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Temperament in Early Childhood and the Development of Anxiety and Depression

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Introduction

Anxiety disorders, in general, and Social Anxiety Disorder (SAD) in particular, produce considerable acute suffering and increase the risk for long-term adverse outcomes. Most adult anxiety disorders begin in childhood or adolescence,[1] with exceedingly common rates between 5% and 10%; and rates of SAD varying from 1.6% to 8.5%.[2-4] In prospective research, the temperamental trait of behavioural inhibition emerges as the best known predictor of risk for later anxiety.[5,6]

The topic of this chapter is to briefly examine relations between this temperament and the emergence of anxiety disorders. We will examine the research on two cognitive processes, attention and executive processes, which contribute to the onset of anxiety disorders amongst behaviourally inhibited children. Finally, in line with recent evidence suggesting that behavioural inhibition may not only represent a specific predisposition to anxiety but rather a more general

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risk factor for internalizing disorders,[7] we will review the existing (yet limited) literature linking early temperament and later development of depression.

Subject

Behavioural inhibition is a temperament that can be identified in infancy and early childhood. Infants with this temperament display heightened distress and motor reactivity to novel stimuli. As toddlers and young children they avoid social encounters and tend to withdraw from unfamiliar social situations making them less assertive[5,6] and prone to peer rejection,[8,9] with its associated negative self-perceptions.[10] As such, inhibited children have fewer friends,[11] and report greater anxiety and loneliness.[12]

Research on risk for anxiety focuses on early temperament, particularly behavioural inhibition.[10, 13,14] For example, Schwartz et al.[6] found that 61% of 13 year olds, identified as behaviourally inhibited at age two, demonstrated clear signs of anxiety during social interactions, compared to only 27% of those who were not inhibited. Similarly, Chronis-Tuscano et al.[15] reported four-fold increased odds of a lifetime diagnosis of social anxiety disorder among adolescents with consistently high levels of behavioural inhibition from ages 1 to 7. Data from both studies suggest that early temperament constrains, but does not rigidly determine, outcome. Only about half of inhibited children manifest risk, and anxiety tends to wax and wane over time.[16]

We contend that childhood temperament shapes the manner in which individuals perceive their surroundings, which influences their social interactions in a reciprocal manner and eventual social and mental health outcomes.[17] This dynamic is particularly evident in early adolescence during which the emergence of the peer group as a more salient influence on development coincides with sharp increases in psychopathology,[16] particularly SAD.[6,15,18] Temperament also shapes vital cognitive processes, such as attention and certain executive processes which provide the foundation from which children perceive and respond to social cues in the environment.

Problems

Questions remain concerning the functional and structural relations between temperament and anxiety.[19] Several reviews[10,17,20,21] have noted a variety of behavioural and physiological similarities as well as distinctions between inhibited temperament groups and anxious individuals. Conceptualized as separate constructs, temperament can either place a child at risk for

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developing anxiety or influence the stability or severity of anxiety disorders once they have emerged.[10] Alternately, these terms may simply refer to different aspects of the same underlying construct with distinctions between them simply imposed from the field.[21]

Research Context

Literature suggests that perturbations in *both "bottom up"* attention mechanisms and *"top down"* executive control processes may play a central role in the etiology and maintenance of anxiety.[22] These perturbations extend to both emotionally charged and affectively neutral stimuli, reflecting both preferential treatment of specific categories of stimuli (i.e., bias to threat cues) and heightened vigilance of one's own performance and behaviour (i.e., cognitive monitoring).

