487.08	2994	641.08	950.33	705.99	0.96	6.8
7	-1758.39	401.66	2981	581.66	943.12	657.53	0.95	6.5
8	-1729.74	344.37	2968	550.37	964.03	637.19	0.96	7.0
9	-1703.16	291.21	2955	523.21	989.09	621.00	0.96	3.3

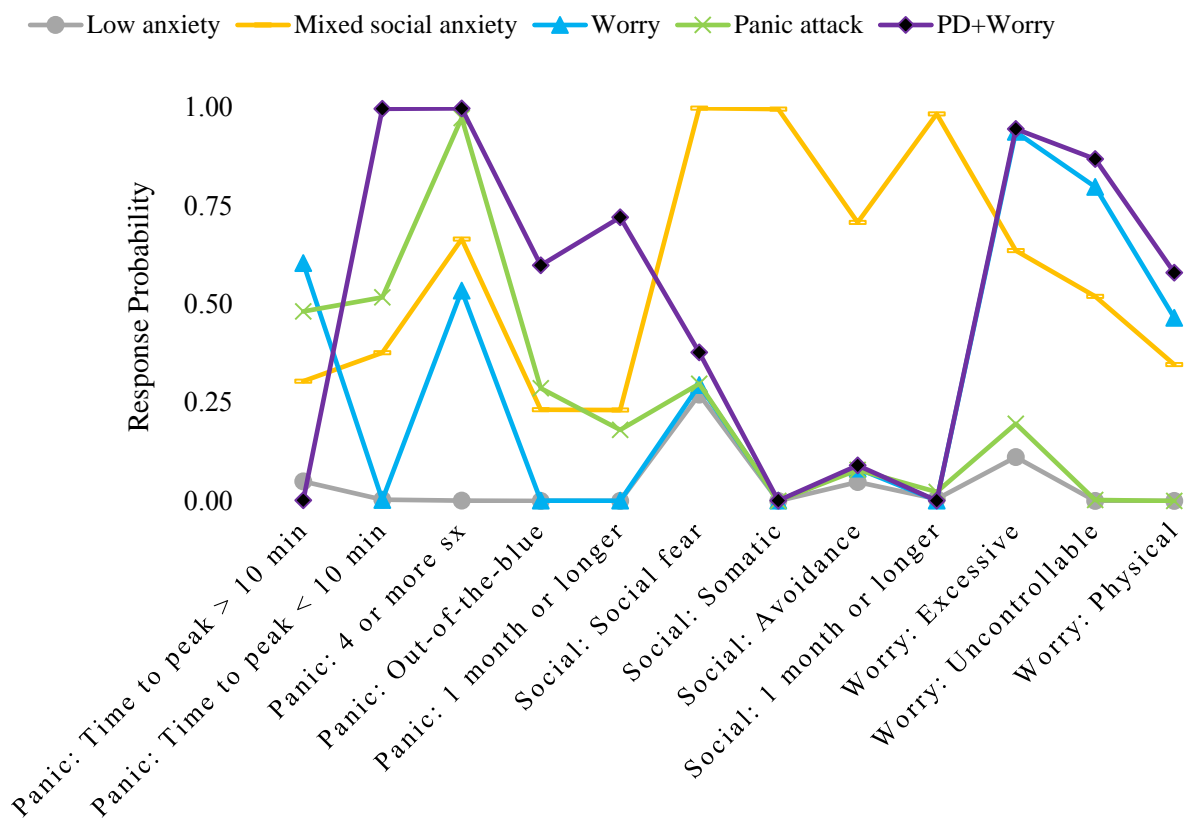


Figure 2. Item Response Plot for the Five-class Model.



The second class (17%) was primarily characterized by high probabilities of reporting social anxiety symptoms. This class demonstrated patterns of overlap with other symptom domains than did other classes and was labeled as “*Mixed social anxiety*” class to acknowledge the heterogeneous symptom presentation. It should be noted that the “*Mixed social anxiety*” label was chosen over the “*Comorbid anxiety*” label, as the co-occurring symptoms of worry and panic attacks were viewed as secondary symptoms that commonly accompany social anxiety (e.g., cued-panic attacks limited to social situations, excessive worries that focus exclusively on social-evaluative concerns). The third class (13%) exhibits prominently elevated endorsement of worry symptoms and the “*Worry*” class was considered to be its most appropriate label. The fourth class (24%) was characterized by elevations in the panic-spectrum symptoms. The probabilities of individuals reporting panic symptoms that reach the clinical threshold for panic disorder were relatively low, suggesting that this class may be best described as a “*Panic attack*” class. The final group (11%) was characterized by high probabilities of the defining features of panic disorder (i.e., 4 or more panic attacks occurring out-of-the-blue, quickly reaching a peak, extended periods of distress/impairment related to panic). The probabilities of excessive and uncontrollable worry symptoms were also elevated and resulted in the label of “*PD+Worry*” class. Cross-tabulations of AP LC membership and AP life-time diagnoses (Table 7) provide additional information that aids interpretation of the classes. As would be expected, none of the individuals in the “*Low anxiety*” group presented with a life-time DSM anxiety diagnosis. Similarly, none of the individuals in the “*Worry*” class had met the diagnostic criteria for SAD, PD, or PA, underscoring the symptomatic purity of this group.

Table 6. Item Response Probabilities for the Five-class Solution.

		<b>Class 1: Low Anxiety</b>	<b>Class 2: Mixed Social Anxiety</b>	<b>Class 3: Worry</b>	<b>Class 4: Panic Attacks</b>	<b>Class 5: PD+ Worry</b>
Latent Class Probabilities		35%	17%	13%	24%	11%
Overall Proportion		Item-response probabilities				
		Panic				
Time to peak	No panic attacks	0.95	0.32	0.39	0.00	0.00
	Peak > 10 min	0.05	0.30	<b>0.60</b>	0.48	0.00
	Peak ≤ 10 min	0.00	0.38	0.00	<b>0.52</b>	<b>1.00</b>
Symptom Count	< 4 symptoms	1.00	0.33	0.47	0.03	0.00
	4 or more symptoms	0.00	<b>0.67</b>	<b>0.53</b>	<b>0.97</b>	<b>1.00</b>
Out-of-the-blue fear	Absent	1.00	0.77	1.00	0.71	0.40
	Present	0.00	0.23	0.00	0.29	<b>0.60</b>
Duration	<1 month	1.00	0.77	1.00	0.82	0.28
	≥1 month	0.00	0.23	0.00	0.18	<b>0.72</b>
		Social Anxiety				
Social Fear	Absent	0.73	0.00	0.71	0.70	0.62
	Present	0.27	<b>1.00</b>	0.29	0.30	0.38
Somatic symptoms	Absent	1.00	0.00	1.00	1.00	1.00
	Present	0.00	<b>0.99</b>	0.00	0.00	0.00
Social Avoidance	Absent	0.95	0.29	0.92	0.92	0.91
	Present	0.05	<b>0.71</b>	0.08	0.08	0.09
Duration	<1 month	1.00	0.02	1.00	0.98	1.00
	≥1 month	0.00	<b>0.98</b>	0.00	0.02	0.00
		Generalized Anxiety				
Excessive Worries	Absent	0.89	0.36	0.06	0.80	0.05
	Present	0.11	<b>0.64</b>	<b>0.94</b>	0.20	<b>0.95</b>
Uncontrollable worries	Absent	1.00	0.48	0.20	1.00	0.13
	Present	0.00	<b>0.52</b>	<b>0.80</b>	0.00	<b>0.87</b>
Somatic symptoms	Absent	1.00	0.65	0.53	1.00	0.42
	Present	0.00	0.35	0.47	0.00	<b>0.58</b>

Note. Symptoms frequently endorsed (>50%) within each class bolded to facilitate interpretation

Class 4, the “*Panic attacks*” group also presented with panic-spectrum symptoms (PA, PD) but not with GAD or SAD. The remaining classes (“*Mixed social anxiety*” and “*PD+Worry*”) demonstrated diagnostic comorbidity and/or heterogeneity, yet none of the parents in the “*PD+Worry*” class had been diagnosed with SAD.

### **Step 2. Estimation of Odds of AC Anxiety given AP latent Class (LC)**

**Membership.** AP latent class membership was significantly associated with AC GAD ( $\chi^2 = 13.51$ ,  $df = 4$ ,  $p = .01$ ) but not with SAD, or the presence of any form of hybrid anxiety disorders. Table 8 presents the odds ratios that correspond to the association between AP latent class membership and AC GAD, with *Low Anxiety* class representing the reference group. As was expected (Hypothesis 2), Children of the *PD+Worry* group parents were significantly more likely to be diagnosed with GAD, when compared to children of the *Low Anxiety* group parents (OR = 4.11) or to those of the *Panic attack* group parents (OR = 2.67). AP membership in the *Mixed Social Anxiety* class was also associated with increased risk (OR = 2.20) for child GAD when compared to the *Low Anxiety* class.

Table 7. Cross-Tabulations of AP LC Membership and AP DSM-IV Anxiety Diagnoses

		Class1 No Anxiety (%)	Class2 Social Anxiety (%)	Class3 Worry (%)	Class4 Panic Attacks (%)	Class5 Worry + Panic (%)	Subtotal
GAD	Absent	145 (35.3)	60 (14.6)	42 (10.2)	102 (24.9)	34 (8.3)	383 (93.4)
	Present	0	9 (2.2)	8 (2.0)	0	10 (2.4)	27 (6.6)
Social Anxiety	Absent	145 (35.3)	35 (8.5)	50 (12.2)	102 (24.9)	44 (10.7)	376 (91.7)
	Present	0	34 (8.3)	0	0	0	34 (8.3)
Panic Disorder	Absent	145 (35.3)	64 (8.3)	50 (12.2)	98 (23.9)	34 (8.3)	391 (95.4)
	Present	0	5 (1.2)	0	4 (0.98)	10 (2.4)	10 (2.4)
Panic Attacks	Absent	145 (35.3)	43 (10.5)	50 (12.2)	52 (12.7)	2 (0.5)	292(71.2)
	Present	0	26 (6.3)	0	50 (12.2)	42 (10.2)	118 (28.8)
Subtotal		145	69	50	102	44	410

Table 8. Parameter Estimates and Odds Ratios for Association between AP Latent Class Membership and AC Anxiety Diagnosis

AC Anxiety Diagnosis	LR $\chi^2$	Class 2: Mixed Social Anxiety (12.3%)		Class 3: Worry (8.9%)		Class 4: Panic Attacks (18.2%)		Class 5: PD+Worry (7.8%)		Pairwise comparisons
		OR	CI	OR	CI	OR	CI	OR	CI	
GAD	<b>13.51*</b>	<b>2.20*</b>	[1.05, 4.62]	1.67	[0.70, 3.97]	1.55	[0.76, 3.12]	<b>4.11****</b>	[1.85, 9.11]	1<2, 1<5, 4<5
SAD	1.88	0.75	[0.27, 2.03]	1.22	[0.49, 3.37]	0.84	[0.36, 1.95]	1.44	[0.54, 3.86]	---
Sep Anx	5.17	0.99	[0.37, 2.69]	1.21	[0.42, 3.45]	1.49	[0.68, 3.28]	2.53	[1.01, 6.32]	---
Any Hybrid Anxiety	7.36	1.39	[0.72, 2.67]	1.37	[0.66, 2.85]	1.22	[0.68, 2.20]	2.64**	[1.29, 5.41]	---

Note. LR= loglikelihood chi-square. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .005$ . \*\*\*\* $p < .001$ . OR= Odds-ratio. CI= 95% Confidence Interval. Low Anxiety class was chosen as the reference group. Pairwise comparisons only reported for model with significant overall loglikelihood ratio p-value (shown in bold face). Pattern of results remained unchanged after controlling for AC age, sex, pregnancy complications and AP sex; therefore, unadjusted results are reported.

