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Family Risk Factors in the Acquisition of Anxiety

Behavioral Inhibition and Social Fear Learning from Parents

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KEYWORDS

- Fear learning • Anxiety • Children • Parent socialization • Temperament • Behavioral inhibition
- Intergenerational transmission

KEY POINTS

- Anxiety runs in families and typically emerges in childhood. Above and beyond shared genetic risk, parental behavior may modify risk of disorder.
- Temperamentally fearful children are at increased risk as they may be more sensitive to environmental input and more attuned to threat cues.
- Parental verbal and nonverbal information can modulate child risk by characterizing the environment as generally safe and supportive, or as a source of threat.
- The impact of parental messaging may be more potent for at risk children in infancy versus childhood, as infants rely heavily on external input to learn about and categorize the environment.

INTRODUCTION AND BACKGROUND

In the past decade, anxiety disorders have become increasingly common among young people, with a significant increase of 25% following the COVID-19 pandemic [1,2]. Given the growing number of global environmental stressors [3], it is expected that anxiety disorders will continue to rise worldwide in the next decade. Therefore, it is crucial to gain a better understanding of the risk factors that contribute to anxiety disorders and find ways to prevent or mitigate their emergence.

Anxiety disorders tend to run in families [4] and typically begin during childhood, with the median age of onset at age 11 years [5]. The presence of anxiety disorders in parents is a well-established intergenerational risk factor for anxiety. Indeed, parental anxiety has been linked to a 2 to 4 fold increase in the risk of anxiety

disorder in their offspring [6,7]. It is clear that the significant overlap of anxiety disorders between generations can be attributed to the transmission of genetic risk from anxious parents, explaining about one-third of the intergenerational covariance [8]. While potent, this mode of transmission is not yet a tractable target for intervention and any technological advances would still have to overcome the fact that this genetic pathway is driven by several genes with small individual effects [9].

However, there are other entry points to the relation between parent and child risk for anxiety. Parental behavior and socialization practices can greatly exacerbate, or ameliorate, shared genetic risk by shaping the rearing environment [6,7]. Parents who have anxiety disorders are more likely to display excessive anxiety responses to situations that they perceive as potentially

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threatening for their child. They often manifest this anxiety through facial expressions, body language, and vocal and verbal cues [10–13].

Theories of social learning suggest that children may acquire fears indirectly through others, in addition to direct aversive experiences with threats [14,15]. Rachman, for example, suggests that anxiety can be passed down from parents to their offspring through social learning in 2 ways: First, as early as in infancy, children can pick up on, and then model, their parent's nonverbal anxiety signals in new situations [16,17]. This can result in the offspring displaying anxious-avoidant reactions to subsequent similar situations. This is a vicarious learning or modeling pathway to fear acquisition. The second pathway is a verbal instruction pathway, where the offspring learns from the parent's direct verbal remarks about threat, which in turn leads to increased anxiety [18]. From the first years of life, nonverbal pathways play a crucial role in keeping children safe by helping them avoid potential dangers while they explore their surroundings. However, as children acquire language skills, the verbal pathway becomes more significant and influential as they can characterize more complex threats and reach into both present and hypothetical dangers [14]. As a result, most studies focus on nonverbal pathways during the first 2 years of life, while verbal pathways are typically studied from early childhood and beyond, once children become more sophisticated communicators [14]. Both social learning pathways likely work through the same associative learning mechanisms as direct learning experiences [19,20]. Instead of experiencing negative stimuli or situations firsthand, however, children learn to associate their parents' verbal or nonverbal expressions of anxiety with potentially threatening situations or stimuli. It is important to note that parents can still model bravery in the face of fear for their children, as in infancy, but with the added layer of verbal contextualization and reinforcement. Parents can also build on emerging memory and verbal skills to revisit past events to either praise adaptive social behavior or help problem solve points of concern.

