HHS Public Access

Author manuscript

Int J Behav Consult Ther. Author manuscript; available in PMC 2015 September 02.

Published in final edited form as:

Int J Behav Consult Ther. 2014 ; 9(3): 7–10.

Improving the Prediction of Suicidal Behavior in Youth

Catherine R. Glenn[*] and **Matthew K. Nock**

Department of Psychology, Harvard University

Abstract

Suicidal behaviors increase dramatically during adolescence. In order to effectively intervene and ultimately prevent suicide in youth, the field needs to be able to identify and predict which adolescents are at greatest suicide risk. However, present knowledge of risk factors for suicide and techniques for identifying at-risk youth are insufficient. The purpose of the current manuscript is to highlight some of the key, yet unanswered, questions about the prediction of suicidal behavior in youth, and to suggest the types of research advances needed to move the field forward.

Keywords

suicide; suicide attempt; suicide risk; adolescence; prediction

I. Scope of the Problem

Suicide and suicidal behavior (i.e., non-fatal suicidal acts) are major public health concerns in youth. Suicide is the second leading cause of death among U.S. adolescents (ages 12–19 years) with over 2,000 suicide deaths annually in this group (Centers for Disease Control and Prevention [CDC], 2013). In addition to suicide deaths, rates of suicidal thoughts and non-fatal suicidal behaviors also are alarmingly high in youth; each year approximately 16% of high school students report seriously considering suicide and 8% report making one or more suicide attempts (CDC, 2012). Notably, suicidal thoughts and behaviors are relatively rare in childhood but increase drastically during the transition to adolescence (Nock, Borges, Bromet, Cha, et al., 2008; Nock et al., 2013). This developmental transition is an important time period for suicide intervention and prevention. But which youth should be targeted for such programs?

Although suicidal thoughts are relatively common in youth, most adolescents who think about suicide will never make a suicide attempt (Nock et al., 2013). Therefore, an important next step is to improve identification of which young people are at risk for acting on their suicidal thoughts or urges. However, in order to identify these at-risk youth, the field needs reliable short-term predictors of suicidal behavior – that is, predictors of which adolescents are at risk of harming themselves in the near future (the next minutes, hours, or days). Though research has progressed in this area over the past few decades, there are still

[*]Correspondence concerning this paper should be addressed to: Catherine R. Glenn, Department of Psychology, Harvard University, William James Hall, 1280, 33 Kirkland Street, Cambridge, MA, 02138. catherienglenn@fas.harvard.edu; Phone: (617) 496-8563; Fax: (617) 496-9462.

significant gaps in our knowledge of reliable risk factors for suicide in adolescents. The purpose of the current manuscript is to highlight some of the important, yet unanswered, questions about the prediction of suicidal behavior in youth, and to suggest the types of research advances needed to move the field forward. In this paper, we have chosen to focus on a few specific research directions that we think are logical next steps in this area; however, the list of questions presented here is not exhaustive nor is it intended to be a roadmap for research in the field.

II. Prediction of Suicidal Behavior in Youth: Key Unanswered Questions

1. What factors predict the first onset of suicidal thoughts and behaviors in youth?

Suicide risk in adolescents and adults has been related to a wide range of sociodemographic (e.g., male gender for suicide death), psychiatric (e.g., presence and accumulation of multiple mental disorders), and psychosocial variables (e.g., stressful life events) (Borges et al., 2006; Nock, Borges, & Ono, 2012; Nock, Hwang, Sampson, & Kessler, 2010). However, the majority of these risk factors predict which adolescents and adults will *think* about suicide at some point in their lifetime but do not actually predict which individuals with suicidal thoughts will act on them and engage in suicidal *behavior* (Nock et al., 2013; Nock, Hwang, et al., 2010).