### Step 3. AP LC, AC Anxiety, and AC Temperament as Predictors of Parenting. A

series of ordinary least squares regression models were estimated to explore the concurrent relations among AP latent class membership, AC anxiety, and parenting behaviors (involvement, discipline, warmth, hostility) assessed at T3. AC anxiety diagnoses (T3), 9-month negative temperament (T1), and 18-month fearful temperament (T2) were tested as potential moderators of the association between class membership and parenting.

**AP involvement.** There was a significant main effect of AP latent class membership on parental involvement. As shown in Table 9, tests of pairwise comparisons revealed that parents of the *Mixed social anxiety* and *PD+Worry* classes reported comparatively low levels of involvement relative to the parents of the *Low anxiety* or *Panic attacks* classes. The associations between AC anxiety diagnoses and parental involvement were non-significant. Parent-rated AC negative temperament at 9-months significantly predicted the degree of parental involvement at T3—higher score on the negative temperament scale predicted less involved style of parenting. 18-month fearful temperament did not show a significant main effect on AP involvement. There was a significant two-way interaction effect between AP LC and AC negative temperament, yet the effect no longer remained significant after the application of the Benjamini-Hochberg method to adjust for multiple comparisons (Table 10).

**AP inconsistent discipline.** AP latent class membership demonstrated significant association with parental inconsistent discipline: *Worry* group parents were more likely to endorse inconsistent discipline relative to the *Low anxiety* or *Panic attack* group parents. The *Mixed social anxiety* group parents were also comparatively more likely to report inconsistent discipline than the *Low anxiety* group parents. Among the child variables, only history of AC negative temperament showed a significant main effect, such that higher negative temperament predicted greater inconsistency in parent discipline. There were no significant interaction effects, after adjusting for the multiple comparisons.

Table 9. Test statistics for AP Latent Class (LC), AC Anxiety, and AC Temperament as Covariates of T2 Parenting

	Involvement		Inconsistent Discipline		Warmth		Hostility	
	<i>b</i>	<i>p</i>	<i>b</i>	<i>P</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
<b>AP LATENT CLASS</b> <sup>abd</sup>								
Low Anxiety	ref	ref	ref	ref	ref	ref	ref	ref
Mixed Social Anxiety	<b>-.55</b>	<b>&lt;.001</b>	<b>.33</b>	<b>.03</b>	-.31	.03	<b>.46</b>	<b>.002</b>
Worry	-.20	.23	<b>.63</b>	<b>&lt;.001</b>	-.08	.64	.32	.08
Panic Attacks	-.12	.36	.10	.48	.10	.43	.10	.44
PD+Worry	<b>-.55</b>	<b>.002</b>	<b>.40</b>	<b>.03</b>	-.14	.41	.22	.22
LC Pairwise Comparisons	1>2,5, 4>2,5		1<2,3,5; 3>4		----		2>1,4	
<b>AC ANXIETY DX</b>								
	<i>b</i>	<i>p</i>	<i>b</i>	<i>P</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
GAD	-.02	.86	.07	.61	-.12	.34	.27	.55
SAD	.08	.65	.18	.27	-.04	.82	.12	.49
Sep Anx	.02	.88	-.03	.85	.13	.40	-.09	.58
Any Hybrid Anxiety <sup>d</sup>	-.06	.60	.15	.19	-.24	.03	<b>.33</b>	<b>.004</b>
<b>AC TEMPERAMENT</b>								
	<i>b</i>	<i>p</i>	<i>b</i>	<i>P</i>	<i>b</i>	<i>p</i>	<i>b</i>	<i>p</i>
Negative Temp <sup>bcd</sup>	<b>-.14</b>	<b>.01</b>	<b>.15</b>	<b>.01</b>	<b>-.20</b>	<b>&lt;.001</b>	<b>.27</b>	<b>&lt;.001</b>
Fearful Temp	.05	.24	.01	.89	-.01	.84	.04	.30

Note. Subscripts (a=Involvement, b=Inconsistent Discipline, c=Warmth, d=Hostility) denote significant loglikelihood chi-square ratio ( $p<.05$ ). Sep Anx=Separation Anxiety Disorder. Negative Temp = Negative Temperament. AP Latent Class  $df=4$ ; AC Anxiety Diagnosis  $df=1$ ; AC Temperament  $df=1$ . For each significant model, LC pairs with significantly different treatment effects ( $p<.05$ ) are listed. Low Anxiety class was chosen as the reference group (ref). AC age, sex, pregnancy complications and AP sex have been included as covariates.

Table 10. Tests of Interaction Effects: Parenting as an Outcome

Parenting	Interaction Term	F-value	Adjusted p-value <sup>a</sup>	LC pairwise differences	<i>b</i>
AP Involvement	AP LC x AC SAD	2.73	ns	---	---
AP Inconsistent	AP LC x AC Separation Anxiety x AC Negative Temperament	2.81	ns	---	---
AP Warmth	AP LC x AC SAD	2.88	ns	---	---
	AL LC x AC SAD x AC Fearful Temperament	3.43	ns	---	---
AP Hostility	AP LC x AC GAD x AC Negative Temperament	4.39	.03	Class 1 vs. 2	-1.27***
		---	---	Class 1 vs. 4	-0.73*
				Class 1 vs. 5	-0.99*
				Class 2 vs. 3	0.99*
	AP LC x AC Hybrid Anxiety x AC Negative Temperament	4.75	.03	Class 1 vs. 2	-1.17***
				Class 1 vs. 5	-1.15***
				Class 1 vs. 4	0.67*
	AP LC x AC SAD x AC Negative Temperament	3.39	ns	---	---
	AP LC x AC SAD	2.88	ns	---	---

*Note.* <sup>a</sup>Adjusted p-value based on Benjamini-Hochberg method (Benjamini & Hochberg, 1995). LC = Latent Class. Class 1= Low Anxiety; Class 2= Mixed Social Anxiety; Class 3= Worry; Class 4 = Panic Attacks; Class 5= PD+Worry. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .005$ . Significant interaction effects remained after controlling for AC age, sex, pregnancy complications and AP sex; therefore, unadjusted results are reported.

**AP warmth.** There was no main effect of AP latent class membership on AP warmth. Similarly, there was no overall significant effect of AC anxiety on child-directed warmth. Only infant negative temperament demonstrated significant inverse relationship with AP warmth at T3. The two-way interaction between AP latent class membership and AC social anxiety disorder was no longer significant after the adjustment was made for multiple comparisons.

**AP hostility.** Significant main effects of AP latent class membership, AC anxiety (any hybrid anxiety), and AC negative temperament were found for AP hostility. These effects were subsumed by two significant three-way interaction effects (AP LC x AC GAD x AC negative temperament ( $F = 4.39$ , *adjusted p-value* = .03); AP LC x AC hybrid anxiety x AC negative temperament ( $F = 4.75$ , *adjusted p-value* = .03)). As such, interpretation was only warranted for the three-way interaction effects. Figures 3A-B and 4A-B present the interaction plots. To facilitate interpretation, AC temperament was plotted along the x-axis for two separate plots for groups with and without AC anxiety diagnoses (i.e., GAD, hybrid anxiety disorder).

**AP LC x AC GAD x AC temperament.** Pairwise comparisons revealed that the three way interaction term for the *Low anxiety* reference group differed significantly from that of the *Mixed social anxiety*, *Panic attacks*, and the *PD+Worry* groups. For the *Low anxiety* group, testing the simple slopes separately in the presence and absence of child GAD indicated that the predictive association between AC negative temperament and AP hostility was significant irrespective of the child GAD diagnosis status (GAD present: Simple slope t-value = 5.15,  $p < .001$ ; GAD absent: Simple slope t-value = 2.46,  $p = .01$ ). That is, given parent membership in the *Low anxiety* group, AC negative temperament at 9-months significantly predicted AP hostility for children with GAD. Conversely, for the *Mixed social anxiety* group parents, AC negative temperament was not found to be associated with



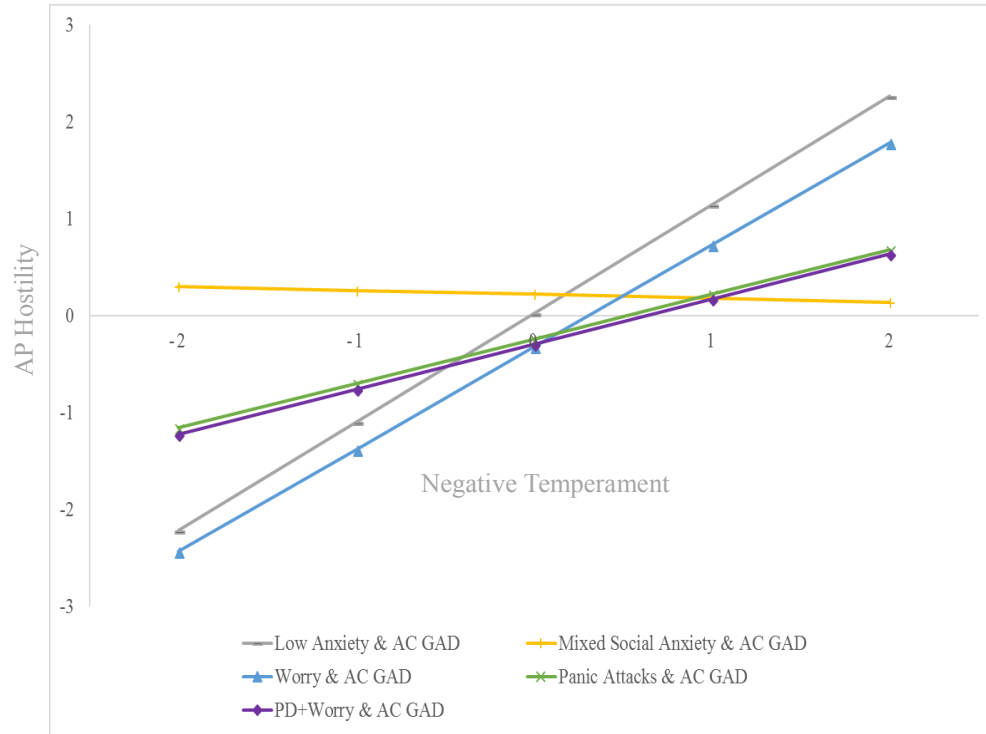


Figure 3A. Interaction between AC Latent Class Membership & AC Negative Temperament: AC GAD Present.