However, not all children are equally susceptible to environmental exposure to their parents' expressions of anxiety [11,12,21]. Additionally, not every child who has genetic, biological, or temperamental dispositions to anxiety goes on to develop an anxiety disorder. Therefore, the intergenerational transmission of anxiety disorders, like their development over time, is a complex process that cannot be attributed to a single risk factor [22,23]. In this study, the authors discuss the interplay between 2 major risk factors in the development and intergenerational transmission of anxiety:

social learning from parents (as already noted) and childhood behavioral inhibition (BI).

BI is characterized by a tendency to show shy, fearful, withdrawn, and avoidant reactions to novelty [24], and is evident as a stable trait by preschool [25]. Crucially, BI is linked to a 4 to 6 fold increase in risk for anxiety by late adolescence [26]. Behaviorally inhibited children are not only at a higher risk of developing anxiety disorders [27,28] but are also more likely to come from families where the parents have an anxiety disorder [29]. As such, temperamental BI may be a developmental conduit for intergenerational transmission [30,31]. Other models put BI in the spotlight as the central risk factor in anxiety development, moderating and mediating the effects of environmental risk [32]. The idea that temperamental dispositions increase vulnerability to environmental risk is central to diathesis-stress and differential susceptibility models [33,34]. These models each suggest that children with temperamental dispositions, such as BI, are more susceptible to the impact of environmental input. As such, BI may facilitate associative fear learning, including social learning [20].

In this study, the authors aim to review the evidence for interactions between child BI and social learning from parents (Table 1). Potential interactions between them have been studied more extensively in nonverbal pathways compared to verbal ones, in part due to the emphasis on early experience in the temperament literature. In a recent systematic review and meta-analysis conducted by Nimphy and colleagues on the impact of vicarious learning in early fear acquisition from parents, 42% of the vicarious learning studies tested the interplay between BI and social learning [35] (8 out of 19 studies). In contrast, only 22% of the studies that focused on the role of verbal information transmission from parents in child fear acquisition incorporated the study of BI and its interaction with social learning (4 out of 18 studies). In the following two sections, the authors address the available evidence for the 2 pathways through which parents transmit anxiety to their offspring—the nonverbal (vicarious/observational) and verbal (verbal transfer of instruction) pathways. Our aim is to assess the strength of the available data in hopes of setting a foundation for later empirical work.

VICARIOUS AND OBSERVATIONAL LEARNING PATHWAYS

General Characteristics of the Studies

As per Rachman's suggestion on the importance of vicarious learning pathways during the first years of

TABLE 1

Brief Summary of Core Studies Examining Parental Input, Temperament, and Anxiety Risk

Task	Studies	N	Age	Interaction of Temperament and Parental Input
Nonverbal Modeling	Blackford & Walden [36], 1998	55	11–15 mo	Low in temperamental fear respond to negative, high in fear respond to positive
	Carpenter [37], 2004	61	9, 12, 18 mo	Infants avoided stimulus at 18 mo with positive input
	De Rosnay et al [21], 2006	24	12–14 mo	High fear infants more avoidant in the anxiety condition.
	Dubi et al [38], 2008	71	15–20 mo	No differences by temperament for fear nor avoidance.
	Murray et al [12], 2008	156	10–14 mo	BI infants of anxious mothers had greater avoidance during the stranger approach.
	Goodman-Wilson [39], 2012	90	12–13.5 mo	Low BI infants showed stronger avoidance after exposure to parental fear.
	Aktar et al [11] 2013	122	12 mo	Parent anxiety–child avoidance is stronger for high BI children.
	Aktar et al [40], 2014	117	30 mo	No relations for fear or avoidance.
	Aktar et al [41], 2018	106	54 mo	More expressed anxiety at 2.5 y from parents predicted more avoidance in moderate-to-high BI children.
	Möller et al [42], 2014	81	10–15 mo	Temperamentally anxious infants showed more avoidance of visual cliff, but only with fathers.
Verbal Instruction	Aktar et al [46], 2022	68	4–6 y	Positive association between child social anxiety and observed fear was stronger for the safe, compared to the threat, condition.
	Nimphy et al [47], 2022	195	8–18 y	No moderation by BI.
	Murray et al [48], 2014	190	4–5 y	No moderation for threat but did moderate maternal encouragement.

