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COGNITIVE PREDICTORS OF WORRY IN AN
ADOLESCENT COMMUNITY SAMPLE

by

Marco Roberto Mentuccia

A thesis submitted to the Department of Psychology
in partial fulfillment of the requirements for the degree of

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COLLEGE OF ARTS AND SCIENCES

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CERTIFICATE OF APPROVAL PAGE

The thesis of Marco Roberto Mentuccia is approved:

(Date)

Signature Deleted

7/27/11

Brian Fisak, Ph.D.

1st Reader

Signature Deleted

Randall Rüssac, Ph.D.

2nd Reader

07/21/11

Accepted for the Department:

Signature Deleted

7/28/11

Michael Toggia, Ph.D.

Department Chair

Accepted for the College:

Signature Deleted

8-2-11

Barbara Hetrick, Ph.D.

Dean of Arts and Sciences

Accepted for the University:

Signature Deleted

8/15/11

Leh Roberson, Ph.D.

Dean of the Graduate School

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Abstract

Although worry is a common source of distress in children and adolescents, relatively few studies have focused on understanding worry in both of these age groups (Cartwright-Hatton, 2006). This area of research is of particular relevance, as understanding worry in youth may have implications for the assessment and treatment of adolescent worry and other anxiety-related difficulties. Consequently, the focuses of this study were to examine the validity and relevance of metacognitive measures of worry in an adolescent sample, to determine the degree to which metacognitive worry is associated with worry in adolescents, and to examine the potential association between adolescent metacognitive worry and intolerance of uncertainty, another cognitive variable hypothesized to be associated with worry, in an adolescent sample. A total of 175 adolescents between the ages of 11-17 were recruited from local middle and high schools to complete a series of self-report measures, which included the following: the Metacognitive Questionnaire for Children, the Meta-Worry Questionnaire, the Intolerance of Uncertainty Scale for Children, the Penn State Worry Questionnaire for Children, and the Spence Children's Anxiety Scale. The findings of this study suggest that metacognition may play a role in the development and maintenance of excessive worry and related generalized anxiety disorder symptoms in adolescents. Further, current findings provide support for the combined influence of metacognitive beliefs and intolerance of uncertainty in the development and maintenance of worry.

Keywords: worry, GAD, metacognition, cognitive model, intolerance of uncertainty, children, adolescents, youth

Cognitive Predictors of Worry in an Adolescent Community Sample

Worry has been defined as an anticipatory cognitive process involving negative thoughts and images, and although worry is a normative experience, some individuals experience excessive amounts of worry that impairs functioning (Borkovec, Shadick, & Hopkins, 1991). Further, worry is a central feature of generalized anxiety disorder (GAD; American Psychiatric Association, 2000; Borkovec et al., 1991; Wells, 2006a). In addition to impaired functioning and distress, pathological worry and GAD are associated with a number of negative outcomes, including low self-esteem, poor academic success, and below average social interaction skills (Cartwright-Hatton, 2006). Unfortunately, treatments for pathological worry have yielded limited success. However, a number of cognitive models have been forwarded in an attempt to explain the development of pathological worry. Amongst these models is the metacognitive model of worry, which has received considerable attention due to its ability to clarify specific elements that facilitate excessive and uncontrollable worry (Wells, 2006a; Wells & Papageorgiou, 1995). This model, and others like it, have the potential to improve understanding of pathological worry and may lead to the development of more effective treatment programs (Fisher & Durham, 1999).

Chronic worry often starts in adolescents and frequently evolves into excessive or uncontrollable worry that is maintained into adulthood (Laugesen, Dugas, & Bukowski, 2003). Further, childhood onset GAD is not uncommon, and GAD has been found to be a common diagnosis in children referred to anxiety clinics (Kendall et al., 1997). However, surprisingly few studies have focused specifically on worry in children and adolescents

(Borkovec et al., 1991; Cartwright-Hatton, 2006). There is a particular paucity of research focused on the cognitive and developmental processes associated with worry in children and adolescents, and little is known about the degree to which cognitive models developed to explain worry in adults apply to youth with pathological worry. Consequently, more research is needed to examine the degree to which models of worry apply to children and adolescents. The present line of research may lead to the development of effective interventions to treat and prevent pathological worry.

Metacognition and the Metacognitive Model of Pathological Worry and GAD

Metacognition refers to the thought processes involved in the monitoring and evaluation of one's thoughts; it is succinctly summarized as —thinking about thinking” (Sica, Steketee, Ghisi, Chiri, & Franceschini, 2007). Recent research suggests that metacognition plays a central role in the development and persistence of many psychological disorders, including pathological worry and GAD (Wells, 2000; Wells & Matthews, 1994). Consequently, a metacognitive model of worry and GAD was developed to explain the development and maintenance of pathological worry in adults (Wells, 2006a; Wells & Papageorgiou, 1995).

