Cognitive mechanisms for worry in early adolescence: Re-examining the role of high verbal intelligence

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ABSTRACT

Despite considerable research on the association between "giftedness" and anxiety, it is unclear whether high intellectual ability is a risk or protective factor. This study examined the association between high verbal intelligence (VIQ) and worry in early adolescence, and the role that cognitive mechanisms (intolerance of uncertainty, metacognitive beliefs about worry, and threat appraisal) play in this association. Participants were ($n = 312$) children aged 9-to-15 years (M = 11.87, SD = 1.23; 55% girls), with Verbal Comprehensive Index scores on the Wechsler Abbreviated Scale of Intelligence, 2nd Edition (WASI-II), spanning average to superior ranges. Consistent with current models of anxiety, intolerance of uncertainty, metacognitive beliefs about worry, and threat appraisal, were directly associated with worry. At the zero-order level, VIQ was negatively associated with intolerance of uncertainty and threat appraisal. Tests of mediation indicated a negative indirect relation between high VIQ and worry via intolerance of uncertainty only, such that the association between high VIQ and intolerance of uncertainty was negative, whereas the association between intolerance of uncertainty and worry was positive. These findings suggest that high VIQ may act as a protective factor that leads to reduced intolerance of uncertainty, which then leads to lower worry.

1. Introduction

Anxiety disorders in childhood and adolescence are one of the most common forms of psychopathology in these periods, and often lead to anxiety and other disorders (e.g., mood disorders, substance abuse) later in life (Essau and Gabbidon, 2013). Child and adolescent risk factors for anxiety have therefore become a major focus of research, and evidence regarding the mechanisms through which these factors operate on anxiety has grown considerably. One such factor that has attracted interest is high intellectual ability (Cross and Cross, 2015). Various studies have reported high intellectual ability to be a predisposing risk factor for various internalizing disorders and dysfunction, such as anxiety, depression, and self-harm, whereas other studies have reported findings to suggest that it may be a protective factor (for a systematic review see Francis, Hawes, and Abbott, 2016). Such disparate findings raise important questions regarding methodological differences between past studies of high intellectual ability and anxiety, and the extent to which mixed results may reflect the specific forms or domains of intellectual ability and anxiety that have been indexed in various studies, and the factors that may affect associations between these domains.

One key issue is that research to date has focused predominantly on relationships between global intellectual ability and global anxiety. This is important, given that such associations may potentially be somewhat specific to particular domains of intellectual ability and anxiety. For example, a recent adult study produced findings to suggest that the domain of worry, as reflected in the diagnosis of Generalized Anxiety Disorder (GAD; DSM-V, American Psychiatric Association, 2013), may show a positive association with high intellectual ability (Coplan et al., 2012).

Worry has been defined as an affect-laden chain of thoughts and images that is relatively uncontrollable, and usually concerned with anticipating future events and their uncertain, potentially negative outcomes (Borkovec, Robinson, Pruzinsky, and DePree, 1983). Coplan et al. (2012) recently found a positive correlation between severity of worry and global intelligence, as indexed by full-scale IQ (FSIQ), within a clinical sample of adults with GAD. Moreover, both high intelligence and worry were found to exhibit an inverse correlation with certain metabolites (e.g., the nutrient choline) commonly used to index activity in the subcortical white matter of the brain, a region strongly

Table 1
Descriptive statistics for key measures and participant characteristics, and composition of IQ based groups.

	Mean(SD)	Range	Sample distribution, mean/SD at each level of WASI-II IQ domain			% distribution of ethnic composition across total sample	% distribution of level of Socio-economic status across total sample
			Group 1 IQ ≥ 130	Group 2 IQ = 115–129	Group 3 IQ ≤ 114		
WASI-II VCI	119.38(13.25)	84–160	*n* = 67 138.33(7.86)	*n* = 127 121.26(4.20)	*n* = 118 106.60(6.20)	Anglo-Saxon (37.2%), North European (3.8%)	67% of sample in top 30% (≥ 8th decile) of Australian Population
WASI-II PRI	113.63(13.88)	75–148	*n* = 41 135.59(4.36)	*n* = 106 121.75(4.33)	*n* = 165 102.96(8.43)	East European (3.5%) Mediterranean (6.7%) Middle Eastern (13.1%)	28% of sample in middle 40% (between 4th and 7th decile) of Australian Population
WASI-II FSIQ	118.70(12.31)	83–145	*n* = 63 135.41(4.18)	*n* = 137 121.85(4.07)	*n* = 112 105.46(6.82)		
TAQ-C Total	45.80(15.71)	11.62–106.62				East Asian (26%) West Asian (8.3%) Latin American (0.3%) African (1%).	5% of sample in bottom 30% (≤ 3rd Decile) of Australian Population
MCQ-C PBW	9.79(3.50)	6–22					
MCQ-C NBW	11.82(3.97)	6–24					
IUS-C Total	60.04(17.66)	29–128					
PSWQ-C	17.63(7.41)	3–41					

