Clarifying the Pathway to Suicide: An Examination of Subtypes of Suicidal Behavior and Their Association With Impulsiveness.

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Clarifying the Pathway to Suicide: An examination of subtypes of suicidal behavior and their association with impulsiveness.

A dissertation presented

by

Alexander J. Millner

to

The Department of Psychology

in partial fulfillment of the requirements

for the degree of

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“Clarifying the Pathway to Suicide: An examination of subtypes of suicidal behavior and their association with impulsiveness.”

Abstract

Suicide is a leading cause of death around the world. Yet research seeking to uncover the causes of suicide has made little advancement. The purpose of this dissertation is to advance the understanding of one understudied but critical component of suicidal behaviors: how individuals move down the pathway from first thinking about suicide to ultimately attempting to take their own lives. A secondary goal of this work is to examine some flawed methods used in prior research in this area. In Paper 1, I examine the validity of single-item measurement, a commonly used approach in this area of research in which key suicidal behaviors are assessed with one brief question. The primary finding in that paper is that single-item measurement is associated with significant misclassification of suicidal behavior. In addition, I offer and examine an approach that improves validity for self-reported suicidal behaviors. In Paper 2, I attempt to improve on prior research examining suicide planning prior to a suicide attempt and present descriptive data showing how people transition from thinking about suicide to actually attempting (i.e. planning steps they take during this transition). This study revealed that, although the pathway to suicide is heterogeneous, the vast majority of steps occur within 2 weeks and most within 12 hours of an attempt. In Paper 3, I examine the association between impulsiveness and suicidal behavior, using more comprehensive measures of both constructs than prior studies and testing whether
increased impulsiveness could help explain why some people that think about suicide go on to attempt to kill themselves and others do not. The findings from that paper reveal only one dimension of impulsiveness – negative urgency – that differs between suicidal and control participants and none that differ between ideators and attempters suggesting that the dimensions of impulsiveness tested do not appear to influence attempts among ideators. In all three papers, I criticize prior research but provide approaches that could lead to modest improvements in methodology and, hopefully, lead to new discoveries in understanding how and why people transition from thinking about killing themselves to attempting suicide.
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Acknowledgements

I cannot express enough appreciation to Matt Nock. When I started in Matt’s laboratory, I was adrift in research, lacking confidence in my own ideas. Although, I still have a long way to go to be a quality scientist, Matt’s incredible support, availability, openness, and trust in me was critical to me reaching this point. He has worked late hours revising my writing, grant proposals and presentations, trying to instill a straightforward, compelling approach from which my mind often digresses towards complexity and confusion. We have had conversations about nearly every aspect of science and academia that have been as important to my development as any other part of our formal work together. Above all else, Matt leads by powerful example - his incredible intelligence, integrity, and generosity combined with his modesty and dedication to the work are inspiring. I will consider my career a success if I come close to exhibiting these qualities that appear effortless for him.

There is also no amount of gratitude that is appropriate to thank my wife, Katie. She has endured this difficult, sometimes agonizing, graduate school experience alongside me from the beginning. I thank her for moving to Massachusetts so I could take advantage of this remarkable opportunity. I thank her for her continual support despite my neuroticism and attraction to despair. I thank her for her determination in preventing me from descending into a workaholic life and ensuring that we have a semblance of balance. I thank her for being a great mother to our son, Simon. Finally, I thank her for her patience over the past month as I have been writing this dissertation and have been, essentially, unavailable.
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I would like to thank Don Robinaugh and Sarah Hope Lincoln, the two other members of my clinical science cohort. I could not have gotten through graduate school without them. They are incredibly smart and critically minded, as well as understanding and compassionate. They both inspired me consistently.

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Introduction

Suicide is a major cause of death around the world. More people die from suicide each year than by all murder and wars combined (Lozano et al., 2012). Furthermore, other than random fluctuations, the rates of suicide in the United States have not changed over the past 60 years (Center of Disease Control and Prevention, 2010). The World Health Organization has called improving suicide prevention efforts an “imperative” (World Health Organization, 2014). Despite the significant number of suicide deaths, little is known about the causes of suicide. Using scientific methods to understand the etiology of other public health concerns has led to effective treatments for widespread maladies, such as polio (Salk, 1955). The same scientifically rigorous approach is needed to advance the understanding and effective treatment of suicidal behavior.

Researchers have collected information about suicide deaths for over 100 years (Durkheim, 1897). However, examining suicide deaths has provided limited understanding of what led to these deaths because the principal subjects of interest - suicide victims - cannot be studied directly. To address this problem, researchers have studied those who have engaged in non-lethal suicidal behavior. In a series of articles in the 1970’s, Beck outlined three main suicidal behaviors of interest: suicidal ideation, plans and attempts (Beck et al., 1973; Beck, Kovacs, & Weissman, 1979; Beck, Weissman, Lester, & Trexler, 1976; Beck, Beck, & Kovacs, 1975). Since then, the majority of studies on these pre-cursors to suicide have either described the prevalence of these three outcomes or examined factors that predict them (Nock, Borges, Bromet, Cha, et al., 2008). However, there are several problems with using these outcomes as the main variables of interest to understand suicide.
Lack of precision in the conceptualization and measurement of suicidal behavior

First, there may be a discrepancy between researchers’ definitions for these terms and participants’ interpretation of the same terms when they are asked to endorse or deny suicidal behaviors on a self-report questionnaire. In the majority of studies of suicidal behavior, the presence of each type of suicidal behavior is measured using a single item (e.g., have you ever made a suicide attempt), this discrepancy may lead participants to misclassify their suicidal behaviors, resulting in reduced validity of both the measurement and of findings produced by studies that use these methods. This is the focus of Paper 1 of this dissertation. Several types of suicidal behaviors, such as suicide ideation and attempts, have been defined through a series of consensus articles (e.g. a suicide attempt requires the person engaged in a potentially lethal behavior with some intention of dying; (O’Carroll et al., 1996; Silverman, Berman, Sanddal, O’Carroll, & Joiner, 2007b)). Surprisingly, virtually no prior studies have examined the extent to which single-item measures of suicide ideation and attempts represent valid measures of these constructs. This is not a trivial issue. Indeed, even in instances in which semi-structured interviews are used (e.g., Nock, Holmberg, Photos, & Michel, 2007; Posner et al., 2011), accurately classifying these behaviors can be challenging. For example, if someone starts to cut themselves with the intention of dying but knowingly stops themselves prior to seriously hurting themselves, is this a suicide attempt? Is it an “aborted suicide attempt?” As another example, a psychiatrist colleague described the following scenario as a suicide attempt: a person goes to a high point to attempt suicide, puts their toes over the edge but never jumps. Is this a suicide attempt? Given the complexity and variability of these cases, it is surprising that in many studies, participants are never interviewed, and instead are given a single self-report question asking
whether they “attempted suicide.” This method leaves room for participants’ individual interpretation of terms and introduces the potential for misclassification of their actual behavior.

Furthermore, some behaviors, such as suicide plan, do not have a consensus operationalization. I would encourage you to pause for a moment and consider what you think it means to have a suicide plan. Does this mean thinking of a suicide method? Thinking of a method and a place to attempt suicide? Settling on a method and place? Something else? When constructs lack operationalization, participants likely interpret the construct in several ways and answer questions about the behavior inconsistently. For example, one participant that has vaguely thought about a suicide method might endorse having a “suicide plan” whereas another person may deny having a “plan” until they have thought of a method, place and time to attempt suicide. If circumstances similar to this occur, group assignment is muddled – participants are categorized based on different criteria (i.e. their own interpretation of the terms). In clinical science, this is a critical problem because researchers cannot randomly assign participants to a psychopathology group, and therefore accurate group categorization is essential to discovering which factors predict psychopathology.

**Limited understanding of the actual pathway to suicidal behavior**

A second problem with the current focus on just three suicidal outcomes is that there is little understanding of how and why people transition from thinking about suicide to “planning” to attempting suicide. Prior studies have found that just less than one-third of people with suicidal ideation go on to make a suicide attempt and for 60% of people this transition occurs within the first year of ideation (Nock, Borges, Bromet, Alonso, et al., 2008). Furthermore, different factors predict different parts of the pathway to suicide: for example, multiple studies have found that although depression is among the largest predictors of suicidal ideation, the
presence of impulsive control disorders significantly predicts attempts among ideators (Nock et al., 2009; Nock, Borges, Bromet, Alonso, et al., 2008). In addition to the limitations of single-item questions noted above, existing findings regarding the transition from ideation to attempt is constrained because these studies use long-term retrospective data, which can be affected by memory limitations or bias.

Furthermore, the field lacks an operationalized and detailed description of the pathway between suicidal ideation and suicide attempts. Some studies have sought to cover this ground using a single-item question about a “plan” but this is problematic because (i) there are likely different interpretations of this term, as discussed above and (ii) asking whether someone had a “plan” does not provide information regarding what steps people took and how long prior to attempting the steps took place. The former limitation is present in other measures of suicide planning as well. Thus, researchers have sought to make inferences regarding differences between those that make “planned” versus “unplanned” attempts prior to understanding what happens in this period of time between thinking of suicide and acting on ones thoughts. This is reminiscent of critiques of psychological research, in which critics have argued that psychological scientists jump straight to making inferences and testing theories, skipping a process to uncover a basic description of phenomena of interest that most natural sciences start with (Kagan, 2007; Tinbergen, 1963). Given, the wide array of approaches to measuring “planning” and the lack of operationalization for the construct, I argue that gaining a description of the steps people take down the pathway to suicide is a necessary first step towards the development of a consensus definition, consistent measurement and, eventually a better understanding of the construct.
Describing the pathway to suicide requires collecting more fine-grained data on this process that has occurred in prior research. This is the focus of the second paper of this dissertation, in which I develop and evaluate a measure to assess more fine-grained information on the pathway to suicide than ever before available and present the data collected with this novel instrument.

**Limited understanding the association between impulsiveness and suicidal behavior**

A third problem is that prior studies frequently fail to test the role of important risk factors in the pathway to suicide. That is, it is rare for researchers to examine whether a risk factor is associated with ideation or attempts among ideators or degree of planning among attempters. The third paper addressed this issue and had three goals: First, it tests whether a hypothesized factor - increased impulsiveness - might be involved in why some ideators transition down the pathway to suicide to attempting suicide, as some theories have posited but has been rarely tested well (Mann, Waternaux, Haas, & Malone, 1999). This notion remains relatively untested because prior studies have both examined impulsiveness as a unitary construct (Baca–Garcia et al., 2005; Mann et al., 1999) when it appears to be multidimensional (Dalley, Everitt, & Robbins, 2011) and, as mentioned, compare attempters to non企图ers (without regard to ideation; Maloney, Degenhardt, Darke, & Nelson, 2009; Mann et al., 1999; Perroud, Baud, Mouthon, Courtet, & Malafosse, 2011) which cannot distinguish whether impulsiveness is related to attempts among ideators or ideation alone. Given these methodological limitations, it is unsurprising that prior studies examining the role of impulsiveness in suicide have shown mixed findings with some showing increased impulsiveness among attempters (Corruble, Damy, & Guelfi, 1999; Perroud et al., 2011; Wojnar et al., 2009; Wu et al., 2009) and others finding no difference between attempters and non-attempters (Dumais et al., 2005; Keilp et al., 2006;
Oquendo et al., 2000). For Paper 3, I measured several different aspects of impulsiveness among attempters and ideators, whose suicidal histories were rigorously evaluated.

**Current Dissertation**

The purpose of this dissertation was to address the lack of precision in the measurement of suicidal behavior, the limited information about the pathway to suicide, and the current questions about the role of impulsiveness in suicidal behavior. I did so via three separate studies aimed at answering each of these questions. My primary goal with these three studies was to advance the understanding of suicidal behavior. A secondary goal was to develop and evaluate more rigorous methods for studying suicidal behavior that overcome some of the long-standing limitations in this area of the field. Below I provide a brief introduction to each of these three studies/papers.

**Paper 1: Single-item measurement of suicidal behaviors: validity and consequences of misclassification**

In the mid-1990’s an article entitled, “Beyond the Tower of Babel,” a reference to a biblical story in which God creates different languages, was published to establish a common nomenclature for suicidal behaviors (O’Carroll et al., 1996). The article begins with anecdotes depicting different professionals’ confusion at the inconsistent use and varied terminology describing suicidal behaviors. Ten years later, a second article was published with a revised nomenclature (Silverman et al., 2007b).

Despite the repeated acknowledgements that the current classification of suicidal behaviors has significant limitations and current suicidal terms are unclear, studies continue to measure suicidal behaviors by posing single-item questions to study subjects asking them to self-classify their suicidal behaviors. In general, studies use single-item questions to query one or
more of three suicidal behaviors: the presence of suicidal ideation, suicide plans and suicide attempts. Many commonly-used instruments, (Kessler, Borges, Sampson, Miller, & Nock, 2009; Nock et al., 2009; Nock et al., 2008) use a series of single questions for each suicidal outcome, such as “Have you ever seriously thought about suicide?”, “Have you ever made a suicide plan?”, and “Have you ever attempted suicide?” without follow-up questions regarding the person’s specific actions and/or intent. Furthermore, recent reviews of epidemiological studies have found that more than half of studies utilize single-item questions to assess suicidal behaviors (Nock, 2014). Even more recently, I conducted a review of all articles with suicide-related outcomes in 3 journals (two psychiatry and one clinical psychology journal) from 2011-2014 and found that single-item questions was used in over 30% of articles to assess suicidal ideation, more than 60% of articles to assess suicide plans and nearly 50% of articles to assess suicide attempts (Millner, Lee, & Nock, unpublished). Thus, the use of single-item questions to assess suicidal behaviors continues to be employed broadly. Yet, researchers have had to continually revise a suicide nomenclature and, anecdotally, I have heard both clinicians and researchers categorize behaviors inaccurately. Therefore, it seems like a mistake to assume that participants know the precise definition of terms like “a suicide attempt” and accurately classify their behaviors.

If participants do not share researchers’ definition of terms like a “suicide attempt” or different participants inconsistently define terms like a suicide plan, it will lead to invalid and unreliable measurement. To test this, I created a novel online survey that provided single-item assessment of suicidal outcomes followed by a series of more thorough questions that could be used to examine the extent to which single-item questions result in misclassification of suicidal
behaviors. In addition, I conducted a statistical simulation that approximated the conditions of a typical study to determine the effects of misclassification on statistical conclusions.

**Paper 2: Describing how people transition from suicidal ideation to a suicide attempt**

Paper 2 followed up on a specific concern from Paper 1: the lack of information on the transition from suicide ideation to attempt, focusing most directly on the lack of operationalization for a suicide plan prior to a suicide attempt. Several studies have investigated risk factors associated with “impulsive” or “unplanned” attempts versus “planned” attempts. Given the complexity of suicidal behavior, rigorously measuring how people move from thinking about suicide to attempting suicide (i.e. the timing of different planning steps and the amount of preparation on the pathway to suicide) can facilitate the discovery of associations between specific risk factors and the different types of suicidal behavior (the focus of Paper 3).

There are several steps people must take to attempt suicide. First, people must have thoughts about suicide as a solution to their problems. Second, they must think of how, where and when to attempt suicide. They may also carry out other preparatory actions, such as obtaining the means to attempt suicide or writing a suicide note. Third, they must carry out the action to kill themselves, which may or may not result in their death. There is both a timescale as well as a degree of thought or planning that goes into each step. People may complete all steps within a short amount of time with little planning or premeditation - which we might characterize as impulsive. On the other hand, others may think about, plan and execute a suicide attempt over a long period of time, paying attention to details and carrying out several preparatory actions. There also may be people who carry out actions somewhere between these two extremes.

The goal of Paper 2 was to provide a detailed description how people move through the pathway from ideation to a suicide attempt while at the same time offering an operationalization
of constructs like a “suicide plan” and the degree to which an attempt should be considered “impulsive.” I hypothesized that a composite measure of the different aspects of the pathway to an attempt would have a bimodal distribution, providing a new and empirically-informed method of carefully distinguishing between planned and unplanned suicide attempts.

**Paper 3: Examining the association between impulsiveness and suicidal behavior**

Paper 3 sought to bring more precise methods to bear on the long-standing question of whether impulsiveness is associated with making a suicide attempt. Prior research has sought to answer this question but these studies have been limited by imprecise measurement as discussed previously. Specifically, theoretical models and empirical studies often fail to specify which aspect of impulsiveness is important and precisely how impulsiveness is involved in suicide. For the former problem, recent research suggests that impulsiveness is a multidimensional construct composed of several constructs. Yet, the vast majority of studies examining the relationship between suicide and impulsiveness use one-dimensional, self-report measures of impulsiveness. For the latter problem, studies do not specify whether impulsiveness should predict which people think about suicide or which people attempt suicide among ideators or if it plays some other role. Theoretical models often provide vague descriptions of the role of impulsiveness and fail to use experimental groups necessary to test the proposed role.

