



Emotional reactivity and cognitive regulation in anxious children

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ARTICLE INFO

Article history:

Received 3 June 2009

Received in revised form

17 December 2009

Accepted 21 December 2009

Keywords:

Anxiety disorders

Emotional reactivity

Emotion regulation

Reappraisal

Childhood

Adolescence

ABSTRACT

Recent models of anxiety disorders emphasize abnormalities in emotional reactivity and regulation. However, the empirical basis for this view is limited, particularly in children and adolescents. The present study examined whether anxious children suffer both negative emotional hyper-reactivity and deficits in cognitive emotion regulation. Participants were 49 children aged 10–17 with generalized anxiety disorder, social anxiety, or separation anxiety disorder as their primary diagnosis, as well as 42 age- and gender-matched non-anxious controls. After completing a diagnostic interview and self-report questionnaires, participants were presented with pictures of threatening scenes with the instructions either to simply view them or to use reappraisal, a cognitive emotion regulation strategy, to decrease their negative emotional response. Emotion ratings, content analysis of reappraisal responses, and reports of everyday use of reappraisal were used to assess negative emotional reactivity, reappraisal ability, efficacy and frequency. Relative to controls, children with anxiety disorders (1) experienced greater negative emotional responses to the images, (2) were less successful at applying reappraisals, but (3) showed intact ability to reduce their negative emotions following reappraisal. They also (4) reported less frequent use of reappraisal in everyday life. Implications for the assessment and treatment of childhood anxiety disorders are discussed.

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Anxiety disorders are among the most common forms of psychopathology in children and adolescents (Costello, Egger, & Angold, 2005). Anxious children and adolescents characteristically display excessive levels of fear, worry, physical complaints, and avoidant behaviors, and these symptoms usually persist unless treated. In the short term, anxiety disorders are associated with impairment in psychosocial functioning and academic performance (Last, Hansen, & Franco, 1997). Over time, anxiety disorders are linked to lower self-esteem, decreased well-being, and increased risk for physical illnesses, substance abuse, and other types of psychopathology, especially clinical depression (Woodward & Fergusson, 2001).

Anxious children and adolescents often report experiencing intense, unpleasant negative emotions and say that they find it difficult to calm themselves down once they are upset. These clinical observations, along with substantial progress in emotion research (Gross & Thompson, 2007), and the growing understanding of the role of emotion regulation in healthy development (Zeman, Cassano, Perrt-Parrish, & Stegall, 2006), have encouraged

the development of models that suggest anxious individuals suffer both greater negative emotional reactivity and deficits in emotion regulation (Hannesdottir & Ollendick, 2007; Mennin, Holaway, Fresco, Moore, & Heimberg, 2007; Suveg & Zeman, 2004; Thompson, 2001). While recent research on adult anxiety has begun to examine these claims empirically, the nature of emotional abnormalities in childhood anxiety is less well understood.

Emotional reactivity in anxiety disorders

There is a striking variability across individuals in the quality and intensity of emotional reactions to similar stimuli, as manifested in experiential, behavioral, and physiological response systems. *Emotional reactivity* refers to the characteristics of the emotional response, including the threshold of stimuli needed to generate emotional response and the intensity of emotional response once emotion is generated (Davidson, 1998).

Anxious individuals seem to show emotional hyper-reactivity, manifested as relatively *intense and frequent negative emotional responses to perceived threat*. This hyper-reactivity is thought to emerge from biased processing of threat-related information (Beck, Emery, & Greenberg, 1985; Wilson, MacLeod, Mathews, & Rutherford,

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2006) that characterizes anxious children, adolescents, and adults (e.g., Bogels & Zigterman, 2000; Chorpita, Albano, & Barlow, 1996; Richards & French, 1992). Consequently, since anxious individuals appraise potentially threatening stimuli as dangerous, they experience frequent and intense negative emotions.

Evidence of emotional hyper-reactivity in anxious adults has taken the form of a) greater self-reported emotional responding in retrospective descriptions (Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005) and in real-time emotional activation (Goldin, Manber, Hakimi, Canli, & Gross, 2009; Mauss, Wilhelm, & Gross, 2004; Mennin, Heimberg, Turk, & Fresco, 2005), and b) heightened physiological responses to threatening stimuli. Specifically, in several studies, anxious individuals reacted with increased heart rate to threatening stimuli or situations compared with non-anxious controls (e.g., Beidel, Turner, & Dancu, 1985). Additionally, in multiple studies that have compared socially anxious with non-anxious controls, socially anxious participants showed hyper-activation in the amygdala, a brain area believed to be involved in threat detection (Liddell et al., 2005), in response to harsh faces (Goldin et al., 2009; Phan, Fitzgerald, Nathan, & Tancer, 2006; Stein, Goldin, Sareen, Zorrilla, & Brown, 2002; Stein, Simmons, Feinstein, & Paulus, 2007).

