



Suicide-related behaviors and anxiety in children and adolescents: A review

Ryan M. Hill ^a, Daniel Castellanos ^b, Jeremy W. Pettit ^{a,*}

^a Florida International University, Department of Psychology, 11200 SW 8th Street, AHC1 room 140, Miami, FL 33199, United States

^b Florida International University, Department of Psychiatry, Herbert Wertheim College of Medicine, 11200 SW 8th Street, AHC2, room 693, Miami, FL 33199, United States

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ABSTRACT

This paper reviews empirical evidence of the association between suicide-related behaviors and anxiety among children and adolescents. It begins with a review of suicide-related behaviors and anxiety, discusses methodological issues related to measurement, and reviews empirical findings published since the last review of this topic in 1988. Evidence is summarized on four criteria necessary to establish anxiety as a causal risk factor for suicide-related behaviors among children and adolescents. There is consistent evidence for a significant association between anxiety and suicide-related behaviors (Criterion 1). Evidence that the influence of anxiety on suicide-related behaviors is not due to a third variable (Criterion 2) is mixed and hindered by methodological limitations. The literature is also unclear as to whether anxiety temporally precedes suicide-related behaviors (Criterion 3). Finally, this review found no evidence to support or refute anxiety's stability independent of and across instances of suicide-related behaviors (Criterion 4). Theoretical and clinical implications of these findings and directions for future research are discussed.

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Suicide-related behaviors, especially among adolescents, are a serious health concern in the United States. Suicide becomes increasingly prevalent over the adolescent years; with rates increasing from .61 per 100,000 for 12 year olds to 9.24 per 100,000 for adolescents 18 years of

age (Centers for Disease Control, 2011). In the most recent, nationally representative Youth Risk Behavior Survey, 6.3% of adolescents reported making a suicide attempt in the previous 12 months and 13.8% reported having seriously considered suicide over the same period (Centers for Disease Control, 2010). Primary known risk factors for suicide and other suicide-related behaviors include a previous suicide attempt and psychiatric diagnoses, especially mood disorders (Brent, Perper, Moritz, & Allman, 1993; Cavanagh, Carson, Sharpe, & Lawrie, 2003). Historically,

* Corresponding author. Tel.: +1 305 348 1671; fax: +1 305 348 3879.
 E-mail address: jpettit@fiu.edu (J.W. Pettit).

the majority of research on suicide-related behaviors has focused on mood, psychotic, and personality disorders (especially Borderline Personality Disorder; Norton, Temple, & Pettit, 2008) with little emphasis on anxiety.

Anxiety disorders are highly prevalent in childhood and adolescence (e.g., Costello et al., 1996; Fergusson, Horwood, & Lynskey, 1993). Estimates of the comorbidity of depression and anxiety range from 10 to 70% in children and adolescents (Angold, Costello, & Erkanli, 1999; Brady & Kendall, 1992), and evidence suggests that anxiety disorders in childhood and adolescence may be causally related to the development of depression (Mathew, Pettit, Lewinsohn, Seeley, & Roberts, 2011). Given these high rates of comorbidity both among children and adolescents (Saavedra & Silverman, 2002) and among adults (Kessler, Chiu, Demler, & Walters, 2005), such a paucity of literature regarding the relations between anxiety and suicide-related behaviors is concerning. A review of the current literature of the contribution of anxiety to suicide-related behaviors in children and adolescents is necessary to draw attention to this often disregarded area of research and to provide directions for future work in this area.

The primary aim of this review is to summarize existing evidence concerning the association between anxiety and suicide-related behaviors in children and adolescents. A similar review (Mattison, 1988) published more than 20 years ago, summarized the literature available at the time (13 empirical studies) and determined that definitive conclusions could not be established, though it appeared that some association between anxiety and suicide-related behaviors was present, and that prospective research designs were needed to further the evidence base. Since that time, over 30 investigations of the relations between anxiety and suicide-related behaviors in children and adolescents have been published, including at least three large prospective studies (Goldston et al., 1999; Lewinsohn, Rohde, & Seeley, 1994; Weissman et al., 1999). The present review focuses on published empirical studies since Mattison's review in 1988. We begin with a review of the definitions of suicide-related behaviors and anxiety, followed by a discussion of methodological and measurement issues relevant to the literature on anxiety and suicide-related behaviors. We then review the current empirical evidence and discuss how the evidence may be integrated with models and theories of suicide. Strengths and weaknesses of the literature are examined and recommendations for future avenues of research are suggested, with the goal of spurring on future progress in this area. Finally, we discuss how these findings may be translated to the clinical arena and what important clinical implications research on anxiety and suicidal behaviors may yet uncover.

1. Definitional issues

1.1. Suicidal behaviors

The currently accepted nomenclature of suicide-related behaviors identifies suicide, nonfatal suicide attempts, and suicidal ideation (O'Carroll, Berman, Maris, & Moscicki, 1996; Silverman, Berman, Sanddal, O'Carroll, & Joiner, 2007). Suicidal ideation includes any self-reported thought of killing oneself. A suicide attempt is a non-fatal self-inflicted act where the individual has some intent to die and where there is the potential for injury, even where no serious injury occurs. Suicide is a fatal self-inflicted destructive act with explicit or implicit intent to die. Researchers have called for a routine distinction between these three major categories (Silverman et al., 2007), as they may be distinct phenomena, have differential risk factors, and because their prevalence rates differ markedly.

In contrast to suicide-related behaviors, non-suicidal self-injury (NSSI) refers to the deliberate, self-inflicted destruction of body tissue resulting in immediate damage without suicidal intent. In addition to differing in intent, NSSI and suicide attempt differ in lethality, correlates, course, function, and response to treatment (Muehlenkamp, 2005; Nock, 2009). Given the clear differences between suicide-related

behaviors and NSSI, the present review focused only on suicide-related behaviors.

1.2. Anxiety

Anxiety is a natural response and necessary warning adaptation. It is a future-oriented mood state in which one is prepared to attempt to cope with impending negative events (Barlow, 2000). Anxiety may manifest via a wide range of physical and affective symptoms, as well as changes in behavior and cognition. Anxiety is often measured as a state phenomenon: that is, an individual's current, temporally-restricted level of anxiety at the point of assessment (Ohring et al., 1996). Trait anxiety, which represents a more stable construct, is marked by a long-standing general tendency toward anxious feelings and responses (Ohring et al., 1996). When anxiety is perceived as overwhelming it often leads to significant impairments in functioning (e.g., social, educational, occupational; American Psychiatric Association, 2000).

The current nomenclature of anxiety disorders includes generalized anxiety disorder (GAD), separation anxiety disorder (SAD), phobias (social phobia, agoraphobia, and specific phobia), panic disorder (PD), obsessive-compulsive disorder (OCD), acute stress disorder (ASD), and post-traumatic stress disorder (PTSD; American Psychiatric Association, 2000). Research suggests that anxiety disorders can be separated into two subclasses: distress disorders and fear disorders (e.g., Sellbom, Ben-Porath, & Bagby, 2008; Watson, 2005). Distress disorders include GAD and PTSD/ASD [as well as the mood disorders major depressive disorder (MDD) and dysthymic disorder, although they will not be a primary focus in this review]. Fear disorders include PD, SAD, and the phobias. Research has not yet clarified whether OCD is most accurately classified as a distress disorder, a fear disorder, or a unique disorder. In spite of these distinctions, there is a high level of homotypic comorbidity within anxiety disorders, as well as heterotypic comorbidity with mood and externalizing disorders (Angold et al., 1999; Kessler et al., 2005).

