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Psychiatric Diagnoses as Contemporaneous Risk Factors for Suicide Attempts Among Adolescents and Young Adults: Developmental Changes

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Abstract

The purpose of this prospective, naturalistic study was to examine the relationships between suicide attempts and contemporaneous psychiatric disorders, and developmental changes in these relationships from adolescence to young adulthood. The sample consisted of 180 adolescents, 12-19 years of age at hospitalization, repeatedly assessed for up to 13 years (n = 1,825 assessments). Semistructured psychiatric diagnostic instruments were administered at repeated assessments to assess psychiatric disorders and suicide attempts. After controlling for demographic variables and prehospitalization suicide attempts, most contemporaneous psychiatric disorders (major depressive disorder [MDD], dysthymic disorder, generalized anxiety disorder [GAD], panic disorder, attention-deficit/hyperactivity disorder [AD/HD], conduct disorder, and substance use disorder [SUD]) were related to increased risk of attempts. The relationship between suicide attempts and MDD, GAD, AD/HD, and SUD strengthened as participants got older. MDD, dysthymic disorder, GAD, and panic disorder were more commonly associated with repeat than 1st-time suicide attempts. In sum, most major psychiatric disorders are associated with increased risk for suicide attempts, but the strength of the relationships between these disorders and attempts changes over the course of development.

Keywords

suicide attempts; psychiatric diagnoses; longitudinal; naturalistic; developmental psychopathology

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According to the *National Strategy for Suicide Prevention*, suicide attempts among adolescents and young adults occur at alarming rates, pose significant public health costs and burden, and are associated with increased likelihood for repeat suicide attempts and eventual death by suicide (U.S. Public Health Service, 2001). In efforts to better understand factors associated with increased risk for suicidal behavior, several community studies have examined the relationship between current psychiatric disorder and lifetime history of suicide attempts among adolescents (Andrews & Lewinsohn, 1992; Gould et al., 1998; Velez & Cohen, 1988). In studies focusing on lifetime histories of suicidal behavior, however, previous suicidal behavior may have occurred prior to the onset of the current psychiatric disorders (Foley, Goldston, Costello, & Angold, 2006). With cross-sectional studies of clinical samples, it has been possible to examine the relationships between psychiatric disorders and suicidal behavior occurring in the same window of time (e.g., Goldston et al., 1998). However, the period of time preceding hospitalization or entry into treatment is likely atypical, even for the highest risk young people.

Longitudinal studies of psychiatric disorders and suicidal behavior may help clarify proximal associations because they offer the opportunity to examine relationships between suicidal behaviors and psychiatric disorders occurring in the same period of time, without the biases associated with one-time assessments in clinical settings. In the seminal community longitudinal study of Lewinsohn, Rohde, Seeley, and Baldwin (2001), psychiatric disorders were examined as predictors of later suicide attempts but not as proximal risk factors for attempts. Pfeffer et al. (1993) relied upon a single follow-up assessment covering 6–8 years to determine that there was a higher risk of suicide attempts occurring in the same year as episodes of major depression and substance use. Nonetheless, the long follow-up period and single follow-up assessment may have resulted in recall bias for young people and adult informants. The Great Smoky Mountain Study (Foley et al., 2006), a community-based longitudinal study, examined suicide thoughts and attempts and psychiatric disorders occurring within the same 3-month window of time among adolescents 9–16 years of age. Eleven different psychiatric profiles differentiated suicidal and nonsuicidal youths, 9 of which involved depressive disorders by themselves or in combination with other disorders. In addition, anxiety and substance use disorders were found to only be related to suicidality when comorbid with other disorders. Nonetheless, this study focused on a broad composite variable of suicidality (thoughts of wanting to die, suicidal thoughts, suicide plans, suicide attempts) rather than attempts per se. The Pittsburgh Childhood Depression Project was a repeated assessments, longitudinal study of outpatient-referred children 8–13 years of age who were followed through late adolescence and young adulthood (Kovacs, Goldston, & Gatsonis, 1993). Suicide attempts were strongly related to concurrent affective disorders during the follow-up and were relatively infrequent in the presence of contemporaneous conduct or substance use disorder without comorbid depression. Kovacs et al.'s (1993) study, however, did not use longitudinal statistical methods to examine the relationship between contemporaneous psychiatric disorders and suicide attempts. Advances in statistical methods (extensions of survival analysis models) make it possible to more precisely examine the presence of psychiatric disorders (as indicated by their onset and offset dates) in relation to the occurrence of repeated suicide attempts over time.

One important question related to the risk associated with different psychiatric disorders is whether the relationships between suicidal behavior and contemporaneous psychiatric disorders are invariant or whether they change over time. Developmental psychopathologists have noted that adolescence often is marked by higher levels of emotional reactivity, increased risk-taking behaviors, and increases in strivings for autonomy, which may result in conflict or a “pushing away” of previous sources of support, such as parental figures (Arnett, 1999; Dahl, 2004). Therefore, risks for suicide attempts may be heightened during adolescence, particularly

in the context of psychiatric disorders associated with increased emotionality or decreased inhibitions. Alternatively, the risk for suicidal behavior during episodes of psychiatric disorders may continue or intensify from adolescence through young adulthood. For example, in the face of stresses associated with the developmental transitions, existing dispositions and action patterns may become accentuated as individuals rely upon past behavioral patterns to adapt to changes (cf. Caspi & Moffitt, 1991). In one example of this phenomenon, the early onset of menarche magnified and accentuated behavioral problems among teenage girls who had already demonstrated early evidence of behavioral difficulties at 9 years of age (Caspi & Moffitt, 1991). Difficulties experienced by adolescents with earlier developmental tasks (e.g., academic difficulties, negotiation of interpersonal relationships) also may contribute to a cascading chain of events that sets the stage for continued stresses and difficulties in young adulthood (Cicchetti & Rogosch, 2002). Such cascading developmental difficulties may contribute to continuity in risk or a strengthening of risk for poor outcomes, particularly in the context of emotional and behavioral dysregulation. Longitudinal studies that track course of disorder and suicidality as youths grow older may provide important information for disentangling these possibilities and understanding developmental changes in risk for suicidal behavior.