Fewer studies have examined emotional reactivity in anxious children and adolescents. However, those studies that do exist are consistent with the adult literature: amygdala hyper-activation has been observed in anxious adolescents in response to fearful faces (Killgore & Yurgelun-Todd, 2005; Thomas et al., 2001), increased heart rate was found in anxious children in response to a socially threatening situation (Beidel, 1991) and to a scary video clip (Weems, Zakem, Costa, Cannon, & Watts, 2005). In addition, anxious children report greater negative emotional intensity than non-anxious controls to vignettes that elicited worry and anger (Suveg & Zeman, 2004) and to ambiguous situations with potentially threatening meanings (Carthy, Horesh, Apter, & Gross, *in press*).

Emotion regulation in anxiety disorders

These accumulating findings of negative emotional hyper-reactivity in anxious individuals suggest down-regulating (decreasing) their negative emotion is a relatively more frequent and demanding challenge than for non-anxious people. Emotion regulation refers to the processes that influence the intensity, duration, and expression of emotions (Gross & Thompson, 2007), and effective emotion regulation can reduce the intensity of negative emotional responses in anxiety-provoking situations.

Indeed, emotion dysregulation is thought to be a core feature of anxiety disorders (e.g., Mennin et al., 2007). Evidence of emotion dysregulation in anxiety disorders comes from studies of generalized anxiety disorder and social anxiety disorder in both analog and clinical samples. These studies have found that anxious individuals report difficulty applying emotion management strategies when experiencing negative emotions and that they are less efficient in repairing negative mood states (e.g., Mennin et al., 2005; Salters-Pedneault et al., 2006; Turk et al., 2005). However, these studies primarily used measures assessing anxious individuals' general beliefs about their regulation ability (e.g., "When I'm upset, I believe that there is nothing I can do to make myself feel better"). While these beliefs are relevant to habitual emotion regulation practices (John & Gross, 2007), they do not give information about specific regulation deficits in real-time emotional activation.

Less is known about emotion regulation in anxious children and adolescents. Several studies have examined attention-control (i.e., the ability to pay attention to a task over an extended time and the

ability to voluntarily move attention from one stimulus to another). According to self-reports, anxious children appear to be less skilled in flexible control of attention, a crucial element in the ability to regulate emotions (Lonigan, Vasey, Phillips, & Hazen, 2004; Muris, Meesters, & Rompelberg, 2007). In addition, they report more dysregulated expression of worry, sadness, and anger compared with non-anxious children (Suveg & Zeman, 2004). Similar to anxious adults, anxious children report being significantly less efficacious in regulating negative emotions than non-anxious children (Suveg & Zeman, 2004). However, because previous studies used general self-report measures that do not distinguish actual and perceived regulatory abilities, and do not distinguish among emotion regulation strategies (e.g., "I try to calmly deal with what is making me feel sad"), it is not clear whether these findings represent actual impairment of emotion regulation abilities or simply perceived impairment (Suveg & Zeman, 2004). One way to clarify this is to focus on specific emotion regulation strategies and examine them in real-time, when negative emotions are activated.

Among the wide range of emotion regulation strategies, reappraisal seems to be of particular relevance for children with anxiety disorders. Reappraisal is a cognitive regulation strategy that involves construing an emotion-eliciting situation or stimulus in a way that changes its emotional impact (e.g., looking at the positive outcome of a scary experience). According to the process model of emotion regulation (Gross, 2001), emotion may be regulated at different points of time in the emotion generative process. Reappraisal may take place at the situation as its meaning is formed (e.g., upon seeing her boss with an angry face, a reappraiser might conjecture that he simply had a bad day instead of the immediately interpreting his expression as a sign that he is angry with the reappraiser), or sometime after the threatening situation/stimulus has been encountered for the first time (e.g., recasting a dreaded medical examination as a brief and salutary intervention).

Reappraisal is considered an efficient emotion regulation strategy, as previous studies have shown it decreases negative emotion experience and expression in the moment (e.g., Goldin et al., 2009). Reappraisal is also considered an adaptive emotion regulation strategy, as it is associated with greater experience and expression of positive emotion and with higher levels of well-being (Gross, 2002; John & Gross, 2007). As anxious individuals display biases towards threatening interpretations, a tendency believed to lead to negative emotional hyper-reactivity (Wilson et al., 2006), reappraisal is expected to be a relatively difficult but especially important emotion regulation strategy for anxious individuals.

Indeed, the most common treatment for anxiety disorders, cognitive-behavior therapy (CBT), involves an extensive work on facilitating cognitive change in different level of cognitions including automatic negative thoughts as well as more complex distorted perceptions (e.g., self-perception). The implied assumption is that anxious individuals lack a sufficient ability to change their biased/distorted appraisals or apply cognitive change in real-time emotional situations. However, this assumption has not been tested empirically, as previous studies on anxious individuals have not addressed the question whether anxious children suffer (a) a real deficit in the ability to down-regulate negative emotions via reappraisal, (b) heightened negative emotional reactivity which challenges intact reappraisal abilities, or (c) both reactivity and cognitive regulation abnormalities.

The present study

The primary goal of the present study was to examine abnormalities in emotional reactivity and in cognitive emotion

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