2. Methodological and measurement issues

In evaluating the literature, it is necessary to review general requirements for establishing anxiety as a risk factor for suicidal behaviors (Alloy, Abramson, Ranieri, & Dyller, 1999; Garber & Hollon, 1991): (1) Anxiety must be significantly and consistently associated with suicidal behaviors and (2) the association between anxiety and suicidal behaviors must not be due to a third variable or set of variables. In addition, anxiety must (3) temporally precede suicidal behaviors and (4) exhibit some degree of stability independent of suicidal behaviors. In this review, we note the extent to which existing research meets each of these requirements.

Both anxiety and suicide-related behavior can be operationalized and measured in a number of ways. Anxiety may be measured as a dimensional construct (state and trait measures of anxiety) or as the presence of one or more dichotomous anxiety disorder diagnoses (either specific disorders or the presence of any anxiety disorder, where all anxiety diagnoses are considered as a class). For suicidal thoughts and behaviors, it is important to note whether a measure assessed suicidal ideation alone, suicide attempt alone, or a combination of the two. Assessment of suicide attempt should also include a measure of intent to die, although this has rarely been the case. For both anxiety and suicide-related behaviors, it is necessary to consider the identity of the informant (usually child, parent, or both) and the method of assessment (self-report vs. interview). Evidence suggests poor agreement between child and parent reports, with parent reports typically yielding lower rates of anxiety symptoms (Wren et al., 2007; Wren, Bridge, & Birmaher, 2004) and suicide-related behavior (Klaus, Mobilio, & King, 2009; Klimes-Dougan, 1998; Liu, Sun, & Yang, 2008; Prinstein, Nock, Spirito, & Grapentine, 2001; Sourander et al., 2006) than child reports. Past work also suggests that rates of suicide-related behavior correspond to the method of assessment, with higher rates obtained in self-report

measures than clinical interviews (de Wilde & Kienhorst, 1995; Safer, 1997; Velting, Rathus, & Asnis, 1998). Demonstration of consistent relationships between anxiety and suicide-related behaviors across different methods and different informants would provide compelling evidence for a link between the constructs, although the interpretation of discrepant findings in such instances presents a challenge. On one hand, discrepancies may be due to methodological issues, such as scale reliability and content validity. On the other hand, systematic discrepancies may have substantive explanations and point toward conditions under which a relation between anxiety and suicide-related behaviors may be detected.

3. Evidence of a relationship between anxiety and suicide-related behaviors

The relationship between anxiety disorders and suicide-related behaviors in adults has received a modest amount of attention. A review of the adult literature concluded that, while there are no definitive results for any single anxiety disorder, anxiety disorders in general are associated with higher rates of suicidal ideation, but their relationship with suicide

attempts remains unclear (Blasco-Fontecilla et al., 2006). Less attention has been paid to these relationships in children and adolescents. An earlier review (Mattison, 1988) concluded that no definitive answers could be reached regarding this relationship in children and adolescents.

Rates of suicidal thoughts and behaviors increase rapidly during adolescence, making it a critical period for the study of the relationship between anxiety and suicide-related behaviors. It has been suggested that clinicians do not routinely investigate suicide risk in patients with anxiety disorders leading to an underreporting of suicidal thoughts and behaviors in these patients (Noyes, 1991). In the following sections, we separately review research on suicidal ideation, nonfatal suicide attempts, and suicide as they relate to each of the four criteria for establishing anxiety as a risk factor for suicide-related behaviors, including studies investigating the bivariate association between anxiety and suicide-related behaviors (Criterion 1); studies that address potential third variables (Criterion 2); studies examining whether anxiety temporally precedes suicide-related behaviors (Criterion 3); and studies that address the temporal stability of anxiety across suicide-related behaviors (Criterion 4). Tables 1–4 provide lists of studies in each of these groupings.

Table 1
Studies addressing the association between anxiety and suicide-related behaviors (Criterion 1).

Study	Sample (n)	Anxiety measure	Suicide measure	Main finding
Apter et al. (2003)	Psychiatric inpatients (n = 348)	OCD	Attempts	Patients with a primary diagnosis of OCD had a lower rate of suicide attempts than those with primary diagnoses of schizophrenia, affective disorders, conduct disorder, and eating disorders.
Beautrais (2003)	Suicide victims (n = 60), attempters (n = 125) and non-suicidal controls (n = 151)	Any anxiety disorder	Deaths, attempts	Suicide victims did not significantly differ from suicide attempters or non-suicidal controls in rates of anxiety disorder diagnoses.
Biuckians, Miklowitz, and Kim (2007)	Treatment study subjects with bipolar disorder (n = 25)	Symptoms	Ideation, attempts	Anxiety scores were associated with suicide attempts/gestures.
Brent et al. (1988)	Suicide victims and suicidal inpatients (n = 83)	Several anxiety disorder diagnoses	Ideation, attempts, deaths	No significant differences were found between suicidal psychiatric inpatients and suicide victims in rates of simple phobia, social phobia, agoraphobia, overanxious disorder, panic disorder, or separation anxiety disorder.
Brent et al. (1993)	Suicide victims and community controls (n = 67)	Any anxiety disorder	Deaths	Suicide victims did not have significantly more anxiety disorders than community controls.
D'Eramo, Prinstein, Freeman, Grapentine, and Spirito (2004)	Psychiatric inpatients (n = 104)	PTSD, GAD, any anxiety disorder	Ideation, attempts	There were no significant differences between non-suicidal youth, suicidal ideators, suicide attempters, and multiple attempters in PTSD or GAD diagnosis or any anxiety disorder diagnosis.
Fergusson and Lynskey (1995)	Representative community sample (n = 954)	Any anxiety disorder	Attempts	Those with a current anxiety disorder were more likely to have made a suicide attempt than those without an anxiety disorder.
Goldston, Daniel, Reboussin, and Kelley (1996)	Psychiatric inpatients (n = 225)	Symptoms	Ideation, attempts	Previous and multiple attempters evidenced higher levels of trait anxiety, but not state anxiety, than did non-attempters.
Horesh and Apter (2006)	Inpatient suicide attempters and non-suicidal controls (n = 87)	Symptoms	Attempts	Suicidal adolescents had higher ratings of state and trait anxiety than non-suicidal inpatients.
Kosky, Silburn, and Subrick (1990)	Suicidal outpatients (n = 340)	Symptoms	Ideation, attempts	Suicidal ideators and suicide attempters did not have significant differences in the number of anxiety symptoms
Marttunen, Aro, Henriksson, and Lonnqvist (1991)	Suicide victims (n = 53)	Any anxiety disorder	Deaths	Only two of the 53 adolescent suicide victims were determined to have had an anxiety disorder.
Myers et al. (1991)	Adolescents with an MDD diagnosis and non-psychiatric controls (n = 138)	SAD symptoms	Ideation, attempts	SAD symptoms did not predict suicidal ideation and suicide attempts in regression models.
Palwak, Pascual-Sanchez, Rae, Fischer, and Ladame (1999)	Suicide attempters and outpatient controls (n = 80)	Any anxiety disorder	Attempts	Suicide attempters and non-attempters had similar rates of anxiety disorders.
Rich, Sherman, and Fowler (1990)	Suicide victims (n = 7)	Any anxiety disorder	Deaths	None of the seven adolescent suicide victims were determined to have had an anxiety disorder.
Ruchkin, Schwab-Stone, Kuposov, Vermeiren, and King (2003)	Incarcerated Russian males with Conduct Disorder (n = 271)	SAD, PTSD, any anxiety disorder	Ideation, attempts	Both suicidal ideators and suicide attempters had higher rates of SAD, PTSD, and any anxiety disorder than non-suicidal youths.
Shaffer et al. (1996)	Suicide victims and community controls (n = 120)	Any anxiety disorder	Deaths	27% of the suicide victims were determined to have had an anxiety disorder; this did not differ significantly from matched community controls.
Woods, Silverman, Gentilini, Cunningham, and Grieger (1991)	High school students (n = 167, 368)	Symptoms	Ideation	Suicide ideators had higher mean anxiety scores than non suicide ideators.

