

## ANXIETY AND DEPRESSION

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# Temperament in Early Childhood and the Development of Anxiety and Depression

**Nathan A. Fox, PhD, Tahl I. Frenkel, MA**

University of Maryland, USA

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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,<sup>1</sup> with exceedingly common rates between 5% and 10%; and rates of SAD varying from 1.6% to 8.5%.<sup>2-4</sup> In prospective research, the temperamental trait of behavioural inhibition emerges as the best known predictor of risk for later anxiety.<sup>5,6</sup>

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

risk factor for internalizing disorders,<sup>7</sup> 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<sup>5,6</sup> and prone to peer rejection,<sup>8,9</sup> with its associated negative self-perceptions.<sup>10</sup> As such, inhibited children have fewer friends,<sup>11</sup> and report greater anxiety and loneliness.<sup>12</sup>

Research on risk for anxiety focuses on early temperament, particularly behavioural inhibition.<sup>10,13,14</sup> For example, Schwartz et al.<sup>6</sup> 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.<sup>15</sup> 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.<sup>16</sup>

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.<sup>17</sup> 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,<sup>16</sup> particularly SAD.<sup>6,15,18</sup> 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.<sup>19</sup> Several reviews<sup>10,17,20,21</sup> 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 developing anxiety or influence the stability or severity of anxiety disorders once they have

emerged.<sup>10</sup> Alternately, these terms may simply refer to different aspects of the same underlying construct with distinctions between them simply imposed from the field.<sup>21</sup>

## 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.<sup>22</sup> 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<sup>23-25</sup> and adults<sup>26,27</sup> show attention biases to threat stimuli. Prior work has found<sup>28,29</sup> that clinically anxious adolescents display perturbations in the *amygdala* and ventrolateral *prefrontal cortex* (vIPFC) 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.<sup>30-32</sup> Anxiety related perturbations in this pattern are evident in both children<sup>33</sup> and adults.<sup>34</sup> 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.<sup>35</sup>

## 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.<sup>36,37</sup> Two recent longitudinal studies<sup>18,38</sup> have examined the link between childhood behavioural inhibition, attention bias to threat and later emergence of social withdrawal. Pérez-Edgar et al.<sup>18</sup> 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.<sup>38</sup> 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.<sup>39</sup> 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.<sup>40-42</sup>

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,<sup>43</sup> less socially competent, and more socially withdrawn<sup>44</sup> than behaviourally inhibited children with low levels of inhibitory control. Similarly, White et al.<sup>45</sup> 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<sup>46,47</sup> and children.<sup>48</sup> McDermott et al.,<sup>49</sup> 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.<sup>49</sup> 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.<sup>50</sup> 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.<sup>10</sup> 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,<sup>51</sup> and evidence suggests that in many instances the presence of an anxiety disorder precedes the development of major depression.<sup>52</sup> 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.<sup>53</sup> Similarly, other studies,<sup>54</sup> 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<sup>55</sup> and other studies revealing that symptoms of depression were more strongly related to social rather than nonsocial behavioural inhibition in childhood.<sup>56</sup>

Interestingly, Sportel<sup>57</sup> 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.<sup>58</sup> Many cross-sectional studies have reported that youth and adults with depressive symptoms exhibit diminished levels of PE and elevated levels of NE<sup>59,60,61</sup> and the combination of these have been associated with concurrent depressive symptoms in clinical<sup>62,63</sup> and community samples.<sup>61,64,65</sup> Furthermore, longitudinal studies have found that lower levels of PE<sup>60,66,67</sup> and higher level of NE in childhood<sup>68-70</sup> 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.<sup>71,72</sup>

## **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.<sup>16,73</sup>

## **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.<sup>74</sup> 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.