In addition, much of what we do know about prospectively predicting suicidal behavior comes from studies focused on suicide *reattempts* – that is, longitudinal studies predicting subsequent suicide attempts after an individual has already started engaging in suicidal behavior. It is important to note that large-scale epidemiological studies, such as the National Comorbidity Survey Adolescent Supplement (Nock et al., 2013), have been used to identify risk factors for initial suicide attempts; however, most such studies use retrospective reports rather than prospectively predict suicide attempts. For practical reasons, it makes sense that longitudinal research has focused on reattempts; suicide attempts are a low base rate behavior and previous attempters are at high risk for engaging in future suicidal behavior (Borges et al., 2006; Lewinsohn, Rohde, & Seeley, 1993). Yet, most individuals who die by suicide do so during their first attempt (Busch, Fawcett, & Jacobs, 2003). Given that existing research focuses primarily on suicide reattempts, the field knows much less about predictors of first suicide attempts that may lead to suicide death.

This issue is particularly important in light of research indicating that predictors of first suicide attempts may differ from predictors of subsequent attempts, or reattempts (Joiner & Rudd, 2000; Kaslow, Jacobs, Young, & Cook, 2006; Miranda et al., 2008). For instance, major negative life events may confer risk differently for first vs. repeat suicide attempts. One study found that more negative life events were related to greater suicide ideation among never- or first-attempters but not among repeat attempters (Joiner & Rudd, 2000). Consistent with the sensitization model used to explain the recurrence of many psychiatric disorders (Post & Weiss, 1998), this research suggests that a greater number of stressors may be necessary to trigger a first suicide attempt compared to subsequent attempts; moreover, individuals may become more reactive, or sensitive, to stressors over time thereby requiring fewer events to trigger subsequent attempts. Given the potential for these factors to confer

differential risk depending on an individual's previous suicide history, it will be important for future research to examine predictors of first suicide attempts and reattempts separately.

Research needed—As a first step, the field needs research that examines the natural development of suicidal thoughts and behaviors in youth. That is, before research can begin to focus on prediction, we need a better understanding of the overall prevalence and course of these thoughts and behaviors in younger populations. Although we know from retrospective reports in large epidemiological studies that suicidal thoughts and behaviors typically begin during adolescence (Nock et al., 2012; Nock et al., 2013), the temporal resolution of these retrospective reports may be limited, especially over longer time periods. To extend this research, prospective studies are needed that follow youth from childhood through adolescence to more accurately examine the course of these thoughts and behaviors over time. For instance, when do children first have passive thoughts of death (e.g., I wish I wasn't around anymore)? When, and in which children, does this first transition to active suicide ideation (e.g., I want to kill myself)? Identifying these earlier stages of risk will be vital for the development of prevention programs aimed at targeting youth before they transition to more seriously considering or acting on their suicidal thoughts.

In addition, the field needs prospective research aimed at identifying predictors of the first onset of suicidal behavior in youth. Studies of this type could target adolescents with active suicide ideation who are most at risk for acting on their suicidal thoughts. Given that most individuals who make the transition from suicidal thoughts to attempts will do so within one year after the onset of their suicidal thoughts (Nock, Borges, Bromet, Alonso, et al., 2008; Nock et al., 2013), research will need to identify these at-risk youth shortly after they *first* begin thinking about suicide.

2. Why does suicide risk increase so dramatically during the transition from childhood to adolescence?

Cross-national studies have carefully documented that suicidal behaviors – both suicide attempts and suicide deaths – are rare in children but increase significantly during the teenage years (Nock et al., 2012). Although previous studies have identified general risk factors for suicidal behavior across the lifespan, research to date has not explained why rates increase so drastically during *adolescence* specifically.

The transition from childhood to adolescence is a significant developmental period characterized by major changes in physical development, social environments, and the desire for independence (Blakemore, 2008; Casey, Jones, & Hare, 2008). Notably, the increase in suicidal behavior during adolescence coincides with key neurobiological changes during this transition, and growing research from developmental neuroscience may offer insight into the increased risk for suicide among youth. In particular, Casey, Somerville, and colleagues have recently proposed a neurobiological model that aims to explain why adolescents engage in more risky, and potentially harmful, behaviors than both children and adults (Casey, Jones, & Somerville, 2011; Somerville, Jones, & Casey, 2010). This model draws upon converging evidence from both rodent models of adolescence (Spear, 2010) and human neuroimaging research (Ernst et al., 2005; Somerville, Hare, & Casey, 2011) indicating that adolescence is

a developmental period characterized by accelerated maturation of subcortical regions (associated with reward responding and emotional reactivity) while prefrontal cortical regions (responsible for inhibitory control) are later to mature (Somerville et al., 2010). They propose that the *maturational imbalance* between these regions leads to adolescents' increased reward-focused behavior without the necessary capabilities for inhibitory control. In short, this model suggests that youth are at risk for harmful behaviors because they have too much drive without a fully developed braking system (Casey et al., 2011).