In Paper 3, I conducted a study in which we precisely measured both suicidal behaviors and dimensions of impulsiveness. I interviewed participants with a new instrument aimed at more accurately assessing suicidal behaviors. To measure five different aspects of impulsiveness, I tested participants on four behavioral tasks and two self-report forms. I hypothesized that all suicidal people would show heightened impulsive choice and reflection impulsivity but that attempters would show increased impulsive action, compared with ideators.
A secondary aim of Paper 3, following up on the finding that suicidal people have higher self-reported (but not behavioral) impulsiveness, was to examine the extent to which people who are suicidal may report being more impulsive after being primed with questions about suicide. More specifically, I hypothesized that directing attempter’s attention to their recent suicide attempt or activating that memory might produce a priming effect would cause them to rate themselves as more impulsive. For ideators, I hypothesized the opposite would occur; they would show reduced levels of impulsiveness if reminded of suicide because they would not have acted on suicidal urges. For constructs that showed neither of these effects, I proceeded to examining how the construct was related to suicide.
Abstract

Objective: Suicide is a leading cause of death worldwide. Although research has made strides in better defining suicidal behaviors, there has been less focus on accurate measurement. Currently, the widespread use of self-report, single-item questions to assess suicide ideation, plans and attempts may contribute to measurement problems and misclassification. We examined the validity of single-item measurement and the potential for statistical errors.

Method: 1,618 participants completed an online survey containing single-item questions regarding a history of suicidal behaviors, followed by questions with more precise language and multiple response options to examine the validity of single-item questions. We also conducted simulations to test whether common statistical tests are robust against the degree of misclassification produced by the use of single-items.

Results: 11.3% of participants that endorsed a single-item measure of suicide attempt, engaged in behavior that would not meet the standard definition of a suicide attempt. Similarly, 8.8% of those who endorsed a single-item measure of suicide ideation endorsed thoughts that would not meet standard definitions of suicide ideation. Statistical simulations revealed that this level of misclassification substantially decreases statistical power and increases the likelihood of statistical decision errors. Providing a wider range of response options for each item reduced the misclassification rate by approximately half.

Conclusions: The use of single-item, self-report questions to assess the presence of suicidal behaviors leads to a substantial amount of misclassification and increases the likelihood of statistical decision errors. Improving the measurement of suicidal behaviors is critical to increase understanding and prevention of suicide.
Introduction

Suicide is a leading cause of death in the United States and throughout the world (Nock, Borges, Bromet, Cha, et al., 2008); however, progress understanding and preventing suicide has been relatively slow. Numerous consensus articles have focused on the definitions of suicidal behaviors (O’Carroll et al., 1996; Silverman, Berman, Sanddal, O’Carroll, & Joiner, 2007a) but measurement has received less critical attention. One major limitation is the common use of single-item self-report measures to assess the presence of suicidal ideation, plans, and attempts (e.g. “Have you ever made a suicide attempt?”). We use the term single-item measurement to refer to the use of one question to assess whether a person has engaged in a single behavior (e.g., suicide attempt). Most single-item measures do not provide a clear definition of the behavior being assessed. Several commonly used instruments, such as the Youth Risk Behavior Survey (YRBS; (Lowry, Crosby, Brener, & Kann, 2014)) and the World Health Organization Composite International Diagnostic Interview (CIDI; (Nock et al., 2009)) contain single-item questions to assess suicidal behaviors. Recent epidemiologic reviews on suicidal behaviors reveal that more than half of all studies use this single-item approach (Nock, Borges, Bromet, Cha, et al., 2008; Nock, 2014).

Although single-item measurement is widely used, few studies have examined whether it results in the reliable and accurate classification of self-reported suicidal behaviors. Two characteristics of single-item assessment might cause misclassification: a lack of clarity and a lack of coverage. Regarding the former, respondents may not clearly understand the specific behavior in question. Although researchers have established definitions for suicidal behaviors (e.g., a suicide attempt requires engaging in a potentially lethal behavior with some intention of dying (O’Carroll et al., 1996; Silverman et al., 2007a)), single-item questions do not inform
participants of this definition. Therefore, participants have to rely on their own definitions of suicidal behaviors, which could be incorrect and lead to misclassification. Regarding the latter, most single-item assessments query the presence of suicide ideation, plan, and attempt; however, there are many more subtle steps in the process of attempting suicide that are omitted when using single-item assessment. For example, many people report starting to take steps to attempt suicide but stopping themselves before acting (i.e. an aborted suicide attempt). When confronted with a single-item suicide attempt question, people that engaged in an aborted attempt may be confused about whether this action constitutes an attempt or not and incorrectly endorse having made a suicide attempt. Furthermore, collecting data on more subtle suicidal behaviors omitted by single-item assessment may increase understanding and improve assessment of suicide risk.

Prior studies suggest that single-item assessment results in misclassification. For example, among a nationally representative sample of adults, 40% of those who endorsed a single-item measure of a “suicide attempt” later indicated in follow-up questions that they did not actually intend to die from their behavior (Nock & Kessler, 2006). In another study, 20% of those who endorsed a single-item measure of a “suicide attempt” reported in follow-up questions that they took steps towards suicide but did not actually engage in the potentially harmful action (Plöderl, Kralovec, Yazdi, & Fartacek, 2011). Misclassification has consequences in both clinical and research practice. Anecdotally, the authors have encountered clinical situations where both clinicians and patients erroneously labeled an action a “suicide attempt.” This misunderstanding could alter doctors’ perception of risk. Imprecise measurement can impede scientific progress, particularly if misclassification rates are large, potentially altering the true probability of finding a result under the null hypothesis (p value), increasing the probability of false conclusions.
The purpose of this study is to: (i) test whether single-item measures result in the inaccurate assessment of self-reported suicide ideation, plan, and attempts and (ii) explore the extent to which current misclassification rates can increase the probability of statistical errors. Participants were asked three single-item gate questions that closely resemble commonly used single-item questions assessing suicidal ideation, plans, and attempts, followed by several follow-up questions that assessed more specific, fine-grained outcomes. In addition, we built statistical simulations to test the consequences of the observed misclassification. We hypothesized that: (i) single-item assessment would lead to substantial group misclassification because participants actual behaviors would not meet researchers’ definitions for the behavior in question and (ii) there would be a range of suicidal behaviors beyond those assessed with single-item questions. Finally, we hypothesized that (iii) statistical simulations would reveal that the observed degree of misclassification would be associated with increased probability of false negative and false positive conclusions.

Method

Participants

Participants were recruited via Craigslist postings throughout the United States from April 2013 through September 2013. Postings contained two different titles to advertise to suicidal (“Online Survey about Suicidal Thoughts and Behaviors”) and non-suicidal people (“Online Survey about Hard Times”) to capture those with a range of thoughts about death and suicide. All participants gave informed consent. Inclusion criteria were: (1) 18+ years of age and (2) ability to correctly answer three questions regarding the study to ensure comprehension of consent and safety information. Upon completion of the survey, participants could enter their
email address into a $350 raffle on an independent webpage. The Harvard University
Institutional Review Board approved the study.

Of the 2,371 subjects that entered the survey, 753 were excluded from analyses because
they failed to complete even one section of the survey or did not provide valid survey data. Of
the remaining 1,618 participants that completed at least one section, 80.5% completed all survey
questions. Table 1.1 contains the demographic information for these 1,618 participants.

Table 1.1

Demographic information

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The online survey was administered using Qualtrics and data were collected anonymously and contained three required sections. In addition, participants’ responses could trigger several additional sections that included, at minimum, age of first and most recent
occurrence and number of times an action occurred, where applicable. Figure 1.1 contains a flow chart of the survey.

Section 1 included three gate questions: single-item yes/no questions regarding a past history of suicide ideation, plans, and attempts. Section 2 contained suicide ideation follow-up questions that assessed the presence of eight different thoughts ordered in increasing severity (see Appendix A for precise wording) that allowed us to test for unreliable measurement. The two lowest severity items included philosophical questions about death, followed by two low severity, passive ideation items (i.e. wishing to disappear and wishing one was not born), two high severity, passive ideation questions (i.e. life is not worth living or I wish I was dead; Paykel, Myers, Lindenthal, & Tanner, 1974), and two active ideation questions (i.e. maybe I should kill

Figure 1.1. A flow chart of the online survey.
myself or I should kill myself). Participants that endorsed any passive or active suicidal thought were asked additional questions about their most severe thought (results not included here).

Section 3 contained suicidal action follow-up questions that assessed the presence of five different actions including: (i) non-suicidal self-injury, (ii) suicide gesture, in which a person had no intent to die and only wanted to look like s/he was attempting suicide, (iii) aborted suicide attempt, in which a person started to take steps to kill herself and stopped at the last minute, (iv) interrupted suicide attempt, in which someone or something else stops a person from attempting suicide and (v) a suicide attempt, described as having engaged in a potentially lethal behavior with some intention of dying.

If participants endorsed at least one prior suicidal action, they were asked additional questions about the highest severity action (and the most recent if more than one). We also queried how much time passed between planning steps and actual action.

If participants endorsed a suicidal thought during the gate questions or follow-up but did not endorse a suicidal action, they were directed to a suicide planning follow-up section. This section included questions regarding the presence or absence of having carried out any planning steps (e.g. “Have ever thought of a method or methods that you would use to kill yourself?”).

Overall, all participants answered, at minimum, Section 1 (i.e. gate questions), Section 2 (i.e. follow-up ideation questions) and Section 3 (i.e. action follow-up questions). If they endorsed ideation, they were asked additional questions about their most severe thought. If they endorsed a suicidal action, they were asked additional questions, including planning items and open-ended questions, about the most recent, highest severity action. If they endorsed suicidal ideation but not suicidal action, they were asked about any planning steps taken. If they denied
all suicidal ideation and actions, they completed Sections 1, 2, and 3 without any additional questions.

**Coding of Narrative Descriptions**

**Suicidal Actions**

To better understand exactly what occurred during any suicidal actions, participants responded to multiple questions that required narrative description (e.g. “What exactly happened?”, “Did you sustain any injuries or have any physical problems as a result?”). We trained coders to determine which suicide action the person had actually carried out based on their responses. Specifically, after establishing a codebook, coders practiced coding training data generated by members of the research team (AJM, MDL) and pilot data not used in the final analysis. Each of four coders coded the dataset separately. Then, each coder was assigned to one of two teams. The two teams independently came to a consensus code for each subject. The consensus codes from each team were then compared and evaluated for agreement. Coders determined whether there was enough information to classify the behavior into a suicidal category. For example, if when asked “What happened?”, a participant responded, “pills,” this would be coded as “not enough information to reclassify” and removed from analysis. If the person responded, “I put the pills in my hand but at the last minute changed my mind and did not take any,” this would be considered to have provided enough information to classify that action (in this case as an “aborted attempt”). If at least one team of coders coded the participant’s action as “not enough information to reclassify,” the participant’s action was removed from analysis. Participants were also removed if coders disagreed on whether the action was a suicide attempt (total excluded; n=84). If the coding teams agreed that there was sufficient information to code the entry and the action was not a suicide attempt but disagreed on the categorization of the
action (e.g. one coding team said it was an aborted attempt and another said the same entry was an interrupted attempt), it was coded as “Not an attempt; could not reclassify.” For entries with sufficient information, the coding process could result in the following final codes: (i) suicide attempt, (ii) interrupted attempt, (iii) aborted attempt (iv) no suicidal action (v) not an attempt; could not reclassify. There was high agreement among coders for determining whether an action met the definition for a suicide attempt (Cohen’s $k = 0.87$) and regarding whether there was enough information to determine that the action was not a suicide attempt (Cohen’s $k = 0.85$).

**Preparatory Actions**

Based each participant’s narrative description, coders determined the number of preparatory actions the person carried out. Due to difficulty measuring separate actions, the purpose of actions served as the main criterion. For example, a person that wrote two or ten suicide notes was still rated as having carried out one preparatory action. We created a codebook with 27 different purposes; however, inclusion of some codes, automatically precluded others. For example, although travel to a location to make a suicide attempt and taking steps to prevent discovery could be separate actions, if a person traveled explicitly to prevent discovery, it was counted as a single preparatory action. We employed the same process described above where four coders: (i) were trained on responses generated by lead researchers and pilot data, (ii) coded items separately, (iii) joined teams of two, and determined a consensus number of preparatory actions for each participant. Each team’s consensus codes were compared and in instances where the number of coded preparatory actions differed, the two were averaged. Examples of codes included: actions to prepare for the suicide attempt (e.g., researching methods to attempt suicide), or actions to prepare for the fact that the person might be dead soon (e.g., writing a suicide note). Coders had a high degree of agreement (intraclass correlation: 0.96).
Analyses

We calculated the percentages of people that endorsed each gate question. For ideation and attempt follow-up questions, participants were classified based on their most severe thought or action (e.g. active ideation overruled passive ideation). For each suicidal outcome, we calculated the percentage of people that endorsed a follow-up question or were coded as carrying out a particular action, among those that either endorsed or denied the gate question. The validity of the suicide ideation and planning gate questions were evaluated with follow-up responses, whereas the suicide attempt gate question was validated with coded actions.

Statistical Simulation

We conducted a statistical simulation to understand whether, and to what extent, misclassification of suicide outcomes increases the probability of erroneous statistical results in studies of such outcomes. Statistical simulations model statistical inference by drawing samples from populations with specific parameters (e.g. two normal distributions with specified means and standard deviations). The current simulation drew samples from two different normally distributed populations (the “true effect” simulation) symbolizing two groups (e.g. non-attempters and suicide attempters). To represent misclassification, we placed data points from one sample in the other sample and vice versa based on the degree of misclassification that we actually observed in the current study. By sampling and then conducting between-groups t-tests thousands of times and calculating the percentage of significant results (i.e. $p<.05$), we could examine whether, compared to normal conditions, misclassification reduced the probability of detecting the true effect. We also conducted an identical simulation with one exception – the samples were drawn from a single population, (the “true null effect” simulation) and we tested
whether misclassification increased the probability of finding a significant effect when one did not truly exist.

A parameter in the simulation, namely, the relationship between the DV and misclassification itself, requires elaboration. To illustrate this idea, perhaps non-attempters with higher emotional reactivity are more likely to misclassify themselves as having attempted suicide because they felt so close to attempting. If this were the case, then there would be a relationship between the DV (emotional reactivity) and a tendency to misclassify one’s behavior (see Figure 1.2A-D for visual example). Although this relationship is unclear in studies that assume accurate classification, it is unlikely to be exactly zero. Therefore, to examine the statistical effects of misclassification at different levels of a DV-misclassification relationship, we forced the simulated samples to correlate with misclassification ($r$ values ranging from -0.25 to 0.25 by increments of .05). For simplicity, when the simulation included two populations, the mean difference was set to 1.0, with a standard deviation of 2.0 (Cohen’s $d$ effect size = 0.50). Total sample size was 210 for a statistical power of 0.95. For consistency, we set the same standard deviation and sample size when drawing from a single population. Each of the 22 simulations (true and null effect simulations at 11 $r$ values) was permuted 50,000 times.
Figure 1.2. A visual example of DV-misclassification relationships and the results of the statistical simulations. (A) Model data of a “true effect” (B) Model data of a “true null effect.” The red and green arrows in (A) and (B) represent data points that will be misclassified due to error. (A) shows an example of when the DV-Misclassification correlation is zero (i.e. misclassification is random) whereas (B) shows an example of when the correlation is
Figure 1.2 (Continued).

approximately \( r = 0.20 \). (C) During a “true effect” when misclassification is random, the effect will be underestimated (misclassification causes the two group means to move closer together), decreasing the probability of finding the “true effect.” (D) During a “true null effect” when, for example, the DV-misclassification correlation is present, misclassification causes the group means to shift further apart, increasing the probability of finding a “false” significant difference. (E) The outcome of the statistical simulation for data with a “true effect” (power = 0.95) and (F) the “true null effect” (alpha = 0.05).

Results

Suicide Ideation

In total, 78.9% of participants endorsed the suicide ideation gate question (Table 1.2A). Of those participants, only 74.6% endorsed the most extreme follow-up question “I should kill myself.” 16.5% indicated that their most extreme suicidal thought was the less certain response of “maybe I should kill myself,” with the other 8.8% reporting, at most, passive suicidal thoughts (e.g., “I wish I was dead”). Among those who denied suicidal ideation in the gate question, 3.3% endorsed the most extreme follow-up question, and another 10.5% indicated that they had the thought “maybe I should kill myself,” and approximately one-third (38.3%) reported passive suicidal thoughts ranging from “I wish I was dead” to “I wish I could disappear or not exist.”
Table 1.2

Responses to gate and follow-up questions for suicide ideation and plans

<table>
<thead>
<tr>
<th>A. Gate Question: Suicide Ideation</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Have you ever seriously thought about killing yourself?&quot; (n=1570)</td>
<td>%</td>
<td>Num</td>
</tr>
<tr>
<td></td>
<td>78.85</td>
<td>1238</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Follow-Up Questions (Most Severe)</th>
<th>Among those who said YES to Gate</th>
<th>Among those who said NO to Gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I should kill myself&quot;</td>
<td>74.64 924 3.31 11</td>
<td></td>
</tr>
<tr>
<td>&quot;Maybe I should kill myself&quot;</td>
<td>16.56 205 10.54 35</td>
<td></td>
</tr>
<tr>
<td>&quot;I wish I was dead&quot;</td>
<td>5.57 69 16.87 56</td>
<td></td>
</tr>
<tr>
<td>&quot;My life is not worth living&quot;</td>
<td>0.97 12 8.43 28</td>
<td></td>
</tr>
<tr>
<td>&quot;I wish I was never born&quot;</td>
<td>0.24 3 3.01 10</td>
<td></td>
</tr>
<tr>
<td>&quot;I wish I could disappear or not exist&quot;</td>
<td>0.81 10 9.94 33</td>
<td></td>
</tr>
<tr>
<td>&quot;What happens to people when they die?&quot;</td>
<td>0.89 11 34.64 115</td>
<td></td>
</tr>
<tr>
<td>&quot;What will it be like when I die?&quot;</td>
<td>0.08 1 6.33 21</td>
<td></td>
</tr>
<tr>
<td>&quot;No to all follow-up questions&quot;</td>
<td>0.24 3 6.93 23</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Gate Question: Suicide Plan</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Have you ever made a plan to kill yourself?&quot; (n=263)</td>
<td>%</td>
<td>Ratio</td>
</tr>
<tr>
<td></td>
<td>33.08</td>
<td>87/263</td>
</tr>
</tbody>
</table>
Table 1.2 (Continued).

