Review article

Meta-analysis of the influence of age on symptom change following cognitive-behavioural treatment for anxiety disorders

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A R T I C L E   I N F O

A B S T R A C T

Introduction: Adolescents, relative to adults, show impairments in learning to reduce or *extinguish* fear. Furthermore, they may struggle with the use of reappraisal techniques to regulate affect. Both learning and reappraisals are critical to cognitive-behavioural treatments (CBT) for anxiety disorders leading to the hypothesis that adolescents may respond more poorly to CBT than adults.
Methods: We use meta-regression to explore whether variability in the mean age of participants in trials of CBT for anxiety predicted variability between studies in symptom change effect sizes. PsycARTICLES, PsycINFO, MEDLINE and Embase databases were searched with the terms *exposure* and each of *anxiety*, *phobia*, or *panic disorder* diagnostic terms and *cognitive behav* therapy* with each of the diagnostic terms. Data were pooled from CBT trials for anxiety disorders (excluding anxiety-related disorders – obsessive compulsive disorder and posttraumatic stress disorder) where participants' mean age was 11 years or older.

149 studies were selected and data on change in symptoms from pre-treatment to post-treatment ($k = 195$), pre-treatment to follow-up ($k = 108$) and post-treatment to follow-up ($k = 107$) were extracted.
Results: Several possible confounding variables were also accounted for (e.g., proportion of females, number of sessions). Younger age was associated with smaller improvement in anxious symptoms from pre-to post-treatment. However, younger age was also associated with greater improvement in symptoms from post-treatment to follow-up.
Conclusions: CBT is effective at reducing anxious symptoms, however, younger people may respond more slowly to treatment than older people.

1. Introduction

Anxiety disorders pose considerable distress, disability and cost to individuals and economies worldwide (Baxter, Scott, Vos, & Whiteford, 2013; Baxter, Vos, Scott, Ferrari, & Whiteford, 2014). Many cases of anxiety begin in youth (Kessler et al., 2005), posing significant long-term academic and social disadvantage (Van Ameringen, Mancini, & Farvolden, 2003). Young people with diagnoses of anxiety disorders such as specific phobia, social anxiety disorder, panic disorder and generalised anxiety disorder, are also at elevated risk of subsequent substance abuse and mood disorders in adulthood (Pine, Cohen, Gurley, Brook, & Ma, 1998). The gold-standard treatment for anxiety disorders – Cognitive Behavioural Therapy (CBT) – is highly efficacious in ameliorating anxiety symptoms (Bennett et al., 2013; Berlim, Van den Eynde, & Jeff Daskalakis, 2013; Chorpita et al., 2011; Drysdale et al., 2014;

Hofmann & Smits, 2008; Kendall & Peterman, 2015). However, 40–50% of people will not respond to treatment (Walkup et al., 2008) and, among those who do, up to 62% will experience a return of fear later (Craske & Mystkowski, 2006). For adolescents, they may be more likely than adults to show problems with the kind of learning and techniques that are thought to be critical to CBT for anxiety disorders, such as with *extinction learning* (Baker, Den, Graham, & Richardson, 2014) or in applying reappraisal techniques to regulate negative affect (McRae et al., 2012; Silvers et al., 2012). Because of these age-typical differences, adolescents with anxiety may respond more poorly to CBT than anxious adults. Although there is a wealth of evidence from CBT studies involving either adolescents or adults with anxiety disorders, this research has yet to be combined meta-analytically to examine whether, across all existing studies, there are important age-related differences in CBT outcomes. The present study will provide the first such analysis with a view to informing our understanding of whether adolescents perform less well in CBT than adults.

