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Sleep Disturbance Preceding Completed Suicide in Adolescents

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Abstract

We examined sleep difficulties preceding death in a sample of adolescent suicide completers as compared with a matched sample of community control adolescents. Sleep disturbances were assessed in 140 adolescent suicide victims with a psychological autopsy protocol and in 131 controls with a similar semistructured psychiatric interview. Rates of sleep disturbances were compared between groups. Findings indicate suicide completers had higher rates of overall sleep disturbance, insomnia, and hypersomnia as compared with controls within both the last week and the current affective episode. Group differences in overall sleep disturbance (both within the last week and present episode), insomnia (last week), and hypersomnia (last week) remained significant after controlling for the differential rate of affective disorder between groups. Similarly, overall sleep disturbance (last week and present episode) and insomnia (last week) distinguished completers in analyses accounting for severity of depressive symptoms. Only a small percentage of the sample exhibited changes in sleep symptom severity in the week preceding completed suicide, but of these, a higher proportion were completers. These findings support a significant and temporal relationship between sleep problems and completed suicide in adolescents. Sleep difficulties should therefore be carefully considered in prevention and intervention efforts for adolescents at risk for suicide.

Keywords

suicide; sleep; sleep disturbance; sleep problems; adolescents

Youth suicide constitutes a major public health problem, ranking among the leading causes of death for young people in many countries worldwide (World Health Organization, 2002). Risk for completed suicide increases dramatically during adolescence (Gould, Fisher, Parides, Flory, & Shaffer, 1996), and research implicates an array of associated factors from genetic, biological, psychosocial, and cognitive domains (Bridge, Goldstein, & Brent, 2006).

Sleep architecture undergoes changes during adolescent development, characterized by delayed sleep phase syndrome (i.e. staying up late and sleeping late), early awakening, and irregular sleep patterns (Knutson, 2005; Taylor, Jenni, Acebo, & Carskadon, 2005). Risk for other sleep disturbances, including insomnia and nightmares, also increases significantly during adolescence (Ohayon, Morselli, & Guillemenault, 1997). Although the physiological need for sleep does not decline during adolescence, adolescents report sleeping substantially less than they have in previous developmental stages (Dahl & Lewin, 2002). Epidemiological

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studies indicate that these altered sleep patterns result in a state chronic sleep deprivation and significant daytime sleepiness for many teens (Wolfson & Carskadon, 1998).

Given the vulnerability to both sleep disturbance and suicide during adolescence, the question follows whether sleep disturbance is related to risk for suicide during this developmental period. Whereas several studies have established a relationship between sleep problems and *suicidal ideation* and *attempts* in adolescence (for a review, see Liu & Buysse, 2005), to date no research has expressly examined the association between sleep problems and *completed suicide* in this population. Experts in the field have thus called for further investigation of this link in order to improve intervention and prevention efforts (Liu & Buysse, 2005). Furthermore, recent efforts by the American Association of Suicidology (AAS) to identify *warning signs* for suicide (i.e., acute and episodic signs of current and immediate risk) that are distinct from *risk factors* for suicide (i.e., static, long-standing factors that predispose an individual to suicidal behavior) highlight the need for further research examining dynamic variables conferring proximal and specific near-term risk. Included among the AAS consensus set of warning signs is sleep difficulties (Rudd et al., 2006).

Sleep and Suicidal Ideation

Research with adolescents has demonstrated a clear relationship between suicidal ideation and sleep problems. In an epidemiological study of French teenagers, Choquet and Menke (1989) found that adolescents with suicidal ideation reported more insomnia as well as more nightmares than adolescents who denied suicidal ideation. In a subsequent sample, suicidal ideation was linked to more sleep difficulties and frequent feelings of daytime tiredness (Choquet, Kovess, & Poutignat, 1993). Results from a school-based survey in the United States indicate that whereas insomnia and hypersomnia independently increase risk for suicidal ideation in adolescents, the presence of both insomnia and hypersomnia incurs further increased suicidal risk in this population (Roberts, Roberts, & Chen, 2001). Barbe et al. (2005) found that depressed youths who endorsed suicidality (at minimum suicidal ideation with plan) presented more frequently with insomnia than did nonsuicidal depressed youths. It is important to note, however, that suicidal patients in this study also had more severe depressive episodes. Cukrowicz et al. (2006) reported a significant relationship between nightmares and suicidal ideation among a sample of undergraduates, a pattern that held after controlling for the effects of depression. Given that depressive severity is determined by the acuity of its comprising symptoms (including sleep difficulties), it follows that in the findings linking sleep disturbance with suicide, severity of sleep disturbance may serve as a proxy for severity of depression more generally. Thus, depressive severity represents an important potentially confounding third variable often unreported in the literature on sleep and suicide in adolescents.