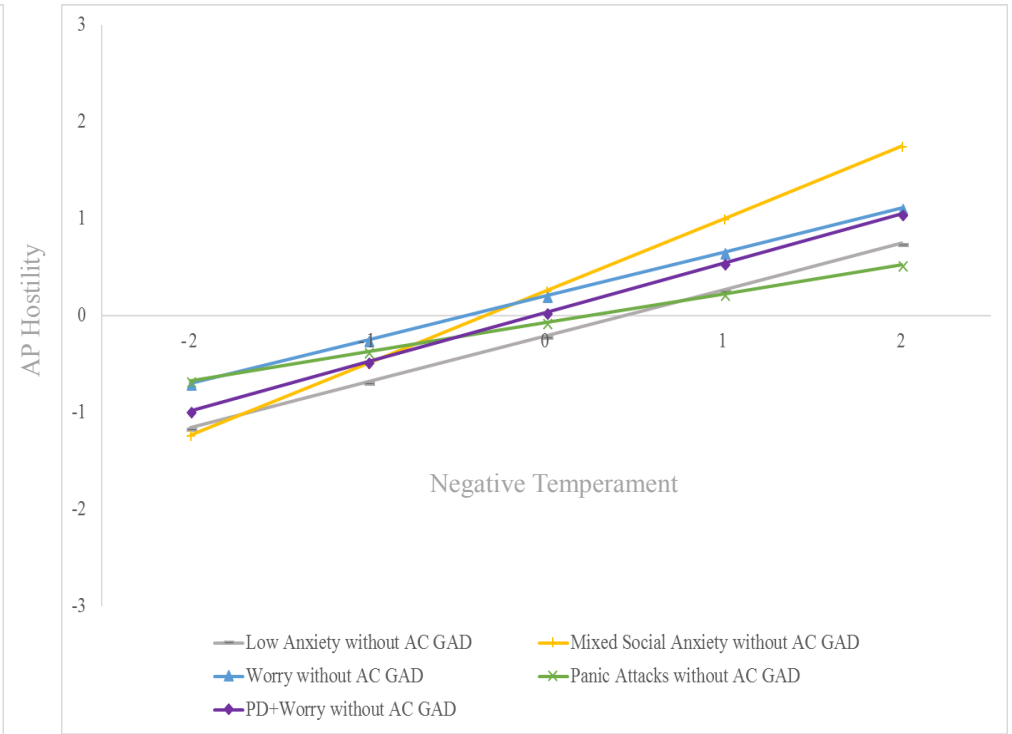


Figure 3B. Interaction between AC Latent Class Membership & AC Negative Temperament: AC GAD Absent

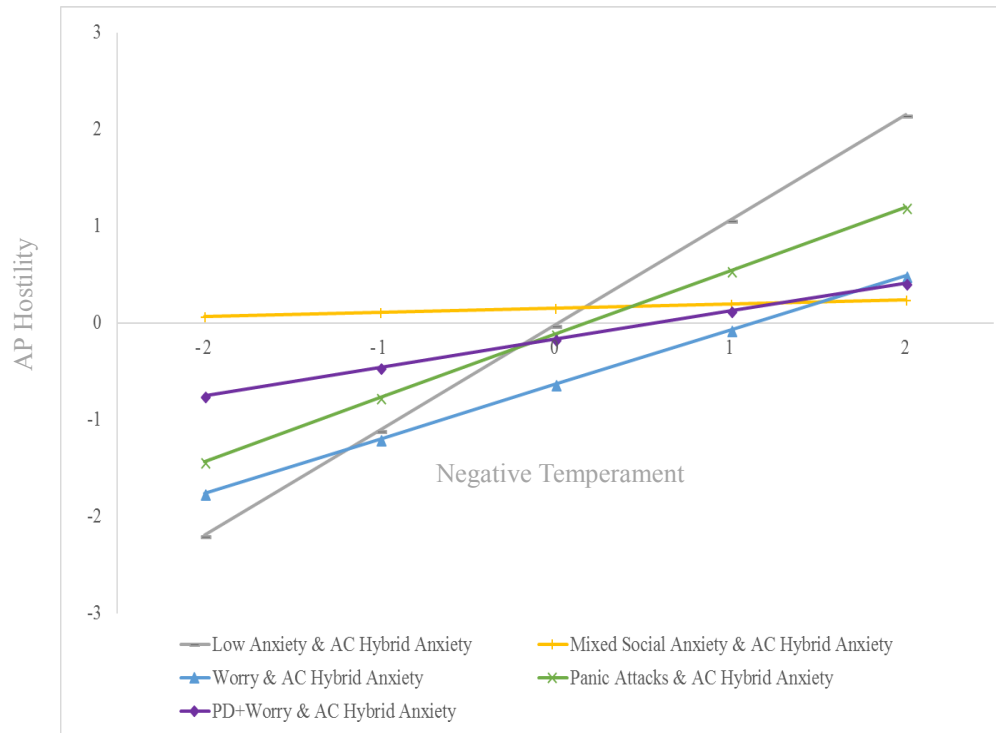


Figure 4A. Interaction between AC Latent Class Membership & AC Negative Temperament: AC Hybrid Anxiety Present

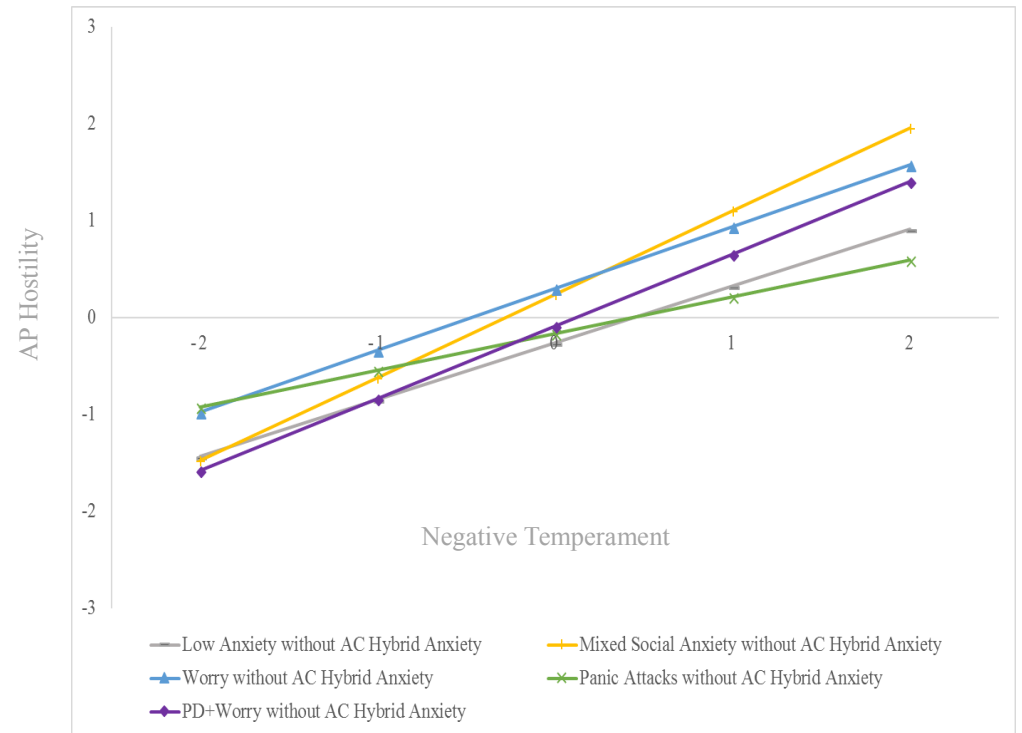


Figure 4B. Interaction between AC Latent Class Membership & AC Negative Temperament: AC Hybrid Anxiety Absent

with AP hostility (Simple slope t-value = -0.04,  $p = .97$ ). However, when children did present with concurrent GAD, history of negative temperament significantly predicted *Mixed social anxiety* group parents' child-directed hostility (Simple slope t-value = 3.32,  $p = .001$ ). That is, the *Mixed social anxiety* group parents showed considerably higher level of hostility toward children who had been rated as fussy and irritable, while they were significantly less likely to be hostile with children who had not received higher ratings on negative temperament as an infant. Simple slopes were not found to be significant for the remaining groups, suggesting that negative temperament and AP hostility were unrelated for parents in the *Worry*, *Panic attacks*, or *PD+Worry* groups, regardless of the presence of AC GAD diagnosis.

*AP LC x AC hybrid anxiety x AC temperament.* Pairwise comparisons of the three three-way interaction terms indicated that the referent *Low anxiety* group differed significantly from the *Mixed social anxiety* and the *PD+Worry* groups. *Mixed social anxiety* group was also found to differ from the *Panic attacks* group. Tests of the simple slopes for the *Low Anxiety* group indicated that the association between AC negative temperament and AP hostility was significant, irrespective of the presence of any hybrid anxiety disorder (Hybrid anxiety diagnosis present: Simple slope t-value = 5.15,  $p = <.001$ ; Hybrid anxiety diagnosis absent: Simple slope t-value = 2.47,  $p = .01$ ). Therefore, high levels of AC negative temperament consistently predicted greater AP hostility for the *Low anxiety* group, whereas lower score on negative temperament predicted significantly less AP hostility for this group.

For the *Mixed social anxiety*, *Worry*, and *PD+Worry* groups, there was a significant positive relationship between AC negative temperament and AP hostility, only in the absence of AC hybrid anxiety diagnosis. Therefore, AP hostility level increased linearly as negative temperament score increased, exclusively for children without a diagnosis of hybrid anxiety diagnosis (*Mixed social anxiety*: Simple slope t-value = 3.51,  $p < .001$ ; *Worry*: Simple slope

t-value = 2.16,  $p = .03$ ; *PD+Worry*: Simple slope t-value = 2.15,  $p = .03$ ). AC negative temperament and AP hostility were unrelated when the children did not have any form of hybrid anxiety disorder, given AP membership in the above three groups. Finally, AC negative temperament and hostility consistently did not show a significant association for the *Panic attacks* group, with simple slopes being non-significant whether AC hybrid anxiety was present or absent.

**Step 4. Comparison of categorical (latent class membership) and dimensional measures AP anxiety and their respective associations with AC anxiety diagnoses.**

Comparison of the categorical and dimensional measures of AP anxiety was completed in three steps: First, dimensional scores were created following the approach adopted by prior research (e.g., Eaton, Krueger, & Oltmanns, 2011; Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998; South & Krueger, 2008), the diagnostic symptom indicators were summed to create dimensional composites of social anxiety, generalized anxiety, and panic symptoms. Dimensional anxiety scores created with CIDI have been described as an acceptable diagnostic alternative (Kessler et al., 1998) with good validity and clinical utility for specific forms of anxiety disorders such as SAD (Ruscio, 2010). Second, the 4-level latent indicator variable (with the “*Low anxiety* class” specified as the reference group) and each dimensional anxiety scores were separately entered in a series of binary logistic regression models that included each AC anxiety diagnosis as the outcome variable. The effects for the categorical and dimensional predictors were estimated using the likelihood ratio tests (Table 11). Additionally, regression coefficients of each level of the latent factor and dimensional scores were computed to determine which individual predictor variable showed significantly elevated rates for AC anxiety outcomes. As the third step, the probability of specific AC diagnosis for each level of latent class factor was estimated and plotted (classes 1-5). First, predicted probability of AC anxiety was computed for each latent class. Next, the probability

for AC anxiety was estimated while holding the given dimensional score at its mean level (Figures 5A-E). Finally, based on the results presented in Table 11 and Figures 5A-E the binary indicator variables for latent classes showing a significant effect were created (i.e., *Mixed social anxiety*, *PD+Worry*). These variables were then paired with each dimensional anxiety score in binary logistic regression models that again specified AC anxiety diagnosis as the outcome variable. To facilitate the interpretation of the regression coefficients for the categorical and dimensional scores, dimensional scores were transformed following Gelman's (2007, 2010) recommendations. Each dimensional anxiety score was divided by its standard deviation in order that the resulting regression coefficients of the dimensional scores become directly comparable to the untransformed binary predictor. Binary representation of latent membership was also re-coded (Yes = +1, No = -1).