Importantly, growing research supports this theory. Previous studies have found that these neurobiological patterns are related to difficulties with inhibitory control in rewarding contexts (Somerville et al., 2011) and the potential for risky behavior among adolescents (Galvan, Hare, Voss, Glover, & Casey, 2007). However, this neurobiological model of adolescence has not yet been used to help explain the increased risk for suicide among youth. Insofar as traits such as risk-taking and impulsiveness are linked with both neurobiological changes during adolescence (Galvan et al., 2007) *and* with suicidal behavior (Nock, Borges, Bromet, Cha, et al., 2008), it stands to reason that these adolescent-specific neural patterns may also be related to suicidal behavior in this age group.

Research needed—What the field needs now is research that directly examines how the neurobiological changes during adolescence may confer risk for suicide in youth. For instance, studies could examine how impulsive behavior in rewarding, or other emotional, contexts may be related to suicidal thoughts and behaviors in this population. Moreover, given that disorders characterized by agitation, aggression, and substance abuse are related to increased risk for suicidal behavior in adolescents (Nock et al., 2013), and the neurobiological changes during adolescence are associated with traits that may underlie many of these disorders (e.g., difficulties with inhibitory control), research on these dynamic neural circuits could help elucidate the mechanism of increased suicide risk among youth with externalizing psychopathology.

Although knowledge of these neurobiological changes may improve understanding of the pathophysiology of suicide risk in youth, this information may not be directly applicable to the assessment and prediction of risk in clinical practice. To increase the clinical utility of this research, it will also be important to examine how these neural circuits relate to behavioral and self-report outcomes that can be more easily assessed in naturalistic settings.

3. How do non-suicidal self-injurious behaviors confer risk for suicidal behaviors in youth?

Recent, and growing, evidence suggests that non-suicidal self-injury (NSSI; e.g., cutting, burning) may be a particularly promising predictor of suicidal self-injury (i.e., suicide attempts). A number of studies now have found that NSSI is one of the most robust prospective risk factors for suicide attempts in adolescents (Asarnow et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011), even surpassing the predictive utility of past suicide attempts (previously identified as the strongest risk factor for future suicidal behavior) (Lewinsohn et al., 1993). Most of these findings have emerged within the past few years and suggest that improving understanding of the link between non-suicidal and

suicidal self-injury will be crucial for advancing knowledge of the pathophysiology, prediction, and treatment of suicidal behavior in youth.

However, the field is only beginning to understand the complex association between suicidal and non-suicidal forms of self-injury. The two classes of self-injurious behaviors are distinct in a number of important ways (Kahan & Pattison, 1984; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2004): (1) prevalence: NSSI is more prevalent than suicidal self-injury, (2) frequency: NSSI is engaged in more frequently than suicidal behavior, (3) age of onset: adolescents typically begin engaging in NSSI between the ages of 12 and 14 (Zetterqvist, Lundh, Dahlström, & Svedin, 2013), whereas the highest risk for onset of suicide ideation, plans, and attempts is in the late teenage years or early 20s (Kessler, Borges, & Walters, 1999), (4) intent: NSSI is performed without suicidal intent whereas suicide attempts are performed with at least some intent to die, and (5) medical severity: NSSI less frequently leads to medical intervention. In fact, important distinctions between these two classes of behaviors have led to NSSI's classification as a distinct clinical phenomenon in the most recent version of the Diagnostic and Statistical Manual of Mental Disorders – DSM-5 – where NSSI disorder is classified as “a condition that requires further study” (APA, 2013). Despite these important differences, suicidal and non-suicidal self-injurious behaviors co-occur to high degree, especially in clinical samples (Klonsky, May, & Glenn, 2013; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006), and, as already noted above, growing research has identified NSSI as one of the strongest risk factors for suicidal behavior (Asarnow et al., 2011; Wilkinson et al., 2011).