Table 2
Studies addressing potential third-variables (Criterion 2).

Study	Sample	Anxiety measure	Suicide measure	Covariates	Main finding
Beautrais, Joyce, and Bulder (1996)	Serious suicide attempters and community controls (n = 282)	Any anxiety disorder	Attempts	Other psychiatric diagnoses	Anxiety disorders were not associated with risk for suicide attempts, controlling for comorbid diagnoses.
Boden, Fergusson, and Horwood (2007)	Representative community sample (n = 1025)	Any anxiety disorder, PD, GAD, specific phobia	Ideation, attempts	Other psychiatric diagnoses, life stress	Presence of any anxiety disorder was associated with increased risk of suicidal ideation or suicide attempt among 16–18 year olds.
Carter, Silverman, Allen, and Ham (2008)	Anxiety disorders outpatients (n = 252)	Symptoms	Ideation	Depressive symptoms	Suicide ideators had higher mean scores of anxiety than non-ideators. Anxiety predicted suicidal ideation, even controlling for depressive symptoms.
Esposito and Clum (2002)	At-risk high school students (n = 73)	GAD	Ideation	Depressive symptoms	GAD diagnosis was significantly associated with suicidal ideation scores, but not after controlling for depression.
Foley, Goldston, Costello, and Angold (2006)	Representative community sample (n = 1420)	Any anxiety disorder	Ideation, attempts	Other psychiatric diagnoses, demographics	Controlling for demographics and other disorders, anxiety disorders were not independent predictors of suicide risk. Comorbid depression and anxiety was one of the strongest predictors of suicide risk.
Ghaziuddin, King, Naylor, and Ghaziuddin (2000)	Psychiatric inpatients (n = 56)	Symptoms	Ideation	Depressive symptoms	Anxiety predicted suicidal ideation, controlling for depression.
Goldston et al. (1999)	Psychiatric inpatients (n = 180)	Symptoms	Attempts	Demographics, psychiatric diagnoses, suicide attempt history	Anxiety disorders did not predict suicide attempts in the 5 years after discharge. Trait anxiety was related to an increase in risk for suicide attempts.
Gould et al. (1998)	Representative community sample (n = 1285)	Any anxiety disorder, panic attacks	Ideation, attempts	Demographics	Panic attacks were associated with suicide attempt or suicidal ideation for females, but not males. Presence of any anxiety disorder associated with increased risk of suicidal ideation or suicide attempt.
Greene, Chorpita, and Austin (2009)	Outpatients (n = 88)	Symptoms	Ideation	Depressive symptoms	The correlation between anxiety and suicidal ideation was significant, but not after controlling for depression.
Lewinsohn, Rohde, and Seeley (1996)	Representative community sample (n = 1709)	Any anxiety disorder	Ideation, attempts	MDD diagnosis	Rates of suicide attempts were not significantly different between those with both MDD and an anxiety disorder and those with MDD alone.
Ohring et al. (1996)	Psychiatric inpatients (n = 118)	Symptoms	Attempts	Depressive symptoms	Trait, but not state, anxiety was associated with suicide attempt, controlling for depression.
Pilowsky, Wu, and Anthony (1999)	School sample (n = 1580)	Panic attacks	Attempts	MDD diagnosis, demographics, alcohol/drug use	Those with panic attacks were three times more likely to have made a suicide attempt than were adolescents without panic attacks, controlling for demographics, MDD, and alcohol and illicit drug use
Prinstein, Boergers, Spirito, Little, and Grapentine (2000)	Psychiatric inpatients (n = 96)	Symptoms	Ideation	Other psychological symptoms	Anxiety symptoms were significantly associated with suicidal ideation but, not after controlling for other psychological symptoms.
Steer, Kumar, and Beck (1993)	Psychiatric inpatients (n = 108)	Symptoms	Ideation	Demographics, mood disorders, depressive symptoms, suicide attempt history	Anxiety was not associated with suicidal ideation after controlling for depression.
Strauss et al. (2000)	Outpatients (n = 1979)	Several anxiety disorder diagnoses	Ideation, attempts	Age	No differences were observed between attempters, ideators, or non-suicidal youths for panic disorder, agoraphobia, simple phobia, social phobia, or obsessive-compulsive disorder.
Thompson, Mazza, Herting, Randell, and Eggert (2005)	Potential high school dropouts (n = 1287)	Any anxiety disorder	Ideation, attempts	Depressive symptoms, hopelessness, gender	Depression and hopelessness mediated the effect of anxiety on suicidal behaviors for males, but only hopelessness was a mediator for females.
Valentiner, Gutierrez, and Blacker (2002)	School sample (n = 138)	Symptoms	Ideation	Depressive symptoms	Tense/Restless scales accounted for unique variance in suicidal ideation, controlling for levels of depression.

Studies outlined in the following sections were required to (a) include a measure of anxiety diagnoses or anxiety symptoms; (b) include a measure of suicidal ideation, nonfatal suicide attempt, or suicide (e.g., medical examiner's report); (c) report quantitative findings relevant to the relationship between anxiety and suicide-related behaviors; and (d) be published on or after 1988, the year of Mattison's earlier review of this topic. Furthermore, each study was required to have a focus on children or adolescents, defined as measurement of anxiety before age 18 and reporting on (a) the association between anxiety and suicide-related behaviors in subjects under the age of 18 and/or (b) the prospective

association between anxiety measured before age 18 and later suicidal behaviors. We acknowledge the somewhat arbitrary nature of the age 18 cut off, but believe that it represented the most logical decision based on typical developmental experiences (e.g., completion of high school, legal emancipation in the United States) and the most commonly used age boundaries in past research. In cases where a study sample included both adolescents and emerging adults, the study was included only if the sample consisted primarily of adolescents (e.g., age range of 14–20 years) or if the adolescent results could be clearly distinguished from those of the adults.