Another important question is the degree to which specific patterns or combinations of disorders increase risk for suicidal behavior. To the extent that different disorders each confer a certain amount of risk, young people with a greater number of disorders should be at higher risk for suicide attempts than individuals with single disorders. However, there may be certain combinations of disorders (or developmental trajectories of these disorders) that work together in a synergistic manner to increase risk beyond that expected from the sum of the individual disorders. For example, the decreased behavioral inhibition and impaired self-regulation associated with substance use, conduct disorder, or attention-deficit/hyperactivity disorder may serve to increase the likelihood that young people will act on self-harm urges when extremely distressed, as in the midst of an episode of major depressive disorder.

Lastly, several cross-sectional studies have noted differences between first-time and repeat attempters in rates of affective disorders (Esposito, Spirito, Boergers, & Donaldson, 2003; Goldston et al., 1998), substance abuse and run-away behaviors (Mandell, Walrath, & Goldston, 2006), and sexual abuse (Mandell et al., 2006). Nonetheless, no repeated assessments longitudinal studies to date have prospectively examined the relationship between psychiatric disorders over time and the proximal occurrence of both first-time and repeat suicide attempts. Differences over time between repeat and single attempters may help shed light on which young people are at risk for recurrent suicidal behavior.

For this study, we focused on a sample known to be at high risk for suicidal behavior—youths who have been psychiatrically hospitalized (Goldston et al., 1999). Using data from a prospective, naturalistic, repeated assessments study of adolescents for up to 13 years following hospitalization, we addressed two primary questions. First, what psychiatric disorders and combinations of disorders (i.e., comorbidities) occur contemporaneously with suicide attempts in this high-risk longitudinal sample? We hypothesized that most psychiatric disorders would be associated with risk, and that comorbid depression and attention-deficit/hyperactivity or conduct disorders, and comorbid depression and substance use disorders, would portend unique risk for suicide attempts. Second, does the relationship between contemporaneous psychiatric disorder or comorbidities and suicide attempts change as youths get older? On the basis of the notion from developmental psychopathology that earlier established behavioral patterns may strengthen during times of transition and adaptation (Caspi & Moffitt, 1991), we hypothesized that the relationships between most psychiatric and substance use disorders and suicide attempts would strengthen from late adolescence through young adulthood. A secondary aim

of this study was to examine in a descriptive manner the rates of contemporaneous psychiatric disorders associated with first-time and repeat suicide attempts.

Method

Participants

The 180 participants in this longitudinal study were recruited from consecutive discharges to an adolescent psychiatric inpatient unit between September 1991 and April 1995. The recruitment site was a private, medical-school affiliated teaching hospital that accepted all forms of insurance, including Medicaid, and a limited number of patients without coverage. Youths were not chosen on the basis of their history of suicidal behavior. The inclusion criteria were as follows: (a) ages 12–19 years at index hospitalization, (b) hospitalization for at least 10 days, (c) ability to cooperate with and complete the assessments in the hospital, and (d) residence in North Carolina or Virginia at time of recruitment. Exclusion criteria were as follows: (a) serious systemic physical disease such as seizure disorder or insulin dependent diabetes mellitus, (b) evidence of mental retardation, and (c) having a sibling already enrolled in the study.

In 1991, when this study was initiated, the average length of stay in an adolescent inpatient psychiatry unit was 23.6 days (National Association of Psychiatric Health Systems, 1991). Youths with stays (at least at this facility) shorter than 10 days were often viewed as having denied problems upon admission, or they were discharged or transferred because of inappropriateness of admission. Indeed, youths hospitalized for fewer than 10 days had significantly lower scores on the Beck Depression Inventory (Beck, Steer, & Garbin, 1988) upon admission than youths with longer stays (Goldston et al., 1999).

To recruit the sample, we attempted contact with 225 adolescents and their families 6 months after their hospital discharge. One youth died of cardiac problems before he could be asked to participate. We successfully contacted 96.0% of the remaining sample, yielding a total sample size of 180 (83.7% recruitment rate). The sample consisted of 91 girls and 89 boys, of which 80% were Caucasian, 16.7% were African American, and the remainder were Hispanic, Native American, or of Asian American heritage. At hospitalization, the mean age of this sample at index hospitalization was 14.8 years (SD = 1.6; range = 12.0–18.4). Of the youths, 16% were in the custody of the Department of Social Services at study entry. Of the remaining youths, the socioeconomic status as classified by Hollingshead's (1957) index was as follows: I (highest) = 3.3%; II = 12.6%; III = 21.9%; IV = 29.8%; and V (lowest) = 32.4%.