Wells' (1994) metacognitive model of pathological worry and GAD is set in the Self-Regulatory Executive Function theory (S-REF) and derived from a pattern of cognition known as Cognitive Attentional Syndrome (CAS; Wells & Mathews, 1996). This cognitive pattern centers on rumination, danger monitoring tactics, and ineffective coping strategies to resolve worry (Wells, 2006a). The metacognitive model was created to expand on CAS by specifying the difference between cognition and metacognition.

Such a division assists in the understanding of development and maintenance of particular psychological disorders.

In the metacognitive model of worry, one's beliefs about worry facilitate ruminations and negative thoughts. In this model, a distinction is made between positive (non-metacognitive Type I) and negative (metacognitive Type II) worry (Wells, 2006a). See Figure 1 for a visual depiction of the metacognitive model of worry.

Type I worry is based on a contemplation of a wide range of negative outcomes to everyday situations; subsequently, various positive and reassuring thoughts are contemplated to manage these negative outcomes. This type of worry relates more to typical worrying such as relationship problems or concerns about an upcoming exam. An example of Type I worry would be a student worrying about a myriad of different negative outcomes that may occur as a result of poor performance on an upcoming exam. Those negative outcomes are typically reduced by responding with anticipation of positive outcomes. As a result, worry is successfully terminated (e.g., thinking: I know all of the material on the exam, so I will do great'). Type I worry usually continues until the individual believes that he or she no longer needs to worry (e.g., using the coping strategy until one believes they are no longer in danger of failing the exam). However, in some situations Type I worry continues until it activates negative worry beliefs known as Type II worry (Wells, 2006a).

Type II worry, also referred to as meta-worry, relates to negative beliefs about the consequences of worry, including concern that worry is uncontrollable or harmful (Wells, 2006a). For example, an individual may believe that his or her worry is dangerous to their health (Cartwright-Hatton & Wells, 1997), such that ~~w~~worrying puts my body under a lot

of stress; my worrying could make me go mad” (Cartwright-Hatton & Wells, 1997, p. 284). A perception of uncontrollability seems to be an integral characteristic of Type II worry, because of this, task and decision making becomes inhibited and increasingly more difficult due to the constant distraction of worry (Borkovec, Robinson, Pruzinsky, & DePree, 1983; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). This form of worry is persistent and intrusive until soon, it becomes very difficult for an individual to cope with meta-worry.

According to Wells (2006a), once Type II worry is activated, it is maintained through a number of different thought strategies. First, these negative beliefs give rise to meta-worry and negative perceptions of emotional symptoms as an indication of control loss or danger to physical or psychological well being. Further, this makes it difficult for the individual to realize that they can cope and worrying becomes very challenging to stop (Cartwright-Hatton & Wells, 1997; Wells, 2006a).

Some individuals will implement behaviors such as avoiding certain situations and seeking out reassurance, which has the ability to activate intrusive thoughts. Further, these behaviors allow worry to continue once it has begun due to its ability to preserve loss of control beliefs and thoughts about the dangers of worry. A related strategy that some individuals will use is thought control, a strategy used to stop worrying (i.e., try not to think about failing an upcoming exam). Attempting to suppress or control worrisome thoughts, referred to as thought suppression, actually creates a paradoxical effect that increases worrisome beliefs (Cartwright-Hatton & Wells, 1997; Wells, 2006a).

As illustrated in Figure 1, the metacognitive model starts with a trigger (e.g., thinking about a car accident). This trigger activates positive meta-beliefs about the

particular trigger (e.g., ‘worrying helps me to cope with everyday tasks’). This is Type I worry and usually persists until the objective of worrying is completed. Sometimes Type I worry escalates to Type II worry, as the model illustrates (Figure 1). In this situation, the positive beliefs about worry develop into negative worry (Type II) (e.g., ‘this worrying could make me have a heart attack’). The Type II worry is then facilitated by behaviors that were discussed previously: emotion, avoidance behavior, and thought control (Wells, 2006a). It is believed that these negative metacognitive thoughts play a critical role in the transition of normal or typical worry to GAD (Wells, 2005). While Type II worry is generally considered specific to GAD, Type I worry is more common and less disorder specific (Wells, 2006a).

Measures to Assess Metacognitive Worry

A number of measures have been developed to examine the metacognitive model of worry and assess the degree to which individuals engage in cognitive processes related to metacognitive worry. A measure of particular significance is the Metacognitions Questionnaire (MCQ). The MCQ was developed to measure metacognitive beliefs about worry and intrusive thoughts consistent with the metacognitive model. The MCQ consists of five subscales: positive beliefs about worry, negative beliefs about worry, cognitive confidence, negative beliefs about thoughts such as superstition, punishment, and responsibility (SPR), and cognitive self-consciousness (Cartwright-Hatton & Wells, 1997). The subscales have been found to predict proneness to obsession symptoms, worry proneness, and general anxiety symptoms (Cartwright-Hatton & Wells, 1997). Further, the subscales have been found to correlate significantly with social, health, meta-worry,

and trait anxiety (Cartwright-Hatton & Wells, 1997). It is also noteworthy, that the MCQ makes a distinction between positive beliefs and negative beliefs about worry.