Sleep and Attempted Suicide

Vignau et al. (1997) and Bailly, Bailly-Lambin, Querleu, Beuscart, and Collinet (2004) demonstrated a significant association between problem sleep and suicide attempts in adolescents over and above the effects of suicidal ideation. In a retrospective examination of medical records, Tishler et al. (1981) found that 81% of adolescents presenting to the emergency room following suicide attempt reported difficulty falling asleep or early morning awakening immediately preceding the attempt. In a large sample of adolescents in China, Liu (2004) found that nightmares were associated with increased risk for suicidal ideation and attempt. Furthermore, those who slept less than 8 hr per night were three times more likely to attempt suicide, even after adjusting for overall depressive symptoms. Insomnia also emerged as a significant predictor of attempted suicide in this sample but was no longer significant when accounting for depressive severity.

Sleep and Completed Suicide

No studies to date have been conducted examining sleep problems among adolescent suicide completers. However in adults, Farberow and MacKinnon (1974) compared suicide completers with matched psychiatric inpatients and found that insomnia distinguished the suicide completers. In Barraclough and Pallis's (1975) study comparing depressed suicide completers (age 15 years and older) with depressed patients referred for treatment, insomnia was one of three symptoms, including self-neglect and impaired memory, differentiating suicide completers from other depressed patients. Likewise, in Fawcett et al.'s (1990) widely cited follow-up study of mood-disordered adults, global insomnia emerged as one of three strongest predictors, along with anhedonia and psychic anxiety, of completed suicide over a 1-year follow-up However, insomnia was not related to completed suicide over long-term follow-up (2–10 years) in this sample.

Better understanding of the relationship between disturbed sleep and suicidality in adolescents may serve to inform efforts at suicide prevention with this population. Research to date supports a relationship between these two constructs. However, several areas merit further study: First, no research has examined sleep difficulties in adolescent suicide completers, a potential limitation given that individuals who complete suicide may demonstrate a distinct risk profile from those who ideate and attempt (Bhatia, Aggarwal, & Aggarwal, 2000; Brent, Perper, Goldstein, Kolko, Allan, Altman, et al., 1988). Second, the extent to which the relationship between sleep and suicide is explained by the presence and severity of affective disorder has been minimally addressed in the extant literature. Third, the temporal relationship between sleep problems and suicidal behavior constitutes another area in need of further exploration. To address these three considerations, we examined sleep difficulties preceding death in a sample of adolescent suicide completers as compared with a matched sample of community control adolescents. We hypothesized that suicide completers would exhibit higher rates of sleep difficulties both in the week preceding death and within their most recent depressive episode as compared with controls. We expected these findings would persist even after controlling for group differences in the presence and severity of depression. Finally, we anticipated that sleep problems would worsen in the week preceding completed suicide.

Method

Sample

The suicide completer group consists of 140 consecutive adolescent suicide victims from 28 counties in Western Pennsylvania and represents 72% of all individuals assigned a definite verdict of suicide between the ages of 13 and 19 years deemed study eligible. The families of the suicide completers were contacted by letter approximately 3 months after the death and were called by the project coordinator a week later to schedule an interview. Basic information was available for 43 of the 54 eligible cases that did not participate in the study. There were no differences between those who agreed to participate and those who refused (n = 16; 30%) or were unable to be reached (n = 27; 50%) in terms of age, gender, race, county, suicide method, or toxicology. Additional information regarding the study sample, psychiatric risk factors, and sequelae are described in detail in previous publications (e.g., Brent, Baugher, Bridge, Chen, & Beery, 1999; Brent, Bridge, Johnson, & Connolly, 1996; Brent, Perper, Moritz, Allman, Roth, Schweers, Balach, & Baugher, 1993).

The 131 community controls were obtained by geographic cluster sampling of communities with similar median income, population density, racial composition, and age distribution to those of the suicide victims (Brent et al., 1992). Once communities were identified, streets within the community were chosen at random; field workers knocked on doors of consecutive homes to verify the presence or absence of an adolescent in the home. Those controls selected

for an interview were subsequently contacted by phone, with a 74% acceptance rate (Brent, Perper, Moritz, Allman, Schweers, Roth, Balach, Canobbio, & Liotus, 1993). Basic demographics of the sample are presented in Table 1. The groups were similar with respect to race, socioeconomic status (four-factor scale, Hollingshead, 1975), and age; males were overrepresented in the suicide completer group (85% of completers vs. 70% of controls), $\chi^2(1, N = 270) = 9.4$, $p < .01$.