***Step 4a: Examination of individual latent class level and dimension scores.*** As was reported in Table 8, the latent class factor variable demonstrated an overall significant effect on AC GAD. Specifically, membership in the *PD+Worry* and the *Mixed social anxiety* groups was associated with comparatively elevated risk for AC GAD (Table 11). When each dimensional score was examined separately, dimensional worry and panic scores were associated with significantly increased odds of AC GAD (Worry: OR = 1.36,  $p = .002$ ; Panic symptoms: OR = 1.48,  $p = .002$ ) and hybrid diagnosis (Worry: OR = 1.35,  $p = .01$ ; Panic symptoms: OR = 1.26,  $p = .003$ ). In contrast, when considered in isolation, the model including the dimensional score of social anxiety was not found to be significant. None of the models that included the AC SAD or separation anxiety diagnoses were found to be significant and thus were excluded from subsequent analyses. The relative prediction made by each latent class membership was further examined in Step 4b.

Table 11. Probability of AC GAD, SAD, and Any Hybrid Anxiety Diagnosis, given AP Latent Class Membership or Dimensional Anxiety Scores

AP Anxiety	GAD		SAD		Separation Anxiety Disorder		Any Hybrid Anxiety Disorder	
	OR	CI	OR	CI	OR	CI	OR	CI
Model 1: AP Latent Classes <sup>a</sup>								
Mixed Social Anxiety	<b>2.20*</b>	[1.05, 4.62]	0.75	[0.27, 2.03]	0.99	[0.37, 2.69]	1.39	[0.72, 2.67]
Worry	1.67	[0.70, 3.97]	1.22	[0.49, 3.37]	1.21	[0.42, 3.45]	1.37	[0.66, 2.85]
Panic Attacks	1.55	[0.76, 3.12]	0.84	[0.36, 1.95]	1.49	[0.68, 3.28]	1.22	[0.68, 2.20]
PD+Worry	<b>4.11***</b>	[1.85, 9.11]	1.44	[0.54, 3.86]	2.53	[1.01, 6.32]	<b>2.64**</b>	[1.29, 5.41]
Dimensional Anxiety Scores								
Model 2: Dimensional Worry <sup>ad</sup>	<b>1.36**</b>	[1.08, 1.70]	1.16	[0.86, 1.54]	1.21	[0.91, 1.61]	<b>1.35**</b>	[1.10, 1.66]
Model 3: Dimensional Social anxiety	1.29*	[1.02, 1.61]	1.01	[0.72, 1.35]	1.02	[0.76, 1.37]	1.17	[0.95, 1.44]
Model 4: Dimensional Panic <sup>ad</sup>	<b>1.43***</b>	[1.13, 1.83]	1.10	[0.81, 1.49]	1.26	[0.94, 1.69]	<b>1.26*</b>	[1.02, 1.56]

*Note.* \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .005$ . Subscripts (a=AC GAD, b=AC SAD, c=AC Separation anxiety disorder, d=AC hybrid anxiety diagnosis) denote significant loglikelihood chi-square ratio ( $p < .05$ ). AP Latent Class=4-level factor variable with levels corresponding to *Mixed social anxiety* (level 1), *Worry* (level 2), *Panic attacks* (level 3), & *PD+Worry* (level 4). *Low anxiety* class is the reference group. The associations of each predictor variable with specific AC anxiety diagnosis are expressed as log odds ratios. Significant  $p$ -value for each latent class indicates whether the probability for given AC anxiety diagnosis differs for the specific latent class and the reference group (i.e., *Low anxiety* group).

***Step 4b: Comparison of Latent factor and dimension score pairs.***

First, the estimated probability of AC GAD and hybrid anxiety diagnosis for each latent class (relative to the *Low anxiety* class as the reference group) was estimated, without accounting for the effects of dimensional anxiety scores. Estimates for AC GAD are listed in descending order: *PD+Worry* = 81.6%; *Mixed social anxiety* = 69.8%; *Worry* = 63.8%; *Panic attacks* = 60.2 %. The estimates were as following for AC hybrid anxiety: *PD+Worry* = 71.3%; *Mixed social anxiety* = 58.8%; *Worry* = 58.3%; *Panic attacks* = 55.2%. Consistent with findings presented in step 4a, membership in the *PD+Worry* group consistently showed the highest probability of AC anxiety, when holding the AP dimensional anxiety scores at their mean levels.

As shown in Figures 5A-5C, the estimated probability of AC GAD was approximately 32% for the *PD+Worry* group when holding the dimensional worry at its mean value and also when holding the dimensional panic score at its mean values. The predicted probability of AC GAD given membership in the *PD+Worry* group increased up to 55%, when holding the dimensional social anxiety score at its mean. Conversely, for the *Mixed Social Anxiety* group, the probability estimates for AC GAD decreased from approximately 22-24% (accounting for dimensional worry or panic scores) to 6.49% when the dimensional social anxiety score was held at its mean value. The predicted probabilities of AC hybrid anxiety diagnosis given membership in the *PD+Worry* class remained relatively stable at 35%, 35%, and 39%, when holding the dimensional worry, social anxiety, and panic scores respectively. For the *Mixed social anxiety* group, the estimates were 28% and 30% when accounting for the dimensional worry and panic scores and the estimate decreased to approximately 3.9% when holding the social anxiety dimensional score at its mean value.

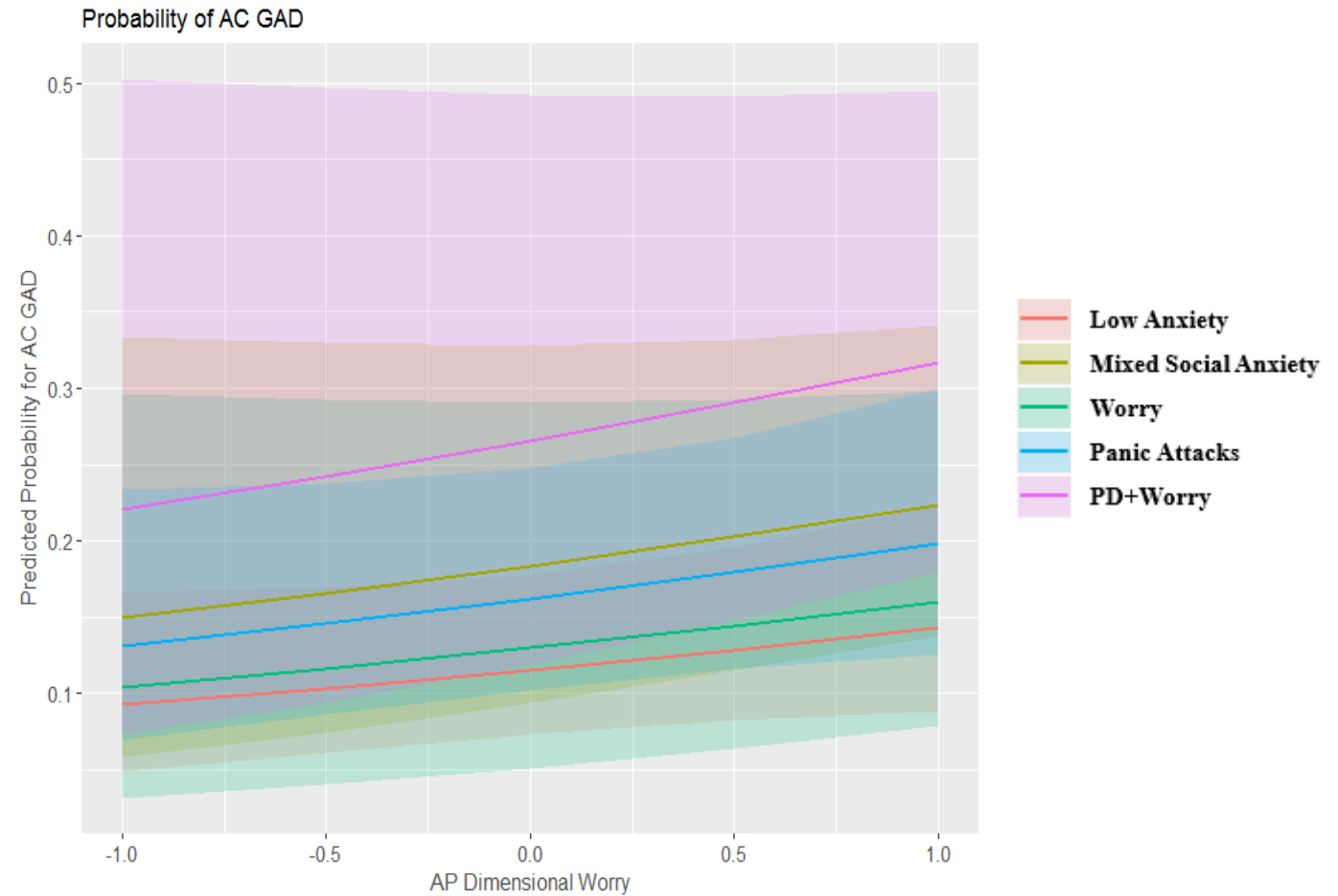


Figure 5A. Predicted Probability of AC GAD as a Function of AP Dimensional Worry. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC GAD given membership in each latent class at different levels of AP dimensional worry, while holding AP dimensional worry at its mean value