The Meta-Cognitions Questionnaire – 30 is currently the most widely used version to date. The MCQ-30 was designed as a shorter version of the MCQ and includes the original 5 subscales (Wells & Cartwright-Hatton, 2002). The measure was found to yield good internal consistency and convergent validity. Test-retest was also good and the psychometric properties imply the MCQ-30 is reliable and valid for the measurement of intrusive thoughts (Wells & Cartwright-Hatton, 2002). The main drawback of the previously discussed questionnaire is that it was created for an adult population, and it is not necessarily applicable to children and adolescents.

Worry in Children and Adolescents

As discussed above, there is considerable evidence that Generalized Anxiety Disorder symptoms and worry-related difficulties often originate in childhood and adolescence (Ellis & Hudson, 2010). Further, approximately 25% of adolescents experience unnecessary and uncontrollable worry, and many adults with worry-related tendencies believe their uncontrollable worry started when they were adolescents (Laugesen, Dugas, & Bukowski, 2003). Although worry-related difficulties often occur in childhood, surprisingly few studies have focused on worry in adolescents and children (Laugesen et al., 2003). For example, little is known about the degree to which cognitive models of worry examined in adults, including the metacognitive model, are applicable to adolescents and children; consequently, additional research with this population is needed (Cartwright-Hatton, Mather, Illingworth, Harrington, & Wells, 2004; Bacow, Pincus, Ehrenreich, Brody, 2009).

The Metacognitive Model in Children and Adolescents

Most of the studies examining the metacognitive model of worry in children and adolescents have relied on adaptations of the MCQ (Cartwright-Hatton, Mather, Illingworth, Harrington, & Wells, 2004). In one of the few studies to focus on metacognitive worry in adolescents, Cartwright-Hatton et al. (2004) developed and evaluated the psychometric properties of the Metacognitions Questionnaire – Adolescent Version (MCQ-A). Some vocabulary and sentence structures of the original MCQ-30 items were altered to make it easier for adolescents to comprehend, and the measure was administered to a sample of adolescents between the age of 13 and 17. It is noteworthy that the MCQ-A was not administered to participants younger than 13 because it was thought that they would lack sufficient cognitive abilities to answer several of the questions accurately. Consistent with the MCQ-30, the same 5 subscales were retained: positive beliefs about worry, negative beliefs about worry, cognitive confidence, superstition punishment and responsibility, and cognitive self-consciousness. Overall, this initial study supports the premise that adolescents hold metacognitive beliefs which may be linked to anxiety and worry (Cartwright-Hatton et al., 2004; Mather & Cartwright-Hatton, 2004; Larøi, Van der Linden, & d'Acremont, 2009). The measure has strong reliability and validity, and the 5 factor structure was supported.

Most recently, a children's adaptation of the Metacognitions questionnaire was developed. The Metacognitions Questionnaire for Children (MCQ-C) is a 24 item questionnaire that targets both children and adolescents in the 7-17 age range (Bacow, Pincus, Ehrenreich, & Brody, 2009). The MCQ-C was modeled after the MCQ-A's content. However, certain words and sentence structures were altered from the MCQ-A to

make it easier for children to comprehend (e.g., “worrying helps me cope” was altered to “worrying helps me feel better”). Unlike the previous measures, the MCQ-C consists of four rather than five subscales. The four factors included: positive beliefs about worry, negative beliefs about worry, superstitious punishment and responsibility beliefs (SPR), and cognitive monitoring. Cognitive confidence was omitted from the measure because it was thought that children under the age of 13 may not have the cognitive abilities to correctly answer the questions at such a young age. The Metacognitions Questionnaire for Children has good internal consistency ($\alpha = 0.87$), and although the concepts are quite abstract, research suggests children and adolescents hold metacognitive beliefs which may be associated with anxiety and worry (Bacow, Pincus, Ehrenreich, & Brody, 2009). To date, there are no other research studies that have tested the MCQ-C.

Intolerance of Uncertainty in Children and Adolescents

Recent studies have examined the extent to which other cognitive factors relate to worry and generalized anxiety disorder. One of the more commonly studied cognitive constructs hypothesized to be related to worry is intolerance of uncertainty (Laugesen et al., 2003).