Anxious children[23-25] and adults[26,27] show attention biases to threat stimuli. Prior work has found[28,29] that clinically anxious adolescents display perturbations in the *amygdala* and ventrolateral *prefrontal cortex* (vlPFC) responses to threat while completing an attention bias task. As such, biases to threat represent early, automatic "bottom up" attention mechanisms that shape cognition and behaviour. Research also implicates a distributed network within the prefrontal cortex through which attention is deployed to closely monitor performance, incorporating feedback, as individuals then call on more specialized cognitive control mechanisms to modify subsequent behaviour.[30-32] Anxiety related perturbations in this pattern are evident in both children[33] and adults.[34] Imaging studies have implicated the *anterior cingulate cortex (ACC)* in this process, as it appears to be hyperactive in anxious individuals during tasks requiring cognitive or "top down" control.[35]

Key Research Questions

Amongst typically developing, Caucasian children in the United States, around 15-20% manifest the temperament of behavioural inhibition in early childhood. Longitudinal studies have found that around half of these behaviourally inhibited children go on to develop anxiety disorders as adolescents or young adults. A key research question from a perspective of early intervention is to identify what factors contribute to these different trajectories over time. That is, what factors (either within the caregiving environment or within the child) either protect or enhance risk for anxiety.

Recent Research Results

Attention bias to threat

Results from recent studies suggest that behavioural inhibition is marked by perturbations in attention control.[36,37] Two recent longitudinal studies[18,38] have examined the link between childhood behavioural inhibition, attention bias to threat and later emergence of social withdrawal. Pérez-Edgar et al.[18] found that adolescents who were behaviourally inhibited as young children showed heightened attention bias to threat. In addition, attention bias to threat moderated the relation between childhood behavioural inhibition and adolescent social withdrawal. In a separate study, Pérez-Edgar et al.[38] found that behavioural inhibition in toddlerhood predicted high levels of social withdrawal in early childhood. Again, this relation was moderated by attention bias, such that this behavioural inhibition-social withdrawal association was only evident for children who displayed an attention bias toward threat. These data provide support for viewing attention bias to threat as a significant moderator of behavioural inhibition and the later emergence of clinical anxiety.

Executive processes: Inhibitory control and cognitive monitoring

Inhibitory control describes the ability to inhibit and override dominant responses and behaviours in favor of more appropriate or subdominant responses and behaviours.[39] Cognitive monitoring reflects the ability to attend to one's own performance, notice errors and correct behaviour as a result of feedback. These executive processes are thought to play a role in the regulation of negative emotions and temperamental reactivity.[40-42]

A number of studies have found that inhibitory control moderated the temperament of behavioural inhibition to predict heightened anxious behaviours. Behaviourally inhibited children with high levels of inhibitory control were found to be more socially anxious,[43] less socially competent, and more socially withdrawn[44] than behaviourally inhibited children with low levels of inhibitory control. Similarly, White et al.[45] found that high levels of inhibitory control increased the risk for anxiety disorders amongst high behaviourally inhibited children.

Parallel work has found enhanced cognitive monitoring to be associated with heightened anxiety both in adults[46,47] and children.[48] McDermott et al.,[49] found that cognitive monitoring was higher in adolescents with high childhood behavioural inhibition as compared to adolescents low on childhood behavioural inhibition. Moreover, heightened monitoring moderated relations between early behavioural inhibition and later anxiety disorders.[49] Thus, like attention bias to threat, executive processes of inhibitory control and cognitive monitoring moderate child temperament towards heightened risk for anxiety.

Research Gaps

Developmental change occurs as a result of reciprocal interactions between the intrinsic characteristics of a child and his environmental context, making the child both the producer and product of the environment.[50] Behavioural inhibition may initiate a child in one of a number of directions, and the targeted outcome can result from a host of predisposing pathways.[10] Research must therefore account for a number of potential moderating factors that can come into play at various points throughout development. There is limited research examining the discontinuous nature of behavioural inhibition and possible intervening protective factors that may contribute to discontinuity in behavioural inhibition trajectories and subsequent prevention of psychopathology. Discontinuity of these patterns provides an important opportunity for the identification of factors which may potentially be applied in preventive interventions.