<table>
<thead>
<tr>
<th>Follow-Up Questions&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Among ideators who said YES to Gate</th>
<th>Among ideators who said NO to Gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thought of a method</td>
<td>93.10/87</td>
<td>64.77/114</td>
</tr>
<tr>
<td>Thought of a place</td>
<td>75.86/66</td>
<td>38.07/67</td>
</tr>
<tr>
<td>Preparatory actions</td>
<td>48.75/39</td>
<td>29.19/47</td>
</tr>
<tr>
<td>Sure of method</td>
<td>64.20/52</td>
<td>37.72/43</td>
</tr>
<tr>
<td>Sure of place</td>
<td>61.54/40</td>
<td>40.91/27</td>
</tr>
<tr>
<td>Four or five planning components&lt;sup&gt;b&lt;/sup&gt;</td>
<td>51.72/30</td>
<td>39.50/18</td>
</tr>
</tbody>
</table>

<sup>a</sup> Participants who responded “No response/Not applicable” or left the item blank were excluded resulting in changing totals (i.e. denominators).

<sup>b</sup> Only participants that endorsed or denied all 5 planning components were included. Using the full sample in the denominator (i.e. 176), 10.80% of people who denied a plan, endorsed four or five planning components.

**Suicide Planning**

In total, 33.1% of ideators without a history of suicidal actions endorsed the suicide plan gate question (Table 1.2B). Among these participants, 93.1% thought of a method, 75.9% thought of a place, and nearly half (48.8%) had engaged in preparatory actions. A sizeable portion of those with ideation who denied ever making a suicide plan reported engaging in behavior that could be thought of as planning. For instance, 64.7% reported that they thought of
a suicide method, 38.1% thought of a place, and 29.2% actually engaged in preparatory actions. A fairly large percentage of both those endorsing a plan (61.5%-64.2%) and those denying a plan (37.7%-40.9%) reported being sure of their method and place, and a sizeable portion of both groups (39.9%-51.7%) endorsed at least four of the items in Table 1.2B.

Examination of the data on suicide planning among attempters reveals several interesting results (Figure 1.3). For all participants the median amount of time prior to attempting that people thought of a method and thought of a place was 6 hours and 1 hour, respectively. The median amount of time between making a decision to kill oneself and making an attempt was 30 minutes. The mean number of preparatory actions was 1.3. Those who do not endorse having made a suicide plan report moving more quickly from thought to action (Figure 1.3a-c) and making less preparatory actions (Figure 1.3d); however, when examining time estimates between those who endorse a suicide plan and those who do not, there was substantial overlap (71-85% using the bin sizes in Figure 1.3a-c) between planners and non-planners on each characteristic.
Figure 1.3. Characteristics of suicide planning among participants who attempted suicide and either endorsed a single-item plan or did not. The plots show that there is large overlap in the actual planning behaviors among those that endorsed and those that denied a single-item plan, suggesting that participants have different interpretations of a suicide plan. (D) Percentage of that made any preparatory actions toward suicide and the mean number of preparatory actions.
Figure 1.4. Responses to single-item suicide attempt question and the results of coded narrative responses

**Suicide Attempts**

In total, 36.6% of participants providing sufficient detail to code their suicide action (93.8%) endorsed the suicide attempt gate question (Figure 1.4). Of those participants, 88.7% were determined by coders to have actually made a suicide attempt, whereas 11.3% were determined to have not made an attempt.
In contrast, 6.4% of all participants (and 9.9% of ideators) who denied the suicide attempt gate question were determined to have made a suicide attempt. For example, one person reported wanting to die, taking an overdose of pills, and losing consciousness. In some cases, participants may have denied making a suicide attempt because they stopped the attempt after it was started. For instance, one person looped a belt around his neck and “kept pulling tighter and tighter on it with the attempt to choke [himself] and cut off [his] circulation” before unlooping the belt. Another reported drinking poison but then stopping halfway through the bottle, induced vomiting and calling poison control. These would both meet the consensus definition used in the field for a suicide attempt (self-injurious behavior with some intention of dying), but may not have been endorsed as such because they did not fully carry out the intended behavior. An additional 8.3% of those who did not endorse the suicide attempt gate question were determined to have engaged in either an interrupted or aborted suicide attempt.

We also used the attempt coding to evaluate the follow-up attempt questions to determine whether embedding definitions in the questions and providing participants with several response options (i.e. increasing clarity and coverage) reduced misclassification. We found that the percentage of people that incorrectly endorsed attempting suicide dropped from 11.3% (using the gate question) to 5.0% (using the follow-up questions). Providing a broader range of response options also lowered the percentage of false negatives among the entire sample (4.2% versus 6.4% for the gate question) and among ideators (8.0% versus 9.9% for the gate question).

**Statistical simulation**

The results of the statistical simulation are presented in Figure 1.2E-F. Results revealed that during the true effect simulation, when data were randomly misclassified (i.e. DV-misclassification correlation was zero), misclassification causes nearly a 15% drop in power to
detect a true effect (i.e. Type II error). Under a true effect, if the DV-misclassification correlation is in the same direction as the effect, it slightly increases the probability of a significant result, leading to a trivial overestimation of a true effect. However, if the DV-misclassification correlation is in the opposite direction of the true effect, the effect can be underestimated, increasing the chance of Type II error (Figure 1.2E).

In the “true null effect”, when there is a small ($r < .05$) or no DV-misclassification relationship, the probability of rejecting the null hypothesis when no effect truly exists (i.e. a Type I error) remains intact. However, as the DV-misclassification relationship increases in either a positive or negative direction it rapidly escalates the probability of Type I error. For example, when the DV-misclassification relationship is $r = \pm 0.10$, one will erroneously reject the null hypothesis 9% of the time (versus the typically acceptable 5%) but 20% of the time when $r = \pm 0.15$ (Figure 1.2F).

**Discussion**

There are four key findings in this study. First, this study revealed that the use of single-item measures of suicidal thoughts and behaviors is associated with a fair degree of misclassification. Critically, for suicide attempts, we rigorously coded participants’ narrative descriptions to provide careful assessment of misclassification. Second, single-item measures fail to capture a large range of potentially important distinctions in suicidal behaviors, such as passive ideation, various suicide planning steps and stopped suicidal actions. Third, statistical simulations revealed that the level of misclassification observed among single-item measures (11% false positive rate and 10% false negative rate among ideators) can substantially increase the probability of false conclusions from statistical tests. Fourth and finally, follow-up questions were associated with lower misclassification rates. These results suggest that single-item
questions lack clarity and coverage and that one partial solution to the problems revealed in this study is to (i) embed the definition of the assessed behavior in the question and (ii) provide multiple response options. Several aspects of these results warrant further comment.

The substantial misclassification produced by single-item assessment suggests that a considerable number of participants do not share researchers’ definitions for suicidal outcomes and single-item questions do not clearly inform these participants of this definition. Further supporting this conclusion, follow-up questions with more specific language had lower rates of misclassification, although the increased number of response options might have also contributed to the improved accuracy.

We also found that participants that endorsed single-item questions did not have homogenous thoughts or behaviors. For example, one might expect that people that “seriously thought about killing themselves,” means they had the thought, “I should kill myself.” However, we found that approximately 9% of the people who endorsed the former item never experienced active suicidal ideation. These results suggest that single-item questions do not cover the full range of suicidal thoughts and behaviors and people with heterogeneous behaviors are categorized as a homogenous group (e.g. “ideators”). The lack of response options may cause single-item measurement to obscure important associations or lead participants that engaged in omitted behaviors (e.g. aborted attempt) unsure of where to classify their behavior, increasing the likelihood of misclassification. It is important to note that several newer instruments, such as the Columbia-Suicide Severity Rating Scale (C-SSRS; Posner et al., 2011) assess a fuller range of suicidal behaviors. However, the C-SSRS (and similar instruments) (i) requires a trained interviewer to administer the instruments and (ii) has been used in considerably fewer studies than single-item measures.
Researchers often create groups based on single-item questions (Borges et al., 2006; Ronald C. Kessler, Berglund, Borges, Nock, & Wang, 2005; Matthew K. Nock et al., 2009). We found single-item assessment leads to inaccurate group categorization. For example, some participants coded as having attempted suicide would be placed in a “non-attempters group” based on their responses to single-item questions. This would result in some actual attempters categorized as attempters but others categorized as non-attempters, eroding group distinctions. Maintaining accurately classified groups is crucial because, in clinical research, group membership is the basis for determining relationships between suicidal behaviors and important risk factors or psychological variables. When people in different groups have actually had identical thoughts or behaviors, categorical differences are no longer present undermining efforts to understand suicidal behaviors. Notably, the current study found misclassification among attempters and non-attempters in fairly equal numbers. If true in the general population, misclassification may not affect base rates but would adversely affect the ability to detect associations between important risk factors and suicide.

The results of the statistical stimulation suggest that misclassification at the levels observed in this study can lead to both false positive and false negative statistical conclusions. This means that prior studies using instruments such as the CIDI or YRBS that contain single-item questions may have, for example, shown support for relationships between a suicidal behavior and another variable that does not exist or, alternatively, failed to detect a relationship that does. Researchers cannot have confidence in a prior literature that might contain multitudinous statistical errors. For this reason, it is imperative that future work continues to evaluate single-item measurement and, if misclassification persists, researchers stop using this
methodology and instead use items with multiple response options where the questions contain
definitions for the behaviors being assessed.

Several of our findings regarding suicide planning warrant additional comment. First, the
terms “suicide plan,” “planned attempt” and “impulsive” or “unplanned attempt” remain poorly
defined (Conner, 2004). If researchers have not agreed on an operational definition of a suicide
plan or a planned attempt, participants are unlikely to hold reliable or valid conceptualizations of
these terms. For example, in a prior study more than a quarter of attempters gave paradoxical
descriptions of their attempts as either (i) “impulsive” but “planned” or (ii) “not impulsive” but
with no “planning” (Wyder & De Leo, 2007). Similarly inconsistent, in the current study,
substantial numbers of ideators who denied planning during the gate question had engaged in
several planning steps (e.g. thinking of a method and/or place to attempt suicide). Second, this
study used novel methods to collect the timing of several planning items prior to a suicide
attempt and examined the entire distribution for these items. In general, the majority of planning
occurs within a day. Some individuals move through the planning stages quickly (< 5 min)
whereas others do so over weeks and months. Future research should continue to examine
suicide planning to better understand the critical time period when people transition from
thinking about suicide to actually attempting.

There are several limitations to this study. First, the sample is not representative and
over-represents females and clinical/suicidal people compared with the general population.
Second, most of the assessment items used relied on retrospective recall of suicidal thoughts and
behaviors and memories of events may be subject to bias or inaccuracies. Third, we excluded
participants from analyses of suicidal actions because coders were unable to identify their exact
suicidal behavior. The results of the study may have been altered if we had interpretable data
from these participants. Fourth, the data were collected over the internet and therefore could have affected by lack of earnest responses. However, we rigorously inspected the data and removed participants with nonsensical responses and several studies have demonstrated the validity of internet responses (Birnbaum, 2004). Despite these limitations, the results suggest that single-item questions lead to inaccurate responses that impede progress describing, understanding, and ultimately preventing suicidal behaviors.

**Paper 2**

Millner, A.J., Lee, M.D., Nock, M.K., Delineating and describing the pathway to suicide prior to a suicide attempt: A novel approach to measuring suicide planning.
Abstract

**Background:** Suicide is a leading cause of death worldwide. Prior research has focused on the occurrence and predictors of suicide ideation and attempts; however, there has been very little attention focused on understanding the pathway through which people move from thinking about suicide to acting on their thoughts. Moreover, in the few studies that have been done, the measurement approaches have been fairly crude, lacked operationalization and have varied dramatically across studies. This has made it difficult to understand what steps people take as they move from thinking about suicide to attempting suicide and how slowly or quickly people move through these steps, and has made replication of any observed effects difficult. We developed a new approach to measuring how people move from suicidal ideation to suicide attempt with the goals of describing the timing and amount of preparation during this process and relate this measure with prior measures of suicide planning.

**Methods:** We developed a novel instrument that assesses the steps people take, and the timing of these steps, leading up to a suicide attempt and administered it to 30 psychiatric inpatients who had made a suicide attempt in the past two weeks. We created a composite score that represents a person’s amount of “suicide planning.” Participants were also interviewed with prior measuring of suicide planning to understand convergent validity between the two measures.

**Findings:** The vast majority of planning steps take place within 1 week of attempt and most occur within 12 hours. The distribution of the composite variable appears to be bimodal, suggesting a “natural” break between more and less planned attempts.

**Interpretation:** Describing and understanding how people transition from thinking about suicide to attempting suicide could help with discovering why people attempt suicide. However, the lack of consensus in the field and the use of crude and arbitrary measures impede progress. This study
represents a possible avenue toward both describing the steps involved in the pathway to suicide and providing a consensus approach to measuring “suicide planning.”

**Introduction**

Although suicide is a leading cause of death around the world some basic characteristics of suicidal behaviors remain relatively unexamined. For instance, prior research has not delineated or described *what* steps people take as they transition from suicidal ideation to a suicide attempt or *how* people move down this pathway to suicide (i.e. the speed with which people move from thinking to “planning” and preparing to the decision to attempt to actually attempting suicide). Describing how people move through the pathway to suicide is important because it lays a foundation for future research examining factors that influence *why* people move from thinking to acting. For example, distinct risk factors may underlie suicide attempts with different levels of prior planning. There has been research examining the degree of planning prior to a suicide attempt (Conner, 2004) and investigating “impulsive” versus “not impulsive” attempts (Simon et al., 2002) but definitions and measurement approaches have varied widely and assessment often is crude or arbitrary. Furthermore, there have been no purely descriptive accounts. Outlining and describing how people move from thinking to attempting suicide can provide a basis for consensus operationalization and consistent measurement that is necessary for reliable and valid research examining, for example, whether certain aspects of planning are associated with greater risk of a future attempt.

Most prior research suggests that an increased level of planning prior to a suicide attempt is associated with increased depression and hopeless (Brown, Overholser, Spirito, & Fritz, 1991; Simon et al., 2002; Spokas, Wenzel, Brown, & Beck, 2012; Wyder & De Leo, 2007) although others have found increased depression among less planned (i.e., more impulsive) attempts (Jeon
et al., 2010) or no difference between those with more and less planned attempts (Wojnar et al., 2009). The notion that less planning is associated with less depression makes some intuitive sense and effect sizes can vary among studies leading some true effects to be non-significant some of the time. However, a major discrepancy among the six studies cited is that all of them used different, fairly crude, criteria to define suicide planning. Varied and/or crude measurement can undermine efforts to discover valid, reliable effects. For example, one study revealed a significant relationship between suicide planning and increased depression when using two “planning items” from a commonly used measure. However, when reviewers recommended that the authors use eight “planning items” from the same scale, the relationship became non-significant (Baca–Garcia et al., 2005).

Researchers have used a wide range of methods to measure suicide planning. Several studies measure suicide planning with the Beck Suicide Intent Scale - Planning subscale (SIS-Plan; (Beck et al., 1976; Beck, Schuyler, & Herman, 1974), which assesses the degree of premeditation and preparation prior to an attempt. The SIS is comprised of interview and self-report items rated on a 0-2 scale. There are two main limitations of the way in which the SIS-Plan has been used in prior research: (i) the number of items to quantify “planning” vary among studies (e.g. studies have used 1, 2, 3 (Baca-Garcia et al., 2001; Spokas et al., 2012; Suominen, Isometsä, Henriksson, Ostamo, & Lönnqvist, 1997; Weyrauch, Roy-Byrne, Katon, & Wilson, 2001), 7 or 8 items (Conner et al., 2005, 2007; Mann et al., 1996)), (ii) studies use different cutoff rules to distinguish between “planned” and “impulsive” attempts (i.e. median split (Dombrovski et al., 2011), 75% quartile (Baca–Garcia et al., 2005), 3 equal-sized groups (Conner et al., 2005) or at a particular score (Chen et al., 2007)). Other methods to measure the how people transition through the pathway to suicide include defining an impulsive attempt as:
(i) a decision to attempt suicide within 5 minutes of actually attempting (Simon et al., 2002; Williams, Davidson, & Montgomery, 1980), (ii) 30-minutes of “planning,” (Wojnar et al., 2008), (iii) 3 hours of contemplation (Spokas et al., 2012), (iv) 7 days of suicide ideation (Conner et al., 2006), (v) denial of a lifetime suicide plan with endorsement of a lifetime suicide attempt (Borges et al., 2006; Kessler, Borges, & Walters, 1999; Nock et al., 2009; Nock et al., 2008) and (vi) a lack of plans, fluctuating ideation and participants endorsing an “impulsive” suicide attempt (Wyder & De Leo, 2007). In short, current methods are crude, somewhat arbitrary (i.e. single-item time cut-offs), lack consensus and no measure provides a clear illustration of how people transition down the pathway to suicide from thinking to acting.