Although the connection between these two behaviors is clearly important, research to date has not yet elucidated *how* non-suicidal self-injury increases risk for suicidal self-injury. The interpersonal-psychological theory of suicide (IPTS) (Joiner, 2005) – a prominent, contemporary theory of suicide – suggests that NSSI may confer risk for suicidal behavior by increasing an individual's capability for engaging in potentially lethal self-harm (Van Orden et al., 2010). Specifically, NSSI may increase an individual's pain tolerance and decrease fear of bodily harm thereby increasing their capability for engaging in more severe forms of self-injury, such as suicide attempts (Van Orden et al., 2010). Consistent with this theory, previous research has found stronger associations between NSSI and suicidal behavior among adolescents who have engaged in a greater number of NSSI methods and who report experiencing less pain during NSSI (Nock et al., 2006).

Research needed—The field is in need of prospective research that specifically examines how NSSI relates to suicidal behavior over time. For instance, longitudinal studies could follow early adolescents (ages 12–13) who have just started engaging in NSSI, but not have yet engaged in suicidal behavior; regular assessments (e.g., weekly to monthly) could examine features of NSSI including number of methods, severity, and functions of the behavior to identify which youth may move from non-suicidal to suicidal forms of self-injury and when they are most likely to make this transition. In addition, it will be important to test proposed mechanisms of risk, such as the acquired capability for suicide (component of the IPTS), by examining changes in adolescents' pain tolerance and fear of death or suicide over time. Moreover, if the ability to engage in suicidal behavior is indeed *acquired* over time (rather than exists as a static trait), this could indicate a mechanism of suicide risk

that is malleable and suggest a potential target for intervention; if an individual can acquire the capability for suicide over time due to reduced fear of death, can this fear be reinstated? Recent research with non-suicidal forms of self-injury indicates that restoring individuals' aversion to NSSI may be an effective intervention (Franklin, Fox, Hooley, & Nock, 2014). The potential extensions of this research to suicidal behavior remain largely unexplored.

4. What factors predict when youth are most at risk?

Research on risk factors for suicide has increased knowledge about *which* youth are at heightened risk for suicide, but much less is known about risk over the short-term and *when* an adolescent is at greatest suicide risk. Knowledge of these short-term risk factors is essential for informing clinical decision making – for instance, when deciding if an adolescent should be hospitalized or discharged from psychiatric care. Existing research on risk factors for suicide has been limited by a reliance on long-term or distal risk factors, as well as time-invariant risk factors.

First, most research to date has focused on long-term correlates, or distal risk factors, for suicidal behavior (i.e., lifetime or 12-month risk factors). These studies have been vital first steps in understanding *which* individuals are at greatest risk for engaging in suicidal behavior. However, the field knows much less about short-term, or acute, risk factors for suicidal behavior. Notably, research indicates that different risk factors may predict suicide over the long-term compared to over shorter time periods; in one study, hopelessness and suicide ideation were found to predict suicide over the next 2–10 years, whereas anhedonia, anxiety, and insomnia predicted suicide over the next 12 months (Fawcett et al., 1990). This research suggests that we cannot assume distal correlates of suicide will be equally useful for predicting acute risk.

Although a number of public health and clinical resources, such as the Centers for Disease Control and Prevention, provide information on “warning signs” for suicide (i.e., the earliest detectable sign that indicates heightened risk for suicide in the near-term; (Rudd et al., 2006), pp. 258), there is currently little empirical evidence linking these warning signs to suicidal behavior. The few studies that have examined suicide risk over shorter time periods (i.e., within one week of the attempt) suggest that negative life events, specifically interpersonal life events (Bagge, Glenn, & Lee, 2013), acute alcohol use (Bagge, Lee, et al., 2013; Chiles, Strosahl, Cowden, Graham, & Linehan, 1986), and intense anxiety or agitation (Busch et al., 2003) may be promising short-term risk factors for suicide. However, most of these studies examined risk factors in relatively small samples, without a comparison group, and therefore it is difficult to know whether these results will generalize to other samples, and if these factors are specific to suicidal behavior (or are related to most acute psychiatric crises). In addition, no studies to our knowledge have examined proximal risk factors over shorter time periods (e.g., within one week) in adolescent samples, and, as a result, we know even less about short-term suicide risk factors in youth.