CBT involves multiple treatment components such as psychoeducation, cognitive restructuring or reappraisal training and behavioural exposure. During the exposure component of CBT people are repeatedly exposed to the object of their fears. Extant research in this area suggests that exposure is perhaps the most important aspect of CBT (Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008) and as such it is often delivered in a standalone format without the other components in adults and young people (Wolitzky-Taylor et al., 2008; Chorpita et al., 2011). Contemporary theories regarding exposure suggest that fear reduces or *extinguishes* as a person learns that a stimulus or situation that they fear (e.g., when their heart rate is perceived to be faster than usual in the case of panic disorder) is no longer predictive of the aversive outcome they expected would follow this stimulus/situation (e.g., that this pattern of heart activity is not predictive of an impending heart attack) (Bouton, 2004; Vervliet, Baeyens, Van den Bergh, & Hermans, 2013). In experimental models of extinction learning healthy adolescents (aged 10–17 years) have shown evidence of impairments such that their fear for discrete stimuli does not reduce across time (Haddad, Lissek, Pine, & Lau, 2011; Lau et al., 2008) and when compared to adults (Britton et al., 2013; Pattwell et al., 2012). Furthermore, adolescents' fear may be more likely than adults' to return after it has been extinguished, again suggesting that the initial extinction learning was impaired (Britton et al., 2013; Den, Graham, Newall, & Richardson, 2015). Similar age-related impairments in extinction learning have also been found in studies with juvenile rodents (Baker & Richardson, 2015; Baker, Bisby, & Richardson, 2016). It is also of note that amongst children and adolescents, poor extinction abilities measured prior to treatment have been associated with worse treatment responses (Waters & Pine, 2016).

Cognitive reappraisal, another component of CBT, refers to the use of more effortful strategies to reinterpret an emotion-eliciting stimulus or situation to alter its meaning and change its emotional impact. While this appears to be a promising way to regulate negative affect in adults, the adolescent capacity to deploy these strategies may be modulated by structural immaturity of neural circuits involved in top-down inhibition of affective responses. Experimental studies comparing cognitive reappraisal abilities in children, adolescents and adults have shown linear but also quadratic relations between age and regulation success. Put otherwise, the ability to effectively down-regulate emotions evoked by negative stimuli, using behavioural but also neural indices of affect, develops throughout adolescence and into adulthood (McRae et al., 2012; Silvers et al., 2012).

Given the comparative difficulty with extinction learning and cognitive reappraisal ability that adolescents show relative to adults, and the importance of this learning in CBT for anxiety disorders, we might infer from this that anxious adolescents may show greater difficulty in responding to treatment compared with adults. It must be noted that although adolescents and adults differ in many of these comparisons when considered categorically, adolescence is a dynamic stage of life where there is tremendous biological, psychological and social change. In particular, during adolescence prefrontal brain regions known to be important in the management of fear and anxiety undergo significant maturation (Caballero, Granberg, & Tseng, 2016). As such, we might expect there to be continuous change across adolescence into adulthood in responsiveness to CBT. Such age-related differences in treatment responses would contrast with the intuitive presumption that anxiety disorders would be more easily treated at earlier ages because these disorders had presumably emerged not long before treatment. This is relative to anxiety disorders that are treated in adulthood that might have emerged much earlier in life. Although some meta-analytical research has already compared CBT outcomes between children and adolescents, with no evidence of a difference between these age groups in CBT effectiveness (Bennett et al., 2013; Drysdale et al., 2014; Kendall & Peterman, 2015), no meta-analyses of the effects of age in the adolescent-to-adult age range have been conducted. It is important that such an analysis takes a continuous approach to age given the change that takes place across adolescence. Our findings might support the need for further adoption of extinction-enhancing techniques (see Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014) or more targeted strategies to encourage the use of cognitive reappraisal in treatments involving adolescents.

Meta-regression techniques were used to examine whether the mean age of participants within a study group predicted differences between studies in the extent to which symptoms changed across and following treatment. We hypothesised that across analyses of symptom change from pre-treatment to post-treatment and pre-treatment to follow-up, the age of participants would show a positive association with study effect sizes. We expected that smaller effects, or less *decrease* in symptoms from pre-treatment, would be associated with younger age. Also, given the evidence that adolescents may be more likely to show a return of fear after extinction than adults, we also hypothesised that age would show a negative association with study effect sizes in our analysis of change in symptoms from post-treatment to follow-up. Put otherwise, we expected that younger age would be associated with greater *increase* in symptoms after treatment.

To capture continuous age effects across adolescence and adulthood, we defined the lower age limit as 11 years in line with previous studies in this area (e.g., Bennett et al., 2013). This age limit allowed us to exclude child samples where CBT is often delivered with parental input, concurrent treatments for other family members or without exposure. Also, this age represents the transition to independence that characterises adolescence as young people enter secondary education. Similarly, we defined the upper age limit of our adult sample as 60 years to remove any confounds of age-associated cognitive decline with responsiveness to CBT treatments (Evans, 2007).