



Research paper

Temporal dynamics and longitudinal co-occurrence of depression and different anxiety syndromes in youth: Evidence for reciprocal patterns in a 3-year prospective study

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A B S T R A C T

Background: Depression is highly comorbid with anxiety in youth. It is frequently reported that anxiety precedes depression; however, evidence surrounding the temporal precedence of anxiety over depression is mixed. Many studies of anxiety-depression co-occurrence lump distinct forms of anxiety, obscuring information regarding trajectories of specific anxiety syndromes. This study sought to more accurately describe the development of anxiety and depression over time by moving beyond the question of temporal precedence to investigate a developmentally dynamic model of anxiety-depression co-occurrence.

Methods: A community sample of 665 youth ($M = 11.8$, $SD = 2.4$; 55% female) completed repeated self-report measures of depression and anxiety (social, physical, and separation anxiety) over a 3-year longitudinal study. Prospective associations between distinct syndromes of anxiety with depression were analyzed using an autoregressive cross-lagged path model over four time points.

Results: Physical symptoms and depression symptoms reciprocally predicted each other, above and beyond the stability of either domain. Social anxiety and depression symptoms similarly predicted each other in a systematic pattern.

Limitations: Our study is limited in its generalizability to other forms of anxiety, like worry. Additional research is needed to determine whether similar patterns exist in clinical populations, and whether these processes maintain symptoms once they reach diagnostic levels.

Conclusions: The development of syndromes of depression, physical, and social anxiety during childhood and adolescence occurs in a predictable, systematic reciprocal pattern, rather than sequentially and unidirectionally (i.e., anxiety syndromes precede depression). Results are clinically useful for predicting risk for disorder, and demonstrate the necessity of tracking symptom levels across domains.

1. Introduction

It is well established that depression is highly comorbid with anxiety during childhood and adolescence (Brady and Kendall, 1992). Estimates suggest that half of depressed individuals have a comorbid anxiety disorder (Kessler et al., 2003). Comorbidity is associated with greater symptom and diagnostic severity, and worse social functioning (Queen and Ehrenreich-May, 2014). It has been frequently reported that anxiety precedes depression (e.g., Cole et al., 1998; Keenan et al., 2009; Avenevoli et al., 2001).

However, there are significant, unresolved questions regarding the temporal and longitudinal relations between anxiety and depression. While it has been established that youth who experience symptoms of

anxiety are at heightened risk for later experiencing symptoms of depression (Kessler et al., 2005; Merikangas et al., 2010; Rohde et al., 1991; Cole et al., 1998), other research shows that those who experience symptoms of depression are similarly at greater risk for later symptoms of anxiety (Moffitt et al., 2007; Pine et al., 1998; Merikangas et al., 2003). To date, most research has focused on a “which comes first” question regarding diagnostic patterns of depression and anxiety comorbidity. More recently, researchers have suggested that the temporal ordering between anxiety and depression may not be as straightforward as has been commonly presumed (Cummings et al., 2014; Moffitt et al., 2007). The present study sought to advance knowledge on the temporal patterning of different forms of anxiety and depression by moving beyond the question of temporal precedence (i.e.,

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“which comes first”) to investigate a more developmentally dynamic model of anxiety-depression co-occurrence over time.

An important issue that may obscure meaningful findings in the study of anxiety-depression co-occurrence is the lumping together of distinct forms of anxiety. In their “multiple pathways” model of anxiety-depression co-occurrence, Cummings and colleagues highlight the need for empirical work that does not treat anxiety as a single, isomorphic class of symptoms and disorder (Cummings et al., 2014). Anxiety disorders and their core defining features (e.g., generalized anxiety, social anxiety, panic, separation anxiety) are heterogeneous in their age of onset, longitudinal trajectories (Copeland et al., 2014; Kessler et al., 2005), and symptom expression (Weems and Costa, 2005). Moreover, the rate of co-occurrence of these heterogeneous forms of anxiety with depression and other psychopathologies varies (Hankin et al., 2016; Angold et al., 1999). Further, the degree of co-occurrence of different forms of anxiety with depression may vary by age and gender, based on the prevalence of each syndrome across childhood and adolescence for boys and girls (Cummings et al., 2014).

The current study longitudinally examined the reciprocal associations of depressive symptoms with different anxiety syndromes. Our main purpose was to investigate whether particular anxiety syndromes predict, and are predicted by, depression, in a systematic manner in youth, as theoretical work has emphasized the importance of examining interactive processes resulting in anxiety-depression co-occurrence (e.g., Cummings et al., 2014). A secondary goal was to examine whether developmental patterns of anxiety and depression co-occurrence are moderated by age and/or gender. To explore these descriptive questions, we assessed depression and different anxiety syndromes (social anxiety, panic, separation anxiety) using a multi-wave prospective design over a three-year follow-up across different age cohorts with community youth.¹ This study aims to contribute to a more nuanced, accurate picture of anxiety-depression co-occurrence over time in childhood and adolescence than the study of temporal precedence alone. By establishing a descriptive pattern of how different forms of anxiety relate to depression among youth, we can better understand processes that may explain why particular anxiety syndromes predict, and are predicted by, depression over time in a systematic manner.