This is an ongoing study in which participants are still being followed. Because recruitment occurred over a 4-year period of time, participants who entered the study at the beginning of recruitment have been followed longer than participants who were recruited at the end of the recruitment frame. As of the cutoff for these analyses (April 3, 2005), participants in the study had been followed up to 13.6 years (M = 10.8, SD = 3.4). By this cutoff, a cumulative 9.4% (n = 17) of the sample had dropped out of the study, and 3.9% (n = 7) of participants had died, none because of suicide. Of the 7 participants who died, 2 were victims of homicide, 1 was a victim of a house fire secondary to substance use, 1 had significant physical health problems secondary to substance use, and 3 were involved in motor vehicle accidents (MVAs). Among individuals who died in MVAs, 1 individual was hit by a drunk driver, 1 fell asleep at the wheel after driving all night and striking another vehicle, and 1 was in a motorcycle accident. To our knowledge, none of the MVAs were considered to be single-driver suicides. The mean age of the participants as of the cutoff date for analyses, or the last date of assessment for participants no longer in the study, was 25.7 years (SD = 3.9; range = 12.9–31.0). Individuals lost to the study by attrition or death did not differ from the remaining participants in age at hospitalization, $t(178) < 1.00$, $p = .653$; gender, $\chi^2(1, N = 180) < 1.00$, $p = .467$; or

prehospitalization suicide attempts, $t(178) < 1.00$, $p = .744$. However, they were disproportionately Caucasian, $\chi^2(1, N = 180) = 4.04$, $p = .045$.

Adolescents were assessed at their index hospitalization. Subsequent assessments, which were the focus of this study, were initially scheduled every 6–8 months and later were scheduled annually. The actual scheduling of follow-up assessments varied within and between participants because of their schedules and preferences, staff shortages, and occasions when participants moved without providing new contact information (in such cases, we continued trying to locate participants until they were found). The total number of assessments by the cutoff date for this report was 1,825. The average number of research assessments for active participants was 12.8 (*SD* = 4.0). The average number of assessments for participants lost to attrition or death was 4.4 (*SD* = 2.3). Other reports from this longitudinal study have focused on the degree to which factors assessed at hospitalization are predictive of later suicide attempts (Goldston et al., 1999, 2001), state and trait characteristics of purported risk factors for suicidal behavior (Goldston, Reboussin, & Daniel, 2006), anger and anger expression over the follow-up in relation to suicide attempts (Daniel, Goldston, Franklin, & Erkanli, 2009), aftercare service use (Goldston et al., 2003), and rehospitalizations in the sample (Arnold et al., 2003).

Instruments

Assessment of psychiatric disorders—Symptoms of psychiatric disorders were assessed with (a) the Interview Schedule for Children and Adolescents (ISCA; Kovacs, 1989; Kovacs, Pollock, & Krol, 1997; Sherrill & Kovacs, 2000), which is a semistructured clinical interview, or (b) the Follow-Up Interview Schedule for Adults (FISA; Kovacs, Pollock, & Krol, 1995; Sherrill & Kovacs, 2000), which is the adult version of this interview. For follow-up assessments, the ISCA was administered to adolescents and an adult informant (typically a parent) until adolescents were 18 years of age or living independently. Following their 18th birthday, participants were administered the FISA. The ISCA and FISA were administered by master's- and doctoral-level mental health professionals extensively trained in the administration of the semi-structured interviews. Training was conducted or supervised by David B. Goldston, who in turn was trained by the developer of the semistructured instruments (Maria Kovacs). The process of training typically occurred over a minimum 3-month period of time, and it included observation of interviews by experienced interviewers, practice with symptom ratings (the goal was “near perfect” calibration with the experienced interviewer), role-played interviews, jointly conducted interviews, and observation of interviews and/or feedback on audiotaped interviews. Additional feedback was offered during periodic review of research records and the process of diagnostic reviews (described below).

Each research assessment began with an open-ended interview, which provided the occasion for developing a detailed timeline on which important dates of life events and transitions were noted. Building upon this timeline method, the chronology of psychiatric symptoms was tracked at each follow-up assessment. When precise information about the onset or offset of symptoms was not available, we estimated these dates using the *midpoint rule* (Kovacs, Feinberg, Crouse-Novak, Pavlavskas, & Finkelstein, 1984). That is, we delineated a window of time using all available information and reports, and we operationally defined the onset as the midpoint of the defined window of time. For example, if a participant reported that a symptom began between Thanksgiving and New Year's Day, we would estimate the onset of that symptom to the midpoint of that window of time. To be counted as a symptom of a psychiatric disorder, symptoms or behaviors on the ISCA or FISA needed to be rated as “clinically significant” on the basis of predefined levels of severity, duration, and functional impairment. When there were discrepant reports between parents and adolescents regarding the presence of symptoms, the symptoms were generally counted as “present” unless the reliability of the positive report was in question (e.g., when specific examples could not be

provided in response to follow-up queries, reports were inconsistent, or positive reports were offered for virtually all symptoms in the interview).

Psychiatric diagnoses were assigned when participants met full diagnostic criteria for disorders. Until the year 2000, diagnoses were assigned in accordance with Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev.; *DSM–III–R*; American Psychiatric Association, 1987) criteria. After publication of the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.; *DSM–IV–TR*; American Psychiatric Association, 2000), diagnoses were reviewed and updated to be in accord with new diagnostic criteria, and all new diagnoses were assigned on the basis of *DSI–MV–TR* criteria. The ISCA and the adult version of the interview, the FISA, are symptom-oriented interviews that are not bound to *DSM* diagnoses. As such, we have been able to use the same interviews throughout the life of this study. In those cases when youths had psychiatric disorders that began prior to hospitalization and continued after hospitalization, the onset dates for these disorders were arbitrarily set to the date of discharge from the index hospitalization, the beginning of the current study. Disorders were offset after participants no longer evidenced two or more clinically significant symptoms associated with the diagnosis. To assign an offset date, we required that participants be asymptomatic for 2 months (or 6 months in the case of conduct disorder or 1 year for substance use disorder). When participants continued to evidence symptoms of disorders but no longer met full diagnostic criteria, they were considered to still be in partial remission and were counted as continuing in the episodes of the disorders (Kovacs et al., 1984).