## References

1. Pine DS, Cohen P, Gurley D, Brook J, Ma Y. The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Archives of General Psychiatry*. Jan 1998;55(1):56-64.
2. Essau CA, Conradt J, Petermann F. Frequency and comorbidity of social phobia and social fears in adolescents. *Behavior Research and Therapy*. Sep 1999;37(9):831-843.
3. Fergusson DM, Horwood LJ, Lynskey MT. Prevalence and comorbidity of DSM-III-R diagnoses in a birth cohort of 15 year olds. *Journal of the American Academy of Child and Adolescent Psychiatry*. Nov 1993;32(6):1127-1134.
4. McGee R, Feehan M, Williams S, Partridge F, Silva PA, Kelly J. DSM-III disorders in a large sample of adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*. Jul 1990;29(4):611-619.
5. Hayward C, Killen JD, Kraemer HC, Taylor CB. Linking self-reported childhood behavioral inhibition to adolescent social phobia. *Journal of the American Academy of Child and Adolescent Psychiatry*. Dec 1998;37(12):1308-1316.
6. Schwartz CE, Snidman N, Kagan J. Adolescent social anxiety as an outcome of inhibited temperament in childhood. *Journal of the American Academy of Child and Adolescent Psychiatry*. Aug 1999;38(8):1008-1015.
7. Schofield CA, Coles ME, Gibb BE. Retrospective reports of behavioral inhibition and young adults' current symptoms of social anxiety, depression, and anxious arousal. *Journal of Anxiety Disorders*. Oct 2009;23(7):884-890.
8. Kagan J. Temperamental contributions to affective and behavioral profiles in childhood. In: Hoffman SG, Dibartolo, P.M., ed. *From social anxiety to social phobia: Multiple perspectives*. Needham Heights, MA: Allyn & Bacon; 2001:216-234.
9. Prior M, Smart D, Sanson A, Oberklaid F. Does shy-inhibited temperament in childhood lead to anxiety problems in adolescence? *Journal of the American Academy of Child and Adolescent Psychiatry*. Apr 2000;39(4):461-468.
10. Perez-Edgar K, Fox NA. Temperament and anxiety disorders. *Child and Adolescent Psychiatric Clinics of North America*. Oct 2005;14(4):681-706, viii.
11. Garcia C, Kagan J, Resnick JS. Behavioral inhibition in young children. *Child Development*. 1984;55(3):1005-1019.
12. Wichmann C, Coplan R, Daniels T. The social cognitions of socially withdrawn children. *Social Development*. 2004(13):377-392.
13. Biederman J, Hirshfeld-Becker DR, Rosenbaum JF, et al. Further evidence of association between behavioral inhibition and social anxiety in children. *American Journal of Psychiatry*. Oct 2001;158(10):1673-1679.
14. Hirshfeld DR, Rosenbaum JF, Biederman J, et al. Stable behavioral inhibition and its association with anxiety disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*. Jan 1992;31(1):103-111.