Assessment

The completers were assessed by a psychological autopsy protocol whereby parents, siblings, and friends of suicide completers were interviewed about current and past psychopathology and the circumstances surrounding the suicide. Between 4 and 6 months after the death (M = 5.1 months, SD = 2.9), a median of four informants (range = 1–14) for each completer were interviewed In all cases, the primary informant included at least one parent or guardian with whom the adolescent resided. Previous studies support the reliability and validity of this method (Brent, Perper, Kolko, & Zelenak, 1988; Brent, Perper, Moritz, Allman, Roth, Schweers, & Balach, 1993; Kelly & Mann, 1996).

The controls and their parents were interviewed directly once informed consent was obtained in accordance with the Institutional Review Board at the University of Pittsburgh. Master's-level clinicians with significant clinical experience underwent extensive training in the administration of semistructured interviews, and conducted all semistructured interviews. All interviews were audiotaped, and a subsample was reviewed to establish inter-rater reliability. For both completers and controls, information from all sources was combined and discussed in diagnostic conferences with a best estimate procedure (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982).

Instruments—Current Axis I diagnoses from the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., American Psychiatric Association, 1980) were assessed with the Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present Episode version (K-SADS-P; Chambers et al. 1985) and Epidemiological version (K-SADS-E; Orvaschel, Puig-Antich, Chambers, Tabrizi, & Johnson, 1982), yielding individual item ratings for both the worst period during the present episode of illness (PE) and the preceding week (last week, LW). For nondepressed subjects, PE ratings reflect the prior 12 months. The reliability and validity of the information gathered from these instruments, even through third-party informant, has been demonstrated to be excellent (Brent, Perper, Goldstein, Kolko, Allan, Allman, et al., 1988; Brent, Perper, Kolko, & Zelenak, 1988) Participants were considered to have a current affective disorder if they met full K-SADS criteria for any one of the following diagnoses: major depressive disorder, dysthymia, depressive disorder not otherwise specified (NOS), or a bipolar spectrum disorder (I, II, not otherwise specified, or cyclothymia). Sleep difficulties were assessed by consensus ratings of the six items pertaining to sleep from the K-SADS Depression section (see Appendix). For the purposes of the analyses, we considered ratings of "3" (definitely present, mild) or higher on all K-SADS sleep items to be present. A participant was considered to have an "overall sleep disturbance" if any one or more (including insomnia and/or hypersomnia) of the K-SADS sleep items was rated as "present" ("3" or higher). Depressive severity was computed for all participants as a mean of 10 K-SADS depression items (depressed mood, irritability, guilt, anhedonia, fatigue, inattention, agitation, retardation, weight loss, increased appetite); prior studies have established the reliability of these items in diagnosing major depression in adolescents (Chambers et al., 1985; Ryan et al., 1987). So as not to confound the analyses examining the relationship between suicide and sleep difficulties, the mean total depressive severity score excludes K-SADS depression items that assess these symptoms (i.e., suicidal ideation, insomnia, and hypersomnia). Rates of current affective disorder and depressive severity scores for the sample are presented in Table 2.

Statistical Analysis

Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS), Version 13. Differences between groups were compared with chi-square, Fisher's exact test, or *t* tests, as appropriate. Two logistic regression models were constructed to examine the relationship between completed suicide and sleep disturbances, controlling for the possible confounding effects of a current affective disorder diagnosis and depressive severity in probands.

Given that males were overrepresented in the suicide completer group, gender was included as a covariate in the logistic regression analyses. We also conducted separate moderator analyses to examine whether the association between sleep disturbance and suicide varied by gender. In addition, prior studies examining group differences in this sample (Brent, Perper, Moritz, Allman, Roth, Schweers, Balach, & Baugher, 1993; Brent et al., 1999) found current substance use disorder and conduct disorder distinguished the suicide and control groups. Given that each disorder was also associated with the presence of sleep disturbance in this sample (substance use disorder $\chi^2(1, N = 244) = 11.20$, $p < .01$; conduct disorder $\chi^2(1, N = 246) = 5.30$, $p < .02$), we controlled for these conditions in the logistic regression analyses. Rates of current anxiety disorder did not differ between the groups; therefore, this variable was not entered as a covariate.

In order to examine sleep changes immediately preceding suicide, change scores were computed for K-SADS insomnia and hypersomnia items by subtracting last week (LW) ratings from current depressive episode (present episode, PE) ratings. A negative change score indicated symptom worsening in the week preceding suicide (i.e., the sleep symptom was rated higher/more severe in the LW than in the PE), whereas a positive score indicated symptom improvement.

Results

Rates of Sleep Disturbance

As can be seen in Table 3, chi-square analyses indicate the rate of overall sleep disturbance was higher for suicide completers than controls, for both the week preceding death (last week, LW) and the current depressive episode (present episode, PE). Completers had higher rates of both insomnia and hypersomnia for the LW as well as the PE. More detailed ratings of type of sleep difficulty were available for the PE, whereby higher rates of initial insomnia and daytime sleepiness distinguished the completer group. The completer and control groups were not different with respect to rates of middle insomnia, terminal insomnia, circadian reversal, nor non-restorative sleep.