In particular, intolerance of uncertainty (IU) has been found to be associated with worry and has been an important factor in discriminating between those who engage in more typical worry from those with excessive worry (Laugesen et al., 2003). Those that experience IU seek control and security. Uncertain situations, in which one does not know what is going to happen, creates a great deal of stress in excessive worriers and often leads to complete avoidance of uncertainty. Avoidance and stress can leave the worrier greatly impaired and unable to act when faced with uncertainty (Dugas, Freeston,

& Ladouceur, 1997). These deleterious behaviors sustain negative beliefs and facilitate thoughts of danger and uncontrollability, and therefore it becomes difficult for an individual to realize that worrying can essentially be harmless. From this line of research, the Intolerance of Uncertainty Scale (IUS) has been developed and found to be a predictor of worry (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994; Khawaja, & Deborah, 2007).

While researchers have suggested that intolerance of uncertainty is a critical construct in the development of uncontrollable and excessive worry in adolescents, there is still a lack of research examining the association between IU and worry in adolescents (Laugesen et al., 2003). In one of the few studies to examine IU in adolescents (Boelen, Vrinssen, & van Tulder, 2010), IU was found to be positively associated with social anxiety and worry. Still, little is known about the degree to which IU is associated with metacognitive worry.

Focuses of Current Study

As discussed above, children and adolescents often experience unnecessary and uncontrollable worry and the onset of GAD in childhood (Laugesen, Dugas, & Bukowski, 2003). However, few studies have examined the degree to which cognitive models, including the Metacognitive Model and Intolerance of Uncertainty Model, are relevant to the development and maintenance of child and adolescent worry.

Interestingly, only recently has there been research on the relation between metacognition and worry in children and adolescents (Bacow et al., 2009; Cartwright-Hatton et al., 2004). Further, only one study using the MCQ (or its derived measures) with children and adolescents has been conducted in the United States; consequently, more research is

needed to evaluate the validity of measures pertaining to metacognition and IU in child and adolescent populations.

The first objective of this study was to examine the psychometric properties of the MCQ-C in a community adolescent sample. In general, it is anticipated that the MCQ-C will demonstrate adequate internal consistency and criterion validity, based on the degree to which the MCQ-C is associated with pathological worry. In particular, it is anticipated that metacognition will be significantly associated with excessive and uncontrollable worry in adolescents. The second objective is to examine the relative contribution of metacognition and IU to adolescent worry. It is predicted that the MCQ-C and IU measures will be significant and unique predictors of adolescent worry.

Method

Participants

A total of 175 (119 females, 56 males) non-clinical adolescents between the ages of 11-17 were recruited. Generally, the sample had older adolescents (125 students in the 14-17 age range and 50 in the 11-13 age range). Participants were recruited from local high and junior high schools; participation was entirely voluntary for this study.

Design & Procedure

High school and junior high school teachers were approached about allowing their students from their classes to participate. For participating classes, informed consent letters were administered to parents or legal guardians to review and sign. Only students who returned signed informed consent letters were permitted to participate in the study. Before participation, students were also required to complete an assent form. Upon completing the assent form, students were instructed to take their time and try to answer

the questionnaire packet in its entirety. Packets were administered in the classroom setting during regularly scheduled classes. Students were given as much time as needed to complete the packets, but generally it took approximately 20-30 minutes to complete.

Measures

All students who participated in this study were administered a demographics form, along with the below measures in a combined questionnaire packet. Additionally, the questionnaire packet included the measures in order of how they are presented below (i.e., MCQ-C, SCAS, PSWQ-C, IUS-C):

The Metacognitions Questionnaire for Children. The MCQ-C is a 24-item questionnaire designed to measure metacognitive beliefs in children and adolescents with a focus on cognitive performance, intrusive thinking, and worry. Criterion validity and convergent validity of the MCQ-C has been demonstrated as measured by the MCQ-A, and overall internal consistency for the MCQ-C is good ($\alpha = 0.87$; Bacow, Pincus, Ehrenreich, & Brody, 2009).

The Spence Children's Anxiety Scale. The SCAS is a 44 item questionnaire designed to assess anxiety symptoms in children aged 8-12 (Spence, 1998). Six clinical subscales are based on 38 of the items on the SCAS. The subscales include: separation anxiety, generalized anxiety disorder, social phobia, panic and agoraphobia, obsessive compulsive disorder, and physical injury fears. The original version of the SCAS also includes 6 items intended to decrease negative response bias; however, due to survey packet length concerns for this study, these items were omitted. The SCAS demonstrates construct validity and excellent internal consistency ($\alpha = 0.92$), high validity with other

child and adolescent anxiety measures, and adequate test-retest over 6 months ($r = 0.60$; Spence, 1998).

The Penn State Worry Questionnaire for Children. The PSWQ-C is a 14 item questionnaire designed to measure worry in children and adolescents in the age range of 6-18 (Chorpita, Tracey, Brown, Collica, & Barlow, 1997). Chorpita et al. (1997) found the PSWQ-C to exhibit excellent internal consistency ($\alpha = 0.90$). Further, test-retest at 1 week ($r = 0.92$) was excellent, and the authors found adequate convergent validity for the PSWQ-C (Chorpita et al., 1997).