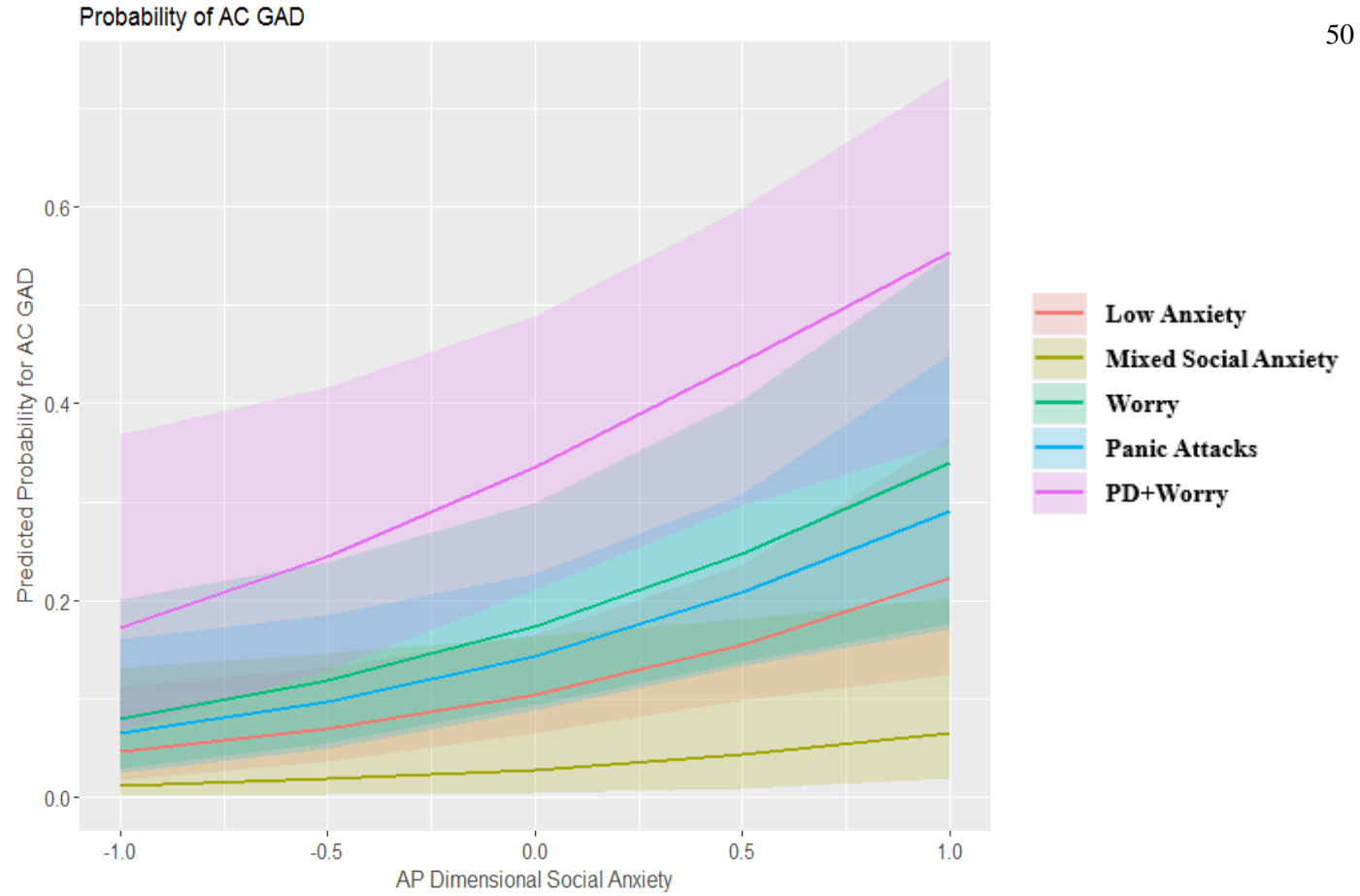


Figure 5B. Predicted Probability of GAD as a Function of AC Social Anxiety. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC GAD given membership in each latent class at different levels of AP dimensional social anxiety, while holding AP dimensional social anxiety at its mean value

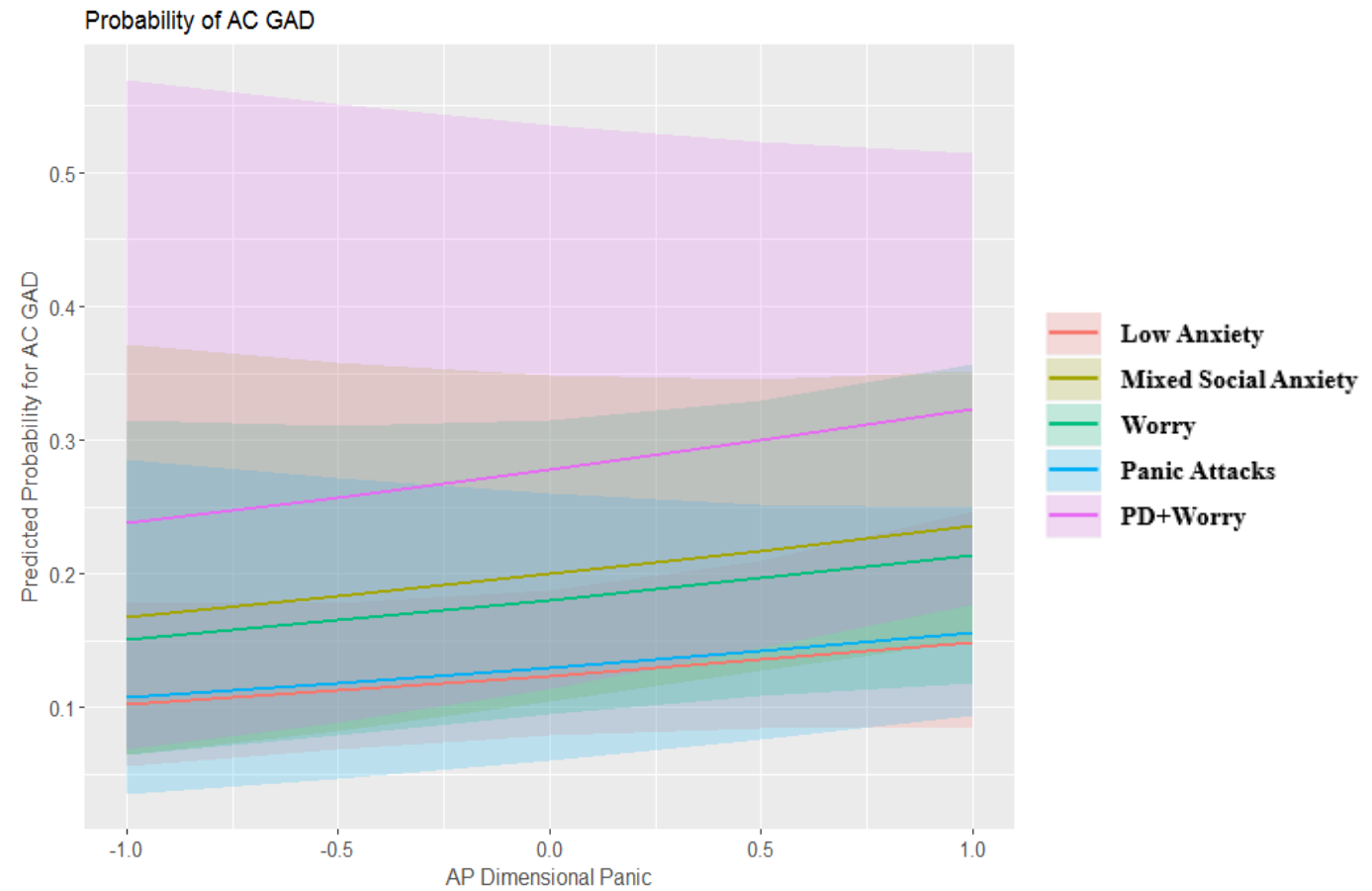


Figure 5C. Predicted Probability of AC GAD as a Function of AP Dimensional Panic. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC GAD given membership in each latent class at different levels of AP dimensional panic, while holding AP dimensional panic symptoms at its mean value

### Probability of AC Hybrid Anxiety

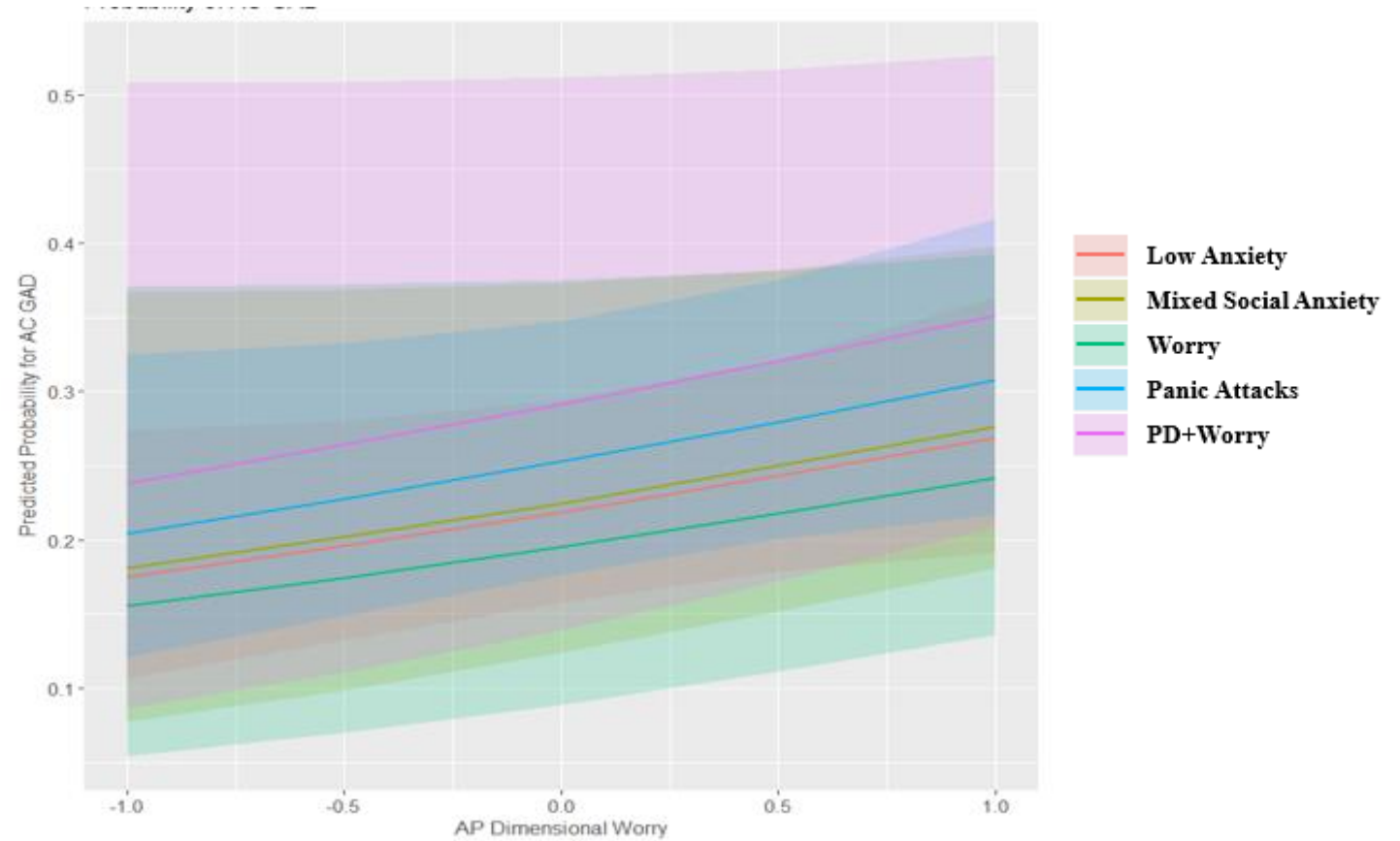


Figure 5D. Predicted Probability of AC Hybrid Anxiety as a Function of AP Dimensional Social Anxiety. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC hybrid anxiety given membership in each latent class at different levels of AP dimensional social anxiety, while holding AP dimensional social anxiety score at its mean value.

