



## Suppressor effects and age differences in the expression of anxious emotion

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### ABSTRACT

This study examined the role of suppressor effects on age differences in anxious emotion. Children and adolescents ( $n = 1099$ ) ages 7–18 years were assessed for separation anxiety, social anxiety, and generalized anxiety. Results of zero-order correlations indicated a significant negative association between age and separation anxiety but no association for social anxiety and generalized anxiety. However, semi-partial correlations indicated the presence of a cooperative suppressor effect such that the associations between age and social anxiety as well as age and generalized anxiety symptoms became significant and positive and the association with separation anxiety became larger in a simultaneous regression analysis of each facet with age. Similar effects occurred when controlling for hyperarousal in an ANCOVA across grade levels. Results suggest that attempts to understand developmental differences in anxious emotion in childhood and adolescence will be facilitated by parsing facets of anxious emotion and attention to potential suppressor effects.

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### 1. Introduction

Anxious emotion is considered multi-faceted and part of a broader system that has an important functional role in normal human behavior serving basic survival responses (see Barlow, 2002). Theoretically, the core specific (to anxiety) feature of maladaptive anxious emotion is dysregulation of the normative anxiety response system and this is often termed hyperarousal (Watson, 2005). An additional but nonspecific (i.e., is also common in depression and externalizing problems) core feature is distress/impairment resulting from dysregulation in the system and corresponding negative emotional states (e.g., being upset, concerned, unhappy about feeling anxious) often termed “negative affect” (Watson, 2005). There are also secondary features of anxiety problems. For example, worry about many different things in generalized anxiety disorder; social evaluative, interpersonal and self-image concerns in social anxiety disorder; fear of separation from parents in separation anxiety disorder. Research (Cannon & Weems, 2006; Chorpita, Albano, & Barlow, 1998; Muris, Schmidt, Merckelbach, & Schouten, 2001; Olatunji & Cole, 2009; Spence, 1997; Watson, 2005; Weems, 2008) supports this hypothetical structure of anxious emotion (i.e., the distinctions amongst the various secondary features and between secondary and core features). While the structure of anxious emotion has been consistently supported in youth, the empirical literature on

developmental differences in the expression of anxious emotion has produced apparently inconsistent results.

There are a number of theoretical perspectives that posit specific developmental trends in anxious emotion (Warren & Sroufe, 2004; Weems, 2008; Westenberg, Siebelink, & Treffers, 2001). These theories suggest that the predominant expression of anxious emotion may be tied to normative developmental periods and challenges and that heterotypic continuity may account for apparent instability (Bosquet & Egeland, 2006) in anxiety across development (Weems, 2008). Across theories (Warren & Sroufe, 2004; Westenberg et al., 2001) predictions are small general decreases in anxious emotion/hyperarousal, large decreases in separation anxiety from about age 6 to 17 years, increases in social anxiety and evaluative concerns starting in early adolescence and also increases in the symptoms characteristic of generalized anxiety disorder (i.e., worrying about a number of different things such as the future, crime, etc.).

Empirically, reports of anxious emotion do tend to decrease longitudinally over time and are reported less in older aged youth than in children (e.g., Olatunji & Cole, 2009; Ollendick, Matson, & Helsel, 1985; Ollendick, King, & Frary, 1989; Westenberg, Gullone, Bokhorst, Heyne, & King, 2007). Studies have also shown separation anxiety symptoms to be the most common expression of anxious emotion in young children with these symptoms relatively less in middle and late adolescence while social anxiety particularly evaluative concerns increase (Sumter, Bokhorst, Miers, Van Pelt, & Westenberg, 2010; Sumter, Bokhorst, & Westenberg, 2009; Weems & Costa, 2005; Westenberg, Drewes, Siebelink, & Treffers, 2004; Westenberg et al., 2007). For example, Weems and Costa (2005) found specific symptoms predominant at certain

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ages (i.e., separation anxiety symptoms in youth 6–9 years, death and danger fears in youth 10–13 years, and social anxiety symptoms as well as failure and criticism fears in youth 14–17 years) using an analysis of covariance (ANCOVA) strategy. Consistent in the studies showing increases with age/time is parsing various facets of anxious emotion but also considering the facets' relative expression across age/time via the use of covariates or other simultaneous analyses (see Weems & Costa, 2005; Westenberg et al., 2004, 2007).

Studies have also failed to find the theoretically predicted increases in social anxiety and generalized anxiety (Chorpita, Moffitt, & Gray, 2005; Gullone & King, 1993, 1997; Hale, Raaijmakers, Muris, Van Hoof, & Meeus, 2008; Olatunji & Cole, 2009; Spence, 1997). For example, Olatunji and Cole (2009) indicated support for distinctions in facets of anxious emotion (e.g., the factor structure of the facets of social anxiety and worry was invariant across time); however, the trajectories showed decreasing social anxiety and worry. Similarly, Chorpita et al. (2005) found significantly lower separation anxiety at older ages but not significantly higher social anxiety or generalized anxiety among older youths. One consistency in studies failing to show positive associations with age (or an increase with time) is either a failure to parse various facets of anxious emotion (e.g., Bosquet & Egeland, 2006) and/or not considering the facets' relative expression across age/time (e.g., analyzing the facets in separate analyses Chorpita et al., 2005; Gullone & King, 1993, 1997). In the context of potential differential declines (e.g., separation anxiety) versus increases (social anxiety) in anxious emotion, the association between age and specific anxiety symptoms may be obscured (Weems & Costa, 2005; Westenberg et al., 2007). This possibility may be understood as a form of statistical suppression.