The Intolerance of Uncertainty Scale for Children. The Intolerance of Uncertainty Scale for Children (IUS-C) is a 27-item questionnaire designed to measure intolerance of uncertainty (Comer, Roy, Furr, Gotimer, Beidas, & Dugas, 2009). This measure's content focuses on uncertainty, reactions to ambiguous situations, attempts to control future events, and the consequences that arise due to uncertainty. The IUS-C has excellent internal consistency from child reports ($\alpha = 0.92$). The convergent validity is supported with strong and significant positive correlations with measures of anxiety and worry (Comer, Roy, Furr, Gotimer, Beidas, & Dugas, 2009).

Results

Descriptive statistics and Cronbach's alphas for the full scale scores are provided in Table 1 and a correlation matrix including all measures present in the study are provided in Table 2. The range for Cronbach's alphas varied from acceptable to excellent for the SCAS, PSWQ, and IUS-C (0.77 to 0.92). A focus of the study was to analyze the internal consistency of the MCQ-C, and the MCQ-C total internal consistency was found to be acceptable ($\alpha = 0.77$). However, the MCQ-C subscales varied from fair to

acceptable (0.56 to 0.74). In particular, the positive beliefs subscale demonstrated the highest internal consistency score ($\alpha = 0.74$), followed by the cognitive monitoring subscale ($\alpha = 0.64$). Finally, the negative beliefs about worry subscale and the superstitious, punishment, and responsibility (SPR) subscale yielded the lowest internal consistencies (0.60 and 0.56, respectively). Overall, the internal consistency of the MCQ-C was mixed and scores were relatively low for two of the subscales. The internal consistency will later be discussed as a central limitation of this research.

MCQ-C, Worry, and Anxiety

Multiple regression analyses were performed to determine if the MCQ-C was significantly associated with worry, as operationalized by the PSWQ-C, and general anxiety symptoms, as operationalized by the SCAS. In the first regression analysis, the PSWQ-C was entered as the criterion variable and the MCQ-C total was entered as the predictor variable. The MCQ-C was found to significantly predict scores on the PSWQ-C ($F(1, 173) = 87.75, p < .001, R^2 = 0.34$). A follow-up regression analysis was conducted to determine which subscales of the MCQ-C were associated with worry symptoms. The subscales of the MCQ-C were entered simultaneously as predictor variables, and the PSWQ-C was designated the criterion variable. The positive beliefs, negative beliefs, and cognitive monitoring subscales of the MCQ-C were found to be significant and unique predictors of worry and positively associated with worry, indicating that those who experience higher levels of these metacognitive variables experience greater levels of worry (see Table 3). The only subscale that was not found to be significantly associated was the superstitious, punishment, and responsibility (SPR) subscale.

Multiple regressions were then performed to determine if the MCQ-C was significantly associated with general anxiety symptoms. In particular, the SCAS was entered as the criterion variable and the MCQ-C was entered as the predictor variable. The MCQ-C total was found to significantly predict scores on the SCAS ($F(1, 173) = 35.20, p < .001, R^2 = 0.17$). Again, a follow-up analysis was conducted to determine the degree to which each subscale on the MCQ-C was associated with general anxiety symptoms. The subscales of the MCQ-C were entered as predictor variables, and the SCAS was designated the criterion variable. The positive beliefs and negative beliefs subscales were found to be significantly and positively associated with general anxiety symptoms (Table 4). In contrast, cognitive monitoring and SPR were not found to be significantly associated with anxiety. Although the MCQ-C total had positive results that were found to be associated with both worry and anxiety, two subscales resulted in dubious results which showed no significant association with either worry (SPR) or anxiety (SPR & cognitive monitoring).

MCQ-C, IUS-C and Anxiety

Analyses were conducted to determine the degree to which the IUS-C and the MCQ-C exhibit additive and overlapping contributions to worry and general anxiety symptoms. First, a bivariate correlation was conducted to examine the potential association between metacognitive worry and intolerance of uncertainty. There was a significant, positive correlation between the two variables observed, $r(173) = 0.47, p < .001$, suggesting moderate overlap in variance between these two variables. A multiple regression was then performed to examine the relative contribution of MCQ-C and IUS-C to adolescent worry. In particular, the MCQ-C and the IUS-C were defined as the

predictor variables while the PSWQ-C was defined as the criterion variable. Overall, the model was significant ($F(2, 172) = 72.00, p < .001, R^2 = 0.46$), and the MCQ-C ($\beta = .39$) and the IUS-C ($\beta = .40$) were both found to be significant predictors of worry (see Table 5). The results suggest that the MCQ-C and the IUS-C are uniquely and positively associated with adolescent worry. Further, it is noteworthy that IUS-C and MCQ-C predict a similar amount of variance in PSWQ-C scores.