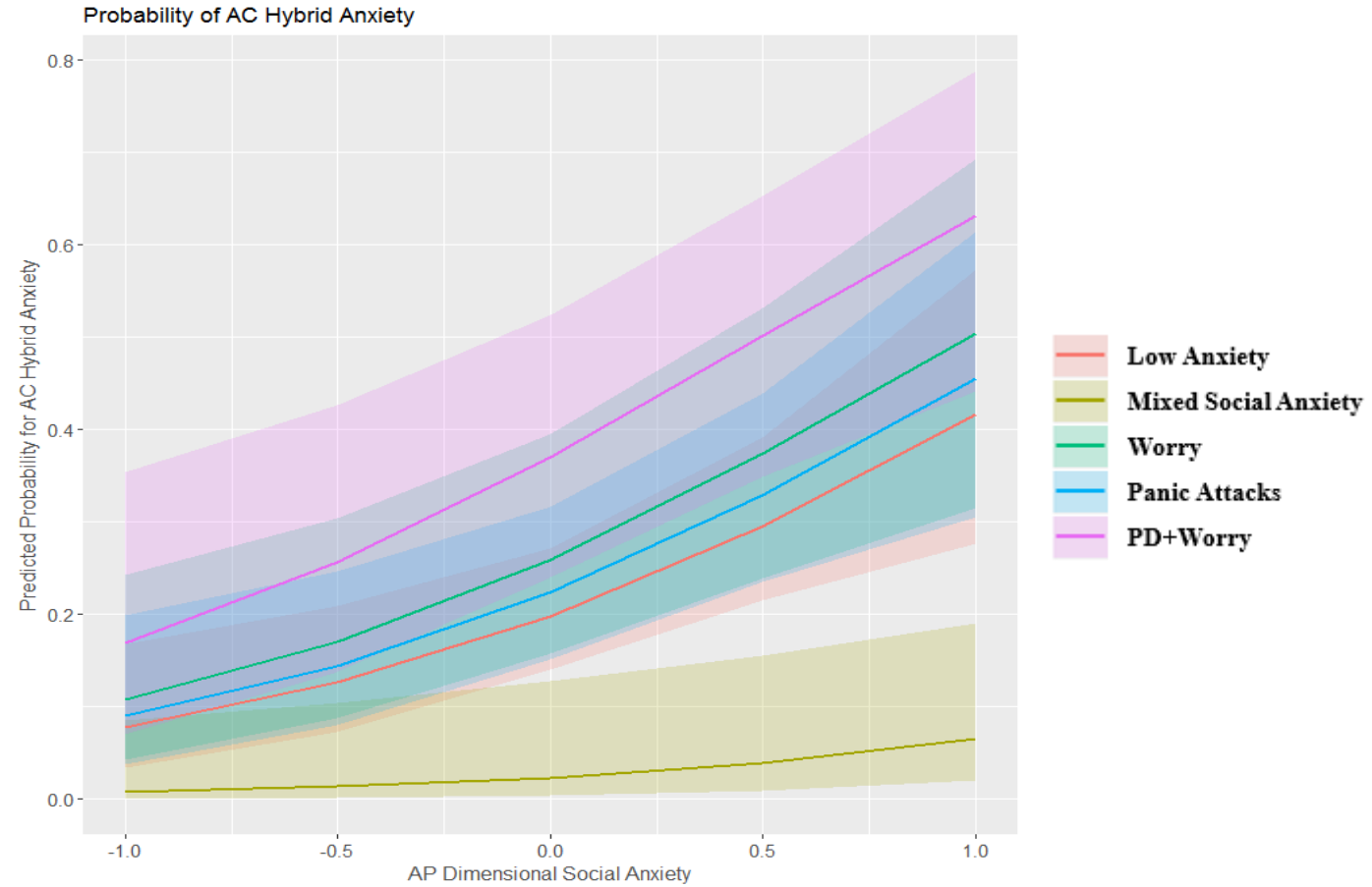


Figure 5E. Predicted Probability of AC Hybrid Anxiety as a Function of AP Dimensional Social Anxiety. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC hybrid anxiety given membership in each latent class at different levels of AP dimensional panic, while holding AP dimensional panic symptoms at its mean value.

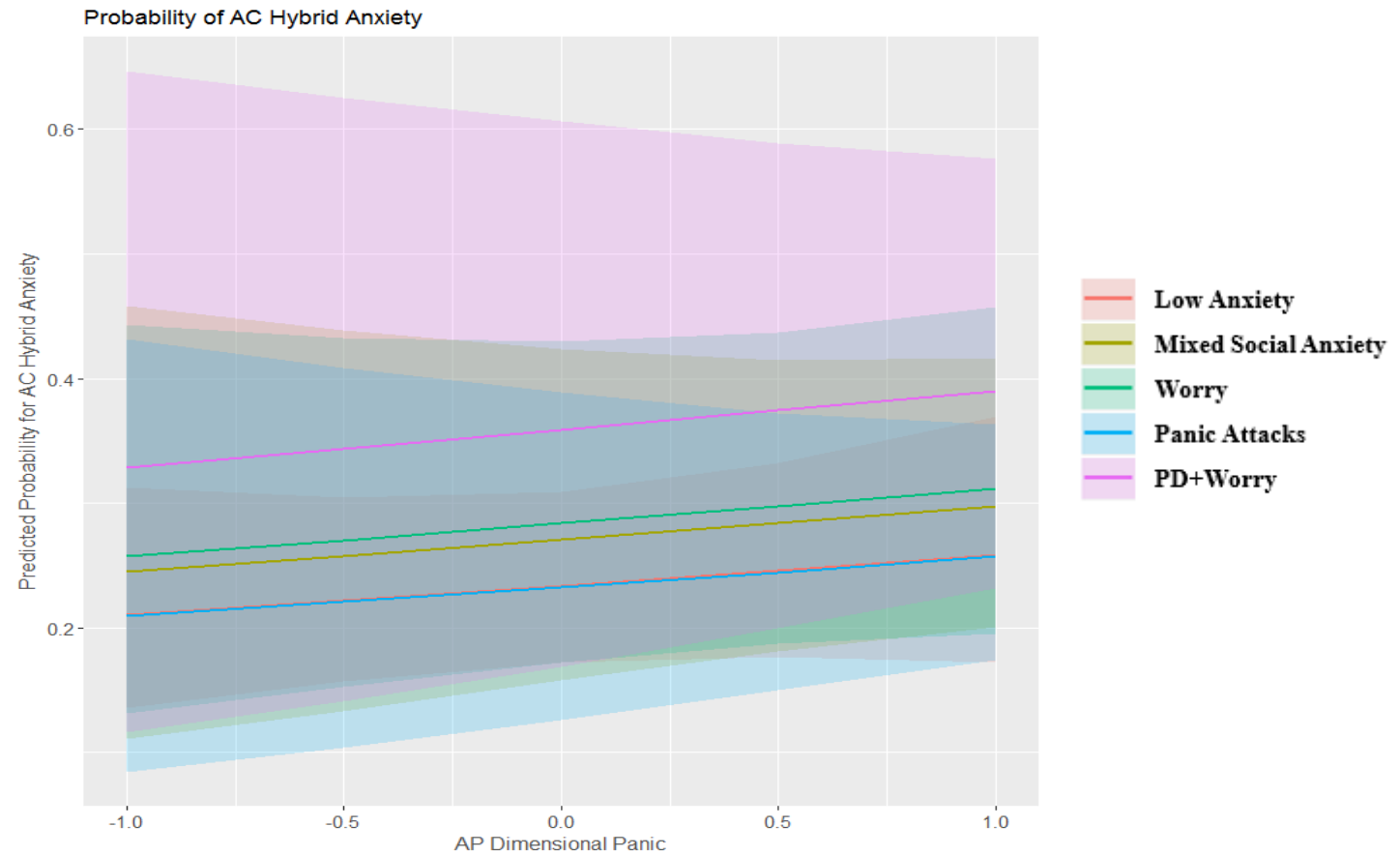


Figure 5F. Predicted Probability of AC Hybrid Anxiety as a Function of AP Dimensional Panic. Shaded areas represent 95% confidence intervals for each latent class. Each line depicts predicted probability of AC hybrid anxiety given membership in each latent class at different levels of AP dimensional panic, while holding AP dimensional panic symptoms at its mean value.

**Step 4c: Comparison of *PD+Worry* class membership and dimension scores.** As the preceding steps indicated that membership in the *PD+Worry* and *Mixed social anxiety* class was associated with an elevated probability of AC anxiety, two binary variables indicating membership in *Mixed social anxiety* and *PD+Worry* versus other classes were created. Only the *PD+Worry* class indicator variable showed an overall significant effect on AC anxiety outcomes (AC GAD:  $\chi^2 = 8.73$ ,  $p = .004$ ; AC hybrid anxiety:  $\chi^2 = 5.94$ ,  $p = .02$ ). The binary indicator variable for the *Mixed social anxiety* group was not significantly associated with AC GAD ( $\chi^2 = 1.15$ ,  $p = .29$ , OR = 1.41) or hybrid anxiety ( $\chi^2 = 0.09$ ,  $p = .78$ ) and thus was not retained in further analyses.

The binary variable for *PD+Worry* group was paired with each dimensional anxiety score in the binary logistic regression models. As can be seen in Table 12, in Model 1 shows that the dimensional worry score demonstrated a significant association with AC GAD, when compared against the binary *PD+Worry* indicator variable. Both the *PD+Worry* indicator variable and the dimensional social anxiety scores were significantly associated with AC GAD in the model that paired the two variables (Model 2). Finally, neither the binary *PD+Worry* group membership variable nor the panic dimensional score demonstrated a comparatively stronger association with AC GAD (Model 3). As for AC hybrid anxiety diagnosis, only the *PD+Worry* group indicator variable was associated with significantly elevated rates of the diagnoses, specifically when it was entered together with dimensional social anxiety score.

Table 12. Odds of AC GAD or Any Hybrid Anxiety Disorder Associated with AP Latent Class Membership or Dimensional Anxiety Scores

AP Anxiety		GAD			Any Hybrid Anxiety Disorder		
		Logit	OR	CI	Logit	OR	CI
Model 1	<b>PD+Worry vs. Worry Dimensional Score<sup>ab</sup></b>						
	PD+Worry Class	0.68	1.97	[0.92, 4.21]	0.49	1.63	[0.79, 3.37]
	Dimensional Worry	<b>0.27*</b>	<b>1.31</b>	[1.01, 1.69]	0.23	1.26	[0.99, 1.59]
Model 2	<b>PD+Worry vs. Social Anxiety Dimensional Score<sup>ab</sup></b>						
	PD+Worry Class	<b>1.21***</b>	<b>3.34</b>	[1.66, 6.73]	<b>0.90**</b>	<b>2.46</b>	[1.28, 4.76]
	Dimensional Social Anxiety	<b>0.30**</b>	<b>1.35</b>	[1.07, 1.71]	0.20	1.22	[0.98, 1.51]
Model 3	<b>PD+Worry vs. Panic Dimensional Score<sup>ab</sup></b>						
	PD+Worry Class	0.64	1.91	[0.87, 4.16]	0.61	1.84	[0.87, 3.87]
	Dimensional Panic	0.28	1.32	[1.00, 1.75]	0.13	1.14	[0.90, 1.47]

*Note.* Logit coefficient and odds ratios (OR) are shown for a 1 standard deviation increase in dimensional anxiety predictors. Results are based on the binary logistic regression models which included pairs of binary *PD+Worry* indicator variable and each dimensional score of AP anxiety. Superscripts indicate the outcomes (a=AC GAD, b= AC any hybrid anxiety disorder) for which the model is significant, based on the likelihood ratio chi-square test ( $p < .05$ ). \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .005$

## Summary of Findings

**Aim 1: *Categorical Characterization of Parent Anxiety Profile.*** AP anxiety symptoms were best characterized by a 5-class solution that included symptom profiles that correspond to the DSM-V diagnoses (i.e., generalized anxiety, social anxiety, panic attacks). The *PD+Worry* class emerged as the only comorbid symptom profile with elevated worry and panic disorder symptoms.