Different approaches to measuring suicide planning are problematic because the act of testing differences between people who carried out dichotomized “impulsive” versus “planned” attempts assumes that these samples come from separate populations. If it is the case that there are separate populations of attempters with different risk factors, for example, that can be detected by characterizing an attempt as impulsive or planned, then discovering the appropriate line to distinguish impulsive and planned attempts is paramount to uncovering true differences between the populations. For example, say that 5 minutes between decision and action is the true differentiating line between impulsive and planned attempters. If a researcher uses a 3-hour decision-to-action criterion to divide attempters, many true “planners” will be placed in the “impulsive” group, degrading differences between groups, increasing the chances of Type II error and failing to discover important differences between the true groups. This is why it is crucial that researchers develop and utilize a consistent and valid measurement of attempt planning.
The diverse measurement approaches point to larger problems with the way suicide planning has been measured. First, the most critical problem, revealed by the varied methodologies, is the lack of conceptual operationalization of what constitutes an “impulsive” or “planned” attempt. For example, the myriad ways of measuring attempt planning with the SIS share little conceptual overlap with asking whether the decision to attempt was within 5 minutes of attempting. The absence of a conceptual operationalization produces several unanswered questions, such as: What, precisely, is a suicide plan? If a person comes up with a “plan” 5 minutes prior to attempting is that a “planned suicide attempt” or not? If not, how long prior to attempting is necessary for an attempt to be considered “planned?” Second, the lack of conceptualization produces assessments that cannot be used across studies. For example, conducting a median split on SIS-Plan data establishes a cut-off point dividing planned from unplanned that is unique to that particular study. The lack of consistent measurement across studies undermines efforts to discover reliable differences between risk factors of more unplanned versus more planned attempts. Third, there is no agreement regarding whether suicide planning should be measured on a continuous scale or attempts should be dichotomized into “planned” versus “unplanned.” Fourth, no prior research has described the timing and amount of preparation as people move from thinking about suicide to attempting suicide. A descriptive account could provide data to help decide several of these issues. For example, if suicide planning appears to fall on a bimodal distribution, then dichotomization is suitable. If not, then a continuous scale is more appropriate. Thus, gaining a comprehensive description of the pathway to suicide is an essential first step toward developing an agreed-upon definition and measure to study suicide planning.
The goals of the study were to describe how people move through the pathway to suicide and overcome the limitations of prior approaches. To accomplish this we developed a novel interview that assessed (i) how long prior to attempting suicide people engaged in planning steps and (ii) the degree of preparation prior to a suicide attempt. For example, one person may settle on how and where to attempt suicide 3 days prior to attempting suicide whereas another person may come up with these steps only within minutes of attempting. Planning steps were (i) thinking of attempting suicide (ii) thinking of the method, (iii) thinking of the place to attempt suicide. The interview distinguished between the lifetime onset of a planning step versus onset for the current attempt versus settling or deciding on a step (see Methods section for details). We also inquired about whether the person had engaged in several preparatory actions (e.g. obtaining a method, traveling to a place) prior to attempting. We developed a composite score to combine these various planning steps and preparation into a single outcome that represented that extent to which a suicide attempt was “planned” or “unplanned.” Finally, to provide convergent validity with prior measures, we tested the correlations among the composite score and several versions of the SIS-Plan. The main goal of the paper was to provide a comprehensive description of how people move through the pathway to suicide. In addition, we hypothesized that (i) the composite pathway score would fall into a bimodal distribution of more or less planned attempts and (ii) there would be a moderate relationship between a composite pathway score and the SIS-Plan.

Methods

Participants

Participants were 30 people in a psychiatric inpatient unit. All participants had made a suicide attempt in the prior two weeks. Inpatient medical staff identified potential participants that likely met the study inclusion criteria and were psychiatrically healthy enough to participate.
In addition to a suicide attempt within the past two weeks, inclusion criteria included being over 18 years of age, no current or past psychotic disorder or cognitive impairment, ability to read English, and correctly answer three questions regarding the informed consent form (100% of participants answered these questions correctly). The McLean Hospital Institutional Review Board approved the study and we obtained informed consent from all participants. Participant demographic information is presented in Table 2.1.

Table 2.1

Demographic data

<table>
<thead>
<tr>
<th>Participants</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n=30</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td><strong>M(SD)</strong></td>
</tr>
<tr>
<td></td>
<td>26.76 (8.93)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>%</td>
</tr>
<tr>
<td>Female</td>
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</tr>
<tr>
<td>Male</td>
<td>12 (40.00)</td>
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<tr>
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<tr>
<td>African American</td>
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<td><strong>SES</strong></td>
<td><strong>M(SD)</strong></td>
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<td>3.40 (0.63)</td>
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Number of Participants with

Past Suicidal Behaviors %
Table 2.1 (Continued).

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<tr>
<th>Description</th>
<th>Value</th>
<th>SD</th>
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<td>Aborted Attempts (1 or more)</td>
<td>18</td>
<td>60.00</td>
</tr>
<tr>
<td>Interrupted Attempts (1 or more)</td>
<td>7</td>
<td>23.33</td>
</tr>
</tbody>
</table>

**Mean Number of Past Suicidal Behaviors $M(SD)$**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Onset Ideation</td>
<td>17.38</td>
<td>9.01</td>
</tr>
<tr>
<td>Aborted Attempts</td>
<td>1.98</td>
<td>3.83</td>
</tr>
<tr>
<td>Interrupted Attempts</td>
<td>2.21</td>
<td>2.38</td>
</tr>
<tr>
<td>Attempts $^a$</td>
<td>1.93</td>
<td>1.33</td>
</tr>
</tbody>
</table>

$^a$One participant who reported 25-50 suicide attempts was an outlier and removed from the mean number of attempts.

**Procedure**

This study was part of a larger study including additional behavioral tasks and self-report questionnaires not reported here. Inpatient medical staff identified likely participants that had engaged in a suicide attempt within the past two weeks and met the additional study inclusion/exclusion criteria. Potential participants were given an informational flyer. If a participant agreed to participate, a time was scheduled. At the beginning of the study, participants granted informed consent and completed a pre-study risk assessment. Then the experimenter (AJM) administered the Pathway to Suicidal Action Interview (see below for more details). On average, the interview took approximately 1 hour. Following the interview, the experimenter and participant completed the Beck Suicide Intent Scale (SIS).
completed several other behavioral tasks and self-report questionnaires followed by a post-study risk assessment and, finally, were debriefed and compensated.

**Measures**

*Pathway to Suicidal Action Interview (PSAI)*

The Pathway to Suicidal Action Interview (PSAI) was developed to assess several different steps people take as they move from thinking about suicide to acting on their thoughts. The PSAI consists of an introduction interview and follow-up interviews. The introduction interview is composed of suicidal ideation and actions sections. Specifically, the ideation section includes six thoughts ranging from low-risk passive ideation (wishing to disappear or not exist or one was never born), to higher-risk passive ideation (thinking life is not worth living or wanting to be dead) to active ideation (thinking that one should *maybe* kill themselves or thinking they should kill themselves). The suicidal actions section assesses non-suicidal self-injury, suicide gestures, aborted suicide attempts, interrupted suicide attempts and suicide attempts. The interview used instructional diagrams and specific language to help participants categorize their behavior. The interviewer (AJM) was also trained to distinguish among suicidal action categories.

Following the introduction interview, the interviewer administered one of three different follow-up interviews, depending on the most severe behavior the participant endorsed. The follow-up interviews assessed either: (i) the most recent suicide attempt, (ii) the most recent aborted or interrupted attempt or (iii) suicidal ideation/planning. The goal of the follow-up interview was to assess specific thoughts and actions the participant carried out down the pathway to suicide (i.e. planning steps) and, for those with prior suicidal actions, to assess the amount of time between planning steps and the suicidal action.
The interview included questions about 4 pathway components: (i) thinking about suicide (i.e. ideation), (ii) thinking of the suicide method, (iii) thinking of the place to attempt suicide, and (iv) carrying out preparatory actions. For the first three of these components, we assessed lifetime onset, onset for the current attempt (i.e. the attempt made just prior to hospitalization), and onset of being sure/settling on/deciding (e.g. being sure one will use this method to attempt).

To assess the onset of suicidal ideation during the “current attempt,” the interviewer asked participants for the last time they went more than one week without suicidal ideation. For suicidal ideation, there was an additional phase not included in method or place: “mulling over” the decision to attempt suicide, defined as strongly considering attempting suicide, perhaps going back and forth in one’s mind about whether to do it or not. This step always occurred prior to the “final” decision to attempt. For participants that endorsed mulling, they were asked how long they mulled over the decision. We define a suicide “plan” as the point at which a person had thought of and settled on both the method and the place to attempt suicide.

Regarding the moment the person made the decision to attempt suicide, participants were asked whether for the decision point they specified they were (a) leaning towards attempting suicide, (b) pretty sure they were going to attempt suicide, or (c) sure they would attempt. If participants reported being less than sure, they were asked the amount of time prior to the attempt they were sure they were going to attempt and this was used as the decision point. The difference in time between the original response and the revised “sure” decision points was added to the time spent “mulling over.”

We also inquired about whether the person had engaged in several preparatory actions prior to attempting either to help carry out the suicide attempt (e.g. obtain the method) or because they would be dead soon (e.g. make a will).
Beck Suicide Intent Scale - Planning Subscale (SIS-Plan)

The Beck Suicide Intent Scale (Beck et al., 1976; Beck et al., 1974) is a 20-item measure that assesses several aspects of a suicide attempt in order to assess the degree of suicidal intent. In the original SIS, the first 8 items contain objective characteristics of a suicide attempt and require an interviewer to determine each on a 0-2 scale. The remaining 12 are self-report items. In the original scale, there is limited structure regarding what to ask participants and how to determine the ratings. For the current study, we used a modified version of the SIS from the Army STARRS project (Ursano et al., 2015) that included both a prompt questions for every item as well as numerous examples to inform ratings. The experimenter read all the questions and anchors for each rating (provided in the modified version) to the participants who responded with a rating. Although the anchors provided in the modified version of the Beck Suicide Intent Scale led to fairly clear-cut responses, when participants had questions about an appropriate rating, the experimenter and participant would confer and determine a final consensus rating. The modified Beck Suicide Intent Scale is listed in the Appendix.

Analyses

PSAI Scoring

The PSAI assessed how long the participant engaged in a planning step prior to attempting suicide. For these timing variables, participants gave free response timing intervals for each item. We converted all the responses to seconds and then, to make the data comprehensible and manageable, we binned the responses into 18 time intervals ranging from under 1 minute to more than 5 years. However, the ten bins consisted of time intervals within a day because the vast majority of planning steps occurred close in proximity to the suicide...
attempt (see Figures 2.1-2.3). All the following analyses were conducted on the binned responses rather than the raw timing data.

**Preparatory actions**

Preparatory actions were tallied based on the purpose of the action and not on the number. For example, writing 1 note or 5 notes were counted both as a single preparatory step. Some purposes precluded others. For example, if a person traveled in order to avoid discovery, other steps taken to avoid discovery would not be counted. A codebook with 27 purposes was established and the preparation data were coded and summed. For simplicity, there was no distinction for actions that prepared the person for the suicide attempt versus those that were in preparation of the person’s death.

**Pathway Composite Score**

We calculated a “Pathway Composite Score,” in which we tried to combine the various pathway steps into a single datum representing “suicide planning.” First, we calculated the average timing for the planning steps based on the timing bins (see *PSAI Scoring* above). Lower bin numbers represent less time between the step and a suicide attempt. For example, a bin score of “1” represents less than a minute between the planning step and the suicide attempt whereas a bin score of “7” represents three hours between the planning step and attempt. Therefore, lower average timing indicates that there was less time between planning steps and the attempt, averaging across different steps. We also added number of preparatory actions to the average timing. Both fewer preparatory actions and lower average timing indicate less planning. There were two additional components added to incorporate other aspects of planning. First, an additional amount was added to the composite score to account for the earliest point at which the person started down the pathway to suicide. Including this was based on the notion that the
earlier the initiation of pathway to suicide the more planned the suicide attempt. Recall that each step is placed in a timing bin. For example, a step that occurred within one minute of attempting suicide has a timing bin of one whereas a step that occurs three hours prior to has a timing bin of seven. Therefore, the timing bin associated with the earliest step was divided by two (so as to not overweigh this aspect) and added to the composite score. The second decision was to exclude steps that occurred 1 year or more prior to the attempt because they were considered too distal. Thus, any step that occurred 1 year or more before the attempt was omitted from the calculation of both the average timing and the additional amount for the start of pathway.

Overall, the Pathway Composite Score consisted of adding the average timing, the number of preparatory actions and half the timing bin of the earliest step, omitting all steps that occurred 1 year or more prior to the attempt. A lower composite score indicates that planning steps were carried out closer in time to the attempt and there were less preparatory actions (i.e. a lower composite score indicates less planning).

SIS-Plan

The SIS was always administered after the PSAI interview was complete. Therefore, the interviewer collected extensive data on the pathway to suicide prior to administering the SIS. We calculated different SIS-Plan subscale sum scores based on the items used by prior studies. Thus, we summed 1 item (Suominen et al., 1997), 2 items (Baca-Garcia et al., 2001), 3 items (Weyrauch et al., 2001), 7 items (Conner et al., 2005), 8 items (Baca–Garcia et al., 2005) to calculate each SIS planning score. We then conducted Pearson correlations between each SIS-Plan score with each other, as well as with the Pathway Composite Score.
Results

A summary of methods used to attempt suicide and medical/physical consequences of the attempts is listed in Table 2.2.

Table 2.2.

Summary of methods used and medical/physical consequences of the attempt.

<table>
<thead>
<tr>
<th>N</th>
<th>Method</th>
<th>Ns for Medical/Physical Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Medication/pills</td>
<td>(6) vomited; (5) required activated charcoal; (2) were dizzy and had memory loss; (2) had nausea; (2) had no effects</td>
</tr>
<tr>
<td>4</td>
<td>Medication/pills &amp; alcohol</td>
<td>(2) slept for over 24 hours; (1) was in the ICU for 3 days; (1) was tachachartic, dizzy, and later orthostatic</td>
</tr>
<tr>
<td>3</td>
<td>Cut wrist</td>
<td>(1) needed stitches; (2) needed bandages</td>
</tr>
<tr>
<td>2</td>
<td>Asphyxiation by restricting airway (e.g. hanging)</td>
<td>(1) l.o.c., ICU; (1) was dizzy</td>
</tr>
<tr>
<td>1</td>
<td>Asphyxiation by restricting airway &amp; medication/pills</td>
<td>had a small abrasion on her neck</td>
</tr>
<tr>
<td>1</td>
<td>Burning charcoal in an enclosed space</td>
<td>asphyxiation to the point of hallucination</td>
</tr>
<tr>
<td>1</td>
<td>Cut wrists &amp; medication/pills</td>
<td>bandages for her wrist, required activated charcoal for pills</td>
</tr>
<tr>
<td>1</td>
<td>pills &amp; suffocation</td>
<td>vomited blood, IV in hospital, kidney problems</td>
</tr>
</tbody>
</table>
Figure 2.1. Orientation to pathway to suicide plots (A) Components of the pathway to suicide: suicide method = red, place = blue, ideation = green, preparatory actions = orange. (B) Method, place and ideation/decision are on a timescale. The right border represents that point at which a suicide attempt occurred. The further left the square markers are plotted, the further away in time they occurred from the suicide attempt. Dotted line represents discontinuous steps (i.e. were not continuous from onset to the suicide attempt). Solid lines represent steps that were continuous from onset to the suicide attempt. All the time bins are on the x-axis. (C) The pathway phases. The color of the square markers gets darker from lifetime to most recent attempt to sure/decision, (D) All the aspects of the plot together.
Figure 2.2. Median of each pathway step. Median lifetime ideation and lifetime thoughts about the method used both occurred years prior to attempting suicide. Median onset of ideation for the current attempt occurred 2 weeks prior to the attempt, and the lifetime thoughts about where to attempt were 1 week before attempting. Median mulling over the decision started 6 hours prior to attempting, whereas the median time for starting to think about the method, settling on the method and thinking of the place to attempt was all 2 hours prior to attempting. Median time for settling on the place was 30 minutes prior and median time for making the decision to attempt was only 5 minutes prior to attempting.
**What does the pathway to suicide attempt look like?**

Plots illustrating the median time points for each step in the pathway to suicide attempt are presented in Figures 2.1 and 2.2. In the current sample of 30 suicide attempts, the median first onset of suicide ideation occurred five years before the attempt and first thoughts about the suicide method used began 1-5 years prior to the attempt. A number of other steps occurred much closer in time to the index attempt. More specifically, the median onset of continuous ideation began two weeks prior to the attempt, the onset of thoughts about *where* to attempt suicide began one week prior to the attempt, the onset of mulling occurred six hours prior to the attempt, and the onset of certainty about method occurred two hours prior to the attempt. The median time for certainty about the place to attempt was 30 minutes prior to the attempt, whereas the final decision to attempt occurred five minutes before the attempt.