Sleep Disturbance, Controlling for the Effects of Current Affective Disorder

Controlling for differences between groups in the rate of current affective disorder (48% of completers vs. 10% of controls; $\chi^2(1, N = 270) = 46.0$, $p < .01$), the rate of overall sleep difficulties remained significantly higher among completers for both the LW (*OR* = 7.0, *CI* = 2.3 to 21.6, $p < .01$) and the PE (*OR* = 5.2, *CI* = 2.4 to 11.3, $p < .01$), where *OR* = odds ratio and *CI* = 95% confidence interval. Over and above the effects of current affective disorder, completers were more likely to have insomnia and/or hypersomnia in the LW (insomnia *OR* = 7.2, *CI* = 2.1 to 24.9, $p < .01$; hypersomnia *OR* = 10.1, *CI* = 1.2 to 88.5, $p = .04$) but not the PE (insomnia *OR* = 1.5, *CI* = 0.6 to 3.8, $p = .40$; hypersomnia *OR* = 3.4, *CI* = 0.9 to 12.3, $p = .06$). Gender did not emerge as a significant moderator of the associations between sleep disturbance and suicide when controlling for current affective disorder (for all, *p*s > .10).

Sleep Disturbance, Controlling for the Effects of Depressive Severity

Suicide completers had higher depressive severity scores than controls for both the LW (completer mean K-SADS depression severity score = 1.7 ± 0.81, control $M = 1.1 \pm 0.26$, $t(212) = 6.48$, $p < .01$) and PE (completer $M = 1.8 \pm 0.84$, control $M = 1.3 \pm 0.65$, $t(214) = 4.50$, $p < .01$). Adjusting for depressive severity, the rate of overall sleep difficulties remained significantly elevated in completers for the LW (*OR* = 4.3, *CI* = 1.2 to 15.2, $p = .03$) and PE (*OR* = 10.4, 95% *CI* = 3.9 to 27.8, $p < .01$). Higher insomnia rates in the completer group held after controlling for depressive symptoms for the LW (*OR* = 5.3, *CI* = 1.4 to 20.4, $p = .02$) but not the PE (*OR* = 2.5, *CI* = 0.9 to 7.2, $p = .08$). In contrast, differences between groups in the rate of hypersomnia were no longer significant after covarying for depressive severity (for LW, *OR* = 0.8, *CI* = 0.1 to 9.8, $p > .10$; for PE, *OR* = 1.9, *CI* = 0.4 to 8.4, $p > .10$). Moderator analyses indicate that the associations between sleep disturbance and suicide are not significantly different between genders when controlling for the effects of depressive severity (for all, $p > .10$).

Change in Sleep Disturbance Preceding Suicide

The suicide and control groups exhibited similar rates of any changes in sleep symptoms (insomnia and/or hypersomnia) from PE ratings to LW ratings (13% for both groups; $\chi^2(1, N = 245) = 0.00$, $p > .10$. However, of the 8 participants in the sample who exhibited a worsening (i.e., any K-SADS sleep item rated higher in the LW than in the PE) of sleep disturbance in the prior week (5 insomnia, 3 hypersomnia), 7 were completers ($p = .02$). The two groups exhibited similar rates of sleep symptom improvement in the LW (8% completers, 12% controls, $\chi^2(1, N = 238) = 0.90$, $p > .10$).

Discussion

Our findings support a clear relationship between sleep difficulties and completed suicide among adolescents. Suicide completers exhibited higher rates of overall sleep difficulties as compared with community controls both within the week preceding suicide and within their most recent depressive episode. Higher rates of insomnia and hypersomnia distinguished the suicide group. Findings of completers' elevated rates of sleep disturbance in the week preceding death remained significant even after accounting for the differential rate of affective disorder between groups. After controlling for depressive severity, suicide completers remained 10 times more likely to have sleep difficulties within the present affective episode, 4 times more likely to exhibit sleep problems in the week preceding death, and 5 times more likely to exhibit insomnia in the week before death. These findings did not differ by gender. Thus, these findings may offer preliminary support for the AAS's declaration of insomnia as a warning sign for completed suicide in adolescents, that is, an acute, episodic factor conferring proximal and specific near-term risk. The two groups demonstrated similar rates of sleep pattern changes in the preceding week. However, more suicide completers exhibited a worsening of sleep symptoms in the final week.