Discussion

Although the metacognitive model of worry has been extensively studied in adult populations (Wells & Cartwright-Hatton, 2002), few studies have examined the degree to which this model, along with beliefs typically associated with this model, applies to children and adolescents. Overall, initial research supports the assertion that adolescents hold metacognitive beliefs that may be linked to worry and other anxiety symptoms (Bacow et al., 2009; Cartwright-Hatton et al., 2004; Larøi et al., 2009; Mather & Cartwright-Hatton, 2004). Although these are encouraging results, only one prior study has focused on using the MCQ-C with children and adolescents (Bacow et al., 2009). Consequently, more research is needed to examine the association between metacognition and the development and maintenance of child and adolescent worry. The current study contributes to the research literature as among the first to examine metacognitive beliefs in an adolescent population.

As hypothesized, the MCQ-C was found to be a significant and unique predictor of metacognitive worry in an adolescent sample. In general, similar to Bacow et al. (2009), the current findings suggest that adolescents, as with adults, hold metacognitive beliefs that may maintain worry and general anxiety symptoms, and these results provide

additional support for the use of the MCQ-C in adolescents aged 11 to 17. The data demonstrate that cognitive factors, specifically those that are metacognitive in nature, are an important construct for the understanding and treatment of adolescent anxiety disorders. For example, by identifying the importance an adolescent assigns to his or her metacognitive beliefs, clinicians may be able to better identify and provide treatment for those who suffer from excessive worry or GAD. Further, the current findings suggest that the application of metacognitive therapy to adolescents may be a viable direction for future research.

Although the current data provide promise for the application of metacognitive models to adolescents, it is noteworthy that findings were mixed in regard to the reliability of two subscales of the MCQ-C (i.e., the negative beliefs about worry subscale and the superstitious, punishment, and responsibility (SPR) subscale). Further, it is noteworthy that internal consistency levels found in the total MCQ-C and the MCQ-C subscales were lower than that found in Bacow et al. (2009). One explanation for this difference is the current study was based on a non-clinical sample, while Bacow et al. (2009) utilized both clinical and non-clinical participants. In particular, the Bacow study sample consisted of 98 children (78 clinical, 20 non-clinical) between the ages of 7 and 17 years. In the clinical sample, a Cronbach's alpha of 0.89 was found for the total scale, and the subscales ranged from 0.69 to 0.89. However, in the non-clinical sample, a Cronbach's Alpha of 0.71 was found for the total scale, and the subscales ranged from 0.58 to 0.76. It is noteworthy that the internal consistency in the current sample (0.77 for the MCQ-C total and subscales ranging from 0.56 to 0.74) was more comparable to the non-clinical sample found in Bacow et al. (2009). One interpretation of this finding is that

the reliability of the MCQ-C may be better in clinical samples when compared to non-clinical samples because those with clinical levels of anxiety may have more pronounced and salient metacognitive beliefs when compared to non-clinical adolescents. Further, the relatively low reliability in the non-clinical sample may suggest a different factor structure in this group. Consequently, it is recommended that future studies include a systematic examination of variation in factor structure in clinical versus non-clinical samples.

The second hypothesis was that the IUS-C measure would also be a significant and unique predictor of adolescent worry. This was supported, and in particular, intolerance of uncertainty was found to be positively associated with worry in adolescents. This was also found by previous research conducted by Comer et al. (2009) and Boelen, Vrinssen, & van Tulder (2010); indicating that IU is a valid and reliable construct in adolescent samples. In particular, the internal consistency with the IUS-C was found to be good and very similar to previous research (e.g., see Comer et al., 2009). Further, IU was found to be a unique and significant predictor of adolescent worry. In general, these findings suggest that intolerance of uncertainty may be a fundamental construct underlying adolescent worry. In addition, intolerance of uncertainty as a construct may provide insight into the processes underlying the development and maintenance of adolescent worry.

One implication of the above findings is that the assessment of metacognition and IU has the potential to improve the identification and treatment of adolescents with generalized anxiety disorder and related disorders. Further, the overlapping contributions of IUS-C and MCQ-C to worry may suggest that modifying both categories of cognition

may maximize treatment effectiveness in those that experience excessive worry.

Interestingly, although initial research suggests an association between these cognitive variables and adolescent worry, few clinical outcome studies have examined the effectiveness of the modification of metacognitive beliefs and intolerance of uncertainty in adolescent populations.

Although the current study elucidates the cognitive processes underlying adolescent worry and may have important clinical applications, this study has several noteworthy limitations. In particular, as discussed above, the internal consistency scores on the MCQ-C were rather low for two subscales (i.e., SPR, negative beliefs) and marginally acceptable for the remaining subscales (i.e., cognitive monitoring, positive beliefs). Consequently, the analyses in the current study, in which the MCQ-C subscales were included, should be interpreted with caution. In particular, the limited reliability found for the SPR and negative beliefs subscales of the MCQ-C may have led to an underestimation of the association between these metacognitions and worry symptoms.