15. Chronis-Tuscano A, Degnan KA, Pine DS, et al. Stable early maternal report of behavioral inhibition predicts lifetime social anxiety disorder in adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*. Sep 2009;48(9):928-935.
16. Fox NA, Henderson HA, Marshall PJ, Nichols KE, Ghera MM. Behavioral inhibition: linking biology and behavior within a developmental framework. *Annual Review of Psychology*. 2005;56:235-262.
17. Lonigan CJ, Vasey MW, Phillips BM, Hazen RA. Temperament, anxiety, and the processing of threat-relevant stimuli. *Journal of Clinical Child and Adolescent Psychology*. Mar 2004;33(1):8-20.
18. Perez-Edgar K, Bar-Haim Y, McDermott JM, Chronis-Tuscano A, Pine DS, Fox NA. Attention biases to threat and behavioral inhibition in early childhood shape adolescent social withdrawal. *Emotion*. Jun 2010;10(3):349-357.
19. Rapee RM, Coplan RJ. Conceptual Relations Between Anxiety Disorder and Fearful Temperament. *Social Anxiety in Childhood: Bridging Developmental and Clinical Perspectives*. 2010;127:17-31.
20. Degnan KA, Fox NA. Behavioral inhibition and anxiety disorders: multiple levels of a resilience process. *Developmental Psychopathology*. Summer 2007;19(3):729-746.
21. Lahey BB. Commentary: role of temperament in developmental models of psychopathology. *Journal of Clinical Child and Adolescent Psychology*. Mar 2004;33(1):88-93.
22. Bar-Haim Y, Lamy D, Pergamin L, Bakermans-Kranenburg MJ, Van-Ijzendoorn MH. Threat-related attentional bias in anxious and nonanxious individuals: a meta-analytic study. *Psychological Bulletin*. Jan 2007;133(1):1-24.
23. Roy AK, Vasa RA, Bruck M, et al. Attention bias toward threat in pediatric anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*. Oct 2008;47(10):1189-1196.
24. Waters AM, Henry J, Mogg K, Bradley BP, Pine DS. Attentional bias towards angry faces in childhood anxiety disorders. *Journal of Behavior Therapy and Experimental Psychiatry*. Jun 2010;41(2):158-164.
25. Waters AM, Mogg K, Bradley BP, Pine DS. Attentional bias for emotional faces in children with generalized anxiety disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*. Apr 2008;47(4):435-442.
26. Mathews A, MacLeod C. Selective processing of threat cues in anxiety states. *Behavior Research and Therapy*. 1985;23(5):563-569.
27. Wilson E, MacLeod C. Contrasting two accounts of anxiety-linked attentional bias: selective attention to varying levels of stimulus threat intensity. *Journal of Abnormal Psychology*. May 2003;112(2):212-218.
28. Monk CS, Nelson EE, McClure EB, et al. Ventrolateral prefrontal cortex activation and attentional bias in response to angry faces in adolescents with generalized anxiety disorder. *American Journal of Psychiatry*. Jun 2006;163(6):1091-1097.
29. Monk CS, Telzer EH, Mogg K, et al. Amygdala and ventrolateral prefrontal cortex activation to masked angry faces in children and adolescents with generalized anxiety disorder. *Archives of General Psychiatry*. May 2008;65(5):568-576.
30. Ridderinkhof KR, van den Wildenberg WP, Segalowitz SJ, Carter CS. Neurocognitive mechanisms of cognitive control: the role of prefrontal cortex in action selection, response inhibition, performance monitoring, and reward-based learning. *Brain and Cognition*. Nov 2004;56(2):129-140.
31. Botvinick MM, Braver TS, Barch DM, Carter CS, Cohen JD. Conflict monitoring and cognitive control. *Psychological Review*. Jul 2001;108(3):624-652.
32. Eysenck MW, Derakshan N, Santos R, Calvo MG. Anxiety and cognitive performance: attentional control theory. *Emotion*. May 2007;7(2):336-353.
33. Ladouceur CD, Dahl RE, Birmaher B, Axelson DA, Ryan ND. Increased error-related negativity (ERN) in childhood anxiety disorders: ERP and source localization. *Journal of Child Psychology and Psychiatry*. Oct 2006;47(10):1073-1082.
34. Hajcak G, McDonald N, Simons RF. Anxiety and error-related brain activity. *Biological Psychology*. Oct 2003;64(1-2):77-90.