A second, but related, limitation of previous research is that many of the well-documented risk factors for suicidal behavior are time invariant. These factors may confer risk over an individual's lifetime, but do not indicate *when* an individual is at heightened risk. For example, a male with a family history of suicidal behavior who has previously attempted

suicide may always be at heightened risk for engaging in future suicidal behavior. Given this baseline level of risk, what will be most useful is knowledge of time-varying factors (emotional, cognitive, behavioral) that indicate *when* this male may be at heightened risk for killing himself.

Research needed—What the field needs now is research that examines more short-term and time-varying risk factors for suicide. This type of research would require intensive assessments (e.g., daily or weekly) of high-risk samples (e.g., after acute hospitalization) over shorter time periods (e.g., weeks to months). Studies should focus on assessing state, or time-varying, factors that have demonstrated some utility in previous studies, such as major life events, acute substance use or other risky behaviors, and intense emotional states (Bagge, Glenn, et al., 2013; Bagge, Lee, et al., 2013; Busch et al., 2003; Chiles et al., 1986). Real-time monitoring techniques, which have been used in previous studies with adolescent self-injurers (Nock, Prinstein, & Sterba, 2009), may be particularly useful for the frequent assessments necessary to advance knowledge in this area. Ultimately, this research will be the most valuable if it can help identify common acute risk factors, or warning signs, for suicide risk in youth.

5. How can we enhance suicide risk assessment in youth by using objective tools?

Research on suicide risk factors also has been limited by a reliance on self-report assessments, which may be inadequate (on their own) for indicating when youth are most at risk. For instance, the standard technique for assessing short-term risk is to ask individuals to self-report their current suicide ideation, plans, and intent. Unfortunately, these self-reports have proven to be poor predictors of suicide risk for a few key reasons: (1) individuals may be motivated to conceal their suicidal thoughts or plans (Busch et al., 2003; Qin & Nordentoft, 2005), and therefore self-reports may be even less reliable during periods of heightened risk; (2) self-injurious and suicidal thoughts are transient (Bagge, Littlefield, Conner, Schumacher, & Lee, 2014; Nock et al., 2009) and self-report methods, which require individuals to aggregate their experience over time (e.g., over the past week), may not be temporally sensitive enough to assess these fluctuations; and (3) given individuals' limited understanding of the processes underlying their behavior (Nisbett & Wilson, 1977), methods that require introspection may have inherent shortcomings for predicting risk.

Given these limitations, there are some notable advantages to augmenting self-report assessments with more objective tools that: (1) are not as susceptible to reporting biases; (2) may be better able to assess fluctuations in suicidal thoughts, plans, and intentions; and (3) do not rely on introspection. For instance, the implicit association test (IAT) has been adapted to measure implicit associations between oneself and self-injury (Nock & Banaji, 2007a, 2007b) or suicide (Nock, Park, et al., 2010), and a version of the Stroop test has been modified to measure attentional bias toward suicide-related words (Cha, Najmi, Park, Finn, & Nock, 2010). These behavioral tools have been shown to distinguish suicidal from non-suicidal individuals in both adolescent (Nock & Banaji, 2007b) and adult samples (Cha et al., 2010; Nock, Park, et al., 2010), as well as to prospectively predict suicidal thoughts and behaviors in adults over the subsequent six months (Cha et al., 2010; Nock, Park, et al., 2010). In addition, prospective research in adolescents is currently underway and these

behavioral tools appear to be demonstrating similar predictive utility in younger populations (Cha, D'Angelo, & Nock, 2014). Another notable advantage of *behavioral* objective tools in particular (as compared to other objective units of analysis, such as neural circuits and genes) is that these types of tests may be more easily disseminated to clinical practice. For example, many of the studies described above administered these tools in clinical settings, such as psychiatric emergency departments, illustrating the feasibility of using these types of measures in acute care.