Further, the study relied exclusively on self-report measures completed by adolescents. These self-report strategies may have led to biased or imprecise recall. Consequently, a suggestion for future research is to utilize clinician-administered semi-structured interviews with adolescents to gather information regarding their worry beliefs (Muris, Meesters, Merckelbach, Sermon, & Zwakhalen, 1998). Further, the use of another rater of the adolescent's level of worry (e.g., parent or teacher ratings) may help minimize self-report bias.

Another limitation is that the study did not include children younger than the age of 11. Therefore, based on the current study, the degree to which the metacognitive

beliefs apply to younger children cannot be inferred. Although Bacow et al. (2009) found that children as young as seven years of age appear to have beliefs about their internal thoughts and worries and are able to consciously answer questions regarding those beliefs on self-report measures, more research is still needed. In particular, little is known about the degree to which abstract reasoning skills influence metacognitive beliefs about worry.

It is also relevant to note that sample size and response rate were less than ideal, and a number of factors may have limited response rate. First, school participation was limited. Although not systematically assessed, it is speculated that administrative demands limited the number of schools that opted to participate. For schools that opted to participate, response rate from students was somewhat low. Based on informal discussion with teachers, a primary barrier appeared to be related to the completion of parental consent forms. Therefore, it appears that either parents did not want their child to participate in the research, or students never gave their parents the consent form due to forgetfulness or lack of interest. In future studies, response bias may be reduced by exploring alternative recruitment strategies, including offering a small incentive for participation.

In summary, the current study is among the first to examine the role of the MCQ-C, a measure of metacognitive beliefs, in adolescent worry. Findings suggest that metacognition may play a role in the development and maintenance of excessive worry and related generalized anxiety disorder symptoms. Further, current findings provide support for the combined influence of metacognitive beliefs and intolerance of uncertainty in the development and maintenance of worry. These findings have relevant

implications for the development and refinement treatment programs for generalized anxiety disorder in adolescents.

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Table 1. Means, Standard Deviations, and Reliabilities of Measures Studied

Measure	Cronbach's Alpha	Mean	Standard Deviation
MCQ-C	0.77	52.41	9.50
MCQ-C/PB	0.74	10.41	3.55
MCQ-C/NB	0.60	13.92	3.65
MCQ-C/SPR	0.56	12.36	3.25
MCQ-C/CM	0.64	15.68	3.65
SCAS	0.88	67.16	15.35
PSWQ-C	0.90	30.44	8.65
IUS-C	0.92	49.26	14.36

Note. MCQ-C = Metacognitions Questionnaire for Children, MCQ-C/PB = MCQ-C subscale positive beliefs about worry, MCQ-C/NB = MCQ-C subscale negative beliefs about worry, MCQ-C/SPR = MCQ-C subscale superstitious punishment and responsibility beliefs, MCQ-C/CM = MCQ-C subscale cognitive monitoring, SCAS = Spence Children's Anxiety Scale, PSWQ-C = Penn State Worry Questionnaire for Children, IUS-C = Intolerance of Uncertainty Scale for Children.

Table 2. Correlation Matrix of Measures Studied

Measure	MCQ-C	MCQ-C/PB	MCQ-C/NB	MCQ-C/SPR	MCQ-C/CM	SCAS	PSWQ-C	IUS-C
MCQ-C	--							
MCQ-C/PB	0.65**	--						
MCQ-C/NB	0.67**	0.12	--					
MCQ-C/SPR	0.67**	0.18*	0.45**	--				
MCQ-C/CM	0.71**	0.43**	0.23**	0.23**	--			
SCAS	0.41**	0.25**	0.38**	0.23**	0.25**	--		
PSWQ-C	0.58**	0.38**	0.45**	0.32**	0.42**	0.60**	--	
IUS-C	0.47**	0.33**	0.36**	0.35**	0.25**	0.67**	0.58**	--

Note. MCQ-C = Metacognitions Questionnaire for Children, MCQ-C/PB = MCQ-C subscale positive beliefs about worry, MCQ-C/NB = MCQ-C subscale negative beliefs about worry, MCQ-C/SPR = MCQ-C subscale superstitious punishment and responsibility beliefs, MCQ-C/CM = MCQ-C subscale cognitive monitoring, SCAS = Spence Children's Anxiety Scale, PSWQ-C = Penn State Worry Questionnaire for Children, IUS-C = Intolerance of Uncertainty Scale for Children * $p < .05$, ** $p < .01$

Table 3. Linear Regression for MCQ-C Subscale Variables Predicting Scores on the PSWQ-C