35. Ursu S, Stenger VA, Shear MK, Jones MR, Carter CS. Overactive action monitoring in obsessive-compulsive disorder: evidence from functional magnetic resonance imaging. *Psychological Science*. Jul 2003;14(4):347-353.
36. Fox NA, Hane AA, Pine DS. Plasticity for affective neurocircuitry - How the environment affects gene expression. *Current Directions in Psychological Science*. Feb 2007;16(1):1-5.
37. Fox NA, Henderson HA, Perez-Edgar K, White L. The Biology of temperament: An integrative approach. In: Nelson C, Luciana M, eds. *The handbook of developmental cognitive neuroscience*. Cambridge, MA: MIT Press; 2008:839-854.
38. Perez-Edgar K, Reeb-Sutherland BC, McDermott JM, et al. Attention biases to threat link behavioral inhibition to social withdrawal over time in very young children. *Journal of Abnormal Child Psychology*. Aug 2011;39(6):885-895.
39. Rothbart MK, Ellis LK, Rueda MR, Posner MI. Developing mechanisms of temperamental effortful control. *J Pers*. Dec 2003;71(6):1113-1143.
40. Derryberry D, Rothbart MK. Reactive and effortful processes in the organization of temperament. *Development and Psychopathology*. Fall 1997;9(4):633-652.
41. Lonigan CJ, Phillips BM. Temperamental basis of anxiety disorders in children. In: Vasey MW, Dadds M, eds. *The Developmental Psychopathology of anxiety*. New York: Oxford University Press; ; 2001:60-91.
42. Waters AM, Valvoi JS. Attentional bias for emotional faces in paediatric anxiety disorders: an investigation using the emotional Go/No Go task. *Journal of Behavior Therapy and Experimental Psychiatry*. Jun 2009;40(2):306-316.
43. Thorell L, Bohlin G, Rydell A. Two types of inhibitory control: predictive relations to social functioning. *International Journal of Behavioral Development*. 2004; 28:193-203.
44. Fox NA, Henderson HA. Temperament, emotion, and executive function: Influences on the development of self-regulation. Paper presented at the Annual Meeting of the Cognitive Neuroscience Society. San Francisco, 2000, April.
45. White LK, McDermott JM, Degnan KA, Henderson HA, Fox NA. Behavioral inhibition and anxiety: the moderating roles of inhibitory control and attention shifting. *Journal of Abnormal Child Psychology*. Jul 2011;39(5):735-747.
46. Righi S, Mecacci L, Viggiano MP. Anxiety, cognitive self-evaluation and performance: ERP correlates. *Journal of Anxiety Disorders*. Dec 2009;23(8):1132-1138.
47. Sehmeyer C, Konrad C, Zwitserlood P, Arolt V, Falkenstein M, Beste C. ERP indices for response inhibition are related to anxiety-related personality traits. *Neuropsychologia*. Jul 2010;48(9):2488-2495.
48. Hum KM, Manassis K, Lewis MD. Neural mechanisms of emotion regulation in childhood anxiety. *Journal of Child Psychology and Psychiatry*. In Press. 2012.
49. McDermott JM, Perez-Edgar K, Henderson HA, Chronis-Tuscano A, Pine DS, Fox NA. A history of childhood behavioral inhibition and enhanced response monitoring in adolescence are linked to clinical anxiety. *Biological Psychiatry*. Mar 1 2009;65(5):445-448.
50. Lerner RM, Hess LE, Nitz KA. Developmental perspective on psychopathology. In: Herson M, Last CG, eds. *Handbook of child and adult psychopathology: a longitudinal perspective*. Elmsford, NY: Pergamon Press; 1991:9-32.
51. Stein MB, Fuetsch M, Muller N, Hofler M, Lieb R, Wittchen HU. Social anxiety disorder and the risk of depression: a prospective community study of adolescents and young adults. *Archives of General Psychiatry*. Mar 2001;58(3):251-256.
52. Brown TA, Campbell LA, Lehman CL, Grisham JR, Mancill RB. Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology*. Nov 2001;110(4):585-599.
53. Gladstone GL, Parker GB. Is behavioral inhibition a risk factor for depression? *Journal of Affective Disorders*. Oct 2006;95(1-3):85-94.
54. Muris P, Merckelbach H, Schmidt H, Gadet B, Bogie N. Anxiety and depression as correlates of self-reported behavioural inhibition in normal adolescents. *Behaviour Research and Therapy*. 2001;39(9):1051-1061.