Table 3

Studies addressing the prospective association between anxiety and suicide-related behaviors (Criterion 3).

Study	Sample	Anxiety measure	Suicide measure	Main finding
Goldston et al. (1999)	Psychiatric inpatients (n = 180)	Symptoms	Attempts	Anxiety disorders did not predict suicide attempts in the 5 years after discharge. Trait anxiety was related to an increase in risk for suicide attempts, controlling for attempt history, psychiatric diagnoses, and demographics.
Lewinsohn et al. (1994)	Representative school-based sample (n = 1508)	Symptoms	Attempts	Internalizing behavior problems predicted suicide attempts in the year after enrolling, but not after controlling for depression.
Weissman et al. (1999); Rao, Weissman, Martin, and Hammond (1993); Wolk and Weissman (1996)	Outpatients with an anxiety disorder (n = 218)	Any anxiety disorder	Attempts, deaths	Young adults with a diagnosis of anxiety disorder in childhood were not at higher risk of lifetime suicide or suicide attempts at a 10–15 year follow-up.

3.1. Criterion 1: Is there an association between anxiety and suicide-related behaviors?

Several investigations have examined the cross-sectional relations between anxiety and suicide-related behaviors (see Table 1 for a listing). One study focused on suicidal ideation as the only outcome, eleven studies examined suicide attempts alone or in addition to suicidal ideation, and five focused on suicide. Studies that controlled for the influence of covariates beyond demographic variables are outlined under Criterion 2 and are thus omitted here. The only study to analyze anxiety and suicidal ideation alone used two samples of high school students (167 and 368 students) and found that students who reported suicidal ideation also reported higher scores on dimensional measures of state anxiety and trait anxiety than students without suicidal ideation (Woods et al., 1991).

Several studies have measured both suicide attempts and suicidal ideation as outcome variables. In a sample of 271 incarcerated Russian male juvenile delinquents ages 14–19 years, both suicidal ideators and suicide attempters had higher rates of SAD, PTSD, and any anxiety disorder than the non-suicidal comparison group (Ruchkin et al., 2003). Furthermore, in another study, anxiety symptom scores were found to predict a composite score of the number, medical lethality, and seriousness of all reported suicide attempts/gestures among 25 treatment-seeking adolescents with a primary diagnosis of bipolar disorder (Biuckians et al., 2007).

Goldston et al. (1996) divided 225 adolescents in an inpatient psychiatric facility into four groups: 27 first time attempters, 32 multiple attempters, 40 previously (but not currently) suicidal youths; and 126 non-attempters. Results indicated that previous attempters and multiple attempters endorsed higher levels of self-reported trait anxiety, but not state anxiety, than did non-attempters. First time attempters did not significantly differ from any of the other three groups.

Other studies have not found support for a relationship between anxiety and suicidal ideation or suicide attempts. A study comparing 82 suicide attempters with 258 suicidal ideators from outpatient mental health facilities found that both suicide attempters and suicidal ideators had similarly high rates of anxiety symptoms (Kosky et al., 1990). Parallel results were found for SAD symptoms: in a sample of 138

children and adolescents recruited from inpatient and outpatient psychiatric services, ages 7–17 years, with either a MDD diagnosis or a non-psychiatric control group, SAD symptoms did not predict suicidal ideation or suicide attempts (Myers et al., 1991). A study of 104 psychiatrically hospitalized adolescents found no significant differences between non-suicidal youths, suicidal ideators, suicide attempters, and multiple attempters, in rates of GAD, PTSD, or any anxiety disorder, though group sizes were small, ranging from 19 to 30 individuals each (D'Eramo et al., 2004).

A few studies have also looked at suicide attempts as the only outcome variable, without including a sample of non-attempting suicidal ideators for comparison. Data from the Christchurch Health and Development Study, following a birth cohort of 954 children, indicated that 14–16-year-old adolescents with an anxiety disorder were 4.9 times more likely to have made a suicide attempt than those without an anxiety disorder diagnosis (Fergusson & Lynskey, 1995). In addition, both state and trait anxiety have been associated with the presence of a suicide attempt among inpatient adolescents: In a sample of 87 inpatient adolescents, adolescents with a history of a suicide attempt had higher ratings of dimensional state and trait anxiety than non-suicidal inpatients (Horesh & Apter, 2006).

Two additional studies failed to find a significant association between anxiety and suicide attempts (Apter et al., 2003; Palwak et al., 1999). Apter et al. (2003) reported that, in their sample of 348 psychiatric inpatients, adolescents with OCD had a lower rate of suicide attempts than patients who had primary diagnoses of schizophrenia, affective disorder, conduct disorder, or eating disorders. It should be mentioned however, that only four patients with OCD had attempted suicide, which raises concern about the reliability of the finding. Focusing on the effect of anxiety disorder on suicide attempts in women, Palwak et al. (1999) analyzed data on 80 patients, ages 15–20 years, from an outpatient clinic. They found similar rates of anxiety disorder diagnosis among those with and without a history of suicide attempt. However, attempters had a much higher rate of affective disorders, and 95% of suicide attempters with an anxiety disorder also had a comorbid depressive disorder.

Several studies assessed presence of anxiety disorders among suicide victims, however, none reported a significant association between anxiety

Table 4

Studies addressing the temporal stability of anxiety across suicide-related behaviors (Criterion 4).

Study	Sample	Anxiety measure	Suicide measure	Main finding
Fergusson, Horwood, Riddler, and Beautrais (2005)	Representative community sample (n = 1265)	Any anxiety disorder	Attempts	Subjects with a history of suicidal ideation or a suicide attempt had significantly higher rates of anxiety disorders in early adulthood, but not after adjusting for confounding factors.
Goldston, Daniel, Reboussin, and Kelley, 1996; Goldston et al. (1998)	Psychiatric inpatients (n = 225)	Symptoms and any anxiety disorder	Ideation, attempts	Previous and multiple attempters evidenced higher levels of trait anxiety, but not state anxiety, than did non-attempters. There were no significant differences in anxiety disorder diagnoses.

and death by suicide. A study of 60 youths who died by suicide, 125 youths who made serious suicide attempts, and 151 nonsuicidal youths ages 14–24 years found no significant differences in the rate of anxiety disorders between those who died by suicide and either suicide attempters or control subjects (Beautrais, 2003). Another study comparing 27 suicide victims with 56 suicidal psychiatric inpatients (including both suicide attempters and suicidal ideators) found no significant differences in the rates of simple phobia, social phobia, agoraphobia, overanxious disorder, PD, or SAD between the two groups (Brent et al., 1988). However, rates of these disorders in the sample were low (ranging from 0% to 14.8% of the individual groups). In the San Diego Suicide Study, a psychological autopsy study of 283 suicide victims in San Diego County between 1981 and 1983, only 7 victims were 13–17 years of age. None of the adolescent victims were determined to have had an anxiety disorder (Rich et al., 1990). A Finnish psychological autopsy study of 53 adolescents ages 13–19 years, reported that 4% (two participants) had an anxiety disorder (Marttunen et al., 1991). Another study of 120 suicide victims all under the age of 20 years reported that 27% of subjects had an anxiety disorder, though this rate did not significantly differ between subjects and controls (Shaffer et al., 1996). Finally, Brent et al. (1993) compared 67 suicide victims with 67 matched community controls in a psychological autopsy study. Although the rate of anxiety disorders was nearly four times as high among suicide victims than among controls, this difference was not significantly significant after correcting for multiple comparisons. Other studies of suicide victims may have assessed anxiety disorders among other psychological diagnoses, but did not report them, possibly indicating null findings (e.g., Graham & Burvill, 1992).