Research needed—Moving forward, the field needs more prospective research in youth that incorporates objective tools. Behavioral tools, such as the IAT, can be completed online (www.pimh.net) from individuals' homes and therefore could be easily incorporated into study protocols. Of note, although measures, such as the Suicide IAT and Suicide Stroop Test, appear sensitive to fluctuations in suicide risk (Cha et al., 2010; Nock, Park, et al., 2010), the predictive utility of these tools has only been measured over the subsequent six months. Therefore, we do not yet know how useful these tools are for predicting short-term, or acute, suicide risk – which is critical for determining the clinical utility of these measures. Research is needed that specifically examines the predictive power of these objective measures over shorter time intervals, such as over the following hours, days, and weeks. Similar to the recommendations made for Question #4 (*What factors predict when youth are most at risk?*), research in this area will require intensive assessments of high-risk adolescents. Ideally, studies would include both objective *and* self-report measures (e.g., via real-time monitoring techniques) to examine how information assessed with these different tools can best be combined to improve knowledge of short-term suicide risk in youth.

III. Summary and Conclusions

Although our understanding of risk factors for suicide has improved over the past few decades, there still remain significant gaps in knowledge that hinder our ability to accurately identify and predict which individuals are most at risk. Moreover, given that the majority of existing research has focused on adult suicide risk, the field knows even less about risk prediction in youth. In this paper, we have highlighted five specific knowledge gaps, and unanswered questions, that we think will be important for future research to address, and have suggested the types of studies necessary to move the field forward in each area. The ultimate goal of this research is to improve our ability to predict *which* youth are most at risk for suicide, and *when* they are most at risk, so intervention and prevention efforts can be targeted for these youth at the appropriate time.

Acknowledgments

The research was supported, in part, by a grant from the National Institute of Mental Health (F32 MH097354) awarded to Catherine R. Glenn and a fellowship from the John D. and Catherine T. MacArthur Foundation to Matthew K. Nock.

IV. References

American Psychiatric Association. DSM 5. American Psychiatric Association; 2013.

Asarnow JR, Porta G, Spirito A, Emslie G, Clarke G, Wagner KD, McCracken J. Suicide attempts and nonsuicidal self-injury in the treatment of resistant depression in adolescents: findings from the

TORDIA study. Journal of the American Academy of Child & Adolescent Psychiatry. 2011; 50(8): 772–781. [PubMed: 21784297]

Bagge CL, Glenn CR, Lee HJ. Quantifying the impact of recent negative life events on suicide attempts. Journal of Abnormal Psychology. 2013; 122(2):359–368. [PubMed: 23088374]

Bagge CL, Lee HJ, Schumacher JA, Gratz KL, Krull JL, Holloman G Jr. Alcohol as an acute risk factor for recent suicide attempts: A case-crossover analysis. Journal of Studies on Alcohol and Drugs. 2013; 74(4):552–558. [PubMed: 23739018]

Bagge CL, Littlefield AK, Conner KR, Schumacher JA, Lee HJ. Near-term predictors of the intensity of suicidal ideation: An examination of the 24h prior to a recent suicide attempt. Journal of Affective Disorders. 2014; 165:53–58. [PubMed: 24882177]

Blakemore SJ. The social brain in adolescence. Nature Reviews Neuroscience. 2008; 9(4):267–277. [PubMed: 18354399]

Borges G, Angst J, Nock MK, Ruscio AM, Walters EE, Kessler RC. A risk index for 12-month suicide attempts in the National Comorbidity Survey Replication (NCS-R). Psychological Medicine. 2006; 36(12):1747–1757. [PubMed: 16938149]

Busch KA, Fawcett J, Jacobs DG. Clinical correlates of inpatient suicide. Journal of Clinical Psychiatry. 2003; 64(1):14–19.

Casey BJ, Jones RM, Hare TA. The adolescent brain. Annals of the New York Academy of Sciences. 2008; 1124(1):111–126. [PubMed: 18400927]

Casey BJ, Jones RM, Somerville LH. Braking and accelerating of the adolescent brain. Journal of Research on Adolescence. 2011; 21(1):21–33. [PubMed: 21475613]

Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. [Accessed November 1, 2014] Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. 2013. Available from www.cdc.gov/ncipc/wisqars

Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States, 2011. MMWR, Surveillance Summaries. 2012; 61:SS–4. Available from www.cdc.gov/mmwr/pdf/ss/ss6104.pdf.

Cha, CB., D'Angelo, EJ., Nock, MK. Manuscript in preparation. 2014. Using implicit and explicit measures to assess and predict self-injury among adolescents.