Psychiatric disorders were required to be associated with significant distress and/or impairment. The interrater reliability of ISCA-derived diagnoses and agreement between ISCA- and FISA-derived diagnoses have been found to be good in other studies (Sherrill & Kovacs, 2000) but were not examined separately in the current study. The predictive validity of ISCA-derived diagnoses has been demonstrated in this longitudinal study (Goldston et al., 1999; Sherrill & Kovacs, 2000).

Initial diagnoses were assigned by research clinicians who conducted the interviews. To minimize the possibility of individual biases in diagnoses, research clinicians who did not conduct the interview reviewed initially assigned diagnoses, and these were discussed in conference. Although information provided during the diagnostic interviews was primarily relied upon in assigning diagnoses, additional information—such as treatment records, legal records, and school records—was also considered. Ancillary records were most useful in clarifying dates when symptoms were present (e.g., when a participant began receiving treatment for depression) but also sometimes provided information about symptoms that may have been minimized in diagnostic interviews (e.g., substance abuse related problems). Final “best estimate” diagnoses (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982; Roy et al., 1997) were determined by the process of consensus in the diagnostic conferences, and they were based on all available information. Similar diagnostic methods using all available information have been used in other longitudinal studies of youths followed into adulthood (e.g., Kovacs et al., 1984; Kovacs, Obrosky, Gatsonis, & Richards, 1997).

In the current study, we focused on the most common major psychiatric disorders that were present in at least 5% of the sample at any point following hospitalization: major depressive disorder (n = 98; 54%), dysthymic disorder (n = 39; 22%), depressive disorder not otherwise specified (NOS; n = 17; 9%), generalized anxiety disorder (n = 24; 13%), panic disorder (n = 15; 8%), phobic disorders (n = 9; 5%), attention-deficit/hyperactivity disorder (n = 29; 16%), conduct disorder (or antisocial personality disorder after 18 years of age; n = 86; 48%), oppositional defiant disorder (n = 18; 10%), and substance abuse/dependence disorder (n = 89; 49%). Depressive disorder NOS was defined as depressive disorders with symptoms similar to major depressive disorder or dysthymic disorder but which did not meet strict diagnostic

criteria for major depression or dysthymic disorder. This category encompassed cases in which participants evidenced depressive symptoms that fell just short of the *DSM–IV–TR* duration criteria for major depressive or dysthymic disorder, occasions in which participants had four instead of five symptoms of major depressive disorder, and occasions in which participants evidenced one depressive symptom that was different from those specified in the *DSM* diagnostic criteria for major depressive or dysthymic disorder (e.g., irritability as a mood symptom for dysthymic disorder during adulthood). Among participants that evidenced substance use disorders over the follow-up, 11 had alcohol use disorders only, 22 had nonalcohol substance use disorders only, and 56 had both alcohol and other substance use disorders.

For describing the broad psychiatric profiles associated with suicide attempts, psychiatric disorders were grouped into four categories: depressive disorders (major depressive disorder, dysthymic disorder, depressive disorder NOS), anxiety disorders (generalized anxiety disorder, panic disorder, phobic disorders), disruptive disorders (attention-deficit/hyperactivity disorder, conduct disorder, oppositional disorder), and substance use disorders. In addition to individual diagnoses or broad diagnostic groups, several specific patterns of psychiatric comorbidity were examined. Specifically, the unique association between suicide attempts and all pairwise combinations of the specific psychiatric disorders found to be related to suicide attempts in predictive models, controlling only for demographic characteristics, was examined.

Assessment of suicide attempts—At the index hospitalization, suicide attempts were assessed with the inquiries of the ISCA (Kovacs, 1989; Kovacs, Pollock, & Krol, 1997; Sherrill & Kovacs, 2000). Auxiliary information was obtained from other sources, including the medical record, prior treatment records, and interviews with parents. Given that parents are often unaware of the suicidal behavior of youths (Goldston, 2003), youths' reports of suicide attempts were generally relied upon most heavily, and treatment records were useful primarily in verifying dates of attempts. History of attempts assessed at hospitalization was necessary for determining whether subsequent attempts were first-time or repeat attempts. At the posthospitalization assessments, history of attempts since the last assessment was assessed with the ISCA or (after participants' 18th birthdays) the FISA (Kovacs et al., 1995; Sherrill & Kovacs, 2000). During the follow-up, auxiliary information about dates of suicide attempts was obtained from mental health treatment, school, and legal records. When precise dates of suicide attempts were not available, we estimated the dates using the aforementioned method of the midpoint rule.

Suicidal behaviors were assessed with standardized ISCA/FISA questions (e.g., “Have you ever thought about killing yourself?”) and corresponding predefined rating scales regarding intent, methods, and medical consequences of self-harm behavior. A suicide attempt was defined as a self-inflicted, completed act that is associated with some nonzero psychological intent to end one's life. Self-destructive behavior was classified as a suicide attempt if it was associated with any desire to die, regardless of multiple motives or ambivalence associated with the act. Self-harm behaviors (e.g., cutting on oneself) not associated with intent to kill oneself were not considered to be suicide attempts. Two interrater reliability trials have indicated very high levels of agreement regarding the presence of suicide attempt as assessed with the ISCA (Goldston et al., 2001; Kovacs, 1981).

The medical lethality of suicide attempts over the follow-up was assessed with the reliable and valid Lethality of Suicide Attempt Rating Scale (Smith, Conroy, & Ehler, 1984; see Goldston, 2003). On this scale, suicide attempts are rated in medical lethality from 0 (*death is an impossibility*) to 10 (*death is almost a certainty*). In accordance with our operational definitions, medical lethality was not considered in classifications of suicidal behaviors.

As previously reported, 105 of the 180 adolescents (58.3%) in the sample did not have a history of suicide attempts before hospitalization (Goldston et al., 1999). Of the 75 adolescents with prehospitalization attempts, 41 (22.8% of the sample) had one prior attempt, 21 (11.7%) had two previous attempts, and 13 (7.2%) had between three and seven previous attempts.