life [14], most of the studies discussed in this section were conducted during infancy and toddlerhood [11,12,21,36–42]. All of these studies fully or partly included participants between 10 and 14 months of age as this is when the first forms of nonverbal social learning, also known as social referencing, begin to emerge [43,44]. Infants at this age show the first signs of the ability to use others' emotional and behavioral reactions to guide their own responses to new or ambiguous objects, individuals, or situations. When parents express fear, they do so using a combination of facial expressions, gestures, and verbal signals [35]. Infants can attend to and process these multimodal signals and then use them to create a gestalt sense of their environment as safe or threatening. A growing number of studies have worked to capture these multiple levels of input. While this approach makes the study of social referencing more ecologically valid, it also creates challenges in identifying the specific contribution of each modality to the social referencing effect.

Child social-referencing abilities have been captured in 2 lines of studies: First, longitudinal semiexperimental designs examine natural variation in parental expressions of anxiety as a result of lifetime/current anxiety disorder in parents in the context of child anxious behavior [11,12,40]. Second, the causal role of social referencing is investigated in single-session experimental designs with typically developing children, where parents provide (trained or instructed) fearful (vs happy) assessments of a novel stimulus [21,36–39]. These 2 lines of studies most often include observations of child fear/anxiety expressions and avoidance tendencies as the affective and behavioral indices of social referencing effects. Most of the studies included predominantly or only mothers, except for a few studies that included within-subject [11,40,41] or between-subjects comparisons of the social-referencing effects with mothers and fathers [42] to gain insight into parental differences. The novel stimuli utilized in these experiments are most often unfamiliar individuals and/or (remote-controlled) mechanical

toys, with only one study testing a potential threatening situation (ie, visual cliff [42]). Given that social-referencing abilities emerge at around the same time as stranger wariness [45], some researchers find it especially interesting to investigate child social referencing of parental anxiety expressions in response to strangers as a pathway to social anxiety acquisition [11,12]. Most of these studies measure child BI or anxious temperamental dispositions via parental report, while the rest uses standardized laboratory observations.

Joint Effects of Behavioral Inhibition and Vicarious or Observational Fear Learning

The majority of empirical studies that have tested the transactions between child BI and modeling of parents' anxiety in social-referencing situations found some evidence in favor of an interactive effect on child fear acquisition, captured in behavioral avoidance and affective fear expressions. In the subsequent section, the authors summarize the findings first from the studies with clinical samples of parents with lifetime anxiety disorders, and then followed by the experimental designs in typically developing infants.

In a longitudinal study investigating social referencing with mothers and fathers with and without lifetime anxiety disorders [11], no significant effect of parental anxiety expressions was found for 12 month olds with low levels of BI. In contrast, higher levels of expressed parental anxiety toward strangers predicted infant avoidance of strangers for moderately or highly inhibited infants. In line with the proposed facilitating effect of BI on social learning [20], the positive link between parental anxiety expressions and child avoidance got stronger for the more inhibited infants [11]. Note, however, that this interactive effect of social learning and BI was only shown in avoidance behaviors, but not in fear/anxiety expressions, and only at 12 months. Later follow-ups of this sample at 30 and 54 months did not reveal a concurrent interaction between BI and levels of parental expressed anxiety when predicting children's avoidant or anxious reactions toward the novel stimuli [40,41]. Yet, there was some evidence for prospective associations: highly behaviorally inhibited children were more avoidant at 54 months if their parents expressed more anxiety at 30 months [41].