Note. WASI-II - Wechsler Abbreviated Scale of Intelligence (2nd ed.): (a) VCI = Verbal Comprehension Index measures VIQ; (b) PRI = Perceptual Reasoning Index – measures PIQ; and (c) FSIQ = Full Scale Index – measures general ability; TAQ-C = Threat Appraisal Questionnaire for Children: Total Threat Score; MCQ-C - Metacognitions Questionnaire for Children: (a) PBW = Positive Beliefs about worry subscale; NBW = Negative Beliefs about worry subscale; IUS-C = Intolerance of Uncertainty Scale for Children; PSWQ-C = Penn State Worry Anxiety Scale for Children.

implicated in intelligence. Furthermore, in a sample of undergraduate college students, Penney, Miedema, and Mazmanian (2015) found an association between worry and the specific domain of verbal intellectual ability (VIQ) but not with nonverbal/performance intellectual ability (PIQ). The relationship between VIQ and worry is perhaps not surprising given that worry has been conceptualized as predominantly verbal-linguistic and abstract in nature (Borkovec, Alcaine, and Behar, 2004; Hirsch and Mathews, 2012).

At the same time, dominant theories of worry have implicated both verbal and non-verbal cognition, raising the possibility that intellectual abilities of both kinds may play a role in worry processes. According to the cognitive avoidance theory (Borkovec et al., 2004), the verbal-linguistic nature of worry provides a strategy by which an individual avoids aversive nonverbal imagery by engaging in the formulation of verbal ideation of the perceived threat which creates a more abstract, mental distance with that threat. This theory hypothesizes that worry dampens the negative affect and uncomfortable physiological arousal associated with aversive imagery (Borkovec et al., 2004). Several studies provide empirical evidence including an inverse relationship between levels of worry and imagery (e.g., Behar, Zuellig, and Borkovec, 2005), as well as a greater likelihood for verbal-based thought to produce less intense emotional reactions (see review Holmes and Mathews, 2010) than that which is nonverbal/imagery-based in nature. It has been suggested that this emotional dampening effect of worry is only temporary and interferes with the emotional processing of worry-related stimuli which then promotes further activation of the worry process (Stokes and Hirsch, 2010).

Another important consideration is that research in this area to date has been limited to investigations of direct relationships between intellectual ability and anxiety, thereby neglecting the mechanisms that may account for such relationships. In terms of the cognitive risk processes emphasized in the most established models of anxiety – especially GAD and worry – three can be considered particularly key. The first is intolerance of uncertainty which refers to the tendency to perceive and interpret any uncertain situation and its consequences as threatening, frustrating, and anxiety-provoking (Dugas and Robichaud, 2007). Second, metacognitive beliefs about worry have also been implicated in the process of worry (Wells, 2011). These include positive beliefs about worry, based on the premise that worry is a useful coping and avoidance strategy for managing future events, as well as negative

beliefs about worry that consider worry to be uncontrollable, or dangerous. The third is threat appraisal which refers to the cognitive processing of threat related cues. This often involves overestimations of the perceived likelihood and outcomes of expected harm, and/or underestimations of the perceived ability to cope (Francis, Hawes, Abbott, and Costa, 2016).

The major aim of the current study was to examine the association between VIQ and worry in early adolescence. As noted, key evidence implicating VIQ in worry has recently been reported in adult samples (e.g., Penney et al., 2015), yet we are aware of no investigations of this association in earlier developmental periods. As such, research into the association between these specific domains in early adolescence may serve to clarify the seemingly paradoxical risk for psychopathology that has been attributed to childhood 'giftedness' in various bodies of literature (Francis et al., 2016). A further specific aim was to examine the role that cognitive mechanisms may play in this association. As outlined, the cognitive risk processes reflected by intolerance of uncertainty, positive beliefs about worry, negative beliefs about worry, and threat appraisal, have been theorized to function as proximal influences on anxiety. Furthermore, the role of verbal processing emphasized in conceptualizations of these risk processes (e.g., Hirsch and Mathews, 2012) supports the notion that individual differences in intolerance of uncertainty, positive beliefs about worry, negative beliefs about worry, and threat appraisal may arise in part from individual differences in verbal capacities. It was therefore hypothesized, first, that high VIQ would be associated with symptoms of worry, as well as the related cognitive risk processes of intolerance of uncertainty, positive beliefs about worry, negative beliefs about worry, and threat appraisal. It was further hypothesized that associations between high VIQ and worry would be mediated by intolerance of uncertainty, positive beliefs about worry, negative beliefs about worry, and threat appraisal.

2. Materials and methods

2.1. Participants

Participants were *N* = 312 children and adolescents (172 females, 140 males, *M* = 11.9, *SD* = 1.23), aged between 9 and 15 years, recruited through Systemic Catholic and Independent Primary and Secondary Schools in Sydney, Australia's largest city. The age range