55. Hayward C, Killen JD, Kraemer HC, Taylor CB. Linking self-reported childhood behavioral inhibition to adolescent social phobia. *Journal of the American Academy of Child & Adolescent Psychiatry*. Dec 1998;37(12):1308-1316.
56. Neal JA, Edelmann RJ, Glachan M. Behavioural inhibition and symptoms of anxiety and depression: is there a specific relationship with social phobia? *British Journal of Clinical Psychology*. Nov 2002;41(Pt 4):361-374.
57. Sportel BE, Nauta MH, de Hullu E, de Jong PJ, Hartman CA. Behavioral Inhibition and Attentional Control in Adolescents: Robust Relationships with Anxiety and Depression. *Journal of Child and Family Studies*. Apr 2011;20(2):149-156.
58. Clark LA, Watson D, Mineka S. Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology*. Feb 1994;103(1):103-116.
59. Brown TA, Chorpita BF, Barlow DH. Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of Abnormal Psychology*. May 1998;107(2):179-192.
60. Caspi A, Moffitt TE, Newman DL, Silva PA. Behavioral observations at age 3 years predict adult psychiatric disorders. Longitudinal evidence from a birth cohort. *Archives of General Psychiatry*. Nov 1996;53(11):1033-1039.
61. Lonigan CJ, Hooe ES, David CF, Kistner JA. Positive and negative affectivity in children: confirmatory factor analysis of a two-factor model and its relation to symptoms of anxiety and depression. *Journal of Consulting and Clinical Psychology*. Jun 1999;67(3):374-386.
62. Joiner TE, Jr., Catanzaro SJ, Laurent J. Tripartite structure of positive and negative affect, depression, and anxiety in child and adolescent psychiatric inpatients. *Journal of Abnormal Psychology*. Aug 1996;105(3):401-409.
63. Lonigan CJ, Carey MP, Finch AJ, Jr. Anxiety and depression in children and adolescents: negative affectivity and the utility of self-reports. *Journal of Consulting and Clinical Psychology*. Oct 1994;62(5):1000-1008.
64. Anthony JL, Lonigan CJ, Hooe ES, Phillips BM. An affect-based, hierarchical model of temperament and its relations with internalizing symptomatology. *Journal of Clinical Child and Adolescent Psychology*. Dec 2002;31(4):480-490.
65. Chorpita BF. The tripartite model and dimensions of anxiety and depression: an examination of structure in a large school sample. *Journal of Abnormal Child Psychology*. Apr 2002;30(2):177-190.
66. Block JH, Gjerde PF. Personality antecedents of depressive tendencies in 18-year-olds: a prospective study. *Journal of Personality and Social Psychology*. May 1991;60(5):726-738.
67. van Os J, Jones P, Lewis G, Wadsworth M, Murray R. Developmental precursors of affective illness in a general population birth cohort. *Archives of General Psychiatry*. Jul 1997;54(7):625-631.
68. Clark LA, Watson D, Mineka S. Temperament, personality, and the mood and anxiety disorders. *J Abnorm Psychol*. Feb 1994;103(1):103-116.
69. Lonigan CJ, Phillips BM, Hooe ES. Relations of positive and negative affectivity to anxiety and depression in children: evidence from a latent variable longitudinal study. *Journal of Consulting and Clinical Psychology*. Jun 2003;71(3):465-481.
70. Rende RD. Longitudinal relations between temperament traits and behavioral syndromes in middle childhood. *Journal of the American Academy of Child Adolescent Psychiatry*. Mar 1993;32(2):287-290.
71. Dougherty LR, Klein DN, Durbin CE, Hayden EP, Olino TM. Temperamental Positive and Negative Emotionality and Children's Depressive Symptoms: A longitudinal prospective study from age three to age ten. *Journal of Social and Clinical Psychology*. 2010;29(4):462-488.
72. Hayden EP, Klein DN, Durbin CE, Olino TM. Positive emotionality at age 3 predicts cognitive styles in 7-year-old children. *Development and Psychopathology*. Spring 2006;18(2):409-423.
73. Lahat A, Hong M, Fox NA. Behavioural inhibition: is it a risk factor for anxiety? *International Review of Psychiatry*. Jun 2011;23(3):248-257.

74. Rapee RM. The development and modification of temperamental risk for anxiety disorders: prevention of a lifetime of anxiety? *Biological Psychiatry*. Nov 15 2002;52(10):947-957.