**Variability in the timing of steps in the pathway to suicide attempt**

The median timing of each step provides a measure of central tendency for the timing of each step; however, we also wanted to examine individual differences in the timing of each of these steps. The spread of scores for each pathway step as well as a “suicide plan” defined as the point at which a person has thought of and had settled on the method and place are presented in Figure 2.3. Histograms for the lifetime onset of suicidal thoughts, method and place are not included. For the current sample lifetime onset of suicidal thoughts and method frequently occur more than 1 year prior to the attempt (see Figure 2.3). In general, the vast majority (82.4%) of the steps (across participants) are carried out within a week of the attempt and 71.4% of steps were carried out within 12 hours of the attempt. With the exception of preparatory actions, onset of ideation and mulling, the modal time bin for each of the steps is less than one minute. Thus, people engage in many of the steps just prior to attempting, although the particular step varies
Figure 2.3. Histograms of the onset of pathway steps prior to the suicide attempt. Plan is defined as the point at which the person had thought of and settled on the method and place for the most recent attempt.
among people. The most skewed distribution is the decision point, in which 13 out of 30 attempters (43.3%) report deciding to attempt within a minute and 18 (60.0%) decided within 5 minutes. No one reported deciding more than 3 days prior to the attempt. The other steps show a fairly high degree of heterogeneity within the week prior to attempting. Each step has a mode of 7 (i.e. 23.3%), at most, indicating diversity in the timing of each step. For preparatory actions, most people carry out between 0 and 4 actions, with a small group of participants carrying out extremely well prepared suicide attempts. For suicidal planning, although the modal response was that all 4 elements of a plan came together in under a minute, there was a large range with some participants reporting having a plan as far as 3 days prior, although most of the time the plan is formed within the same day as the attempt.

**Order of Pathway Steps**

Regardless of the precise timing we also determined the sequence of planning steps (i.e. which step came first, then second, etc…). Even when looking at only 5 proximal steps (timing of ideation, method, place, mulling and decision for the current attempt) we found that the pathway to suicide is heterogeneous: there were 17 unique sequences among the 30 attempters. The most frequent sequence was to have the onset of ideation, thinking about the method, place and making the decision to attempt suicide occur simultaneously (16.7%).

Table 2.3 shows the percentage of times steps down the pathway occurred either before, after (Table 2.3B) or at the same time (Table 2.3A) as other steps. Notably, the majority of participants first thought (lifetime) about the method they used to attempt suicide prior to every other step.
About half of participants first thought about the method before thinking of the place and nearly half first thought (lifetime) about the method and place at the same time. Nearly three-quarters of participants were sure of the method at the same time that they (i) first thought of the method during the most recent attempt and (ii) at the same time that they were sure of the place to attempt. 80% of participants settled on the place at the same time that they first thought of the place for the current attempt 63% settled on the place at the same time they made their decision. 56% thought of and settled on the method and place all at the same time during the most recent attempt with more than half of these attempters also making the decision to attempt at the same time.
Table 2.3

Percentage of times pathway steps occurred either before, after or at the same time as other steps

<table>
<thead>
<tr>
<th>Method (Lifetime)</th>
<th>Method (Current Attempt)</th>
<th>Sure of Method</th>
<th>Place (Lifetime)</th>
<th>Place (Current Attempt)</th>
<th>Sure of Place</th>
<th>Ideation (Current Attempt)</th>
<th>Mulling (Current Attempt)</th>
<th>Decision (Current Attempt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method (Current Attempt)</td>
<td>26.67</td>
<td>20.00</td>
<td>43.33</td>
<td>16.67</td>
<td>13.33</td>
<td>16.67</td>
<td>6.67</td>
<td></td>
</tr>
<tr>
<td>Sure of Method</td>
<td>20.00</td>
<td>73.33*</td>
<td>40.00</td>
<td>63.33</td>
<td>73.33</td>
<td>33.33</td>
<td>22.22</td>
<td>46.67</td>
</tr>
<tr>
<td>Place (Current Attempt)</td>
<td>43.33</td>
<td>46.66</td>
<td>40.00</td>
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<td>43.33</td>
<td>30.00</td>
<td>33.33</td>
<td>30.00</td>
</tr>
<tr>
<td>Sure of Place</td>
<td>13.33</td>
<td>63.33</td>
<td>73.33</td>
<td>43.33</td>
<td>80.00</td>
<td>40.00</td>
<td>33.33</td>
<td>46.67</td>
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<td>Ideation (Current Attempt)</td>
<td>13.33</td>
<td>40.00</td>
<td>33.33</td>
<td>30.00</td>
<td>40.00</td>
<td>36.67</td>
<td>22.22</td>
<td>16.67</td>
</tr>
<tr>
<td>Mulling (Current Attempt)</td>
<td>16.67</td>
<td>38.88</td>
<td>22.22</td>
<td>33.33</td>
<td>33.33</td>
<td>16.67</td>
<td>22.22</td>
<td>-</td>
</tr>
<tr>
<td>Decision (Current Attempt)</td>
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<td>30.00</td>
<td>46.67</td>
<td>63.33</td>
<td>16.67</td>
<td>-</td>
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</table>

<table>
<thead>
<tr>
<th>Method (Lifetime)</th>
<th>Method (Current Attempt)</th>
<th>Sure of Method</th>
<th>Place (Lifetime)</th>
<th>Place (Current Attempt)</th>
<th>Sure of Place</th>
<th>Ideation (Current Attempt)</th>
<th>Mulling (Current Attempt)</th>
<th>Decision (Current Attempt)</th>
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<tbody>
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<td>Method (Current Attempt)</td>
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<td>10.00</td>
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<tr>
<td>Sure of Method</td>
<td>80.00</td>
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<td>50.00</td>
<td>20.00</td>
<td>6.67</td>
<td>60.00</td>
<td>55.56</td>
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</tr>
<tr>
<td>Place (Current Attempt)</td>
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<td>10.00</td>
<td>3.33</td>
<td>3.33</td>
<td>36.67</td>
<td>16.67</td>
<td>-</td>
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<tr>
<td>Sure of Place</td>
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<td>26.67</td>
<td>20.00</td>
<td>53.33</td>
<td>16.67</td>
<td>63.33</td>
<td>55.56</td>
<td>-</td>
</tr>
<tr>
<td>Ideation (Current Attempt)</td>
<td>70.00</td>
<td>3.33</td>
<td>6.67</td>
<td>33.33</td>
<td>3.33</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mulling (Current Attempt)</td>
<td>77.78</td>
<td>22.22</td>
<td>22.22</td>
<td>50.00</td>
<td>27.78</td>
<td>27.78</td>
<td>77.78</td>
<td>-</td>
</tr>
<tr>
<td>Decision (Current Attempt)</td>
<td>93.33</td>
<td>60.00</td>
<td>53.33</td>
<td>70.00</td>
<td>53.33</td>
<td>36.67</td>
<td>83.33</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Note: (A) Shows a symmetric matrix representing the percentage of times different steps occurred simultaneously. For example, thinking of the method and being sure of the method occurred at the same time for 73.33% of participants (3rd column, 2nd row in grey box). (B) Represents the percentage of times steps occurred before or after other steps. The items in the rows occurred after the items in columns. For example, at the bottom of the first column, lifetime thoughts about the method occurred before the decision point for 93.33% of participants, since Method (lifetime) is in the columns (before) and Decision (Current Attempt) is in the rows (after).
Pathway Composite Score

To validate the Pathway Composite Score, we correlated it with different forms of the SIS-Plan (Table 2.4) and also examined the degree to which the different versions SIS-Plan were correlated with each other. The correlations between the Pathway Composite Score and the SIS-Plan subscale ranged from $r = 0.78$ to $0.85$ while the correlations between the different SIS-Plan scores were very high, ranging from $r = 0.72$ to $0.95$.

Figure 2.4 contains a histogram of the Pathway Composite Score (see Methods for calculation). Lower Pathway Composite Scores represent less time between the planning steps and the suicide attempt and fewer preparatory actions. The histogram reveals a bimodal distribution, with 10 participants falling together in a left distribution representing “less planned” attempts, 19 participants in the right distribution representing “more planned” attempts and 1 participant in-between the two distributions. We further examined the individuals in the “unplanned” distribution to understand the boundary between “unplanned” and more planned attempts. Interestingly, because this approach is multifaceted, the most “planned” attempters in the “unplanned” distribution had two different profiles. For one person all the planning steps (excluding components with an onset of longer than 1 year), including the decision to attempt and settling on the method and place occurred around 15 minutes prior to attempting with 1 preparatory action. For another person the onset of ideation and tentative planning began 1 hour prior to attempting but he settled on the method and place and made the decision to attempt all within 1 minute of attempting.
Table 2.4

*Correlations between the Pathway Composite Score and SIS-Plan versions*

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Pathway Composite Score</th>
<th>SIS-Plan - 1 Items</th>
<th>SIS-Plan - 2 Items</th>
<th>SIS-Plan - 3 Items</th>
<th>SIS-Plan - 7 Items</th>
<th>SIS-Plan - 8 Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite Score</td>
<td>1.00</td>
<td>0.78</td>
<td>0.85</td>
<td>0.80</td>
<td>0.79</td>
<td>0.85</td>
</tr>
<tr>
<td>SIS-Plan - 1 Items</td>
<td>0.78</td>
<td>1.00</td>
<td>0.96</td>
<td>0.74</td>
<td>0.72</td>
<td>0.79</td>
</tr>
<tr>
<td>SIS-Plan - 2 Items</td>
<td>0.85</td>
<td>0.96</td>
<td>1.00</td>
<td>0.82</td>
<td>0.80</td>
<td>0.87</td>
</tr>
<tr>
<td>SIS-Plan - 3 Items</td>
<td>0.80</td>
<td>0.74</td>
<td>0.82</td>
<td>1.00</td>
<td>0.90</td>
<td>0.92</td>
</tr>
<tr>
<td>SIS-Plan - 7 Items</td>
<td>0.79</td>
<td>0.72</td>
<td>0.80</td>
<td>0.90</td>
<td>1.00</td>
<td>0.95</td>
</tr>
<tr>
<td>SIS-Plan - 8 Items</td>
<td>0.85</td>
<td>0.79</td>
<td>0.87</td>
<td>0.92</td>
<td>0.95</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Figure 2.4. Histogram of Pathway Composite Score.*
Individual-level pathways to suicide attempt

We also examined each individual’s pathway to suicide to determine whether there are any detectable sub-types of pathways or notable patterns across individuals. The sample size precluded a cluster analysis or latent class analysis. Separate plots for each participant are presented in Figure 2.5 and are sorted based on the Pathway Composite Score. Several general patterns are observed in these data. Some individuals have longer-term suicidal thoughts (i.e. a year or more) but carry out all of the steps for a suicide attempt in less than 5 minutes without a single preparatory action (Column A). Others carry out several preparatory actions and have engaged in most planning steps more than a day before actually attempting (Column E). However, the majority of attempters have patterns that fall between these two extremes. Overall, the pathway to suicide is very heterogeneous with very few common patterns.

Using a 5-minute criterion to separate impulsive and non-impulsive attempters, as some studies have done (Simon et al., 2002; Williams et al., 1980), appears arbitrary when examining all the pathway steps measured here. For example, other than Figure 2.5, Column F, which represent the most planned attempts, every other column contains people that made the decision to attempt suicide within 5 minutes of doing so. The difference is that some of these individuals had engaged in no other forms of planning (Column A) whereas others had engaged in fairly extensive planning but still only made the decision at the last minute (Column E). Thus, studies using the 5-minute criterion place people in an “impulsive attempters group” when, in reality, these attempters likely show a wide range of suicide planning.
Figure 2.5. Individual pathway to suicide plots for every participant (n=30). Sorted by the Pathway Composite Score. As plots move down and to the right, individuals move through the pathway slower and with more preparatory actions. Y-axis labels are coordinates for identifying columns.
Discussion

Information about how people transition from thinking about suicide to attempting suicide is sparse, yet crucial for building a consensus approach to measuring suicide planning as well as understanding risk factors associated with why people move down the pathway to suicide. The current study sought to describe the degree of preparation and the timing of steps people take as they move through the pathway to suicide as an operationalization for “suicide planning” and “impulsive attempts.” There are five main findings. First, although the onset of suicidal ideation and suicide method can occur years prior to an attempt, the vast majority of steps down the pathway to suicide occur within a week and most within 12 hours of the attempt. Second, looking at the order of the steps, regardless of the precise timing, revealed that (i) the most common order was when several the steps occurred together but this was still relatively rare (16.6%) and (ii) settling on a method and place occurred simultaneously for more than 70% of attempters. Third, combining the steps down the pathway to suicide into a composite score resulted in a bimodal distribution. Fourth, the composite score showed convergent validity with the SIS-Plan. Fifth, although we observed some interesting commonalities in the pathway to suicide attempt, it is important to keep in mind that the pathway to suicide is heterogeneous with both the timing and order of steps incredibly diverse among participants. Several findings warrant further comment.

The first key finding was that the vast majority of pathway steps occurred within a week and most within 12 hours. Furthermore, many steps showed a modal timing of 1 minute prior to attempting with two of the quickest steps planning and the decision to attempt. In addition, several people reported an absence of suicidal ideation until just prior to attempting. Taken together, these data suggest that, although logistically difficult, research aimed at examining
psychological processes occurring during the days (or day, if possible) before a suicide attempt would provide enormous insight into why people attempt suicide, particularly because this appears to be the timescale in which the majority of planning and decisions are made. There are similar arguments for studies predicting suicide. Most studies prospectively predicting suicide have had follow-up periods of 6 months or longer and have largely failed to identify important, reliable risk factors (Franklin et al., unpublished). These data suggest that predication efforts might do better to focus over much shorter periods of time.

The second key finding was that the most common order was for several steps to occur simultaneously and that settling on a method and place frequently occurred at the same time. Although it makes conceptual sense to characterize settling on a method and place as a “suicide plan,” the fact that we found that these two steps often occur together provides additional support to this designation. That is, at the point when people are finished planning, they have decided on method and place to attempt, which is why the onset of these two steps frequently occur simultaneously. There were no attempters in this sample that made the decision to attempt and then carried out planning steps afterward, although some steps occurred at the point of the decision. Thus, the decision point represents the last step of the pathway to an attempt and therefore represents the highest risk step.

The third key finding was that the Pathway Composite Score revealed a bimodal distribution. Developing a Pathway Composite Score to examine suicide attempt planning is important for several reasons. As mentioned in the Introduction, three limitations of prior research examining planning prior to suicide attempts include (i) a lack of conceptualization regarding “planning” and what constitutes a “planned” versus “impulsive” attempt, resulting in a vast array of approaches to measure the construct, (ii) assessments that cannot be used across
studies (e.g. conducting a median split that is dependent on the sample) and (iii) no agreement regarding whether suicide planning should be measured on a continuous scale or attempts should be dichotomized. To address the first limitation, we provided a conceptual framework to establish the Pathway Composite Score: it includes an average timing across the planning steps, the number of preparatory actions and adds a weight for the onset of the pathway itself. In addition, the fact that the composite score revealed a bimodal distribution addresses all three limitations. That is, if the bimodal distribution is replicated in larger samples, it provides (i) an approach with a conceptual framework, (ii) a “natural” break in the distribution of attempts to distinguish “planned” from “impulsive” attempts that can be used across studies and (iii) a compelling reason to dichotomize the construct.

Although, the composite score itself is not interpretable, it is easily traced back to quantifiable, interpretable data, rather than arbitrary ratings alone. Locating the two individuals with the least impulsive attempts among the left distribution (i.e. the distribution of more impulsive attempts) resulted in two different profiles due to the multifaceted approach. One started tentative planning 1-hour prior but only settled on all aspects of the plan and made the decision to attempt within 1 minute of attempting. The other decided to attempt and settled on a method and place about 15 minutes prior to the attempt and carried out 1 preparatory action. Thus, this multifaceted methodology defies a simplistic approach but may provide a more nuanced, data-driven method to distinguishing the population of “impulsive” attempters from more “planned” attempters. It should be noted that we excluded steps that were either discontinuous (more than a week without thinking about suicide) or were continuous but with an onset of more than 1 year prior. These were considered distal processes that were less likely to be associated with the attempt directly. Thus, one assumption of our approach is that impulsive
attempts can have longer-term processes operating in the background, as long as the attempt is precipitous (i.e. several steps carried out simultaneously within proximity to the attempt).