Additionally, the link between behavioural inhibition and depression has received less empirical attention. In considering the relations between behavioural inhibition and depression, it is important to note that individuals suffering from anxiety disorders are at an increased risk for developing depression in comparison to non-anxious individuals,[51] and evidence suggests that in many instances the presence of an anxiety disorder precedes the development of major depression.[52] Given such temporal relations between anxiety and depression, it is important to consider that associations between behavioural inhibition and depression may be largely contingent upon the presence of anxiety. In fact, one study found that social anxiety fully mediated the relation between behavioural inhibition and depression.[53] Similarly, other studies,[54] revealing associations between behavioural inhibition and anxiety and depression employed structural equations modeling which found that a pathway in which behavioural inhibition results in anxiety, which in turn leads to depression, provided the best fit for the data.

Additional studies investigated the specificity of the social versus nonsocial components of self-reported behavioural inhibition during childhood and their relation with young adults' current symptoms of anhedonic depression, social anxiety and anxious arousal. Findings were mixed with some studies revealing that nonsocial behavioural inhibition (''fearfulness''), but not social behavioural inhibition, increased risk for future depression[55] and other studies revealing that symptoms of depression were more strongly related to social rather than nonsocial behavioural inhibition in childhood.[56]

Interestingly, Sportel[57] investigated the additive and interacting effects of behavioural inhibition and attentional control on internalizing dimensions in a sample of non-clinical adolescents. Findings revealed stronger associations of behavioural inhibition than of attentional control with

anxiety symptoms and stronger associations of attentional control than of behavioural inhibition with depressive symptoms. Furthermore, while behavioural inhibition was associated with both anxiety and depression, attentional control moderated this association thus reducing the impact of high behavioural inhibition on the generation of both internalizing dimensions.

Finally, in considering temperament as a vulnerability factor for depression, it is important to note that in addition to behavioural inhibition several theorists have developed temperament models that link additional temperamental styles, particularly Positive Emotion (PE) and Negative Emotion (NE) to depression.[58] Many cross-sectional studies have reported that youth and adults with depressive symptoms exhibit diminished levels of PE and elevated levels of NE [59,60,61] and the combination of these have been associated with concurrent depressive symptoms in clinical[62,63] and community samples.[61,64,65] Furthermore, longitudinal studies have found that lower levels of PE[60,66,67] and higher level of NE in childhood[68-70] predict the development of depressive symptoms and disorders. For instance, low PE in preschool-aged children predicted higher levels of depressotypic cognitive styles at age 7 and depressive symptoms at age 10.[71,72]

Conclusions

Behavioural inhibition is a risk factor for the development of internalizing disorders, though research suggests that not all children with this temperament develop a disorder. Current research is focused on describing the complex interplay between temperament and potential moderating factors which may alter temperamental trajectories. Research on endogenous factors suggest that both attention and executive processes are important moderators of behavioural inhibition toward anxiety or resilience from these disorders. While not covered in this review, there is a good deal of work on the role of exogenous factors in moderating the temperament of behavioural inhibition.[16,73]

Implications for Parents, Services and Policy

Identification of young children who are at risk for anxiety disorders and the implementation of prevention efforts to reduce risk are important outcomes of research on behavioural inhibition. Due to the compliant and nondisruptive nature of behaviourally inhibited children, teachers and parents do not necessarily identify these children early in childhood and elementary school. Because only some children with behavioural inhibition go on to develop anxiety disorders it is important to identify both the endogenous and exogenous factors that moderate temperament psychopathology relations. Preliminary research suggests an optimistic picture for preventative

strategies and easily accessible education programs for the parents and caregivers of inhibited preschool children.[74] Such programs are aimed at educating the caregivers regarding the nature of temperament and withdrawal and providing techniques through which they may help behavioural inhibition children develop the ability to regulate reactivity to novelty thus promoting the development of social skills and decreasing inhibited and anxious behaviour over time. Finally, innovative approaches including attention and executive process training may effectively reduce anxious withdrawal in this temperamentally at risk population.

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