### **Aim 2: *Estimation of Concurrent Relations between AP Anxiety and AC Anxiety***

***Diagnoses.*** AP anxiety profiles demonstrated significant associations with AC GAD.

Specifically, compared to the *Low Anxiety* Group, AP membership in the *PD+Worry* group was associated with a near 4-fold increase in odds of AC GAD (OR = 4.11). Similarly, AP membership in the *Mixed Social Anxiety* class was linked to significantly elevated odds of AC GAD (OR = 2.2) when compared against the *Low Anxiety* Group.

### **Aim 3: *Examination of Relations among AP Anxiety, AC Anxiety diagnoses, and***

***Parenting: Temperament as a Potential Moderator.*** Consistent with study hypotheses, AP anxiety subtypes—*Mixed Social Anxiety*, *Worry*, *PD+Worry*—were significantly associated with AP parenting. In particular, AP membership in the *Mixed Social Anxiety* consistently demonstrated significant association with AP parenting (e.g., low involvement, high inconsistent discipline). In addition, a significant three-way interaction suggested that the *Mixed Social Anxiety* profile showed a distinctive pattern of relation with AC anxiety, such that increased infant negative temperament was associated with AP hostility for the *Mixed Social Anxiety* group in the *absence* of AC GAD; notably, in the presence of AC GAD, high infant negative temperament did not show significant association with child-directed hostility for the *Mixed Social Anxiety* group. As such, parents with social anxiety symptom profile seemingly down-regulated their child-directed hostility for temperamentally difficult children, specifically in the presence of child anxiety symptoms. In contrast, for the AP *Low*



*Anxiety* group, high infant negative temperament was associated with increased AP hostility, irrespective of AC GAD diagnosis.

**Aim 4: Comparison of Categorical and Dimensional Representation of AP Anxiety: Links to AC Anxiety Diagnoses.** Of the five AP anxiety symptom profiles, the *PD+Worry* profile consistently showed highest estimated probability of AC anxiety diagnoses. Likewise, dimensional measures of worry and PD symptoms were associated with significantly elevated risk for AC GAD. Notably, the significant association between AP dimensional worry score and AC GAD remained significant after adjusting for the effect of AP membership in the *PD+Worry* profile.

## Chapter 4

### DISCUSSION

The present study examined parental anxiety as an environmental context in which children's risk for anxiety develops and persists. Several features of the present study supported the exploration of the above question: First, the study sample—comprised of adoptive parent-child dyads—made it possible to examine the patterns of familial aggregation of anxiety symptoms, in the absence of shared genetic risk for anxiety. Second, using structured diagnostic interview data, two approaches to characterizing parent anxiety symptoms were tested. Comparative examination of the categorical and dimensional classifications of parent anxiety revealed differential patterns of risk associated with distinct symptom profiles. Third, this study was guided by a transactional view of child anxiety risk, wherein the characteristics of parent-child dyad interactively determine the environmental risk associated with child anxiety. Consistent with this view, findings highlight the reciprocal relations among parent-child anxiety and offer a potential way to reconcile findings from previous research that tended to characterize parent- and child-anxiety symptoms as competing determinants of anxiety-enhancing parenting.

#### **Diagnostic Characteristics of the Present Sample**

Overall, the three anxiety disorders of interest—GAD, SAD, PD—were found to be well-represented within this non-clinical sample of adoptive parents, with frequency rates being comparable to those reported for nationally representative samples. Lifetime prevalence estimates for AP GAD (6.6%) were largely equivalent to estimates documented by the US National Comorbidity Survey Replication (NCS-R) (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Estimates for SAD (8.3%) were relatively lower than that of the general population (13%). Rates of panic disorder (4.6%) in the present sample fell within the range estimated for the NCS-R samples (3.7% to 5.2%) (Kessler et al., 2006; Kessler et

al., 2012). A greater proportion of the present sample (29%) reported lifetime experience of panic attacks when compared to the estimates (23%) for a nationally representative sample (Kessler et al., 2006).

Prevalence rates of child anxiety diagnoses were not only higher when compared to the corresponding estimates for adoptive parents but also to rates documented for the general pediatric populations. For instance, a meta-analysis of epidemiological data collected between 1992 to 2007 indicated that the average prevalence estimates for childhood GAD, SAD, and separation anxiety disorder to be 1.7%, 2.2%, and 3.9% respectively for children aged 6-12 years. In comparison, a recent study utilizing the PAPA interview with preschool-aged (2-5 years) children presenting at a primary care setting yielded considerably higher prevalence estimates (GAD = 9%; SAD = 8%, Separation anxiety disorder = 11%) (Carpenter, Sprechmann, Calderbank, Sapiro, & Egger, 2016; Franz et al., 2013). It was suggested that the relatively elevated estimates for the above study were attributable to differences in sampling design, response rate variability, or specific features of the sample (e.g., geographic location) (Franz et al., 2013). It may also be possible, however, that the use of a developmentally sensitive criteria anchored by concrete behavioral examples (e.g., reassurance seeking) and age-appropriate dimensional scores facilitate the detection of clinical symptoms present in school-aged children.

### **Latent Class Structure of AP Anxiety**

Taking a data-driven approach, this study examined the latent class structure of social anxiety, worries, and panic-spectrum symptoms. The resulting five-class solution partially conformed to the study hypotheses—distinct classes that correspond to social anxiety and generalized anxiety syndromes were identified, along with one class characterized by minimal symptoms of anxiety. The presence of a separate social anxiety class is consistent with findings from Kessler and colleagues' (2005) examination of the NCS-R data. (Latent

class analysis of 19 disorder classes yielded a class with high rates with social phobia without any case of GAD or PD.) It is noteworthy that item-response probabilities for the social anxiety class showed elevations across other symptom domains and warranted the label “*Mixed social anxiety*.” This profile was thought to reflect the breadth of symptoms that are commonly associated with SAD: cued-panic symptoms related to situations involving social performance and excessive anticipatory concerns about social evaluation. Likewise, examination of the cross-tabulations of the latent classes and parents’ life-time DSM diagnoses indicated that parents in the “*Mixed Social Anxiety*” class presents with a relatively heterogeneous pattern of diagnostic history.

On the contrary, the “*Worry*” class appeared to only capture those with a history of pure GAD, supporting the idea that GAD represents a “meaningful stand-alone disorder” (Newman et al., 2013). The “*Panic attacks*” class similarly demonstrated a distinctive diagnostic history in that the majority of the parents (92%) in the class had not been diagnosed with SAD, GAD, and even PD; therefore, this group presented with comparatively mild symptoms of anxiety. Finally, identification of the “*PD+Worry*” latent class was significant for a number of reasons. First, the PD+Worry group was the only class to be characterized by a clearly comorbid symptom profile. This finding is in line with high rates of comorbidity reported for the Panic disorder and GAD, although it should also be noted that this class was characterized by comorbidity between the subsyndromal forms of PD and GAD. Interestingly, a Worry+Social Anxiety class was not identified, despite evidence suggesting comparable rates of comorbidity between the two conditions (Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Kessler, Chiu et al., 2005). Second, there is strong evidence suggesting that comorbid PD+GAD is accompanied by particularly severe impairment (Bruce et al., 2005) and unique developmental course and risk factors (avoidant attachment style) (Newman et al., 2016). Even when not all individuals that belonged to this

class did not meet the full diagnostic criteria for PD and GAD, comorbidity existing at the subsyndromal level was nonetheless associated with a relatively greater environmental risk (discussed below). Taken together, the overall latent class structure was considered to be diagnostically and clinically meaningful. Additionally, the detailed characterization of parent anxiety symptom profile contributed to a more nuanced understanding of the types of symptoms that serve as an “environmental context” for children.

### **Association between AP Latent Class membership and AC Anxiety Diagnoses**

Based on extensive evidence documenting familial aggregation of anxiety, the present study investigated the potential patterns of aggregation of anxiety within adoptive parent-child dyads. Findings revealed particularly elevated rates of GAD among children of adoptive parents in the *PD+Worry* and *Mixed social anxiety* groups. The magnitude of relative risk associated with the *PD+Worry* group is noteworthy, considering that less than 40% of this latent class met the diagnostic criteria for lifetime GAD or PD. In other words, even subclinical levels of comorbid worry and panic-spectrum symptoms appeared to represent a substantial environmental risk for GAD development in adopted children. Together, these findings support the basic premise of this study—that distinct parent anxiety profiles are differentially related to child anxiety risk. The observed pattern of aggregation of anxiety within this sample of adoptive parent-child dyads cannot be attributed to shared genetic influences. Thus, the present study extends prior research emphasizing the relative importance of environmental influences on the intergenerational transmission of risk for child anxiety (e.g., Eley et al., 2015) by clarifying which child anxiety disorder (i.e., GAD) may be particularly susceptible to environmental risk factors.

The absence of an overall significant association between AC GAD and AP “*Worry*” group membership was somewhat unexpected, given theoretical models suggesting that exposure to parents’ anxious cognitions might facilitate children’s learning of worry

behaviors (Kertz & Woodruff-Borden, 2011). However, as is discussed further below, the dimensional score of worry was found to be significantly related to AC GAD. Additionally, the strong association between child GAD and parent membership in the *PD+Worry* group suggests the possibility that (1) excessive worries may in fact increase the risk for environmental transmission of worry-proneness; and (2) such process is enhanced in the context of greater symptom severity or comorbidity; and finally that (3) the unpredictable nature of the panic disorder symptoms may further impact children's sense of uncertainty and control over their environment. Worry occurring in this context may represent an attempt to gain control over a potentially unpredictable parent-child interactions (Zlomke & Young, 2009)

Finally, the finding that children of the *Mixed social anxiety* group parents—but not the *Worry* group—showed comparatively elevated rates of GAD raises questions about possible underlying environmental processes. One explanation may be that the *Mixed social anxiety* group simply presents with a greater degree of symptom severity or impairment, potentially given that this group also endorsed moderate symptoms of worry (though potentially secondary symptoms reflecting social evaluative concerns). As a consequence, greater symptom severity may have a more pronounced impact on parenting by the *Mixed social anxiety* group. Alternatively, it may be the case that social anxiety and worry symptoms are differentially related to parenting behaviors that increase and sustain children's risk for anxiety. For example, an observational study documented that socially anxious mothers, as a group, showed more impaired parenting when compared to the mothers with GAD and nonanxious controls (Murray et al., 2012). Furthermore, anxious children of socially anxious parents responded poorly to cognitive behavioral therapy (CBT) relative to anxious children of parents with GAD (Cooper, Gallop, Willetts, & Creswell, 2008). The following section reviews additional findings which suggest possible symptom-specific

environmental processes associated with parental social anxiety and worry symptoms.