A fourth key finding was that the Pathway Composite Score showed high correlations with the SIS-Plan. The SIS-Plan is a widespread method for measuring suicide planning, although researchers use several different combinations of items to construct the scale (Conner, 2004). We found high correlations within the different forms of the SIS-Plan, as well as between each form of the SIS-Plan and the composite score. Both of these were the case even when the SIS-Plan consisted of a single item. This suggests that both the different SIS-Plan versions and the composite score are measuring similar constructs. We used a modified version of the SIS, which contained prompt questions and several examples to help guide ratings, unlike the much sparser original version of the scale. Additionally, administration of the SIS always followed the PSAI after the participant and interviewer (AJM) had thoroughly recounted the participant’s suicide attempt. Therefore, one interpretation of the strong relationship between a single SIS item and the pathway composite score is that the data from the PSAI help to inform the ratings on the SIS item. On the other hand, it does suggest that, given the necessary information, rating a single SIS item regarding the degree of premeditation captures much of the same information as the composite score.

Even though there are strong correlations between the SIS-Plan and the composite score, there are important advantages to using the PSAI. First, it can provide important descriptive statistics regarding how people move from thinking to acting that are currently unknown. This includes revealing the underlying distribution for the amount of time prior to a suicide attempt the different steps are carried out as well as the distribution of the composite measure. This latter point is crucial to understanding whether the timing of planning steps and amount of preparation
rests on a unimodal or bimodal distribution, as the current data suggest. This, in turn, can inform the development of a more empirically derived measurement approach that would gain more widespread consensus and use. Although, the SIS-Plan captures much of the same variance as the composite score, it is unlikely to lead to a consensus approach (as none have been established since its inception in the 1970’s) and methods for measuring the degree of attempt planning are likely to remain fragmented. A second reason to continue to study the each of the pathway steps is that future research can examine risk factors that predict transition from one step to another, as well as factors that predict the timing of different steps or the pathway itself. This type of approach is not possible using the SIS-Plan. This type of study could be crucial in both understanding why people transition from thinking to acting and help improve prevention efforts.

The fifth key finding is that although there are people who proceed through all the planning steps within minutes of attempting and those who carry out the steps over the course of several hours and days, in general, most people fall between these two extremes and the timing and order of steps along pathway to suicide is very heterogeneous, particularly among more planned attempters. One prior definition for an impulsive attempt was to make the decision to attempt within 5 minutes of attempting (Simon et al., 2002; Williams et al., 1980). Having all the pathway steps in view, this criterion appears arbitrary criterion. In fact, given that heterogeneity in this multifaceted approach, it appears that using any single step as a main indicator of attempt planning may omit other important aspects.

Importantly, there are several limitations to this study. First and foremost, the sample size is small. Additional studies with larger samples need to confirm several of the findings here, particularly the bimodality for the composite score distribution. Second, the participants in this study were largely young (i.e. 18-35 years old), and white and therefore the pathway steps should
be tested across a more diverse sample. For example, in a prior study with people over 50 years old, older age was associated with increased suicide planning (Conner et al., 2007), although a different study with a large, representative sample found no relationship between age and planning based on the SIS-Plan (Hjelmeland et al., 2000). Although currently unclear, there is a chance these data over-represent the percentage of attempts that are less planned compared with a sample that included older adults. Third, many of the analyses relied on the timing bins, which were established based on approximating a logarithmic function (although the time bins are a steeper function) and readability (i.e. split in a way in which time is typically divided). However, certain choices affect the results. For example, including both a 2-hour and 3-hour bin creates gaps in the 3-hour bin for several steps. With larger samples, one could develop a data-driven approach to binning or clustering participants. Fourth, we developed the PSAI and did not conduct any psychometric testing. On the other hand, the high correlations with the SIS-Plan do suggest high convergent validity. Fifth, although we interviewed people within 2 weeks of attempting suicide, they might have difficulty remembering specific details from the event or the time leading up to it. Despite these limitations, this study makes several advances over previous studies examining suicide planning provides some of the first evidence that there is a “natural” demarcation between “unplanned” and “planned” suicide attempts.
Abstract

Background: Suicide is a leading cause of death worldwide. Impulsiveness has been identified as an important factor in suicidal behaviors, yet there are three limitations of prior research. First, studies have generally failed to specify or study the precise role that impulsiveness plays in suicidal behavior. For example, if impulsiveness is an important factor in why people that think about suicide go on to attempt suicide, then studies should compare suicide attempters against suicide ideators. However, most prior research examined suicide attempters against non-attempters or suicidal versus non-suicidal. Using these groups, researchers are unable to determine whether impulsiveness is associated with ideation or attempts among ideators. Second, although impulsiveness is a multidimensional construct, prior research frequently studies impulsiveness as a single, unitary construct. Third, no one has tested whether, in the period following a suicide attempt, completing questions about suicide prime attempters to inflate their self-reported impulsiveness.

Methods: We compared recent suicide attempters, suicide ideators and non-suicidal controls on four different behavioral tasks and two self-report measures of impulsiveness measuring six dimensions of impulsiveness as well as aggression and sensation seeking. We also randomly assigned participants to either complete clinical self-report scales with questions about depression and suicide prior to self-report impulsiveness questionnaires or vice versa to test whether the order of completion influence self-reported impulsiveness.

Findings: We found only one dimension of impulsiveness that differed between the groups – negative urgency. Specifically, both suicidal groups showed increase negative urgency compared with non-suicidal controls. Furthermore, we found that, compared with ideators, attempters reported higher self-reported impulsiveness if the measure was completed after questionnaires of
suicide and depression but there was no difference between attempters and ideators if impulsiveness measures were completed prior to the clinical scales. Furthermore, a second impulsiveness questionnaire showed an identical pattern although it was not significant.

**Interpretation:** Negative urgency, which is defined as acting rashly when in a negative affective state is the only form of impulsiveness we found associated with suicide. Perhaps the lack of affective material is why none of the behavioral tasks differed between the groups. Therefore, the relationship between impulsiveness and suicide may require an affective component. Furthermore, answering questions about suicide may prime suicide attempters to inflate their self-reported impulsiveness. If this finding is replicated, prior studies using self-reported impulsiveness may have exaggerated effects of impulsiveness in suicide.
Introduction

Suicide is a leading cause of death around the world, yet there is limited understanding of psychological causes that influence people to think about or attempt suicide. This is due, in part, to the wide range of risk factors associated with suicidal behavior but also because research often fails to assess whether risk factors predict suicidal ideation versus the transition from ideation to a suicide attempt. Understanding precisely how different risk factors predict distinct parts of the pathway to suicide could increase our understanding how numerous factors work together to increase risk and greatly help prevention efforts. Recent research examining this distinction has revealed that whereas major depression is among the strongest predictors of suicide ideation, disorders characterized by agitation and poor impulse-control are the strongest predictors of which people with suicidal ideation go on to make suicide attempts (Nock et al., 2009; Nock, Hwang, Sampson, & Kessler, 2010). These results suggest one often mentioned yet understudied hypothesis that increased impulsiveness is associated with suicide attempts among ideators.

Although few studies have examined whether impulsiveness predicts attempts among ideators, there has been voluminous research on the general relationship between impulsiveness and suicidal behaviors (e.g. comparing attempters and non-attempters (regardless of ideation) on impulsiveness). A recent meta-analysis examining 70 studies testing this general relationship found a small-to-medium effect (Anestis, Soberay, Gutierrez, Hernández, & Joiner, 2014). In addition, several theoretical models of suicide implicate impulsiveness as a critical factor. However, there are 3 main limitations to this prior literature: (i) in both theoretical and empirical literature impulsiveness is often treated as a unitary construct and is frequently measured with a single, self-report instrument (e.g. 57 of the 96 studies reviewed in a recent meta-analysis used the Barrett Impulsiveness Scale and less than 20 used more than single measure of impulsiveness
(Anestis et al., 2014)) (ii) theories of suicide generally fail to identify the precise role or dimension of impulsiveness involved in suicidal behaviors and (iii) studies are not designed to test whether increased impulsiveness is associated with suicidal ideation or suicide attempts among ideators (the results of which would inform theory).

Recent research suggests that rather than a single psychological process, impulsiveness should be considered an umbrella term encompassing several independent processes (Bagge, Littlefield, Rosellini, & Coffey, 2013; Brevers et al., 2012; Dalley et al., 2011). In general, impulsive behaviors often include a tendency to engage in precipitous actions with little or no regard for negative consequences of the action (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). However, researchers have identified several behaviors that fit this description but appear to be independent processes. Different forms of impulsiveness include: difficulties with moment-to-moment control over one’s actions, such as inhibiting a response (i.e. impulsive action), insufficiently gathering evidence to make a decision (i.e. reflection impulsiveness), a reluctance to choose larger delayed rewards when compared with smaller but more immediately achieved rewards (i.e. impulsive choice), a failure to plan ahead or properly prepare (i.e. lack of premeditation), and rash action when in highly negative affective states (i.e. negative urgency (Dalley et al., 2011; Whiteside & Lynam, 2001). Importantly, several studies have shown that each facet of impulsiveness is unrelated to the others (Bagge et al., 2013; Cyders & Coskunpinar, 2011; Dalley et al., 2011). Furthermore, different psychiatric disorders are associated with distinct forms of impulsiveness. For example, children with attention-deficit hyperactivity disorder exhibit increased impulsive action (ADHD; Casey et al., 1997; Nigg, 1999; Slaats-Willemse, Swaab-Barneveld, de Sonnevile, van der Meulen, & Buitelaar, 2003; Sykes, Douglas, & Morgenstern, 1973; Wodka et al., 2007) whereas substance dependent individuals display
elevated impulsive choice (Coffey, Gudleski, Saladin, & Brady, 2003; Kirby, Petry, & Bickel, 1999; Madden, Petry, Badger, & Bickel, 1997). In addition to the facets mentioned, researchers have identified other forms of impulsiveness that are not associated with suicide, such as positive urgency – rash behaviors when in a positive affective state - and lack of perseveration, which is a tendency to become easily distracted when faced with monotonous activities (Klonsky & May, 2010). Sensation seeking is often included in discussions of impulsiveness but some have argued it is a separate domain of processes, separate from impulsiveness (Dalley et al., 2011).

Two commonly used approaches to measuring aspects of impulsiveness are the use of behavioral tasks and subjective self-report. Facets such as impulsive choice, impulsive action and reflection impulsiveness, typically have been measured using behavioral tasks, whereas other dimensions, such as lack of premeditation and negative urgency, often are measured through retrospective self-report. Impulsive action is measured by tasks that require people to inhibit a tendency to response or inhibit an initiated action. Impulsive choice is measured by offering people choices between a monetary reward in some short time interval (e.g. at the end of the study) and a larger reward in the future (e.g. in a month). Tasks of reflection impulsiveness require participants to choose between choosing to accept small costs to acquire information so they can make a more informed choice versus choosing riskier, less informed options with potentially larger payouts. For tasks of negative urgency participants are asked to rate how frequently they engage in sudden or reckless behavior when in a negative affective state. For lack of premeditation, participants are asked the extent to which they fail to plan for future events.

Despite the evidence of several forms of impulsiveness, existing theoretical models of suicide, and empirical studies testing them, have failed to precisely specify the dimension of impulsiveness proposed to lead to suicidal behaviors. For example, Mann and colleagues drew
on the findings from an empirical study to propose a model in which a trait-level tendency for aggressive-impulsive behaviors puts ideators at a higher risk of making an attempt because they are more likely to act on their suicidal urges (Mann et al., 1999). One limitation of this study is that the authors treat impulsiveness as a single, general construct and measure it as such, using a total score from a general measure – the Barratt Impulsiveness Scale – to assess impulsiveness. Interestingly, these authors argue that a person could have a well-developed suicide plan but still make an impulsive decision to attempt suicide. Thus, it is unclear whether this model is specifying the role of impulsive action, impulsive choice, both or another facet of impulsiveness in suicidal behaviors. A second limitation is that the study findings could not support the theory directly because it compared attempters to non-attempters without respect to ideation. Thus, similar to much of the prior research, this study is unable to precisely identify which form of impulsiveness is relevant to suicide (i.e. the dependent variable is imprecise) and precisely how impulsiveness is involved (i.e. whether impulsiveness is related to suicide ideation or attempts among ideators; the independent variable is imprecise).

Studies that have tested more precise forms of impulsiveness have used differing, idiosyncratic independent variables and have inconsistent results. One prior study found increased impulsive action was associated with making an unplanned attempt, compared with planned attempters and non-attempters, among a large alcohol dependent sample (Wojnar et al., 2009). Another study revealed increased impulsive action among suicide attempters, particularly among those with prior high lethality attempts, compared with psychiatrically-matched controls (Swann et al., 2005). Given that high lethality is associated with less impulsive attempts (Baca-Garcia et al., 2001; Dombrovski et al., 2011), these two results are conflicting and neither is able to address whether impulsive action is associated with ideation or with attempts among ideators.
A third study found increased impulsive action among attempters, particularly those with multiple attempts, compared with healthy controls (Dougherty et al., 2004). These studies’ differing independent variables make it difficult to reconcile the conflicting findings. Furthermore, all provide hints about the relationship between impulsive action and suicide (e.g. impulsive action increases the likelihood of making an impulsive attempt or, conversely, a high lethality attempt or multiple attempts) but none are able to address precisely how impulsive action is associated with suicide attempts. Furthermore, the latter two studies have low power and none of these studies have been replicated.

Intriguingly, recent research suggests some forms of impulsiveness may play a role in some suicide attempts but not in others. Dombrovski and colleagues (2011) found that older people (i.e. aged 60+) who engaged in well-planned, high lethality attempts showed reduced impulsive choice compared with attempters with unplanned, low lethality attempts and suicidal ideators without a prior attempt. These results suggest that some attempters cannot be characterized as impulsive decision-makers and this was further demonstrated in their deliberate, planned suicide attempts. On the other hand, unplanned attempters exhibited higher impulsive choice than non-suicidal, depressed participants and healthy controls, but not suicidal ideators, suggesting that increased impulsive choice is not necessarily associated with the transition from ideation to unplanned attempt. This study was limited by a relatively small sample size and therefore, needs to be replicated and extended outside of older adults. Klonsky and May (2010) examined negative urgency and lack of premeditation across suicidal attempters, ideators and non-suicidal controls and found increased negative urgency separated suicidal from non-suicidal groups but lack of premeditation separated attempters from ideators and controls. These studies suggest that measuring specific dimensions of impulsiveness among several different suicidal
groups can lead to a nuanced and more precise role for impulsiveness in suicidal behaviors than prior studies.

Aside from questions of the specificity for independent and dependent variables, the use of self-report measures in suicide studies could be problematic. Many times people are unaware of implicit influences over their behavior and self-reported evaluations are particularly susceptible to these influences (Nisbett & Wilson, 1977). Several studies have shown that implicit priming can affect people’s behavior and self-perception, including self-reported aggressiveness (DeMarree, Wheeler, & Petty, 2005; Wheeler, Jarvis, & Petty, 2001). Thus, being asked questions about a recent suicide attempt may prime suicide attempters, increasing their self-perceived impulsiveness and leading them to report increased impulsiveness. On the other hand, for participants that had urges to attempt suicide but inhibited the urge or obtained help, directing their attention toward this suicidal action may prime the opposite self-perception: that, generally, they are less impulsive. If priming occurred, it would introduce significant error to self-reported impulsiveness potentially lead to false differences between ideators and attempters.

To overcome the limitations of prior studies and test whether certain facets of impulsiveness are associated with making a suicide attempt among ideators, we tested 5 facets of impulsiveness (impulsive action, impulsive choice, reflection impulsiveness, negative urgency and lack of premeditation) among 3 groups of participants: those with a prior suicide attempt (within the prior 2 weeks), suicide ideators, and community control participants. In addition, to test for potential influence of priming and biased self-report, participants randomly completed self-report questionnaires in one of two orders: they either completed clinical measures, including questionnaires about suicide, hopelessness and depression, prior to impulsiveness and aggression measures or the order was reversed. We examined the influence of order on the self-
reported facets of impulsiveness (negative urgency, lack of premeditation), as well as two self-report measures commonly used in suicide studies (the Barratt Impulsiveness Scale and the hostility subscale of the Buss-Perry Aggression Questionnaire). We hypothesized that (i) impulsive action would be increased among attempters, compared with ideators and controls, whereas (ii) impulsive choice and reflection impulsiveness would be increased among suicidal groups compared with controls. We hypothesized that suicide attempters who completed self-report clinical questionnaires prior to self-report impulsiveness measures would rate themselves as more impulsive compared with those that received the impulsiveness scales first. However, we hypothesized that for ideators the inverse would occur: compared with those that first completed the impulsiveness scales, those that completed the clinical scales first would rate themselves as less impulsive. To test for moderators of impulsiveness among attempters, we also conducted several exploratory analyses comparing differences in impulsiveness with attempters split into two subgroups (e.g. whether the attempter made a planned or unplanned attempt or high or low lethality attempt, or had a history of multiple suicide attempts versus one prior attempt).