It should be noted that the studies outlined in the following sections (Criteria 2, 3, and 4) provide evidence in support of Criterion 1, as more complex analysis (e.g., entering covariates into the analysis) was conducted only after finding a significant bivariate association between anxiety and suicide-related behaviors.

3.2. Criterion 2: Is the association between anxiety and suicide-related behaviors due to a third-variable?

Several research studies examined possible third variables that might account for the relationship between anxiety and suicide-related behaviors, with mixed results (see Table 2). Again, it should be noted that studies reviewed in this section provide support for Criterion 1, as examination of multivariate associations was conducted only where significant bivariate associations were found. It also should be noted that we found no studies that controlled for third variables when examining the association between anxiety and death, most likely because past research has failed to find a significant bivariate association between these variables. The remainder of this section therefore focuses on suicidal ideation and attempts.

With regard to suicidal ideation, three studies found that the association between anxiety and suicidal ideation remained significant after controlling for dimensional depression scores (Carter et al., 2008; Ghaziuddin et al., 2000; Valentiner et al., 2002), although four other studies found that the relationship did not remain significant after controlling for dimensional depression scores (Esposito & Clum, 2002; Greene et al., 2009; Prinstein et al., 2000; Steer et al., 1993).

Carter et al. (2008) identified a sample of 126 children and adolescents with suicidal ideation and 126 controls without suicidal ideation from an outpatient clinic, all 252 of whom were 7–16 years of age and had a primary diagnosis of anxiety disorder. They found that the suicidal ideation group had a higher mean score on a dimensional measure of anxiety symptoms than the non-suicidal group. In addition, when removing overlapping items from both the depression and anxiety scales, anxiety predicted suicidal ideation, even controlling for depression scores. Similar results were found by Ghaziuddin et al. (2000): In a sample of 56 inpatient adolescents, anxiety symptoms predicted suicidal ideation after controlling for depression scores, accounting for 24% of the variation in suicidal ideation. Similarly, a

study of 138 high school students, ages 14–18 years, used two scales of panic symptoms. Scores on these scales accounted for unique variance in suicidal ideation above and beyond variance accounted for by depression (Valentiner et al., 2002).

In contrast, some studies have reported that the association between anxiety and suicidal ideation does not remain significant when controlling for other psychiatric symptoms. Greene et al. (2009) found that anxiety symptoms were not significantly correlated with suicidal ideation after controlling for depression in a sample of 88 adolescent outpatients. Similar results were found in a study of 96 adolescent psychiatric inpatients, ages 12–17 years, where anxiety symptom scores did not independently predict suicidal ideation when controlling for other psychiatric symptoms (Prinstein et al., 2000). In a study of 73 high school students identified by school personnel as having an emotional disturbance, GAD diagnosis was not significantly associated with suicidal ideation scores after controlling for depressive symptoms (Esposito & Clum, 2002).

Still another study found that the relationship between anxiety and suicidal ideation persisted after controlling for depression diagnoses, but not after controlling for depressive symptom scores on a dimensional measure. Steer et al. (1993) investigated the role of anxiety and suicidal ideation using a sample of 108 adolescents, ages 12–17 years, recruited from an inpatient psychiatric unit. In regression analyses, a dimensional measure of anxiety significantly predicted suicidal ideation when controlling for gender, ethnicity, age, past suicide attempt history, and mood disorder diagnoses, but not when a dimensional measure of depressive symptoms was added to the model.

As with the studies outlined under Criterion 1, a number of studies examined both suicidal ideation and suicide attempt as outcomes. One large epidemiological study of children and adolescents reported significant associations between the presence of any anxiety disorder and suicide-related behaviors (Gould et al., 1998). In a sample of 1285 randomly selected 9–17 year old children and adolescents from the community, presence of any anxiety disorder in the past six months was associated with a three-fold increase in the odds of suicidal ideation and an almost six-fold increase in the odds of suicide attempt, both measured in the previous 6 months, adjusted for demographic variables (Gould et al., 1998). This study also found that the presence of panic attacks was a significant predictor of being in a combined suicide attempter/suicide ideator group for girls, but not for boys.

Additional data from the Christchurch Health and Development Study, a longitudinal study of a birth cohort followed through age 25 years, found that, of the 1025 participants followed up at ages 16–18 years, those with specific phobias, PD, GAD, or any anxiety disorder diagnosis had higher rates of suicidal ideation and suicide attempts than those without these diagnoses (Boden et al., 2007). After adjusting for co-occurring disorders and life stress, presence of any anxiety disorder remained a significant predictor of suicidal ideation and suicide attempts in the same period, though results for the individual disorders were mixed.

Data from 1420 youth from the community, ages 9–16 years, who participated in the Great Smoky Mountains study, supported the incremental validity of anxiety diagnoses in the prediction of any non-fatal suicidal behavior (wish to die, ideation, plan, or attempt), even controlling for other psychiatric disorders (Foley et al., 2006). After controlling for age, sex, race, and poverty, however, anxiety disorder was no longer a significant predictor of suicide-related behaviors. Presence of comorbid depression and anxiety was one of the strongest predictors of suicide risk (Foley et al., 2006). These results indicated that (a) anxiety disorder was associated with increased risk for suicide-related behavior above and beyond the effects of other psychiatric disorders, (b) the risk conferred by anxiety disorder was not independent of sociodemographic factors, and (c) anxiety disorder conferred the greatest risk in the presence of comorbid depression.

In a study of 1709 community adolescents, 14–18 years of age, who completed at least one visit as part of the Oregon Adolescent Depression

Project, the rates of suicide-related behaviors were low among participants who met lifetime criteria for an anxiety disorder but did not meet criteria for comorbid MDD: 5.4% for suicidal ideation and 2.0% for a suicide attempt (Lewinsohn et al., 1996). Rates were considerably higher among adolescents who met criteria for MDD, either in isolation or comorbid with an anxiety disorder. Moreover, suicide attempt rates did not significantly differ between those with comorbid anxiety-MDD and MDD without comorbid anxiety (Lewinsohn et al., 1996).

Thompson et al. (2005) proposed a theoretical model of anxiety, depression, and hopelessness in relation to suicidal behaviors (including ideation, threats, and prior attempts). In their model, the effects of anxiety symptoms on suicidal ideation, suicide threats, and past suicide attempts would be mediated by depression and hopelessness. Using a sample of 1287 high school students identified as at risk for dropping out, tests of several models revealed that both depression and hopelessness mediated the relationship between anxiety symptoms and suicidal behaviors among boys, and hopelessness (but not depression) mediated the relationship among girls. The authors concluded that anxiety may have an important role in predicting suicidal behaviors in youth but that this link operates via the influence of anxiety on depression and hopelessness.