Suicide Deaths

To determine whether participants with whom we had lost contact had died, we conducted searches of the publicly available Social Security Death Index. No evidence was found that any participants had died, other than the 7 participants (previously described) of whom we were already aware because of information provided by family members.

Ethical and Safety Considerations

Informed consent was initially obtained at the time of the first assessment in the study, and participants were reconsented after the age of 18 years. This study was approved by the Institutional Review Boards of Wake Forest University School of Medicine, Duke University School of Medicine, and the University of North Carolina Greensboro. Participants were told that unless permission was obtained, confidentiality would only be broken when someone posed imminent risk of serious harm to themselves, imminent risk of serious harm to others, or in the case of previously unreported child abuse. Confidentiality was not broken in other circumstances. Although treatment was not offered in the context of this study, we did offer to help participants with referrals for treatment in the community upon request. Although an infrequent occur-rence, participants occasionally were encouraged to seek treatment when markedly deteriorating mental health was noted during research assessments (e.g., onset of auditory hallucinations). On the infrequent occasions when participants reported suicidal thoughts with intent or plan, or recent suicidal behavior at the time of research assessments, research clinicians collaboratively worked with them to develop a safety plan and, if needed, referral to an outpatient mental health provider.

Statistical Methods

To examine the relationship between contemporaneous suicide attempts and psychiatric disorders, we used Andersen–Gill recurrent events survival models (Andersen & Gill, 1982). These models are extensions of survival regression models that can be used to examine risk for multiple outcomes occurring over time among individuals. In the case of our analyses, these models were used to examine the relationship between psychiatric disorders and suicide as youths got older. These models produce estimates of hazard ratios, or risk ratios, similar to odds ratios used in case-control studies. The hazard ratio is the ratio of the risk of an event occurring in one group compared with the risk in another group.

In these models, predictors can be both fixed (that is, time-invariant, such as variables assessed at hospitalization) and can vary over time. The demographic variables of age at hospitalization, gender, race/ethnicity, and number of prehospitalization suicide attempts were fixed covariates in these models. The different psychiatric disorders (denoted by their onset and offset dates) were considered to be time-varying covariates in these models. We used robust standard errors to account for the within-subject correlations that arise from repeated outcomes of suicide attempts, and repeated measurements of psychiatric disorders for each participant. In the initial models, the risk for suicide attempts over the follow-up and each of the contemporaneous psychiatric disorders was examined. In a final multivariate model, all of the contemporaneous psychiatric disorders were entered into the models simultaneously to determine the independent effects of these disorders on suicide attempts following hospitalization. Each of the patterns of comorbidity was examined separately with interaction terms between the component disorders; these patterns of comorbidity were tested in models including main effects for the separate psychiatric disorders. To determine whether the effects of the different disorders

varied over time as youths got older, we conducted tests of the proportionality assumption for disorders that were significantly related to suicide attempts (Schoenfeld, 1982). Lastly, for descriptive purposes only (no statistical comparisons), we tabulated the degree to which first-time and repeat suicide attempts during the follow-up occurred in the presence of different psychiatric disorders.

Results

Forty-six participants made 128 suicide attempts during the course of the follow-up period; of these, 28 were the first suicide attempts ever made by participants, and 100 were repeat attempts. The 100 repeat attempts were made by 33 participants, 11 of whom had made more than one repeat attempt prior to their index hospitalization. In terms of medical lethality, 57.8% of attempts during the follow-up period were rated as low lethality (death is impossible or an improbable outcome), 37.5% were rated moderate lethality (death is improbable as long as first aid is administered, or a 50–50 or equivocal outcome), and 4.7% were rated as high lethality (death is probable without immediate or vigorous attention or a highly probable outcome). Nine attempts (7.0%) occurred in the absence of the Axis I diagnoses assessed in this study, 21 (16.4%) occurred in the presence of a single psychiatric disorder, and 98 (76.6%) occurred in the presence of comorbid psychiatric disorders. Psychiatric comorbidity was strongly associated with suicide attempts, as reflected in the increasing risk for suicide attempts as a function of increasing number of disorders ($b = 0.90$, $SE = 0.08$, $\chi^2 = 141.97$, Hazard Ratio [HR] = 2.46, $p < .0001$). Among the individuals making repeat attempts during the follow-up period, there were no differences between participants who already had made repeat attempts prior to their index hospitalization and those who had not in total number of attempts, and in number of psychiatric diagnoses (ps > .10). However, participants who made repeat attempts within the 1st year following discharge from the hospital made more attempts overall during the follow-up period than participants who made repeat attempts, but not in the 1st year after hospitalization ($b = 0.87$, $SE = 0.35$, $\chi^2 = 5.98$, HR = 2.38, $p = .014$).

The most common broad diagnostic profiles contemporaneously associated with suicide attempts were as follows: depressive + disruptive disorders ($n = 31$), depressive + anxiety + substance use disorders ($n = 18$), depressive + disruptive + substance use disorders ($n = 15$), depressive + anxiety disorders ($n = 13$), depressive disorders alone ($n = 12$), and disruptive disorders alone ($n = 12$). Depressive disorders were present in 87 of the 98 (89%) comorbid diagnostic profiles associated with suicide attempts. Anxiety disorders contemporaneously associated with suicide attempts were always comorbid with other disorders. Similarly, substance use disorders were predominately associated with suicide attempts in the presence of comorbid depressive and/or disruptive disorders ($n = 48$ of 50; 96%).