To our knowledge, this is the first report on the association between sleep problems and completed suicide in adolescence. These findings are similar to those in the adult literature demonstrating a link between insomnia and completed suicide (Barraclough & Pallis, 1975; Farberow & MacKinnon, 1974; Fawcett et al., 1990). Furthermore, our findings converge with those of other groups demonstrating an association between insomnia in adolescents and suicidal ideation (Barbe et al., 2005; Choquet et al., 1993; Choquet & Menke, 1989) and attempts (Tishler, McKenry, & Morgan, 1981). Although Liu (2004) also reported elevated rates of insomnia as well as hypersomnia among adolescent suicide ideators, findings in that sample did not remain significant after adjusting for depressive symptoms. Although seemingly disparate from the present findings, the time frame for assessing sleep symptoms in the Liu

study was 1 month, whereas in the present study we found that insomnia in the last week (but not in the present episode) distinguished the groups in the analyses controlling for depressive severity. Alternatively, it is possible that suicide completers do, in fact, represent a different risk profile than ideators.

The converging evidence thus supports a strong link between sleep disturbance and suicidality in adolescents. However, the mechanism/pathway remains to be established. It has been hypothesized that insomnia and hypersomnia may increase suicide risk in vulnerable individuals by impairing cognitive function such that processes including judgment and concentration are severely compromised (Liu, 2004). Similarly, fatigue resulting from sleep difficulties may lead to hopelessness and decreased impulse control, both demonstrated risk factors for suicide (Joiner, Brown, & Wingate, 2005). Likewise, sleep deprivation may impair problem-solving ability; coupled with decreased capacity to regulate emotional states when tired, vulnerable adolescents may utilize limited alternatives for tolerating emotional distress (Dahl & Lewin, 2002). Alternatively, it is possible that sleep disturbance activates or exacerbates an individual's susceptibility to psychopathology (Liu & Buysse, 2005). Another explanation may lie in shared biological determinants underlying both circadian rhythm disruptions and suicide; for example, deficient serotonergic systems are implicated in completed suicide (Arango et al., 2001) and have also been shown to regulate rapid eye movement (REM) latency in adolescents (Dahl et al., 1990; Goetz, 1996).

Limitations

Information on sleep difficulties from suicide completers was collected retrospectively by informant interview. Although this methodology has been demonstrated to have high reliability and validity, research indicates that parents of adolescent suicide attempters underestimate depressive symptoms (Brent, Perper, Kolko, & Zelenak, 1988; Velting et al., 1998). If the same holds true for parents of adolescent suicide completers, sleep problems reported herein among suicide completers are *underestimates* of such problems. In addition, given the intimate nature of sleep, it is unknown to what extent informants would be aware of certain sleep difficulties —indeed, some sleep problems (e.g, circadian reversal) would be more readily identifiable by informants than others (e.g., difficulty falling asleep). Furthermore, the time lapse (on average 5 months) between the adolescent's death and conduct of the informants' psychological autopsy interviews may also be associated with reporting bias. In contrast, information on sleep difficulties among controls was based on best-estimate ratings from direct interviews with the adolescent and a parent/guardian, rendering group differences in the report of sleep problems likely. Future studies should aim to collect prospective data on sleep and suicidal behavior in order to minimize informant bias. Additionally, our study involved a community control group obtained by geographic cluster sampling; although analyses controlled for group differences in depression, future studies utilizing a control group of depressed adolescents with no history of suicidality would provide further evidence of the unique risk for suicide conferred by sleep problems. Information on additional problematic sleep patterns shown to be associated with suicide in other studies were not collected, including total hours of sleep, nightmares, and sleep quality; these variables should be explored in future research to further elucidate the sleep–suicide relationship Lastly, variables other than psychiatric disturbance associated with both suicidality and sleep problems, including skills deficits in emotion regulation, should be examined to determine their relative contribution to risk.

Clinical Implications

Sleep difficulties in adolescents at risk for suicide should be regularly assessed, as such disturbances may render the individual vulnerable to suicide over and above the vulnerability conferred by presence and severity of affective disorder. Findings suggest that focused assessment on sleep disturbance in the preceding week, regardless of depressive symptom

severity, may be of particular importance in this population. Any acute changes in sleep patterns should also alert clinicians to carefully consider safety issues Intervention for high-risk adolescents should focus on sleep disturbance as a specific vulnerability for suicidal behavior, separate from its association with depression. Although empirical data on the effectiveness of treatments for sleep disturbance in adolescents is limited, promising psychosocial models include cognitive–behavioral therapy for insomnia (Bootzin & Stevens, 2005). Careful consideration should also be given to the use of pharmacological interventions to improve sleep (Mindell & Owens, 2003; Owens, Rosen, & Mindell, 2003). Finally, prevention efforts should target good sleep hygiene and early detection and treatment of problematic sleep patterns in order to decrease risk for suicide In this regard, psychosocial intervention may play a central role in the prevention of adolescent suicide.

References

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 3. Washington, DC: Author; 1980.