Some research has found different results for suicidal ideators and suicide attempters in the context of a single study. In a study of 1979 participants from an outpatient clinic, Strauss et al. (2000) did not find any significant differences between suicide attempters, suicide ideators, or non-suicidal youths as a function of PD, agoraphobia, simple phobia, social phobia, or OCD diagnoses. Among those under 15 years of age, however, suicide attempters had fewer cases of SAD than suicide ideators or non-suicidal participants. Among those over 15 years of age, the rate of GAD was significantly higher among suicide ideators than the non-suicidal group. Thus, this study, like Foley et al. (2006), found that a demographic variable may account for part of the relationship between anxiety and suicide-related behaviors.

Four other studies considered the relationship between anxiety and suicide attempts, but not suicidal ideation, controlling for possible third variables; again, these drew mixed conclusions. Dimensional trait anxiety, but not state anxiety, remained significantly associated with suicide attempts even after controlling for depressive symptoms in a sample of 118 inpatient adolescents (Ohring et al., 1996). In a study by Goldston et al. (1999), 180 previously psychiatrically hospitalized adolescents were followed for 5 years post discharge. Conduct disorder and oppositional defiant disorder, but not anxiety disorders, predicted suicide attempts, controlling for sociodemographic variables and previous attempt history. However, after covarying sociodemographic variables, previous attempt history, and baseline psychiatric diagnoses, a baseline dimensional measure of trait anxiety was related to a slight increase in the hazard for suicide attempts in the 5 years post discharge, but similarly measured state anxiety was not (Goldston et al., 1999). Pilowsky et al. (1999) found that, among 1580 students, 13–14 year olds with panic attacks were three times more likely to have made a suicide attempt than were adolescents without panic attacks, after controlling for demographics, MDD, and alcohol and illicit drug use. In a study of 129 13–24 year olds who had made a serious suicide attempt and 153 nonsuicidal control subjects, Beautrais et al. (1996) found that presence of an anxiety disorder was associated with a three-fold increase in odds for suicide attempt, but that the association was not significant after controlling for comorbid diagnoses.

3.3. Criterion 3: Does anxiety temporally precede suicide-related behaviors?

To determine if anxiety can be considered a risk factor for suicide-related behaviors, it is necessary to show that anxiety is present in youth before suicide-related behaviors occur. Such demonstration calls for prospective longitudinal studies. Due to the resource-intensive nature of these designs, few studies have examined the temporal relations

between anxiety and suicide-related behaviors in children and adolescents. Each of them reported suicide attempts as their outcome (see Table 3).

In the Goldston et al. (1999) study described in the evidence in support of Criterion 2, trait anxiety, but not state anxiety, was related to increased hazard of suicide attempts 5 years after discharge from a psychiatric hospital, among 180 adolescents. This finding is consistent with the notion that trait anxiety, as compared to state anxiety, may have a more persistent effect on suicide risk over time (Goldston, Reboussin, & Daniel, 2006).

Using a less conventional, proxy measure of anxiety, Lewinsohn et al. (1994) reported findings from 1508 adolescents drawn from the Oregon Adolescent Depression Project, a longitudinal community study. Internalizing behavior problems at baseline were associated with a four-fold increase in odds for suicide attempts in the year after study entry. Internalizing behavior problems were defined as a combination of items addressing worry, hypomanic episodes, state anxiety, quantity and nature of sleep, and hypochondriasis. Though not a pure measure of anxiety, the elements included both state anxiety and constructs related to anxiety (e.g., worry).

Additionally, Weissman and colleagues conducted a 10–15 year follow-up of 218 prepubertal children ages six and above, diagnosed with MDD, an anxiety disorder, and non-psychiatric controls. Those with a childhood anxiety disorder were not at increased risk for lifetime suicide attempt compared to the MDD group and the non-psychiatric control group (Weissman et al., 1999; Wolk & Weissman, 1996). Data from the same study reported no significant association between childhood anxiety disorder diagnosis and suicide by age 16–28 years (Rao et al., 1993). The authors identified seven suicide deaths among those enrolled in the study and all were among participants initially diagnosed with MDD, none were among those in the group diagnosed with an anxiety disorder.

3.4. Criterion 4: Is anxiety temporally stable across suicide-related behaviors?

This fourth criterion requires that anxiety displays some degree of stability independent of suicide-related behaviors (i.e., among children and adolescents who have experienced suicide-related behaviors, anxiety occurs at least some times when suicidal behaviors do not). In its simplest form, this criterion is satisfied by studies that provide evidence for the temporal precedence of anxiety (Lewinsohn et al., 1994), demonstrating that a subset of children and adolescents with anxiety at one point in time develop suicide-related behaviors at a later point. An additional form of temporal independence would be found in the persistence or recurrence of anxiety following the resolution of non-fatal suicidal behaviors (for obvious reasons, this would not be applicable to suicide). To our knowledge, this latter form of temporal independence has not been addressed directly in prior research.

Some investigations have addressed this issue indirectly by comparing the rates of anxiety between individuals with and without prior histories of suicide-related behaviors (see Table 4). A report from a cross-sectional study of 225 adolescent psychiatric inpatients indicated that adolescents with a past (but not recent) history of suicide attempt displayed significantly elevated levels of self-reported trait anxiety compared to adolescents who had never made a suicide attempt (Goldston et al., 1996). In contrast, the two groups did not significantly differ in the rate of anxiety disorder diagnosis (Goldston et al., 1998). Similarly, a report on 1265 people from the Christchurch Health and Development Study found that a history of suicidal ideation and suicide attempt in adolescence significantly predicted a higher rate of anxiety disorder in early adulthood, but that these associations did not remain significant after adjusting for confounding factors (Fergusson et al., 2005).

Finally, the most stringent form of temporal independence would require evidence that anxiety preceded the development of suicide-

related behaviors and persisted following the resolution of non-fatal suicide-related behaviors. We found no studies that reported on the presence of anxiety before and after suicide-related behaviors, although the data necessary to address that issue may be available in a small number of existing prospective epidemiological studies.

4. Summary and integration of past research

As noted above, the following criteria must be met for anxiety to be considered a causal risk factor for suicide-related behaviors: It must (1) be significantly and consistently associated with suicide-related behaviors, (2) predict suicide-related behaviors above and beyond the effects of a third variable or set of variables, (3) temporally precede suicide-related behaviors, and (4) exhibit some degree of stability independent of suicide-related behaviors (Alloy et al., 1999; Garber & Hollon, 1991). The evidence to date is mixed and will be summarized in the following paragraphs.