In a related vein, Murray and colleagues [12] investigated children of mothers with or without social anxiety disorder longitudinally at 10 and 14 months in a stranger social referencing task. They showed that behaviorally inhibited infants of mothers with social anxiety disorder display a larger increase in their avoidant behavior toward strangers over the course of 4 months, as

observed during the stranger approach. In turn, this increase was smallest for the highly inhibited children of parents without social anxiety disorder. Taken together, the findings suggest that the end of the first year of life can be a sensitive period for the observation of the joint effects of temperament and social learning on child fear acquisition. In addition, the effects of earlier exposure to parental anxiety expressions in toddlerhood may be more prolonged or pronounced for highly behaviorally inhibited children.

In an experimental study of social referencing, De Rosnay and colleagues trained parents to display anxious facial, bodily, and vocal expressions to their 12 to 14 month old infant in a stranger social referencing task [21]. Infants with higher levels of BI were more strongly affected by parents' anxious (vs non-anxious) interactions with the stranger, as apparent in their fear and avoidance responses [21]. Another study by Carpenter and colleagues reported that 9 to 18 month old infants who display more temperamental distress to novelty were more likely to show fearful affect, and less likely to approach novel social and non-social stimuli, following exposure to maternal fearful expressions as compared to children with low levels of temperamental distress [37]. Möller and colleagues reported parallel findings in the visual cliff with fathers and their 10 to 15 month olds [42]. Infants with higher levels of anxious temperamental dispositions showed more avoidance of the visual cliff after exposure to parental anxiety expressions of their fathers, but not mothers. These results provide evidence for an enhanced vulnerability of children with high BI when exposed to parental anxiety expressions.

However, the literature is far from settled. Other studies either did not find a significant interplay of BI and social learning or reported a different moderation pattern [36,38]. In an experiment where mothers expressed fear and disgust toward fear-relevant (snakes, spiders) and irrelevant (flowers, mushrooms) stimuli, Dubi and colleagues reported no difference as a function of temperament in 15 to 20 month olds [38]. Another study by Blackford and Walden [36] that measured child negative affect and avoidance of novel toys before and after exposure to maternal fearful (vs happy) expressions reported a significant interplay between temperament and parental fearful (vs happy) expression in 11 to 15 month olds but not 16- to 22 month olds' responses. However, this interaction was not in the expected direction: Children with low BI levels showed more negative mood and avoidance of toys after witnessing mothers' fearful expressions, whereas high BI children did not show a change in their

behavior. In turn, while low BI children's behavior or affect remained unchanged after exposure to parents' happy expressions, high BI children showed more negative affect and avoidance of the toys after the maternal positive expressions.

Another study by Goodman and Wilson [39] found a significant interplay of temperament and parental fearful messages: Infants with low levels of temperamental fear showed stronger avoidance of strangers (but not toys) after being exposed to maternal fear expressions, whereas high BI children become more avoidant after exposure to non-anxious versus anxious maternal expressions [39]. Although it is difficult to explain why positive or non-anxious maternal expressions would make highly inhibited/fearful children more negative and avoidant, the lack of change in behavior following mothers' fearful expressions may be related to ceiling effects, in that high BI children already show high levels of negative reactivity due to their own anxious dispositions, leaving little room for additional fear acquisition via parental modeling [36].

SUMMARY

The reviewed studies provide some evidence in favor of enhanced vulnerability to parental fear or anxiety modeling on the part of infants with temperamental dispositions to anxiety. However, this pattern was not highly robust as it did not hold across different ages, the 2 parents, different types of novel stimuli, or behavioral and affective indices of child fear acquisition. In line with this consensus, Nimphy and colleagues conducted a meta-analysis of social-referencing studies in the first 2 years of life, and found small but significant effects for the interaction between child temperament and parental fear expressions on child avoidance ($g = 0.25$), but not on fear [35].