Cha CB, Najmi S, Park JM, Finn CT, Nock MK. Attentional bias toward suicide-related stimuli predicts suicidal behavior. Journal of Abnormal Psychology. 2010; 119(3):616–622. doi: 10.1037/a0019710. [PubMed: 20677851]

Chiles JA, Strosahl K, Cowden L, Graham R, Linehan M. The 24 hours before hospitalization: factors related to suicide attempting. Suicide and Life-Threatening Behavior. 1986; 16(3):335–342. [PubMed: 3764997]

Ernst M, Nelson EE, Jazbec S, McClure EB, Monk CS, Leibenluft E, Pine DS. Amygdala and nucleus accumbens in responses to receipt and omission of gains in adults and adolescents. Neuroimage. 2005; 25(4):1279–1291. [PubMed: 15850746]

Fawcett J, Scheftner WA, Fogg L, Clark DC, Young MA, Hedeker D, Gibbons R. Time-related predictors of suicide in major affective disorder. American journal of psychiatry. 1990; 147(9): 1189–1194. [PubMed: 2104515]

Franklin, JC., Fox, KR., Hooley, JM., Nock, MK. Manuscript under editorial review. 2014. A novel phone app dramatically reduces self-injurious behaviors: Evidence from a randomized controlled trial.

Galvan A, Hare T, Voss H, Glover G, Casey BJ. Risk-taking and the adolescent brain: Who is at risk? Developmental Science. 2007; 10(2):F8–F14. [PubMed: 17286837]

Joiner, TE. Why people die by suicide. Harvard University Press; Cambridge: 2005.

Joiner TE, Rudd MD. Intensity and duration of suicidal crisis vary as a function of previous suicide attempts and negative life events. Journal of consulting and clinical psychology. 2000; 68(5):909–916. [PubMed: 11068977]

Kahan J, Pattison EM. Proposal for a Distinctive Diagnosis: the Deliberate Self–Harm Syndrome (DSH). Suicide and Life-Threatening Behavior. 1984; 14(1):17–35. [PubMed: 6506129]

Kaslow NJ, Jacobs CH, Young SL, Cook S. Suicidal behavior among low-income African American women: A comparison of first-time and repeat suicide attempters. Journal of Black Psychology. 2006; 32(3):349–365.

Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. Archives of General Psychiatry. 1999; 56(7):617–626. [PubMed: 10401507]

Klonsky ED, May AM, Glenn CR. The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. Journal of Abnormal Psychology. 2013; 122(1): 231–237. [PubMed: 23067259]

Lewinsohn PM, Rohde P, Seeley JR. Psychosocial characteristics of adolescents with a history of suicide attempt. Journal of the American Academy of Child & Adolescent Psychiatry. 1993; 32(1): 60–68. doi: 10.1097/00004583-199301000-00009. [PubMed: 8428885]

Miranda R, Scott M, Hicks R, Wilcox HC, Harris Munfakh JL, Shaffer D. Suicide attempt characteristics, diagnoses, and future attempts: Comparing multiple attempters to single attempters and ideators. Journal of the American Academy of Child & Adolescent Psychiatry. 2008; 47(1): 32–40. [PubMed: 18174823]

Muehlenkamp JJ. Self–injurious behavior as a separate clinical syndrome. American Journal of Orthopsychiatry. 2005; 75(2):324–333. [PubMed: 15839768]

Muehlenkamp JJ, Gutierrez PM. An investigation of differences between self-injurious behavior and suicide attempts in a sample of adolescents. Suicide and Life-Threatening Behavior. 2004; 34(1): 12–23. [PubMed: 15106884]

Nisbett RE, Wilson TD. Telling more than we can know: Verbal reports on mental processes. Psychological Review. 1977; 84(3):231–259.