1.1. Developmental progression of anxiety-depression co-occurrence

A large body of research has investigated the temporal patterns of different forms of anxiety with depression (Cummings et al., 2014) with the goal of addressing the question of “which comes first.” Most prior work finds that anxiety, when broadly conceptualized and measured, predicts depression (e.g., Kouros et al., 2013; Kessler et al., 2005; Merikangas et al., 2010; Rohde et al., 1991; Cole et al., 1998). Much of this work combines multiple anxiety syndromes into a broad “anxiety symptoms” scale. However, this conclusion that anxiety precedes depression may depend on the specific anxiety syndromes examined as predictors of depression. We focus here on the association of syndromes of social anxiety, panic, and separation anxiety with depression. While much of the prior literature on anxiety-depression co-occurrence focuses on comorbidity at the disorder level, we focus on syndromes, as predictors of disorders (Gerhardt et al., 1999). Existing models further emphasize the importance of studying anxiety-depression co-occurrence at the symptom- or syndrome-level, as youth with subclinical levels of these syndromes experience significant distress and impairment (Epkins and Heckler, 2011).

Social anxiety and depression are related during childhood and adolescence (Epkins and Heckler, 2011; Hamilton et al., 2016; Ranta

et al., 2009); however, their temporal association has been debated. Cummings et al. (2014) proposed that social anxiety may predict depression, and vice versa, as impairment in one domain results in an increase in symptoms in the other domain. Many studies show that social anxiety predicts depression across the lifespan (e.g., Aune and Stiles, 2009; Last et al., 1992; Beesdo et al., 2007). Others find that depression predicts social anxiety during adolescence, but that social anxiety did not predict depression (Hamilton et al., 2016). However, most of these studies have not repeatedly assessed social anxiety and depression with more than three time points. With three time points or fewer, it cannot be determined whether prediction from one symptom domain to another happened only once, or whether *both* temporal sequences exist as part of a larger pattern of mutually reinforcing symptom escalation (i.e., social anxiety predicts, and is predicted by, depression over time). This possibility has yet to be examined empirically.

Studies of adults find that panic is a risk factor for depression (Horn and Wuyek, 2010). However, National Comorbidity Survey data (Kessler et al., 1998) show of those individuals who reported both depressive episodes and panic attacks, 43.4% reported their first panic attack occurred before their first depressive episode, whereas 31.1% reported the reverse sequence. A review similarly found that panic precedes depression in one third of adults, depression precedes panic in another third, and panic and depression develop concurrently in the last third (Johnson and Lydiard, 1998). As panic has a later age of onset than social and separation anxiety, it may be more likely to temporally follow depression than either social or separation anxiety (Lewinsohn et al., 1997). Thus, the precise temporal patterning between panic and depression symptoms is not well understood, especially among youth.

Most research has focused on separation anxiety as a risk factor for depression, and has found separation anxiety precedes depression (e.g., Lewinsohn et al., 1997). The median age of onset of separation anxiety disorder is younger than that of social anxiety and panic disorder across samples (Kessler et al., 2005; Last et al., 1992). Therefore, the temporal patterning of separation anxiety and depression may differ from that of other forms of anxiety with depression, such that separation anxiety may be most likely to precede depression symptoms. The heterogeneous ages of onset for different anxiety syndromes, combined with different temporal patternings of particular anxiety manifestations with depression, support the use of an analytical approach that can parse the independent associations of specific forms of anxiety with depression over time.

1.2. Moderators of anxiety-depression co-occurrence

Age and gender may moderate the temporal associations of anxiety and depression. Depression and anxiety are more prevalent among girls than boys (Hankin et al., 1998; Costello et al., 1996; Axelson and Birmaher, 2001), and anxiety-depression co-occurrence is more common in girls (Cummings et al., 2014). Research finds greater heterotypic continuity from anxiety to depression, and vice-versa, for girls than for boys (Costello et al., 2003; McGee et al., 1992). However, findings have been equivocal on whether gender moderates the development of anxiety and depression symptoms. Some studies have found stronger associations between anxiety and depression for girls over time (Merikangas et al., 2003), whereas others have not found that gender moderates developmental trajectories of anxiety and depression (McLaughlin and King, 2015; Hamilton et al., 2016). Relatedly, there are well-established age differences in both depression and certain forms of anxiety (Kessler et al., 2005), which have been proposed to lead to different patterns of comorbidity by age (Cummings et al., 2014). Few studies have examined whether age moderates trajectories of anxiety and depression across time.

¹ As the present investigation uses the Multidimensional Anxiety Scale for Children (MASC; March et al., 1997) as our measure of anxiety, we do not examine associations between generalized anxiety and depression. This represents an important avenue for future work.

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