**Methods**

**Participants**

Participants were 95 adults recruited into one of three groups: (i) psychiatric inpatients who had made a suicide attempt in the past two weeks ($n=30$), (ii) psychiatric inpatients in the hospital due to suicidal ideation within the prior 2 weeks but without a lifetime history of suicide attempts ($n=31$), and (iii) non-suicidal controls ($n=34$), 32 of which were recruited from the community and 2 of which were recruited from the same psychiatric inpatient unit. The participants with a prior suicide attempt were included in a separate study examining the degree
of planning prior to the attempt (Paper 2 of this dissertation). Thus, the majority of the non-suicidal patients had no psychiatric history. Most participants in the suicide ideation group initiated steps towards carrying out a suicide attempt but stopped themselves (i.e. aborted attempt, \( n=19 \)) or were stopped by someone else (i.e. interrupted attempt, \( n=2 \)). To be clear, those with aborted or interrupted attempts never actually initiated a potentially harmful or lethal action; they only took some steps towards a suicide attempt. This could have included actions such as taking pills out of a bottle but then putting them back (or in the case of interrupted attempt, someone walking in and preventing the person from taking the pills) or a person going to a high place while thinking about jumping off but then never jumping (or for an interrupted attempt, someone either physically preventing the person from jumping or convincing the person to not jump). Once a person starts to swallow pills or actually jumps from a high place – even if the former person changes their mind and induces vomiting or the latter person lands in a net – they have initiated a potentially harmful or lethal action and this would be considered a suicide attempt. I included those with aborted attempts in the ideators group because we are interested in uncovering risk factors for people that actually go through with taking the step in which they could potentially bring harm to themselves. This is particularly relevant in examining impulsiveness in suicidal behaviors. One might expect that those who approach a suicide attempt but then inhibit this behavior and do not attempt (i.e. an aborted attempt) to have decreased impulsiveness, particularly impulsive action. For this reason, I reasoned that including those with aborted attempts might actually increase power to detect an effect.

One could make an argument that those with an interrupted attempt should not be considered ideators since they might have gone through with the attempt if someone or something had not stopped them first. On the other hand, the notion that a person would have
attempted suicide, had they not been interrupted, is speculative. In any case they did not attempt suicide. I decided \textit{a priori} that those with interrupted attempts would be placed in the “ideators” group because they did not attempt suicide and we sought to determine whether impulsiveness was related to attempting suicide.

Only 10 were hospitalized for suicidal ideation but had not taken any steps towards killing themselves. Given that most participants in this group stopped themselves from engaging in suicidal behavior, we would expect this to be a less impulsive group than the broader population of suicide ideators, and this should maximize our likelihood of detecting differences in impulsiveness between suicide attempters and ideators in this study.

Inclusion criteria for all groups included: being between 18 and 55 years of age, attending psychiatrist’s approval that patient was healthy enough to participate (for safety concerns), ability to read English, and correctly answer three questions regarding the informed consent form. Exclusion criteria were electroconvulsive shock therapy within the past year, a current or past psychotic disorder or cognitive impairment and having a history of a suicide attempt longer than 2 weeks prior to potential study participation. Attempters had to have attempted suicide within the past 2 weeks. Ideators had to have been hospitalized for suicidal thoughts or actions within past 2 weeks and have no history of an attempt. Control participants could not have passive ideation (e.g. having the thought, “I wish I was dead”) within the past 30 days or a history of suicidal ideation or attempts.

Eighteen people were approached and declined to participate. Attending psychiatrists deemed that four additional people were too decompensated to participate. One participant did not complete the protocol after starting the study due to logistical reasons. An additional 9 participants were excluded from all analyses. One participant in the hospital denied any suicidal
behaviors, despite contradictory evidence from family. Another participant had a prior attempt but not within the past 2 weeks. The last seven were intended to be control participants who endorsed passive or active suicidal ideation. Remaining participant demographic information is presented in Table 3.1. The McLean Hospital Institutional Review Board approved the study and we obtained informed consent from all participants.

Table 3.1

*Demographic information and suicidal history for each group*

<table>
<thead>
<tr>
<th></th>
<th>Attempter</th>
<th>Ideator</th>
<th>Control</th>
<th>Test Statistic</th>
<th>ES^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>n=30</td>
<td>n=31</td>
<td>n=34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age M(SD)</td>
<td>26.8 (8.9)</td>
<td>26.2 (8.9)</td>
<td>27.2 (8.3)</td>
<td>F(2,92)=0.09</td>
<td>0.06</td>
</tr>
<tr>
<td>Sex N(%)</td>
<td></td>
<td>χ^2(2,N=95)=0.16</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>18 (60.0)</td>
<td>19 (61.3)</td>
<td>22 (64.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (40.0)</td>
<td>12 (38.7)</td>
<td>12 (38.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race N(%)</td>
<td></td>
<td>χ^2(6,N=95)=9.55</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>25 (83.3)</td>
<td>23 (74.2)</td>
<td>26 (76.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>1 (3.3)</td>
<td>6 (19.4)</td>
<td>1 (2.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>3 (10.0)</td>
<td>2 (6.5)</td>
<td>5 (14.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American</td>
<td>1 (3.33)</td>
<td>0 (0.0)</td>
<td>2 (5.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES M(SD)</td>
<td>3.4 (0.63)</td>
<td>3.0 (0.6)</td>
<td>2.7 (0.5)</td>
<td>F(2,92)=12.32*</td>
<td>0.21</td>
</tr>
</tbody>
</table>
Table 3.1 (Continued).

<table>
<thead>
<tr>
<th></th>
<th>Attempter</th>
<th>Ideator</th>
<th>Test Statistic</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=30</td>
<td>n=31</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of Participants with Past Suicidal Behaviors N(%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aborted Attempts (1 or more)</td>
<td>18 (60.0)</td>
<td>23 (74.2)</td>
<td>$\chi^2(1,N=61)=1.39$</td>
<td>0.01</td>
</tr>
<tr>
<td>Interrupted Attempts (1 or more)</td>
<td>7 (23.3)</td>
<td>5 (16.1)</td>
<td>$\chi^2(1,N=61)=0.50$</td>
<td></td>
</tr>
<tr>
<td><strong>Mean Number of Past Suicidal Behaviors M(SD)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of Onset Ideation</td>
<td>17.4 (9.0)</td>
<td>17.8 (8.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aborted Attempts</td>
<td>2.0 (3.8)</td>
<td>3.37 (8.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interrupted Attempts</td>
<td>2.2 (2.4)</td>
<td>1.2 (0.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attempts^b</td>
<td>1.9 (1.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^aES = Effect sizes are Partial $\eta^2$ for ANOVAs, Cramer's $V$ for $\chi^2$, and Cohen's $d$ for $t$-tests

^bOne participant who reported 25-50 suicide attempts was an outlier and removed from the mean number of attempts

*Denotes a significant result $p < .05$

**Procedure**

The recruitment process began when participants were identified by inpatient medical staff as likely meeting inclusion and exclusion criteria for one of the three groups. Potential participants were approached and given a flyer with information about the study. After agreeing to participate in the study and granting informed consent, participants were given a pre-study risk assessment, then interviewed with the Pathway to Suicidal Action Interview (see below) by the
same experimenter (AJM). On average, the interview took approximately 1 hour. Following the interview, the experimenter and participant completed the Beck Suicide Intent Scale (SIS). Then participants completed the 4 behavioral tasks, which also took approximately 1 hour. Finally, the participants completed the self-report measures. The self-report measures were presented in 4 different pseudo-randomized orders. In 2 orders, all of the clinical measures were completed first followed by the self-report measures of impulsiveness and hostility. In the other 2 sequences all of the impulsiveness/hostility self-report measures were completed first, followed by the clinical measures. Participants then completed a measure of socio-economic status, followed by a post-study risk assessment and, finally, were debriefed and compensated.

**Materials**

*Clinical measures*

*Pre/post risk assessment*

To ensure that our protocol did not increase suicidality, we assessed pre/post risk assessment measures by asking participants before and after the study to rate their (i) current mood, (ii) desire to die and (iii) desire to hurt themselves. All ratings were on a 1-10-point scale. For mood, a higher score indicates a more positive mood. For desire to die and desire to hurt oneself, a higher score indicates higher self-harm thoughts/urges. For mood, “negative,” “neutral” and “positive” were anchored to ratings of 1, 5 and 10, respectively. For wanting to hurt oneself and wanting to die, “not at all,” “a little,” and “very much” were anchored under 1, 5, and 10, respectively.

We also tested whether there were significant differences on these items between attempters and ideators that might explain differences in impulsiveness.

*Medical record data*
We received permission from each participant to extract medical record data, including clinical diagnosis at discharge, medications at discharge, number of hospitalizations, and duration of hospitalization. We then compared the attempters and ideators on these clinical indicators to test whether they were matched in clinical severity or, if they did not, whether clinical differences could account for group differences in impulsiveness.

*Pathway to Suicidal Action Interview (PSAI)*

The PSAI was used to (i) thoroughly assess prior suicidal behaviors to classify participants into suicide groups for the primary analyses and (ii) carefully assess the steps each participant took toward making a suicide attempt to collect data about the extent to which a suicidal attempt was unplanned versus planned in order test levels of impulsiveness among planned and unplanned attempts.

The PSAI consists of an introduction interview and follow-up interviews. The introduction interview is composed of suicidal ideation and suicidal actions sections and contains roughly 20 questions (some questions are skipped depending on prior responses). Specifically, the suicidal ideation section includes six thoughts ranging from low-risk passive ideation (wishing to disappear or not exist or one was never born), to higher-risk passive ideation (thinking life is not worth living or wanting to be dead) to active ideation (thinking that one should *maybe* kill themselves or thinking they should kill themselves). The suicidal actions section assesses non-suicidal self-injury, suicide gestures, aborted suicide attempts, interrupted suicide attempts and suicide attempts. The interview used instructional diagrams and specific language found to be useful in valid conceptualization of categorizing participants’ behavior (see Paper 1 of this dissertation). The interviewer (AJM) was also trained to distinguish among suicidal action categories and made the final determination of category of suicidal behavior.
The follow-up interviews contained approximately 60 detailed questions to determine the extent of planning and preparation involved in the most severe, most recent suicidal action. For suicide attempters, we determined participants’ “Pathway Composite Score” to determine the extent a suicidal was unplanned (see Paper 2 of this dissertation). This measure has high correlations with the Beck Suicide Intent Scale Planning subscale (also found in Paper 2 of this dissertation).

*Beck Suicide Intent Scale (SIS)*

The SIS (Beck, Schuyler, & Herman, 1974) is a 20-item questionnaire that assesses intent to die from self-injurious behavior and is administered as an interview. The SIS was administered to study the relationship between PSAI measures and the SIS-Planning subscale. The results of this analysis are in Paper 2 of this dissertation.

*Behavioral tasks of impulsiveness*

*Kirby Monetary Delay Questionnaire (MDQ)*

We administered the MDQ (Kirby et al., 1999) to assess impulsive choice. In this task participants must choose between smaller immediate monetary rewards and larger delayed rewards on 27 trials. The MCQ has small ($25–$35), medium ($50–$60), and large trials ($75–$85). Similar to previous studies (Dombrovski et al., 2011; Kirby et al., 1999) to improve ecological validity, participants were told prior to the task that, once the task was complete, they could win one of their selected choices by rolling a 6 on a 6-sided die. We used a hyperbolic function used previously with the MDQ to determine discount rates. This function is

\[ V = \frac{A}{1 + kD} \]

where \( V \) is the current value, \( A \) is the delayed value, \( D \) is the delay and \( k \) is a parameter that determines the discount rate. As \( k \) increases a person discounts future rewards more steeply.
However, rather than relying on an approximation of $k$, as prior studies using the MDQ have done (Dombrovski et al., 2011; Kirby et al., 1999), we used maximum likelihood estimation (MLE) to identify each participant’s best fitting $k$. For 2 participants that chose the immediate reward on every trial, we defaulted to the maximum $k$-value designated by Kirby and colleagues (Kirby et al., 1999). There was a high degree of reliability between the standard approximation method and the MLE method (intraclass correlation value = 0.95). Finally, we log-transformed $k$ so the data were normally distributed.

The MDQ shows convergent validity, with drug addicts showing increased discount rates (Kirby et al., 1999) and longitudinally predicts which women would relapse to cigarette smoking (predictive validity; Yoon et al., 2007). The delay-discounting shows appropriate reliability with high test-retest correlations over 1- and 6-weeks ($rs = 0.64$ to 0.8; Beck & Triplett, 2009; Simpson & Vuchinich, 2011).

*Information Sampling Task (IST)*

To assess reflection impulsiveness we administered the IST (Clark, Roiser, Robbins, & Sahakian, 2009; Clark et al., 2011; Crockett, Clark, Smillie, & Robbins, 2012). In the IST participants have to choose between absorbing small costs to gather information in order to make a more informed decision or make a decision with less information but with the potential for a larger payoff. The task was administered as follows: A 5 x 5 matrix of white boxes appeared on the screen, with two colored panels at the bottom of the screen. Clicking on a white box caused it to reveal one of the two colors. The participants’ goal was to determine, which of the two colors was the majority color. The ratios of minority to majority color were 8:17, 9:16, 10:15, 11:14 and 12:13 and each ratio was presented with 4 total times. Participants chose the number of boxes to open and the pace. Open boxes stayed open for the duration of the trial. Participants clicked one
of the colored boxes at the bottom to select the color thought to be the majority color. Once a
decision was made, all the underlying colors were revealed and participants received feedback
saying either “Correct! You have won x points” or “Wrong! You have lost 100 points,” for 2 sec.
Following feedback the total number of points was presented for 4 sec.

The task has two conditions. In the Free condition participants can open boxes without
penalty and win or lose 100 points regardless of the number of boxes opened. In the Cost
condition the number of points to potentially win starts at 250 and is reduced by 10 points for
every box opened. The number of points lost for an incorrect choice was fixed at 100 points,
regardless of the number of boxes opened. For both conditions, the amount of money to be lost
or won was displayed in the upper left corner. There were 4 different pseudo-randomized trial
sequences. In 2 of the sequences, the cost condition trials were presented first and in the other 2
sequences, the free condition trials were presented first.

There two main dependent measures were the probability of being correct (P[Correct])
and expected value (EV) at the time of the decision. For P[Correct], the following equation
precisely quantifies the degree of information available on a trial-by-trial basis:

\[ P(\text{Correct}) = \frac{\sum_{k=A}^{Z} \binom{Z}{k}}{2^Z} \]

where \( Z = 25 \)-number of boxes opened and \( A = \) number of opened boxes of chosen color. If for
example, a participant opened 7 boxes, of which 5 were blue and he selected blue, then \( Z=25–7=18 \), \( A=13–5 = 8 \), and \( P(\text{correct}) = \frac{18!(8!x10!)+18!(9!x 9!) +18!(10!x 8!)\ldots 18!(18!x0!)}{2^{18}} = .7597 \). EV was calculated by multiplying \( P[\text{Correct}] \) * amount won if correct – \((1-
P[\text{Correct}] \) * amount lost if incorrect (which was always 100)). Thus a person that made a
decision after opening 10 boxes, 5 of each color would have roughly the same \( P[\text{Correct}] \) as
another person that guessed without opening a single box but the latter person would have a larger EV during the cost condition because they would not have lost any money opening boxes. Similar to the MDQ, in order to improve ecological validity, participants were paid 5 cents for every point won at the end of the game. The most one could win was an additional $18.

Although the IST has not been used widely, some studies have shown convergent and discriminant validity. For example, drug users demonstrate reduced sampling (Clark, Robbins, Ersche, & Sahakian, 2006) and while medication improves response inhibition in children with ADHD, they continued to show impulsive responding on the IST (DeVito et al., 2009).

Stop-Signal Reaction Time task (SSRT task)

We administered the SSRT task (Logan, Van Zandt, Verbruggen, & Wagenmakers, 2014) to test impulsive action; specifically inhibiting an initiated action. Prior beginning the task, the experimenter placed participants approximately 21 inches from the computer screen. Each block began with the presentation of a fixation cross (+) in white with a black background. On 75% of trials the participants’ goal was to discriminate between the two task stimuli - a square and a diamond – by pressing the corresponding response key. The stimulus remained on the screen for 1500 ms. On the other 25% of trials the lines of the task stimulus (i.e. either square or diamond) flashed thicker for 250 ms at some variable delay after presentation. This signal, referred to as the “stop-signal,” instructed participants to withhold their response. The inter-stimulus interval (ISI) was 2 sec. The stop-signal delay (SSD; time between onset of the stimulus and onset of the stop-signal) was initially set at 250 ms but was adjusted based on response accuracy. If the participant successfully inhibited a response on a stop-trial, the SSD increased by 50 ms (i.e. a longer duration between stimulus onset and stop-signal onset), whereas if response inhibition is unsuccessful, the SSD decreased by 50 ms. Participants were shown information
about their performance between blocks and had to wait at least 10 sec. before beginning the next block. The task consists of 4 blocks.

The main dependent measure of the SSRT task is the stop-signal reaction time (SSRT), which is an estimate of the latency of the stop process and cannot be directly measured. The SSRT is computed by subtracting the mean stop-signal delay (the delay between the Go and Stop signals) and mean reaction time for all button presses. For the current study, we employed an integration method to calculate SSRT because the original SSRT calculation can lead to bias and spurious inhibitory differences (Verbruggen, Chambers, & Logan, 2013).