Arango V, Underwood MD, Boldrini M, Tamir H, Kassir SA, Hsiung S, et al. Serotonin 1A receptors, serotonin transporter binding and serotonin transporter mRNA expression in the brainstem of depressed suicide victims. Neuropsychopharmacology 2001;25:892–903. [PubMed: 11750182]

Bailly D, Bailly-Lambin I, Querleu D, Beuscart R, Collinet C. Sleep in adolescents and its disorders. A survey in schools Encephale 2004;30:352–359.

Barbe RP, Williamson DE, Bridge JA, Birmaher B, Dahl RE, Axelson DA, et al. Clinical differences between suicidal and nonsuicidal depressed children and adolescents. Journal of Clinical Psychiatry 2005;66:492–498. [PubMed: 15816792]

Barraclough BM, Pallis DJ. Depression followed by suicide: A comparison of depressed suicides with living depressives. Psychological Medicine 1975;5:55–61. [PubMed: 1118531]

Bhatia MS, Aggarwal NK, Aggarwal BBL. Psychosocial profile of suicide ideators, attempters, and completers in India. International Journal of Social Psychiatry 2000;46:155–163. [PubMed: 11075627]

Bootzin RR, Stevens SJ. Adolescents, substance abuse, and the treatment of insomnia and daytime sleepiness. Clinical Psychology Review 2005;25:629–644. [PubMed: 15953666]

Brent DA, Baugher M, Bridge J, Chen J, Beery L. Age and sex-related risk factors for adolescent suicide. Journal of the American Academy of Child and Adolescent Psychiatry 1999;38:1497–1505. [PubMed: 10596249]

Brent DA, Bridge J, Johnson BA, Connolly J. Suicidal behavior runs in families: A controlled family study of adolescent suicide victims. Archives of General Psychiatry 1996;53:1145–1152. [PubMed: 8956681]

Brent DA, Perper JA, Goldstein CE, Kolko DJ, Allan MJ, Allman CJ, et al. Risk factors for adolescent suicide: A comparison of adolescent suicide victims with suicidal inpatients. Archives of General Psychiatry 1988;45:581–588. [PubMed: 3377645]

Brent DA, Perper JA, Kolko DJ, Zelenak JP. The psychological autopsy: Methodological considerations for the study of adolescent suicide. Journal of the American Academy of Child and Adolescent Psychiatry 1988;27:362–366. [PubMed: 3379020]

Brent DA, Perper J, Moritz G, Allman C, Friend A, Schweers J, et al. Psychiatric effects of exposure to suicide among the friends and acquaintances of adolescent suicide victims. Journal of the American Academy of Child and Adolescent Psychiatry 1992;31:629–639. [PubMed: 1644725]

Brent DA, Perper JA, Moritz G, Allman CJ, Roth C, Schweers J, Balach L. The validity of diagnoses obtained through the psychological autopsy procedure: Use of family history. Acta Psychiatrica Scandinavica 1993;87:118–122. [PubMed: 8447238]

Brent DA, Perper JA, Moritz G, Allman C, Roth C, Schweers J, Balach L, Baugher M. Psychiatric risk factors for adolescent suicide: A case-control study. Journal of the American Academy of Child and Adolescent Psychiatry 1993;32:521–529. [PubMed: 8496115]

Brent DA, Perper JA, Moritz G, Allman C, Schweers J, Roth C, Balach L, Canobbio R, Liotus L. Psychiatric sequelae to the loss of an adolescent peer to suicide. Journal of the American Academy of Child and Adolescent Psychiatry 1993;32:509–517. [PubMed: 8496113]

Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. Journal of Child Psychology and Psychiatry 2006;47:372–394. [PubMed: 16492264]

Chambers WJ, Puig-Antich J, Hirsch M, Paez P, Ambrosini PJ, Tabrizi MA, et al. The assessment of affective disorders in children and adolescents by semistructured interview: Test–retest reliability of the schedule for affective disorders and schizophrenia for school-age children, present episode version. Archives of General Psychiatry 1985;42:696–702. [PubMed: 4015311]

Choquet M, Kovess V, Poutignat N. Suicidal thoughts among adolescents: An intercultural approach. Adolescence 1993;28:649–659. [PubMed: 8237550]

Choquet M, Menke H. Suicidal thoughts during early adolescence: Prevalence, associated troubles, and help-seeking behavior. Acta Psychiatrica Scandinavica 1989;81:170–177. [PubMed: 2327280]

Cukrowicz KC, Otamendi A, Pinto JV, Bernert RA, Krakow B, Joiner TE Jr. The impact of insomnia and sleep disturbances on depression and suicidality. Dreaming 2006;16:1–10.