VERBAL INFORMATION AND INSTRUCTION PATHWAYS

General Characteristics of the Studies

Relative to nonverbal social learning pathways, we know less regarding the moderating role of temperamental dispositions in verbal information pathways to child acquisition of fear and anxiety [46–48]. In line with Rachman's [14] proposal to focus on the salience of verbal information in the childhood years, studies have used a variety of approaches to examine variations in transmission among older children. For example, 2 studies enrolled 4 to 6 year olds to

investigate the role of verbal information in the acquisition of social fears, focusing on novel social encounters [46,48]. Another study included older children between 8 and 18 years of age and leveraged the threat and novelty surrounding the COVID-19 pandemic to assess fear acquisition [47]. The links between parental verbal information and child social anxiety acquisition have been examined with correlational designs in community [47] and clinical samples [48], and in experimental designs testing the effects of trained parental verbal information on child fear [46]. For example, one study implemented an experimental design in typically developing children of healthy mothers [46], and another study focused on the transmission of school-related fears from socially anxious mothers to their 4 to 5 year old children. Similar to observational learning research, the studies included (mostly or only) mothers.

Most of the studies focused on trained verbal anxiety expressions without controlling for nonverbal signals. Although this safeguards ecological validity, it makes it difficult to make inferences on the separate contribution of verbal and nonverbal visual and auditory channels. With respect to BI, studies relied on questionnaires (reported by mothers or children), with only one study including retrospective measures early temperamental dispositions in infancy [48]. Finally, the multidimensional nature of fear reactions [49] is relatively better acknowledged in this line of work on verbal information pathways, such that studies typically included objective and subjective indices of fear [46,48]. One study additionally included heart rate and attention biases as additional physiologic and cognitive indices of fear [46].

Joint Effects of Behavioral Inhibition and Fear Learning Via Verbal Information from Parents

The limited available evidence on the interactive effect of child temperamental dispositions with parental verbal information comes from 3 verbal learning studies that incorporated BI in their design. The first study by Aktar and colleagues investigated the acquisition of stranger fears by 4 to 6 year olds in a repeated experimental multimethod design where primary caregivers provided trained verbal expressions of anxiety (vs safety) about strangers with whom children later interacted in social tasks [46]. This study incorporated observed subjective (reported fear) and objective (observed anxiety and avoidance), along with physiologic (heart rate) and attentional (attention biases measured in computerized experiments) indices of fear. Child BI was measured with parent-report questionnaires and analyzed in a composite score with

parents' report of child trait social anxiety due to a strong correlation between these two constructs in their sample. They found a significant moderation of parental verbal information of threat (vs safety) by this composite score only for observed fear: There was a positive association between the measures, particularly in response to the stranger paired with safety information, rather than verbal threat. This finding suggests children may tend to revert to, or act in line with, their existing anxiety dispositions when receiving parental positive information. While intriguing, this finding is at odds with the idea of an enhanced vulnerability to parents' verbal threat information among temperamentally anxious children.

The second study by Murray and colleagues [48] investigated maternal verbal threat expressions about school and child representations of school (measured in a doll play task), internalizing disorder symptoms (measured with parent and teacher reports) and anxiety diagnoses (measured with maternal clinical interviews on child anxiety) among 4 to 5 year olds [48]. This study confirmed that parents with social anxiety disorder are more likely to make higher threat attributions in their narratives to their children. Children of parents who made higher threat attributions were, in turn, more likely to have a social anxiety disorder. No links were found with respect to school representations or internalizing disorder symptoms. Finally, there was no evidence for a significant moderation of these links by child temperament measured via observation in infancy. This study found instead a moderation of the negative link between maternal encouragement and school representations by BI: Children high in BI were more likely to hold negative school representations if their parents did not show encouragement, whereas children low in BI seemed unaffected by maternal encouragement levels. The third study by Nimphy and colleagues studied the interrelations between parent and child fear of COVID-19 and parental verbal threat information about COVID-19 (based on child and parent reports) among 8 to 18 year olds [47]. While a significant link between parent and child fears of COVID-19 was partially mediated by parental verbal threat information in this study, the link between parental verbal information and child COVID fear was not moderated by BI.