### **AP Anxiety and Parenting: Evidence of Transactional Relations with AC Anxiety and Temperament**

**Class-specific associations.** As was hypothesized, AP class membership demonstrated significant associations with parenting behaviors including involvement, inconsistent discipline, and hostility. A number of class-specific patterns were observed, with the *Mixed social anxiety* group showing (a) lower parental involvement; (b) higher probability of inconsistent discipline; and (c) greater child-directed hostility relative to the *Low anxiety* or the *Panic attacks* group. Therefore, when compared to other latent classes, parents of the *Mixed social anxiety* group were most likely to endorse problematic parenting characterized by disengagement, inconsistent assertion of control, and critical attitude toward their children. As mentioned above, these findings are consistent with previous research documenting higher levels of passivity and expressed anxiety among socially anxious mothers (Murray et al., 2012). Although specific factors that may predispose the parents with *Mixed social anxiety* symptom profile to particularly maladaptive parenting are unknown, the above parenting behaviors may reflect interpersonal traits that are commonly associated with social anxiety. Specifically, interpersonal traits of socially anxious adults have been characterized by a tendency to be “cold (yet) submissive,” “lacking in assertiveness,” or “conflict avoidant” (Davila & Beck, 2002; Erickson et al., 2016; Kachin et al., 2001; Rodebaugh, Bielak, Vidovic, & Moscovitch, 2016). Whether the interpersonal features of social anxiety that are seen in friendships and other intimate relationships have a similarly adverse impact on socially anxious adults’ relationship with children warrants further examination. Moreover, comparison of parents’ self-reported parenting problems with those reported by children would be informative, especially given evidence suggesting that self-rated interpersonal functioning of socially anxious individuals might differ markedly from

those reported by friends (Rodebaugh et al., 2014) or family (Caster, Inderbitzen, & Hope, 1999).

Three latent classes demonstrated significant relations with inconsistent discipline relative to the *Low anxiety* class, yet only the *Worry* group parents endorsed significantly higher degree of inconsistency than another anxiety group (*Panic attacks* group). Recent evidence suggests that individuals with GAD are motivated to avoid a negative affective contrast experience (Newman & Llera, 2011; Llera & Newman, 2014). That is, those with GAD are particularly sensitive to unexpected increase in their negative affective states and are likely to preemptively use worry as a means to preclude a sharp increase in negative emotions. However, chronic worrying inadvertently creates and perpetuates the experience of negative affect. From this perspective, it may be possible that worry-prone parents seek to prevent further escalation in their baseline negative affect and are thus reluctant to follow through on consequences that may elicit a strong negative emotion in their children and themselves (e.g., “feel that getting [my] child to obey is more trouble than it’s worth”). Although parental inconsistency was only assessed with respect to discipline practices, future studies could examine the extent to which a general tendency for inconsistent parent-child interaction may be distinctively associated with parents’ worry symptoms.

**Three-way-interaction effects.** Unlike the conclusions drawn by most prior research that aggregated different parent anxiety disorders, findings of the present study suggest that specific forms of parenting behaviors are more closely associated with parent anxiety while others tend to reflect the joint contribution of parent and child anxiety symptoms. More importantly, the evidence of the three-way interaction—among AP latent class status, AC anxiety, and children’s history of negative temperament—underscore the complex patterns of relations among parent and child characteristics. Particularly interesting was the finding that the presence of child GAD markedly changed the pattern of relations among AP symptom



profile, hostility, and history of negative temperament. The significant pairwise comparisons across all latent classes appear to suggest that child GAD elicits a notably variable pattern of responses from parent with different symptom profiles. Contrary to the idea that anxious parents are more prone to engaging in negative parenting in the face of child distress (Creswell et al., 2013), parents in the *Mixed social anxiety* group seemingly down-regulated their hostility toward their anxious children with high risk for emotion regulation difficulties. That is, these parents endorsed higher hostility for children with history of negative temperament, only if the children did not present with clinical levels of anxiety. In turn, nonanxious parents were found to escalate child-directed hostility toward children who may be at an elevated risk for a stably high trajectory of anxiety. Similarly, parents of the *Worry*, *Panic attacks*, and *PD+Worry* group showed subtle differences in their response to children presenting with negative temperament and/or anxiety diagnoses (GAD or any hybrid). Together, these findings highlight the importance of considering the nature of parental anxiety symptom presentation and the associated affective and interpersonal features. Just as the overall clinical presentation of comorbid conditions does not merely equal the “sum” of the relatively pure forms of two disorders (Norton & Chase, 2015), distinct combinations of anxiety disorders occurring within parent-child dyads may be characterized by different patterns of parent-child interaction styles.

As noted previously, irritability has been implicated as a significant risk factor (Dougherty et al., 2013) and a correlate of child GAD (Pina et al., 2002). In fact, parent rated infant negative temperament—possibly reflecting dispositional irritability—was significantly associated with AC GAD in middle childhood. Findings of the present study shed additional light on the longitudinal link, as they emphasize the long-term association between parent rating of infant dispositional irritability and several aspects of parenting assessed during middle childhood. Therefore, temperamentally irritable infants’ developmental trajectories

toward GAD or anxiety-related outcomes are likely to be multiply-determined by various environmental risk processes. Consistent with the family systems perspective (Hughes & Gullone, 2008), parents' own characteristics were found influence their response to children at-risk for GAD, even as children's anxious traits impact their behaviors. In sum, results of the present study suggest that the significance of child characteristics are likely to be fully grasped within the broader context of parent characteristics (Belsky, 1984). Evidence of the complex three-way interaction suggests that these patterns are likely to be overlooked when parent anxiety symptoms are aggregated across multiple symptom domains.

### **Comparison of the Categorical and Dimensional Representations of AP Anxiety:**

#### **Links to AC Anxiety**

Finally, based on the notion that parental anxiety represents a form of an environmental context for children, the present study sought to examine whether the clinical significance of this contextual risk factor might be better captured by categorical or dimensional indices of AP anxiety. As the categorical variables were derived through a data-driven approach, the categorical and dimensional measures used in this study were not constructed to reflect identical symptom clusters; consequently, each measure represented overlapping yet distinct constructs. For instance, the indicators that comprised the worry and PD dimension scores resulted in three distinct classes (*Worry*, *Panic attacks*, *PD+Worry*) that differed from the dimensional constructs with respect to range of symptom severity (*Panic attacks* vs. panic dimension score) or scope of symptom coverage (*PD+Worry*). More importantly, it should be kept in mind that the latent classes were derived from a non-clinical sample and a relatively small number of individuals met the diagnostic criteria for the respective diagnoses. With these caveats, findings that suggest differential results for the categorical and dimensional measures are interpreted below.

#### **Convergence between categorical and dimensional measures.** Latent class

representing elevated social anxiety symptoms was associated with elevated rates of AC GAD, specifically when compared against the low anxiety class. However, the overall effect of the binary indicator of the *Mixed social anxiety* group was nonsignificant. Likewise, dimensional social anxiety score did not show an overall significant association with AC anxiety. Although previous research has reported that a dimensional measure of social anxiety outperformed the categorical social anxiety diagnosis (DSM-IV) in its prediction of a range of clinically meaningful outcomes (Ruscio, 2010), relative contribution of categorical versus the dimensional measures of AP social anxiety symptoms to child anxiety remains inconclusive on the basis of the findings of the present study. Furthermore, neither the categorical nor the dimensional measure of AP social anxiety showed significant association with AC social anxiety diagnosis. These findings stand in contrast to the significant association between the worry symptoms in the adoptive parent-child dyads and highlights the need to examine environmental processes that may account for “symptom-specific” aggregation of anxiety symptoms (Rapee, 2002).

**Divergence between categorical and dimensional measures.** As noted above, the latent classes representing worry (“*Worry*”) and panic attack (“*Panic attacks*”) symptoms were not significantly related to AC anxiety diagnoses. However, dimensional measures of worry and panic symptoms demonstrated significant associations with AC GAD and hybrid anxiety diagnoses. As such, when considering the subsyndromal forms of worry and panic symptoms, dimensional measures appear to show a stronger association with AC anxiety risk. Although the present study was not designed to answer questions about the clinical utility of the dimensional versus the categorical measures of worry, findings of the present study are broadly in line with previous research supporting the dimensional structure of worry (Ruscio, Borkovec, & Ruscio, 2001) and possibly GAD (Kessler, Brandenburg et al., 2005; Ruscio et al., 2005; Rutter & Brown, 2015).

Alternatively, the significant association between *PD+Worry* and AC anxiety suggests the possibility that the categorical indices of worry and panic attack symptoms did not reach a specific symptom threshold (e.g., presence of at least three symptoms associated with GAD, un-cued panic attacks), for these symptoms to have a pronounced impact on these individuals' capacity for parenting. Notably, the DSM requirement for excessive worry has been called into question as a rather strict criterion yet individuals that do meet this diagnostic requirement do present with a more chronic course and worse symptom severity (Ruscio et al., 2005). In the present study, individuals that belonged to the *Worry* group were significantly likely to endorse this symptom and are not likely to present with a particularly mild form of worry symptoms. It may thus be the case that dimensional worry symptoms better capture the environmental risk associated with child anxiety. Future studies could clarify whether (a) these patterns of results may hold for parents with GAD, panic disorder, or comorbid PD+GAD, using both categorical and dimensional scores; (b) the differential patterns for *Worry*, *Panic attacks*, and *PD+Worry* groups may be due to a specific symptomatic threshold that distinguishes these classes with respect to parenting or across multiple functional domains.

### **Limitations**

The present study is among the first to examine the environmental significance of parental anxiety symptoms using an adoption design. However, a number of potential limitations were also present. First, concurrent measures of AP anxiety, AC anxiety, and parenting were examined and it was not possible to examine the potential direction of influence linking the above factors within a mediation framework. The present study was better suited to examine potential moderation effects, particularly as the moderation framework aligned closely with the theoretical premise that anxiety symptoms of parents and their children jointly determine the process of parenting. Furthermore, the inclusion of

temperament measured at 9 months of age offered a longitudinal view of factors that influence the transactional relations among the above variables. Second, measures examined in the present study were completed by primary caregiver. Reliance on a single informant increases the possible likelihood of shared method variance or specific informant effects. For instance, higher maternal trait anxiety (i.e., higher score on Beck Anxiety Inventory) was associated with less discrepancy in mother-child report of child anxiety whereas higher maternal worry score (i.e., higher score on Penn State Worry Questionnaire) was linked to increased discrepancy in mother-child report on child anxiety (Affrunti & Woodruff-Borden, 2015). That said, it is worth noting that the PAPA interview was designed to be an interviewer-based interview that places the “onus” on the interviewers to ensure that caregiver responses are consistent with the highly detailed operationalization of the symptoms (e.g., concrete behavioral examples, symptom frequency, intensity, duration) as outlined in the glossary (Egger et al., 2006). These unique features of the PAPA are thought to minimize the potential informant effects on parent-reported child symptoms. Relatedly, the majority of the primary caregivers in this study were mothers and thus potentially limits the generalizability of the findings to fathers. Based on available findings that emphasize the distinctive contribution of fathers’ parenting to child anxiety (Möller, Nicolíć, Majdandžić, & Bögels, 2016), future investigations should examine whether environmental risk associated with paternal anxiety might differ. Finally, although the anxiety disorders considered in this study were well-represented in the sample, the generalizability of the findings to the clinical sample warrants further investigation.

### **Conclusion and Implications**

Findings of the present study extend the literature on the environmental risk associated with parental anxiety symptoms. A high-risk symptom profiles emerged—*PD+Worry* symptom profile or high scores of AP worry and panic symptoms—challenging

the notion that parent anxiety symptoms represent a static environmental risk indicator for child anxiety. More importantly, identification of the latent class structure of parent anxiety yielded a nuanced view of transactional relations among anxiety symptoms within adoptive parent-child dyads. Consistent with Belsky's theory (1984) that child characteristics are best understood in the broader context of parent characteristics, evidence presented above suggest that it is essential to consider the dynamic interaction among parent and child symptom presentation. The distinctive patterns of environmental risk associated with parent anxiety may inform efforts to target parent-factors associated with childhood anxiety and children's response to intervention.

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**PUBLICATIONS**

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