Evidence for the first criterion generally supports a relationship between anxiety and suicidal ideation and attempts (Biuckians et al., 2007; Esposito & Clum, 2002; Fergusson & Lynskey, 1995; Goldston et al., 1996; Horesh & Apter, 2006; Lewinsohn et al., 1996; Prinstein et al., 2000; Ruchkin et al., 2003; Valentiner et al., 2002; Woods et al., 1991), but not suicide (Beautrais, 2003; Brent et al., 1988, 1993; Marttunen et al., 1991; Rich et al., 1990; Shaffer et al., 1996). Methodological issues may have played a role in the few studies that failed to find a significant association between anxiety and suicide-related behaviors. One found different effects for trait than state measures of anxiety (Goldston et al., 1996), whereas others may have lacked sufficient statistical power to detect an effect due to a small sample size (e.g., Brent et al., 1993, which included only 10 participants who met criteria for an anxiety disorder; Rich et al., 1990, which only included seven adolescent participants) or to the very high rates of anxiety disorder among both suicidal and control patients in clinical samples (Myers et al., 1991; Palwak et al., 1999) or among both suicide attempts and suicidal ideators (Kosky et al., 1990). Still other studies may have failed to find a significant relationship between anxiety and suicide-related behaviors and not reported their null findings in the literature (i.e., the “file drawer” phenomenon). Thus, it is possible that contradictory evidence is underestimated.

The second requirement for establishing anxiety as a causal risk factor for suicidal thoughts and behaviors is that the association between these variables not be due to the influence of a third variable. The most likely candidate for such a third variable is depression, whether measured dimensionally or as a diagnosis, because of the high covariance between and co-occurrence of anxiety and depressive disorders (Angold et al., 1999). Unfortunately, a large number of the studies cited in this review did not control for depressive symptoms or a depressive disorder diagnosis. Among those that did control for depression, evidence is inconclusive: There seems to be consensus between two studies that found a link between panic attacks or panic symptoms and suicidal ideation and attempts (Pilowsky et al., 1999; Valentiner et al., 2002). Three other studies considering anxiety disorders as a class found that the association between anxiety and suicidal ideation or suicide attempt did not remain significant when controlling for depression (Foley et al., 2006; Lewinsohn et al., 1996; Thompson et al., 2005). Still another study measuring anxiety as a dimensional construct concluded that trait anxiety, but not state anxiety, remained a significant predictor of suicidal thoughts (Ohring et al., 1996). Foley et al. (2006) found that anxiety disorder remained an independent predictor of suicidal thoughts and behaviors after controlling for depression and other psychiatric disorders, but not once demographic variables were controlled, whereas others (e.g., Gould et al., 1998) found an association after controlling for demographic factors. Foley et al. (2006) did note, however, that the combination of depression and anxiety disorders was associated with the highest rate of suicidal outcomes. Thus, it seems that children and adolescents presenting with a coexisting mood and anxiety disorder may be at a higher risk of suicidal behaviors than those with either a

mood or anxiety disorder individually, although contradictory findings exist (Lewinsohn et al., 1996).

Another candidate for a confounding third variable is negative emotionality, the tendency to experience negative emotions (Naragon-Gainey & Watson, 2010). It has been suggested that some of the variance in suicidal ideation may be accounted for by negative emotionality (Naragon-Gainey & Watson, 2010), which seems to have a robust relationship with depression, anxiety, and suicidal ideation. None of the studies reviewed here controlled for negative emotionality, however. These same authors suggested that controlling for other anxiety disorders, in addition to depressive disorders, can help isolate the influence of a specific anxiety disorder, though studies with these more stringent criteria may be less likely to find significant results. Again, none of the studies reviewed here used such stringent controls.

With regard to the third criterion, to our knowledge only three studies examined the prospective relationship between anxiety and suicide-related behaviors. Lewinsohn et al. (1994) found that their measure of internalizing behavior problems, a proxy for anxiety, was related prospectively to a four-fold increase in odds for suicide attempt over 1 year. Goldston et al. (1999) conducted a 5-year follow-up study of previously psychiatrically hospitalized adolescents. In their study, dimensional trait anxiety (but not state anxiety) predicted suicide attempts during the 5-year follow-up period. The presence of an anxiety disorder, however, did not predict suicide attempts during this period. Finally, a 10–15 year follow-up of children diagnosed with either MDD or an anxiety disorder and non-psychiatric controls did not find an increased risk of either suicide or suicide attempts associated with childhood anxiety disorder diagnosis (Weissman et al., 1999; Wolk & Weissman, 1996). As a result, evidence for the third criterion is mixed and not sufficient to either affirm or deny the presence of a temporal relationship, although it does suggest that future studies consider anxiety as both a dimensional construct and as a class of disorders.

We are not aware of evidence in support of the stability of anxiety over the onset and offset of suicidal behaviors (Criterion 4). Two investigations indirectly addressed this issue (Fergusson et al., 2005; Goldston et al., 1996, 1999) but the evidence was mixed and these studies alone are not sufficient to support or deny the fulfillment of this criterion. Longitudinal epidemiological data would be ideal for this purpose, to determine if anxiety or anxiety disorders were present before suicide-related behaviors and remained present after those behaviors diminished.

5. Future directions

A sizable number of studies have examined the relationships between anxiety and suicide-related behaviors in children and adolescents. These studies have been informative in documenting associations between the two broad constructs in youth. Even so, a number of gaps in the current literature and knowledge base need to be addressed before more definitive conclusions can be drawn regarding the role of anxiety in suicide-related behaviors in children and adolescents. We organize our discussion of future directions around four primary themes: (1) the third variable problem, (2) measurement issues, (3) temporal considerations, and (4) the value of theory-driven research.

5.1. The third variable problem

First, many studies failed to control for the influence of other psychiatric diagnoses when considering the influence of anxiety on suicidal thoughts and behaviors. Given the high rates of diagnoses comorbid with anxiety (Angold et al., 1999; Youngstrom, Findling, & Calabrese, 2003), especially depression (Kessler et al., 2005), it is crucial to control for the effects of other psychiatric diagnoses in future work. This will aid in the effort to disentangle the effects of anxiety on suicide-related behaviors from the influence of other symptoms and diagnoses.

Future work would also benefit from a more systematic inclusion of personality-based constructs such as impulsivity and emerging borderline personality symptoms, given their important roles in suicide-related behaviors in youth (e.g., Javdani, Sadeh, & Verona, 2011; Muehlenkamp, Ertelt, Miller, & Claes, 2011)

In addition, future research should incorporate recent advances in understanding the structure of the anxiety and other internalizing disorders. Given the growing evidence in support of the distinction between fear-based and distress-based internalizing disorders (Lahey et al., 2004; Sellbom et al., 2008; Watson, 2005), it will be important to determine the independent relations of each with suicide-related behaviors, as well as the independent contributions of positive emotionality and negative emotionality to suicide-related behavior. Such research may reveal aspects of anxiety that enhance risk for suicide-related behaviors. This may prove useful for etiological models, risk assessment, and prevention strategies.

5.2. Measurement issues

As Carter et al. (2008) pointed out, measures matter when examining the relations between anxiety and suicide-related behaviors. Existing research suggests that associations between anxiety and suicidal outcomes are most likely to be detected using measures of stable, trait-like anxiety rather than measures of transient, state anxiety (Goldston et al., 1996, 1999; Ohring et al., 1996).