Nock MK, Banaji MR. Assessment of self-injurious thoughts using a behavioral test. American journal of psychiatry. 2007a; 164(5):820–823. doi: 10.1176/appi.ajp.164.5.820. [PubMed: 17475742]

Nock MK, Banaji MR. Prediction of suicide ideation and attempts among adolescents using a brief performance-based test. Journal of consulting and clinical psychology. 2007b; 75(5):707–715. doi: 10.1037/0022-006X.75.5.707. [PubMed: 17907852]

Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais A, Williams D. Cross-national prevalence and risk factors for suicidal ideation, plans, and attempts in the WHO World Mental Health Surveys. British Journal of Psychiatry. 2008; 192:98–105. [PubMed: 18245022]

Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S. Suicide and suicidal behavior. Epidemiologic Reviews. 2008; 30(1):133–154. [PubMed: 18653727]

Nock, MK.Borges, G., Ono, Y., editors. Suicide: Global perspectives from the WHO World Mental Health Surveys. Cambridge University Press; New York: 2012.

Nock MK, Green JG, Hwang I, McLaughlin KA, Sampson NA, Zaslavsky AM, Kessler RC. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: Results from the National Comorbidity Survey Replication Adolescent Supplement. JAMA Psychiatry. 2013; 70(3):300–310. doi: 10.1001/2013.jamapsychiatry.55. [PubMed: 23303463]

Nock MK, Hwang I, Sampson N, Kessler RC. Mental disorders, comorbidity, and suicidal behaviors: Results from the National Comorbidity Survey Replication. Molecular Psychiatry. 2010; 15(8): 868–876. [PubMed: 19337207]

Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ. Non-suicidal self-injury among adolescents: diagnostic correlates and relation to suicide attempts. Psychiatry Research. 2006; 144(1):65–72. doi: 10.1016/j.psychres.2006.05.010. [PubMed: 16887199]

Nock MK, Park JM, Finn CT, Deliberto TL, Dour HJ, Banaji MR. Measuring the suicidal mind: Implicit cognition predicts suicidal behavior. Psychological Science. 2010; 21(4):511–517. doi: 10.1177/0956797610364762. [PubMed: 20424092]

Nock MK, Prinstein MJ, Sterba SK. Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. Journal of Abnormal Psychology. 2009; 118(4):816–827. doi: 10.1037/a0016948. [PubMed: 19899851]

Post RM, Weiss SR. Sensitization and kindling phenomena in mood, anxiety, and obsessive–compulsive disorders: The role of serotonergic mechanisms in illness progression. Biological Psychiatry. 1998; 44(3):193–206. [PubMed: 9693391]

Qin P, Nordentoft M. Suicide risk in relation to psychiatric hospitalization: evidence based on longitudinal registers. Archives of General Psychiatry. 2005; 62(4):427–432. doi: 10.1001/archpsyc.62.4.427. [PubMed: 15809410]

Rudd MD, Berman AL, Joiner TE Jr. Nock MK, Silverman MM, Mandrusiak M, Witte T. Warning signs for suicide: theory, research, and clinical applications. Suicide and Life-Threatening Behavior. 2006; 36(3):255–262. doi: 10.1521/suli.2006.36.3.255. [PubMed: 16805653]

Somerville LH, Hare T, Casey BJ. Frontostriatal maturation predicts cognitive control failure to appetitive cues in adolescents. Journal of Cognitive Neuroscience. 2011; 23(9):2123–2134. [PubMed: 20809855]

Somerville LH, Jones RM, Casey BJ. A time of change: Behavioral and neural correlates of adolescent sensitivity to appetitive and aversive environmental cues. Brain and Cognition. 2010; 72(1):124–133. [PubMed: 19695759]

Spear, LP. The Behavioral Neuroscience of Adolescence. W. W. Norton & Company; New York, NY: 2010.

Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner TE Jr. The interpersonal theory of suicide. Psychological Review. 2010; 117(2):575–600. [PubMed: 20438238]

Wilkinson P, Kelvin R, Roberts C, Dubicka B, Goodyer I. Clinical and psychosocial predictors of suicide attempts and nonsuicidal self-injury in the Adolescent Depression Antidepressants and Psychotherapy Trial (ADAPT). American journal of psychiatry. 2011; 168(5):495–501. [PubMed: 21285141]

Zetterqvist M, Lundh L-G, Dahlström Ö, Svedin CG. Prevalence and function of non-suicidal self-injury (NSSI) in a community sample of adolescents, using suggested DSM-5 criteria for a potential NSSI disorder. Journal of abnormal child psychology. 2013; 41(5):759–773. [PubMed: 23344701]