SUMMARY

Taken together, the limited available evidence on the interactive effect of child temperamental dispositions with parental verbal information does not provide

support for an enhanced vulnerability to parental verbal anxiety transmission among behaviorally inhibited children. The study by Murray [48] suggest that rather than threat, the absence of positive encouragement may be especially detrimental for high BI children when linked to arguably their most salient social environment, the school.

DISCUSSION

There is clear evidence in the literature for a strong biologically based foundation for the emergence of anxiety in childhood. First, children of parents with an anxiety disorder are likely to subsequently show enhanced anxiety [6,7]. In addition, behaviorally inhibited children show an elevated risk for anxiety [26]. Indeed, BI children are more likely to have an anxious parent and anxious parents are more likely to have inhibited children [50]. Given that BI is our strongest individual difference factor predicting the emergence of early anxiety, many studies have probed for factors that may enhance or ameliorate this early risk. A separate literature has suggested the parental fear and threat signaling, both verbal and nonverbal, may provide information that children attend to, process, and act on in determining how to characterize and behave within their social worlds. As such, parents who convey threat cues or threatening information to their children about the social world may inadvertently increase their child's risk for anxiety. Our review suggests that the data are somewhat sparse and a good deal of additional research is needed. However, the information we do have at hand points to clear differences in the strength of these transmission pathways among very young and older children.

First, it appears that nonverbal threat or anxiety cues are attended to by infants, particularly if they are temperamentally at risk. The combination of temperamental fearfulness and threat information leads to greater withdrawal and avoidance. In contrast, the evidence among older children is much more equivocal. In particular, studies have found either no relation between temperament, parental information, and anxiety, or in some cases even opposite trends. These differences may reflect the unique developmental tasks facing children across different developmental windows. That is, infants are taking in information from their environment in order to shape an initial, ground truth, understanding of the world they live in. Their own approach to their environment is still fragile and coalescing. As such, information gathered from parents may have an outsized effect on their developmental trajectories.

In turn, it may be that even by ages 4 to 6 stable patterns are already in place that are less amenable to modulation by parental verbal input. That is, older children who show stable patterns of extreme BI and risk for anxiety have a narrow range with respect to any potential modulation in their trajectory toward anxiety. Their risk mechanisms are biologically rooted and have already been reinforced by early social experiences. In contrast, and perhaps ironically given initial hypotheses, verbal input from parents may play a larger role in developmental trajectories for children not a biological risk for anxiety. For these children parental input is a new source of potential anxiogenic experiences and thus can move the needle toward the emergence of anxiety.

Clearly, additional information will be needed in order to test and refine these initial conclusions. It may also be that despite the less than robust relations for older children between threat information and outcome, reframing or cognitively reappraising events (verbal framing) may help lessen anxious profiles that already do exist. In particular, explicitly providing positive feedback regarding social experiences [48], while fostering bravery [51], may counter the tendency to avoid social interactions. That is, while we may not have strong evidence for a causal pathway after infancy, verbal processes may still be a potential entry point for intervention.

SUMMARY

Anxiety runs in families, likely reflecting shared genetic risk and shared exposure to signals of threat and fear messaging. Children begin to internalize these signals from the earliest months of life, providing a causal or treatment mechanism that is tractable to intervention. The data suggest that while temperamentally fearful children differentially respond to parental verbal and nonverbal signaling, the impact may be more powerful prior to early childhood.

CLINICS CARE POINTS

- The specific mechanisms through which family dynamics influence the development of anxiety can inform targeted interventions.
- In reducing risk and promoting resilience in children, interventions can target parental behaviors that model fear reactivity.
- For children with extreme BI, interventions can focus on supporting bravery and fostering more social exploration.

- However, interventions useful for non-inhibited children, such as fostering greater inhibitory control, may be counterproductive as it may lead to greater rigidity and rumination.

DISCLOSURE

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