Another important consideration was raised by Carter et al. (2008). These authors compared two mediational models of anxiety, depression, and suicidal ideation in a cross-sectional study, where depression was theorized to mediate the influence of anxiety on suicidal ideation. In the first model, dimensional depression and anxiety inventories were used. In the second model, overlapping items were removed from each inventory, so that the depression scale did not include any anxiety-related items and vice versa. Results showed that anxiety was an independent predictor of suicidal ideation (partial, compared to full, mediation) only when overlapping items were removed from the two scales. This suggests that measurement issues may be confounding the relationship between anxiety and suicidal ideation *even when depression is statistically controlled*. None of the other studies cited in this review adjusted for item overlap in measures of depression and anxiety. Future research, must consider overlap between anxiety- and depression-related measures. Failing to consider overlapping item content may lead to inappropriately stringent statistical controls, masking the true relationship between anxiety and suicide-related behaviors.

5.3. Temporal relations

There is a very clear need for longitudinal research examining the temporal pathways between anxiety, other psychiatric disorders, and suicide-related behaviors. Few of the studies reviewed were longitudinal; most used cross-sectional designs, limiting their utility for determining temporal associations between factors. Of the reviewed investigations, only three took a prospective longitudinal approach (Goldston et al., 1999; Lewinsohn et al., 1994; Weissman et al., 1999; Wolk & Weissman, 1996). The work of Goldston et al. (1999) showed that dimensional measures of anxiety may capture more of the influence of anxiety on suicide risk than anxiety disorder diagnoses (this may be due to the greater statistical power afforded by a dimensional measure as compared to a dichotomous measure). Additionally, longitudinal research needs to measure anxiety symptoms both before and after episodes of suicidal ideation or a suicide attempt. Such research is necessary to confirm or disconfirm the possible causal risk status of anxiety and is quite valuable from a developmental perspective. Longitudinal multi-wave studies may provide critical information about the timing of suicide-related behaviors in relation to anxiety onset and offset, developmental periods of heightened risk, and the processes leading up to suicide-related behaviors among youth who

experience elevated anxiety. Future primary or secondary prevention trials may also be valuable for providing information about the temporal relationship between anxiety and suicide-related behaviors by measuring possible etiologic pathways (Costello & Angold, 2006; Howe, Reiss, & Yuh, 2002). Including measures of suicide-related behaviors in anxiety prevention trials and, vice versa, including measures of anxiety in suicide prevention efforts, may document the temporal relation between anxiety and onset suicide-related behavior. This would allow for testing anxiety as a mediator of effects in suicide prevention programs. Thus, research to investigate the fourth criterion for establishing anxiety as a risk factor for suicide-related behaviors may suggest the most effective targets for suicide-prevention programs.

5.4. Theory-driven and mechanistic research

Future research should seek to move beyond the demonstration of significant associations between anxiety and suicide-related behaviors in youth and focus on the identification of mechanisms that explain the links between anxiety and suicide-related behaviors. Such work will be most informative when guided by theoretical models of anxiety and suicide-related behaviors. Leading theories that may be most relevant include the interpersonal-psychological theory of suicide (IPT; Joiner, 2005), the looming vulnerability to threat model (LVM; Rector et al., 2008; Riskind, 1997; Riskind et al., 2000), Baumeister's (1990) escape theory, and the biomedical model (Shaffer & Craft, 1999).

The IPT asserts that the desire for death results when individuals experience a sense of social disconnection or failure to belong (thwarted belongingness) and also a sense that their life is a hardship for others (perceived burdensomeness). Suicide occurs, according to the IPT, when an individual with a desire for death also possesses the acquired capacity to enact lethal self-injury. The LVM proposes that a maladaptive looming style, which is characterized by a tendency to perceive multiple dangers as spatially or temporally drawing near, is a determinant in escalating anxiety. The perception of multiple looming threats induces anxiety and may be appraised as exceeding one's coping resources, leading to hopelessness. This situation engenders escape behaviors, including suicide. As described in Baumeister's (1990) theory, escape reflects a desire to disconnect from negative affect (e.g., high anxiety) by means of cognitive deconstruction, rejecting and avoiding meaningful thought. A restricted focus on proximal goals, on the immediate present, and on concrete sensations is evidence of cognitive deconstruction, as they distract from painful self-awareness. Suicide, in this model, is the deepest level of cognitive deconstruction; it is the final escape from painful self-awareness and negative affect (i.e., anxiety; see also Hendin, 1991 for examples). Another approach, the biomedical model, proposes that an active psychological disorder, when coupled with a stressful event, acute mood change, and an underlying or socially acquired disposition, culminates in suicide (Shaffer & Craft, 1999). Examples of theory-driven research topics in this area might include the extent to which anxiety promotes feelings of social disconnection and burdensomeness toward others (Joiner, 2005), whether suicidal thoughts and behaviors are maintained by avoidance and negative reinforcement (e.g., suppression of suicidal thoughts; Pettit et al., 2009), and the role of anxiety and looming threat in promoting hopelessness and urges to escape (Beauchaine, Neuhaus, Brenner, & Gatzke-Kopp, 2008).

In the context of such theory-driven work, research needs to incorporate information about the neural circuitry involved in anxiety and suicide-related behaviors (cf. Beauchaine et al., 2008). Substantial advances have been made in understanding the neural architecture of anxiety disorders in the past decade, with a primary focus on the "fear circuit" encompassing the amygdala, ventral prefrontal cortex, and the hippocampus (Pine, 2009). The majority of research on the neural architecture of suicide-related behaviors has focused on the "stress response system" of the hypothalamic adrenal axis and the serotonergic and noradrenergic systems (Mann & Currier, 2010). Rapidly

advancing research will provide an even clearer picture of the neural circuitry involved in these behaviors, which can both guide and constrain theories of how anxiety may relate to suicidal behaviors (Pine, 2006).

6. Clinical implications

It is clear that anxiety is a risk marker for suicide-related behaviors in children and adolescents. Even so, there is not yet sufficient evidence to confirm anxiety as a causal risk factor for suicide-related behaviors in this age group. As such, assessment of suicide-related behaviors should be routine practice among children and adolescents who present with anxiety. Screening for suicidal thoughts and behaviors is especially important when symptoms of depression are also present. In addition, clinicians who work with anxious youth should monitor other risk factors, including hopelessness, feelings of social disconnection and burdensomeness, and urges to escape painful experiences.

Conversely, clinicians who treat suicidal youth need to understand the relationship between state anxiety (e.g., stress) and trait anxiety (e.g., chronic worry or fear) and suicide risk. Knowing that a suicidal youth suffers from anxiety provides one possible avenue for managing an acute crisis (i.e., reducing anxiety). Thus, it is important for clinicians to assess both state and trait anxiety when working with youth at acute risk for suicide-related behaviors. We also speculate that interventions for anxiety may reduce the risk of suicide-related behaviors. Future work may shed light on this speculation. It is possible that untreated or unrelieved anxiety disorders represent missed opportunities for suicide prevention efforts, especially where they co-occur with depressive disorders. At present, this remains an open empirical question that needs to be addressed. The current literature represents promising first steps, but a great deal of work is still necessary to clarify the role of anxiety in suicide-related behaviors.

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