The results of the models examining the relationship between specific contemporaneous psychiatric disorders and suicide attempts are presented in Table 1. Prehospitalization suicide attempts were associated with subsequent suicide attempts in all models (ps < .05). In none of these models were the effects of race/ethnicity significantly related to attempts, and only in the model examining conduct disorder was female gender related to greater likelihood of attempts ($b = 0.61$, $SE = 0.30$, $\chi^2 = 4.15$, HR = 1.83, $p = .042$). As can be seen in Table 1, most of the major psychiatric disorders were associated with increased contemporaneous risk for suicide attempts over the follow-up. The highest risk for attempts was associated with major depressive disorder and with panic disorder. In post hoc analyses for substance use disorders, we found that participants who had a lifetime history of both alcohol and other substance use disorders ($n = 56$) were at higher risk for suicide attempts than individuals with either alcohol use disorders or nonalcohol substance use disorders alone ($n = 33$; $b = 0.79$, $SE = 0.38$, $\chi^2 = 4.28$, HR = 2.20, $p = .039$).

In the multivariate model, major depressive disorder, dysthymic disorder, panic disorder, and conduct disorder continued to be associated with suicide attempts. Major depressive disorder conferred the most substantive contemporaneous risk of suicide attempts of the psychiatric disorders.

The only specific pattern of comorbidity associated with independent risk for suicide attempts was comorbid major depression and conduct disorder. Nonetheless, the relationship between this pattern of comorbidity and suicide attempts required further clarification. As such, we contrasted the effects of conduct disorder without major depression, major depression without conduct disorder, major depression in addition to conduct disorder, and the presence of neither disorder (by assigning dummy variables to the four possible combinations). Results of these follow-up analyses indicated that conduct disorder primarily conferred risk in the presence of major depression (conduct disorder alone: $b = 0.33$, $SE = 0.28$, $\chi^2 = 1.31$, HR = 1.38, $p = .253$; comorbid conduct disorder and major depression: $b = 1.42$, $SE = 0.33$, $\chi^2 = 19.19$, HR = 4.16, $p < .0001$), whereas major depression was associated with increased risk both with and without conduct disorder (major depression alone: $b = 1.86$, $SE = 0.23$, $\chi^2 = 64.30$, HR = 6.42, $p < .0001$). The absence of both major depression and conduct disorder was associated with significantly decreased risk for suicide attempts ($b = -2.29$, $SE = 0.27$, $\chi^2 = 70.17$, HR = 0.10, $p < .0001$).

The results of the tests of the proportionality assumption are presented in Table 2. The relationship between suicide attempts and contemporaneously occurring major depressive disorder, generalized anxiety disorder, attention-deficit/hyperactivity disorder, and substance use disorder strengthened as participants became older. The relationship between suicide attempts and both the diagnoses of conduct disorder and panic disorder weakened as youths got older.

Finally, descriptive data regarding the relationship between different psychiatric disorders and first-time ($n = 28$) and repeat attempts ($n = 100$) are presented in Table 3. As can be seen, the rates of contemporaneous major depressive disorder, dysthymic disorder, generalized anxiety disorder, and panic disorder were considerably more common among repeat suicide attempters than among first-time attempters.

Discussion

In this prospective, repeated assessments study of a previously psychiatrically hospitalized sample, we were able to track the onset and offset of disorders over an extended period of time to more precisely examine linkages between contemporaneous psychiatric disorders and the occurrence of suicide attempts than previous studies; we were also able to document the developmental changes in these relationships. To our knowledge, these methods and statistical approaches have not previously been used in tandem to examine developmental changes in risk for outcomes such as suicidal behavior.

The great majority of psychiatric disorders in this study were found to convey risk for suicide attempts. The findings of this study focused on the transition between adolescence and young adulthood, and they extend recent findings of heterogeneous clinical presentations proximally associated with suicidality in a younger community sample (Foley et al., 2006). By implication, the results underscore the possibility that there are many pathways, starting points, or processes that may lead to suicidal behavior in young people, consistent with the systems theory and developmental psychopathology concept of equifinality (Cicchetti & Rogosch, 2002). The fact that major depressive disorder was associated with the greatest contemporaneous risk for suicide attempts—greater than a five-fold increase in risk even after controlling for the presence of other disorders—coincides with findings from other longitudinal studies (Foley et al.,

2006; Kovacs et al., 1993; Pfeffer et al., 1993). Different theoretical approaches have highlighted the role of depression and hopelessness in the genesis of suicidal behavior (Abramson et al., 2000). The fact that depression was present in almost 90% of the cases of suicide attempts in which there was comorbidity indicates that despite multiple diagnostic patterns, a common path along trajectories culminating in suicidal behavior was the experience of diagnosable depression.

The great majority of suicide attempts in this study occurred in the presence of psychiatric comorbidity. In fact, we found that the likelihood of suicide attempts increased almost 250% with each additional psychiatric disorder. However, for the most part, specific combinations of disorder did not confer risk over and beyond the additive risks associated with disorders. The one pattern of comorbidity that did contribute unique risk was the combination of conduct disorder and major depressive disorder. However, unlike previous findings that comorbid disruptive disorders increase the risk associated with depression (Kovacs et al., 1993), in this study, disruptive disorders did not confer additional risk to depressed youths. Rather, we found that the risk associated with conduct disorder occurred primarily in the presence of major depression, and the absences of conduct disorder and major depressive disorder were associated with substantively decreased risk for suicide attempts. This suggests the possibility that conduct disorder increases risk for suicidal behavior by increasing the likelihood of depression. Indeed, Costello, Erkanli, Federman, and Angold (1999) noted that chronologically, disruptive disorders often precede the onset of depressive disorders among young people. Moreover, Conner and Goldston (2007) have suggested that substance abuse, aggression, and associated disruptive behaviors in young people may increase the likelihood of suicide via pathways associated with developmental failures or disruptions of developmental tasks (e.g., school suspensions, school dropout), which in turn increase the likelihood of depression. In a cascading manner (Cicchetti & Rogosch, 2002), the depression and co-occurring difficulties can contribute to further developmental setbacks or difficulties, which increase the likelihood of self-harm behaviors.