Suppression is said to occur when a third (or more) variable contributes to a variable's association with another variable by helping to account for error variance (Gaylord-Harden, Cunningham, Holmbeck, & Grant, 2010). Cooperative suppression, for example, has been defined as a situation in which one or more variables and suppressor variable(s) both become more strongly correlated with another variable when included together in a regression (Gaylord-Harden et al., 2010). Ultimately suppression occurs when the simultaneous analysis of two or more variables (e.g., separation, generalized, and social anxiety) improves the association of one or all with an additional variable (e.g., age). Inconsistencies in the research on age differences in anxious emotion may be partially resolved by addressing potential suppressor effects. In other words, the simultaneous inclusion of separate facets of anxious emotion in analyzing age trends may improve/clarify the correlations between age and types of anxious symptomatology (i.e., separation anxiety, social anxiety, and generalized anxiety). Suppressor effects are commonly known in experimental ANCOVA designs where a covariate is controlled to increase the power of ANOVA by removing predictable variance that may obscure an effect (see Tabachnick & Fidell, 2001). While suppressor effects have tended to mainly be considered post hoc in correlational and regression model designs, new research suggests they are replicable and that they can and should guide a priori predictions (see Gaylord-Harden et al., 2010) similar to other interdependence analyses (e.g., mediation and moderation).

The purpose of this study was to test the suppression hypothesis of age and positive associations with social anxiety and generalized anxiety. It was hypothesized that a significant negative association between age and separation anxiety would be found but that there would be a small negative or no significant association with age for social anxiety and generalized anxiety. However, we predicted the presence of a suppressor effect such that the association between age and social anxiety as well as age and generalized anxiety symptoms would be positive and statistically

more robust if analyzed simultaneously (i.e., the partial correlations would be larger than the zero-order correlations). Potential sex differences in the association between age and anxious emotion were also examined. We expected similar findings across sex given previous work (Weems & Costa, 2005).

## 2. Method

### 2.1. Participants

The recruitment sample consisted of 1199 3rd through 12th graders attending six urban public schools in the Southeast United States. Consent from parents was not obtained from 100 students for a final sample of ( $n = 1099$ ). Data on one or more variables were missing for 65 participants. The sample was aged 7–18 years (median age 14 years) and was 53% female. Youth reported their ethnicity/race as 91% African American, 7% Mixed, and 2% as other ethnicities. The school serves youth predominantly from low-income families (school data indicate that over 90% of the students receive free lunch). For grade comparisons the sample consisted of 161 elementary school youth (grades 3–5), 336 middle school/junior high school youth (grades 6–8) and 592 high school youth (grades 9–12).

### 2.2. Measurement of anxious emotion

A modified version of the *Revised Child Anxiety and Depression Scales* (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000; Spence, 1997) was used to assess symptoms of generalized anxiety, social anxiety, and separation anxiety. This shortened version of the RCADS consists of 38-items and was developed to reduce participant time burden. Previous research suggests good reliability and validity (Weems et al., 2010). The RCADS is an adaptation of the Spence Anxiety Scales (Spence, 1997), with youth asked to rate how often they experience anxiety and depressive symptoms on a 4-point scale consisting of Never (0), Sometimes (1), Often (2) and Always (3). The version of the RCADS used in this study demonstrated good reliability for each of the three main subscales employed in this study: generalized anxiety ( $\alpha = .84$ ; example item "I worry about things"), social anxiety ( $\alpha = .82$ ; example item "I feel afraid if I have to talk in front of my class"), and separation anxiety ( $\alpha = .74$ ; example item "I feel scared if I have to sleep on my own") subscales. Items also assessed aspects of hyperarousal ( $\alpha = .87$ ; example item "When I have a problem, my heart beats really fast"). Items from each scale were summed to form scores for each of the subscales.

### 2.3. Procedures

Data collection was conducted as part of the school's counseling curriculum; however, informed consent for the use of the data in research was obtained from the parent (>90% response rate). The data reported here represents screening data from a test anxiety intervention carried out in the schools. Oral assent was obtained from the child (>90%) and so children were not required to fill in the questionnaires or to participate if they chose. The IRB reviewed the procedures and exempted approval was obtained for the use of the de-identified data. Youth completed the measures in a group classroom setting and were assisted by trained staff. As done in previous research (Chorpita et al., 2000, 2005; Weems & Costa, 2005), younger children were read the instructions and each item by a staff member, and trained staff helped individual children as necessary. The teachers and/or counselors for each classroom were queried about the reading level of the class and shown the measures. Students were read the measures in classrooms where

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