Dahl RE, Lewin DS. Pathways to adolescent health: Sleep regulation and behavior. Journal of Adolescent Health 2002;31:175–184. [PubMed: 12470913]

Dahl RE, Ryan ND, Puig-Antich J, Nelson B, Dachille S, Cunningham SL, et al. EEG sleep in adolescents with major depression: The role of suicidality and inpatient status. Journal of Affective Disorders 1990;19:63–75. [PubMed: 2140847]

Farberow NL, MacKinnon D. A suicide prediction schedule for neuropsychiatric hospital patients. Journal of Nervous and Mental Disease 1974;158:408–419. [PubMed: 4841286]

Fawcett J, Scheftner WA, Fogg L, Clark DC, Young MA, Hedeker D, et al. Time-related predictors of suicide in major affective disorder. American Journal of Psychiatry 1990;147:1189–1194. [PubMed: 2104515]

Goetz RR. Rapid eye movement density among adolescents with major depressive disorder revisited. Archives of General Psychiatry 1996;53:1066–1067. [PubMed: 8911234]

Gould MS, Fisher P, Parides M, Flory M, Shaffer D. Psychosocial risk factors of child and adolescent completed suicide. Archives of General Psychiatry 1996;53:1155–1162. [PubMed: 8956682]

Hollingshead, A. Four-factor index of social status. New Haven, CT: Yale University; 1975.

Joiner TE Jr, Brown J, Wingate LR. The psychobiology and neurobiology of suicidal behavior. Annual Review of Psychology 2005;56:287–314.

Kelly TM, Mann JJ. Validity of *DSM–III–R* diagnosis by psychological autopsy: A comparison with clinician ante-mortem diagnosis. Acta Psychiatrica Scandinavica 1996;94:337–343. [PubMed: 9124080]

Knutson KL. The association between pubertal status and sleep duration and quality among a nationally representative sample of U.S adolescents. Human Biology 2005;17:418–424.

Leckman JF, Sholomskas D, Thompson WD, Belanger A, Weissman MM. Best estimate of lifetime psychiatric diagnosis: methodological study. Archives of General Psychiatry 1982;39:879–883. [PubMed: 7103676]

Liu X. Sleep and adolescent suicidal behavior. Sleep 2004;27:1351–1358. [PubMed: 15586788]

Liu X, Buysse DJ. Sleep and youth suicidal behavior: neglected field. Current Opinion in Psychiatry 2005;19:288–293. [PubMed: 16612215]

Mindell, JA.; Owens, J. A clinical guide to pediatric sleep: Diagnosis and management of sleep problems. Philadelphia: Williams & Wilkins; 2003.

Ohayon MM, Morselli PL, Guillemenault C. Prevalence of nightmares and their relationship to psychopathology and daytime functioning in insomnia subjects. Sleep 1997;20:340–348. [PubMed: 9381055]

Orvaschel H, Puig-Antich J, Chambers W, Tabrizi MA, Johnson R. Retrospective assessment of prepubertal major depression with the Kiddie–SADS-E. Journal of the American Academy of Child Psychiatry 1982;21:392–397. [PubMed: 7119313]

Owens J, Rosen CL, Mindell JA. Medication use in the treatment of pediatric insomnia: Results of a survey of community-based pediatricians. Pediatrics 2003;111:628–635.

Roberts RE, Roberts CR, Chen IG. Functioning of adolescents with symptoms of disturbed sleep. Journal of Youth and Adolescence 2001;30:1–18.

Rudd MD, Berman AL, Joiner TE Jr, Nock MK, Silverman MM, Mandrusiak M, et al. Warning signs for suicide: Theory, research, and clinical applications. Suicide and Life-Threatening Behavior 2006;36:255–262. [PubMed: 16805653]

Ryan ND, Puig-Antich J, Ambrosini P, Rabinovich H, Robinson D, Nelson B, et al. The clinical picture of major depression in children and adolescents. Archives of General Psychiatry 1987;44:854–861. [PubMed: 3662742]

Taylor D, Jenni OG, Acebo C, Carskadon MA. Sleep tendency during extended wakefulness: Insights into adolescent sleep regulation and behavior. Journal of Sleep Research 2005;14:239–244. [PubMed: 16120098]

Tishler CL, McKenry PC, Morgan KC. Adolescent suicide attempts: Some significant factors. Suicide and Life-Threatening Behavior 1981;11:86–92. [PubMed: 7256821]

Velting DM, Shaffer D, Gould MS, Garfinkel R, Fisher P, Davies MD. Parent–victim agreement in adolescent suicide research. Journal of the American Academy of Child and Adolescent Psychiatry 1998;37:1161–1166. [PubMed: 9808927]

Vignau J, Bailly D, Duhamel A, Vervaecke P, Beuscart R, Collinet C. Epidemiologic study of sleep quality and troubles in French secondary school adolescents. Journal of Adolescent Health 1997;21:343–350. [PubMed: 9358298]