In the research and clinical literature, there has been little discussion of the possibility that relationships between psychiatric disorders and outcomes may change over the course of development. Interestingly, we found that the majority of relationships between suicide attempts and psychiatric disorders were not time-invariant. Focusing on the three most robust sets of findings in particular (i.e., those with $p \leq .001$), we found that the relationship between suicide attempts and major depressive disorder, generalized anxiety disorder, and substance use disorder strengthened from adolescence through young adulthood. The strengthening of an association between suicide attempts and major depression and substance use disorders is of particular concern, given the increasing rates of these disorders from adolescence through young adulthood (Lewinsohn et al., 2001; Wagner & Anthony, 2002). The increasing risk posed by these disorders as a function of age may reflect increasing disability or impairment associated with these disorders from adolescence through young adulthood. Alternatively, the findings may reflect a strengthening of maladaptive behavioral responses in the faces of numerous stresses reported by the young people in this sample as they transitioned into young adulthood, including early parenthood, financial and employment difficulties, legal problems, and relationship strains, particularly in the context of emotional and behavioral dysregulation. Caspi and Moffitt (1991) have noted that in the face of stress or transition, individual differences in action patterns may become accentuated. Hence, earlier maladaptive responses in the face of stress may set the stage for later similar maladaptive coping strategies as young people grow older and face new challenges.

Although a less robust finding, it appeared that the relationship between attention-deficit/hyperactivity disorder and suicide attempts also increased from adolescence through young adulthood. Many symptoms of attention-deficit/hyperactivity disorder diminish as youths grow

older (Biederman, Mick, & Faraone, 2000), but it is possible that the subgroup of individuals who continue to manifest significant attention-deficit/hyperactivity disorder symptoms through young adulthood are especially at risk for negative outcomes. In this regard, Barkley and Fischer (2005) found that young adults diagnosed with attention-deficit/hyperactivity disorder in childhood were more likely than individuals without attention-deficit/hyperactivity disorder to have attempted suicide, to have been hospitalized for suicidality, and to have considered suicide after secondary school. The increased risk appeared to be associated with severity of attention-deficit/hyperactivity disorder, as well as histories of major depressive disorder and conduct disorder, similar to the current study's findings that increased risk associated with attention-deficit/hyperactivity disorder was attenuated after controlling for other disorders. Impulsivity and related deficits in executive functioning and self-regulation of behavior and affect among individuals with attention-deficit/hyperactivity disorder (Barkley, 2005) may be important in the risk or processes culminating in suicidal behavior, particularly as these individuals face the new challenges, frustrations, and stresses of young adulthood.

The decrease in the relationship between suicide attempts and conduct disorder was not expected and should be replicated. The decreasing relationship parallels the decrease in rates of minor acts of physical aggression (but not the more serious, lethal acts of aggression) as youths grow older (Conner & Goldston, 2007) and could also reflect increasing mediation of the conduct disorder–suicide attempt relationship via a link with substance use disorders as youths grow older (Gould et al., 1998). The decrease in the strength of the relationship between panic disorder and suicide attempts over time also was not expected, particularly given the stronger and increasing relationship between generalized anxiety disorder and suicide attempts. A relationship between panic and suicide attempts has been documented in adults, but there have been differing findings regarding the degree to which this relationship is mediated by comorbid disorders, such as depression and substance use (Goodwin & Roy-Byrne, 2006). It is possible that the phenomenology of the disorder or associated comorbidities differ from adolescence through young adulthood, that adolescents and young adults cope differently with the disorder, or that individuals learn to habituate to their panic symptoms over time and become less likely to react in a self-harmful manner.

A secondary aim of this study was to descriptively examine the patterns of psychiatric disorders associated with first-time and repeat suicide attempts occurring over the follow-up. Repeat suicide attempts were associated with greater rates of psychiatric disorders and psychiatric comorbidity. The high rates of disorders among repeat attempters dovetail with cross-sectional findings from adults suggesting that a history of multiple attempts is a marker for high levels of psychopathology or impairment (Forman, Berk, Henriques, Brown, & Beck, 2004). Repeat attempts, in particular, were associated with higher rates of major depression, dysthymia, generalized anxiety disorder, and panic disorder. An important step in the prevention of repeat suicidal behavior may be the effective treatment of these often prolonged or recurring conditions.

Several limitations of this study should be acknowledged. First, the sample was ascertained from a single inpatient psychiatric setting, with only 20% representation of youths of ethnic minority heritage and with lower rates (less than 5%) of bipolar disorder than has been documented in some other clinical samples of adolescents (e.g., Brent et al., 1993). In addition, the youths in this study were all hospitalized for a minimum of 10 days, and in-depth information regarding youths not participating in the study is not available. Although this length of stay for hospitalization was not unusual at the time of recruitment, and although participants were followed for a considerable period following this hospitalization, it is possible that these findings are not generalizable to other high-risk populations. Second, the diagnoses were not determined blind to suicide attempt status, and suicidal thoughts and attempts were one of the