Variables	B	SE B	β
Constant	2.68	3.05	--
MCQ-C/PB	0.55	0.17	0.23**
MCQ-C/NB	0.80	0.17	0.33***
MCQ-C/SPR	0.20	0.19	0.07
MCQ-C/CM	0.55	0.17	0.23**

Note. MCQ-C/PB = MCQ-C subscale positive beliefs about worry, MCQ-C/NB = MCQ-C subscale negative beliefs about worry, MCQ-C/SPR = MCQ-C subscale superstitious punishment and responsibility beliefs, MCQ-C/CM = MCQ-C subscale cognitive monitoring, PSWQ-C = Penn State Worry Questionnaire for Children * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4. Linear Regression for MCQ-C Subscale Variables Predicting Scores on the SCAS

Variables	B	SE B	β
Constant	2.68	3.05	--
MCQ-C/PB	0.72	0.33	0.17*
MCQ-C/NB	1.36	0.33	0.32***
MCQ-C/SPR	0.13	0.37	0.03
MCQ-C/CM	0.43	0.33	0.10

Note. MCQ-C/PB = MCQ-C subscale positive beliefs about worry, MCQ-C/NB = MCQ-C subscale negative beliefs about worry, MCQ-C/SPR = MCQ-C subscale superstitious punishment and responsibility beliefs, MCQ-C/CM = MCQ-C subscale cognitive monitoring, SCAS = Spence Children's Anxiety Scale * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. Linear Regression for MCQ-C & IUS-C Predicting Scores on the PSWQ-C

Variables	B	SE B	β
Constant	0.25	2.76	--
IUS-C	0.24	0.04	0.40***
MCQ-C	0.36	0.06	0.39***

Note. MCQ-C = Metacognitions Questionnaire for Children, MCQ-C/PB = MCQ-C subscale positive beliefs about worry, MCQ-C/NB = MCQ-C subscale negative beliefs about worry, MCQ-C/SPR = MCQ-C subscale superstitious punishment and responsibility beliefs, MCQ-C/CM = MCQ-C subscale cognitive monitoring, PSWQ-C = Penn State Worry Questionnaire for Children, IUS-C = Intolerance of Uncertainty Scale for Children * $p < .05$, ** $p < .01$, *** $p < .001$

The Metacognitive Model

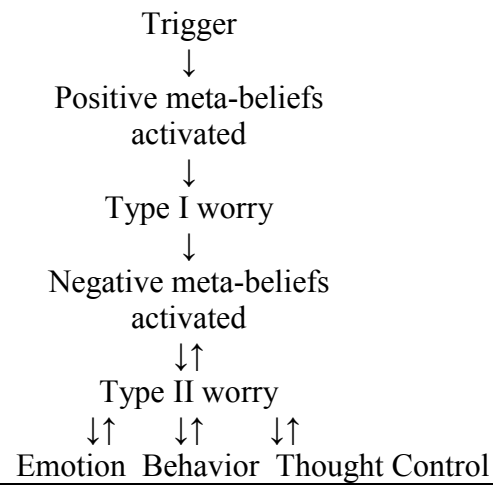


Figure 1. The Metacognitive Model of GAD

Note: The metacognitive model is from Wells, 2006a, p.182

Marco Mentuccia

Born in

Mmentuccia@yahoo.com

984 Fern Avenue • Orlando, FL 32814 • (407) 256-4687

EDUCATION

University of North Florida Aug. 2009 – Aug. 2011
 Master of Arts in General Psychology

University of Central Florida May 2004 – May 2008
 Bachelor of Arts in Psychology

American Institute for Foreign Studies Summer 2007
 Study abroad program in Florence, Italy

THESIS AND RESEARCH

Master's thesis:

-Cognitive Predictors of Worry in an Adolescent Community Sample

Graduate Student Lab Member Sep. 2009 - May 2011

- I conducted research for Dr. Brian Fisak's lab concerning topics such as worry and anxiety in children/adolescents, sickle cell anemia, metacognition, and other cognitive predictor variables related to worry in youth.

Collaborative Institutional Training Initiative Certificate (CITI) Oct. 2009
 Human Subjects Research Curriculum Completed. Member ID: 1450884.

HONOR SOCIETIES & ACHIEVEMENTS

Ψ Psi Chi President (UNF chapter) Jan. 2010 – Aug. 2011

- Oversaw a wide spectrum of chapter duties. Including organizing, managing, and speaking at all Psi Chi meetings, raising awareness/recruiting new members, and arranging chapter participation with non-profit organizations and fundraisers.

Ψ Psi Chi Vice President (UNF chapter) Mar. 2010 - Dec. 2010

Ψ Psi Chi (International Honors Society in Psychology) Member Dec. 2009 - present

VOLUNTEER EXPERIENCE

Mayo Clinic Emergency Department Student Volunteer Jul. 2010 – May 2011

- 109 hours completed.

Multiple Sclerosis Society Student Volunteer Aug. 2003 - May 2004

- 100 hours completed.