Wolfson A, Carskadon MA. Sleep schedules and daytime functioning in adolescents. Child Development 1998;69:875–887. [PubMed: 9768476]

World Health Organization. Suicide rates and absolute numbers of suicide by country. Geneva, Switzerland: Author; 2002. Retrieved from http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/

Appendix

Schedule for Affective Disorders and Schizophrenia for School-Aged Children Depression Section Sleep Item Ratings

	Hypersomnia (rated 0–6)
0	No information
1	Not at all
2	Occasionally
3	Frequently sleeps at least 1 hour more than usual
4	Frequently sleeps at least 2 hours more than usual
5	Frequently sleeps at least 3 hours more than usual
6	Frequently sleeps at least 4 hours more than usual

	Insomnia (rated 0–6)
0	No information
1	Not at all
2	Slight: Occasional difficulty
3	Mild: Often (at least 2 times a week) has some significant difficulty
4	Moderate: Usually has considerable difficulty
5	Severe: Almost always has great difficulty
6	Extreme: Claims he/she almost never sleeps

Types of insomnia (rated for present episode only if insomnia is present, i.e., ≥3; each item is rated 0–4)	
Initial insomnia	Difficulty falling asleep
Middle insomnia	Difficulty staying asleep, preceded and followed by sleep

Types of insomnia (rated for present episode only if insomnia is present, i.e., ≥3; each item is rated 0–4)

Terminal insomnia	Difficulty staying asleep the usual amount of time or final awakening after 5 hours of sleep
Circadian reversal	Regularly falls asleep no earlier than 4 am and wakes up no earlier than noon. Not under voluntary control.
Non-restorative sleep	Does not feel rested upon awakening
Daytime sleepiness	Feels drowsy or sleepy during the day

0	No information
1	Not present
2	Doubtful (or < 30 min)
3	Definitely present, mild to moderate (or 30–90 min)
4	Definitely present, severe (or over 90 min)

Note. From J. Puig-Antich & N. D. Ryan, 1986, *The Schedule for Affective Disorders and Schizophrenia for School-Aged Children—Present Episode version, 4th edition (K-SADS-P)*. Pittsburgh, PA: Western Psychiatric Institute and Clinic, University of Pittsburgh Medical Center. Reprinted with permission of the authors.

Table 1

Demographic Variables for Adolescent Suicide Completers and Controls

Variable	Suicide completers (*n* = 140)	Controls (*n* = 131)
Race (% Caucasian)	95.7	100
SES (*M* ± *SD*)	3.2 ± 1.2	3.2 ± 0.9
Age in years (*M* ± *SD*)	17.3 ± 1.9	17.5 ± 1.7
Gender (% male)[a]	85	70

Note. SES = socioeconomic status (Hollingshead, 1975).

[a] $\chi^2(1, N = 270) = 9.40, p < .01$.

Table 2

Current K-SADS Affective Disorder Diagnoses and Depressive Severity Scores for Adolescent Suicide Completers and Controls

Measure	Completers (*n* = 140)		Controls (*n* = 131)			
	n	**(%)**	***n***	**(%)**	**$\chi^2(1, N = 270)$**	***p***
Current affective disorder	66	(48%)	13	(10%)	46.00	<.01
	M	*SD*	*M*	*SD*	$_t$[a]	*p*
K-SADS Depressive severity (LW)	1.7	0.8	1.1	0.3	6.5	<.01
K-SADS Depressive severity (PE)	1.8	0.8	1.3	0.7	4.5	<.01

Note. K-SADS = Schedule for Affective Disorders and Schizophrenia for School-Aged Children. LW = last week; PE = present episode.

[a]For LW, *df* = 212; for PE, *df* = 214.

Table 3

K-SADS Sleep Disturbance and Suicide Completer Status

	Completers (n = 140)		Controls (n = 131)			
Variable	***n***	**%**	***n***	**%**	**$\chi^2(1, N = 247)$**	***p***
Last week						
Any sleep disturbance	35	31	5	4	32.6	<.01
Insomnia	30	30	4	3	32.4	<.01
Hypersomnia	16	15	1	1	17.3	<.01
Present episode						
Any sleep disturbance	67	58	19	15	50.7	<.01
Insomnia	32	31	14	11	14.9	<.01
Initial insomnia	25	23	14	11	6.7	.01
Middle insomnia	8	8	4	3	2.5	.10
Terminal insomnia	0	0	4	3	__[a]	.10
Circadian reversal	5	4	1	1	__[a]	.10
Non-restorative sleep	10	10	9	7	0.9	.30
Daytime sleepiness	13	13	7	5	4.3	.04
Hypersomnia	17	16	6	5	4.5	<.01

Note. K-SADS = Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present Episode and Epidemiologic versions.

[a] Fisher's exact test.