symptoms of *DSM–IV–TR* major depressive disorder. Although this may be a source of bias, the fact that major depressive disorder at hospitalization in this study was the only psychiatric disorder found to predict repeat suicide attempts (Goldston et al., 1999) lends weight to the importance of the relationship between depression and suicidal behavior. Third, the research clinicians who interviewed participants in this study were not blind to previous assessments. Following the precedence of procedures used in other studies (Kovacs, Obrosky, et al., 1997), research interviewers were encouraged to track symptoms over time in an effort to determine onsets and offsets of psychiatric symptoms and, in turn, diagnoses over time. As reflected in the very low cumulative attrition rate in this longitudinal study, this approach likely increased the comfort of participants, who felt relieved that they did not have to "repeat their story" at each assessment. The bias in such an approach should have been offset by the fact that diagnoses were based on the presence of all available information, were independently reviewed, and were arrived at by a process of consensus. Fourth, it should be acknowledged that although reliability information for diagnostic information collected with these instruments has been collected in previous studies, and although multiple other steps were taken to ensure the fidelity of the diagnostic process and validity of diagnostic data obtained, we did not conduct a formal internal reliability check, other than that conducted for suicide ideation and attempts. Fifth, we should note that none of the participants in this study have died by suicide. On the one hand, this should not be entirely unsurprising given the dramatically different yearly base rates of nonlethal suicide attempts (6.9 per 100 among high school suicide students) and suicide deaths (9.0 per 100,000 among individuals 12–28 years of age for the year 2005; Centers for Disease Control and Prevention, 2008a, 2008b). However, we cannot rule out the possibility that participation in the longitudinal study provided some protective effects for some participants. Last, this is the first study of which we are aware to statistically examine developmental changes in the strength of relationships between risk factors and outcomes by examining Schoenfeld's (1982) residuals. Although the resulting findings are illuminating, they also bear replication because of the new methods involved.

In sum, the current findings build upon and extend those from a younger community sample (Foley et al., 2006) in suggesting not only that the great majority of child psychiatric disorders confer significant risk for suicidal attempts but also that the nature of this risk changes over the course of development. As a practical manner in clinical assessment, it should be emphasized that although many suicide attempts occur in the context of episodes of depressive disorders, almost all psychiatric morbidity among young people is associated with increased risk for suicidal behavior. In addition, mental health professionals should recognize that the risk associated with depressive disorders, generalized anxiety disorder, attention-deficit/hyperactivity disorder, and substance use disorders increases from adolescence through young adulthood, and that depressive disorders, generalized anxiety disorder, and panic disorder seem to be especially prominent among repeat suicide attempters. Aggressive steps taken to interrupt the course of these often prolonged disorders and their associated disability likely will reduce the long-term risk of suicide attempts among youths who have been seen in treatment settings.

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Table 1

Contemporaneous Psychiatric Disorders and Suicide Attempts From Adolescence Through Young Adulthood

	Separate models					Multivariate model				
Diagnosis	***b***	***SE***	χ^2	**HR**	***p***	***b***	***SE***	χ^2	**HR**	***p***
Major depressive disorder	1.94	0.25	60.59	6.95 (4.22, 11.47)	<.001	1.71	0.25	46.54	5.53 (3.35, 9.12)	<.001
Dysthymic disorder	0.92	0.38	5.89	2.51 (1.17, 5.37)	.015	0.69	0.35	3.95	2.00 (0.99, 4.01)	.047
Depressive disorder NOS	0.42	0.59	<1.00	1.52 (0.47, 4.95)	.480	0.92	0.59	2.43	2.51 (0.77, 8.17)	.119
Generalized anxiety disorder	1.37	0.48	8.03	3.92 (1.51, 10.28)	.005	0.67	0.52	1.64	1.96 (0.69, 5.53)	.200
Phobias	0.06	0.82	<1.00	1.06 (0.21, 5.47)	0.94	0.07	0.80	<1.00	1.07 (0.22, 5.31)	.931
Panic disorder	2.10	0.54	13.63	7.46 (2.77, 24.05)	<.001	0.86	0.39	4.86	2.35 (1.08, 5.16)	.027
Attention-deficit/hyperactivity disorder	0.88	0.34	6.91	2.41 (1.22, 4.76)	.009	0.42	0.34	1.53	1.52 (0.77, 3.00)	.216
Oppositional defiant disorder	−0.64	0.53	1.47	0.53 (0.18, 1.52)	.225	0.00	0.55	<1.00	0.997 (0.33, 3.00)	.996
Conduct disorder	1.03	0.25	16.44	2.79 (1.69, 4.62)	<.001	0.84	0.28	9.00	2.31 (1.32, 4.06)	.003
Substance use disorder	1.14	0.36	10.03	3.14 (1.79, 6.42)	.002	0.48	0.32	2.25	1.62 (0.85, 3.06)	.134

Note. HR = Hazard Ratio; NOS = not otherwise specified.

Table 2

Developmental Changes in the Relationship Between Suicide Attempts and Contemporaneous Psychiatric Diagnoses

Diagnosis	ρ	χ^2	*p*
Major depressive disorder	.19	11.98	<.001
Dysthymic disorder	−.03	<1.00	.386
Generalized anxiety disorder	.14	10.62	.001
Panic disorder	−.12	6.54	.011
Attention-deficit/hyperactivity disorder	.11	3.95	.047
Conduct disorder	−.11	4.20	.040
Substance use disorder	.10	11.89	<.001

Table 3

Proximal Psychiatric Disorders Related to First-Time and Repeat Suicide Attempts

	First-time attempts		Repeat attempts	
Diagnosis	**%**	***n***	**%**	***n***
Major depressive disorder	32.1	9	60.0	60
Dysthymic disorder	7.1	2	35.0	35
Depressive disorder NOS	10.7	3	1.0	1
Generalized anxiety disorder	7.1	2	25.0	25
Phobias	0.0	0	3.0	3
Panic disorder	0.0	0	14.0	14
Attention-deficit/hyperactivity disorder	14.3	4	25.0	25
Oppositional defiant disorder	7.1	2	5.0	5
Conduct disorder	57.1	16	45.0	45
Substance use disorder	42.9	12	38.0	38

Note. n = 28 first-time attempts; n = 100 repeat attempts. NOS = not otherwise specified.