In regards to convergent validity, individuals with high self-reported impulsivity and individuals with impulse-control disorders (e.g. ADHD (Solanto et al., 2001)). The SSRT task shows high test-retest reliability (ICC > 0.7). (Congdon et al., 2012; Solanto et al., 2001)

Continuous Performance - Go/NoGo task (CPT-GNG)

The CPT-GNG (Esterman, Noonan, Rosenberg, & DeGutis, 2013; Esterman, Rosenberg, & Noonan, 2014), requires participants to inhibit a prepotent response tendency, a second test of impulsive action. Prior beginning the task, the experimenter placed participants approximately 21 inches from the computer screen. Participants were presented with images of scenes from cities (of building and streets) and scenes of mountains. When presented with a city scene, participants were required to press the spacebar with both index fingers and withhold a response to mountain scenes (i.e. NoGo trials). Like all other Go/NoGo tasks, the vast majority of trials required a response (~90% were Go trials). This builds a tendency to respond and requires effortful control to inhibit a response on a NoGo trial. Images were presented in overlapping fashion without a full inter-trial interval. Thus, an image or combinations of images appeared on the screen at all times. Each image gradually appeared over 400 ms, then was held on for 200
ms, before transitioning off as the next image began to appear. The task consisted of two 5-minute blocks. The main dependent variable was $d'$. $D'$ is a measure of sensitivity to the target computed by subtracting the $z$-score of the false alarm rate from the $z$-score of the hit rate. Higher values reflect better discrimination between targets and non-targets. Although, some studies have discussed results on Go/NoGo tasks and SSRT tasks with an assumption that they measure the same construct (Aron & Poldrack, 2005), studies have found that performance on the two tasks are not related (Cheung, Mitsis, & Halperin, 2004).

Although the task used has been used in only a few studies, Go/NoGo tasks in general show convergent validity, with poorer performance in populations with impulse-control disorders (Epstein et al., 2007) and task measures correlating with other theoretically relevant cognitive tasks (Langenecker, Zubieta, Young, Akil, & Nielson, 2007). Go/NoGo tasks show medium to high test-retest reliability ($rs = 0.5 - 0.8$; Langenecker et al., 2007). We chose this task because prior research showed fairly high rates of commission errors, which is a signal of impulsive responding incorporated in $d'$.

**UPPS-P**

The UPPS-P Impulsive Behavior Scale (Whiteside & Lynam, 2001) is a 59-item scale assessing 3 different facets of impulsiveness: lack of perseverance, lack of premeditation, and negative urgency as well as sensation seeking, which is related but different from impulsiveness (Dalley et al., 2011). Items range along a 4-point scale from “strongly agree” to “strongly disagree.” The subscales of the UPPS scale have good convergent and discriminant validity with different impulsive behaviors (Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011). Each scale shows high internal consistency (all Cronbach’s $\alpha > 0.8$) (Whiteside & Lynam, 2001).

**Barratt Impulsiveness Scale-11 (BIS-11)**
The BIS-11 (Barratt, 1959) consists of 30-items and is a common measure of impulsiveness. Items range along a 4-point scale from Never/Rarely to Almost Always/Always. This questionnaire has been used more frequently in suicide research to test differences in impulsiveness between suicidal and non-suicidal populations. Commonly the total score is reported, reflecting researchers’ tendency to treat impulsiveness as a single construct. We included this measure to test whether questions about suicide might influence scores but also to replicate prior work. There are several first and second order factors within the BIS-11. For parsimony and to limit the number of tests we conducted, we first sought to test group differences and, if differences were found, we would conduct exploratory follow-up tests on different factors/aspects of impulsiveness measured within the BIS-11.

The BIS-11 shows high internal consistency (Cronbach’s $\alpha = 0.83$), test-retest reliability over 1 month (Spearman’s Rho = 0.83) and convergent validity with other impulsiveness questionnaires and several impulsive control disorders demonstrate increased scores (Stanford et al., 2009).

*Buss-Perry Scale (BPAQ)*

The BPAQ (Buss & Perry, 1992) is a measure of aggressive responding consisting of 4 subscales; physical aggression, verbal aggression, hostility, and anger on a scale of 1-7 from “extremely uncharacteristic of me” to “extremely uncharacteristic of me.” Multiple studies have revealed that hostility, but not the other subscales, are related to suicide (Bridge et al., 2012; Doihara et al., 2008; Dougherty et al., 2004). Thus, to reduce the number of tests, we restricted analyses to the hostility subscale. Given that suicide often is an aggressive act and aggression and impulsiveness can occur together (Barratt, Stanford, Dowdy, Liebman, & Kent, 1999), we included the BPAQ for the reasons stated above (to test whether questions about suicide
influenced self-reported hostility) and to replicate prior work.

**Clinical Self-Report Measures**

Like other clinical measures, we compared the attempters and ideators on clinical self-report measures to test whether they were matched in clinical severity or, if they did not, whether clinical differences could account for group differences in impulsiveness.

**Beck Hopelessness Scale (BHS)**

The BHS (Beck, Weissman, Lester, & Trexler, 1974) is a 20-item self-report instrument that assesses the degree to which one is feeling hopeless about the future. The BHS has been shown to predict eventual suicide-death (Beck, Brown, & Steer, 1989).

**Beck Depression Inventory (BDI-II)**

The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report instrument of different symptoms associated with suicide. The BDI displays high internal consistency (Cronbach’s alpha = 0.92-.93) and high test-retest reliability over 1 week ($r = 0.93$). In addition, the scale shows decent discriminant validity with higher association with depressive scales ($r = 0.89$) than anxiety scales ($r = .71$; Steer, Ball, Raneeri, & Beck, 1997).

**Beck Suicide Scale for Ideation (SSI)**

The SSI (Beck, Steer, & Ranieri, 1988) is a 21-item self-report instrument that assesses the severity of suicidal thoughts and desires. The items range from 0-2 and quantify frequency, duration, and controllability as well as patients’ attitude regarding the thoughts. It takes approximately 10 minutes. The SSI has high internal consistency (Cronbach’s $\alpha = 0.96$) and shows convergent validity with high correlations between self-reported and clinician rated scales ($r = 0.9 - 0.94$) and depression and hopelessness scales (Beck, Steer, & Ranieri, 1988).

**Alcohol-Drug Dependence Brief Survey**
The Alcohol-Drug Dependence Brief Survey is a brief survey to determine a history of alcohol or drug dependence and recentness of use taken from Army STARRS (Ursano et al., 2015).

Socio-Economic Status (SES)

We used an approximate measure of SES by rating participants’ income and education on a 7-point scale, as well as that of their mother and father. We took the mean rating across these categories and subtracted mean use of social services such as food stamps, welfare, or disability or signs of poverty such as homelessness for each participant. Given that some studies have found relationships between delay discounting and SES (Reimers, Maylor, Stewart, & Chater, 2009), as well as the notion that several behaviors that could be considered choosing short-term over long-term gratification (e.g. cigarette smoking, obesity, drugs and alcohol) are higher among low-SES populations (Bickel, Moody, Quisenberry, Ramey, & Sheffer, 2014), we wanted to test whether SES was equivalent across the groups.

Analyses

Data analyses were completed in several steps. First, individual data for each participant across all study measures were plotted and checked for normality, outliers, and missing data. For the SSRT, 10 participants were excluded because of poor performance (i.e. pressing a button on every trial). One participant was excluded from the MDQ analyses due to an extremely inconsistent choice pattern.

Second, in order to ensure that any observed differences in impulsiveness between attempters and ideators were not due to clinical differences (e.g. diagnostic, medications, depression, etc…), we compared the two groups on such variables using one-way analyses of variance (ANOVAs) or chi-square tests. In order to ensure that demographic or SES differences
were matched among attempters, ideators and controls, we conducted similar one-way ANOVAs or chi-square tests on the 3 groups.

Third, in the primary study analyses testing group differences on impulsiveness, we conducted five 3 Group (Attempter, Ideator, Control) one-way ANOVA on the five main dependent measures from the four behavioral tasks of impulsiveness. We hypothesized that suicide attempters would show increased impulsive action compared with ideators and controls (e.g. lower d’ and increased SSRT) but that both attempter and ideators would show increased impulsive choice and reflection impulsiveness (i.e. increased delay discounting on the MDQ and poorer P[Correct] and Expected Value for Cost trials during the IST), compared with controls.

For the self-report measures of impulsiveness, the BIS-11, UPPS Premeditation, and UPPS Negative Urgency were selected a priori because of prior research suggesting that these measures, but not UPPS Perseverance, were associated with suicidal behaviors (Klonsky & May, 2010). In addition to impulsiveness, we tested differences between groups in hostility from the BPAQ and UPPS sensation seeking as these scales have been to be increased in those with a history of a suicide attempt (Bridge et al., 2012; Doihara et al., 2008; Dougherty et al., 2004) and suicidal ideation (Klonsky & May, 2010), respectively. Prior to examining group differences on the 5 self-report constructs, we tested whether the order in which participants received the scales influenced their self-rated impulsiveness, sensation seeking and hostility (see below for this analysis). That is, we hypothesized that there would be an order effect (e.g. suicide attempters who completed clinical scales first would rate themselves as more impulsive than with those that completed the impulsiveness scales first). If we observed an order effect, we did not proceed with examining group differences for two reasons: (i) if an order effect was present suggesting a potential priming effect, there was a possibility that even those who received the impulsiveness
scales first were influenced by the fact that they had provided details about their suicide attempt or suicidal ideation earlier in the study making the results potentially invalid and (ii) examining only those who received the impulsiveness scales first would have greatly reduced our power. For those scales that did not display order effects, we conducted 3 Group (Attempter, Ideator, Control) one-way ANOVAs. For behavioral task and self-report measures in which group differences were tested, we followed up significant results by conducting Tukey HSD follow-up tests to correct for multiple comparisons and contain family-wise error-rate at 0.05.

Fourth, prior to examining group differences on the 5 self-report constructs, we tested whether the order in which participants received the scales influenced their self-rated impulsiveness, sensation seeking and hostility. To check for order effects, we conducted a 2 Group (Attempter, Ideator) X 2 Order (Clinical Scales Completed First, Impulsiveness/Sensation Seeking/Hostility Scales Completed First) on each of the five measures. We only report main effects of Order and Group x Order interactions. For measures without evidence of order effects, we conducted a 3 Group (Attempter, Ideator, Control) one-way ANOVA.

Fifth, because prior studies have found variables that moderated the relationship between a dimension of impulsiveness and suicide attempts (planning: unplanned or planned attempt (Wojnar et al., 2009), lethality: high or low lethality attempt (Dombrovski et al., 2011; Swann et al., 2005), attempt history: single versus multiple prior attempts (Dougherty et al., 2004)), we conducted several exploratory analyses with the attempter groups dichotomized by these variables. Thus, we divided the attempter group into planned (n=9) and unplanned attempts (n=11; based on the Pathway Composite Score from Paper 2 of this dissertation), high (n=17) and low lethality attempts (n=13; lethality based on the Beck Lethality Scale (Beck, Beck, & Kovacs, 1975); median split dictated assignment to high and low lethality attempts) and
attempters with a single attempt ($n=16$) and multiple attempts ($n=14$). We then conducted exploratory 4 Group one-way ANOVAs. For example, for the analyses examining lethality of the attempt as a moderator in impulsiveness, the factor of Group was High Lethality versus Low Lethality versus Ideator versus Control.

To avoid potentially exaggerated p-values (Ioannidis et al., 2014; Simmons, Nelson, & Simonsohn, 2011), we limited the number of dependent variables, all analyses were selected a priori and all analyses were conducted after data collection was completed. All analyses conducted outside of these established procedures are labeled exploratory. All measures, conditions, data exclusions and tests conducted are reported. Sample sizes were determined because of both power and pragmatism. There have been few studies comparing attempters from ideators on the tasks of impulsiveness making power analysis difficult. We sought to include 30 participants in each group permitting the detection of medium to large effect sizes. Once data were collected for 30 participants in each group, data collection terminated.

**Results**

**Demographic, Clinical and SES Characteristics**

For the demographic data, groups were matched on sex, age and mostly on race, although the ideators group contained more mixed race individuals than the attempter or control groups (Table 3.1). The groups were significantly different on socio-economic status (SES), with attempters demonstrating significantly higher SES than ideators, who, in turn, had higher SES compared with control participants ($ps < .05$). However, there were no differences in the number of students in each group. For suicidal history, attempters and ideators had comparable number of individuals with past suicidal behaviors and age of onset of suicidal ideation. Attempters had
made on average 1.9 attempts including the recent attempt that caused them to be categorized into the attempters group.

For clinical data aside from suicidal history, we only tested for significant differences between the attempter and ideator groups only, given that the control group largely was from the community and therefore, mostly psychiatrically healthy. Attempters and ideators were comparable across almost all clinical variables we measured (Table 3.2), including suicidal ideation (BSS, pre- and post-study desire to die), depression (BDI), diagnoses and most medications. The exceptions to this were that a significantly larger number of ideators were taking serotonin-norepinephrine reuptake inhibitor (SNRI) medication and, compared with ideators, attempters had significantly longer duration of hospitalization and increased post-study mood rating (i.e. increased positive mood).

Overall, other than SES, the groups were well-matched on demographic factors and the ideators and attempters were similar in terms of clinical severity.

Table 3.2

**Clinical variables among the different groups**

<table>
<thead>
<tr>
<th>Medical Chart</th>
<th>Attempter</th>
<th>Ideator</th>
<th>Control</th>
<th>Test Statistic&lt;sup&gt;a,b&lt;/sup&gt;</th>
<th>ES&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis N(%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Depression</td>
<td>23 (76.7)</td>
<td>27 (87.1)</td>
<td>1 (2.9)</td>
<td>$\chi^2 = 1.12$</td>
<td>$&gt;0.01$</td>
</tr>
<tr>
<td>Bipolar Disorder</td>
<td>1 (3.3)</td>
<td>1 (3.2)</td>
<td>1 (2.9)</td>
<td>$\chi^2 = 2.07$</td>
<td>$&gt;0.01$</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>7 (23.3)</td>
<td>12 (38.7)</td>
<td>2 (5.9)</td>
<td>$\chi^2 = 1.68$</td>
<td>0.02</td>
</tr>
<tr>
<td>Substance Abuse</td>
<td>13 (43.3)</td>
<td>9 (29.0)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 1.35$</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Table 3.2 (Continued).

Borderline/ Cluster B

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>5 (16.7)</th>
<th>6 (19.4)</th>
<th>1 (2.9)</th>
<th>$\chi^2 = 0.07$</th>
<th>$&gt;0.01$</th>
</tr>
</thead>
</table>

**Medications N(%)**

<table>
<thead>
<tr>
<th>Medication</th>
<th>N(% )</th>
<th>N(% )</th>
<th>N(% )</th>
<th>$\chi^2$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulant</td>
<td>0 (0.0)</td>
<td>2 (6.5)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 2.00$</td>
<td>0.03</td>
</tr>
<tr>
<td>Benzodiazepine</td>
<td>7 (23.3)</td>
<td>12 (38.7)</td>
<td>1 (2.9)</td>
<td>$\chi^2 = 1.68$</td>
<td>0.03</td>
</tr>
<tr>
<td>Anticonvulsant</td>
<td>7 (23.3)</td>
<td>7 (22.6)</td>
<td>1 (2.9)</td>
<td>$\chi^2 = 0.01$</td>
<td>$&gt;0.01$</td>
</tr>
<tr>
<td>Mood Stabilizer</td>
<td>4 (13.3)</td>
<td>1 (3.2)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 2.07$</td>
<td>0.03</td>
</tr>
</tbody>
</table>

**Atypical**

<table>
<thead>
<tr>
<th>Antipsychotic</th>
<th>10 (33.3)</th>
<th>11 (35.5)</th>
<th>2 (5.9)</th>
<th>$\chi^2 = 0.03$</th>
<th>$&gt;0.01$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Antidepressant</td>
<td>8 (26.7)</td>
<td>15 (48.4)</td>
<td>2 (5.9)</td>
<td>$\chi^2 = 3.06$</td>
<td>0.05</td>
</tr>
<tr>
<td>Tricyclic</td>
<td>0 (0.0)</td>
<td>2 (6.5)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 2.00$</td>
<td>0.03</td>
</tr>
<tr>
<td>SNRI$^d$</td>
<td>1 (3.3)</td>
<td>8 (25.8)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 6.1*$</td>
<td>0.10</td>
</tr>
<tr>
<td>SSR$^d$I</td>
<td>16 (53.3)</td>
<td>13 (41.9)</td>
<td>2 (5.9)</td>
<td>$\chi^2 = 0.79$</td>
<td>0.01</td>
</tr>
<tr>
<td>Opioid Agonist</td>
<td>0 (0.0)</td>
<td>1 (3.2)</td>
<td>1 (2.9)</td>
<td>$\chi^2 = 0.98$</td>
<td>0.02</td>
</tr>
<tr>
<td>Beta Blocker</td>
<td>2 (6.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>$\chi^2 = 2.14$</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Pre- and Post-Study**

**Status M(SD)**

<table>
<thead>
<tr>
<th>Status</th>
<th>Pre- Mood</th>
<th>5.4 (1.6)</th>
<th>5.4 (1.7)</th>
<th>7.6 (2.1)</th>
<th>$t = 0.03$</th>
<th>0.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- Desire to Die</td>
<td>2.3 (1.9)</td>
<td>2.6 (1.9)</td>
<td>1.0 (0.0)</td>
<td>$t = -0.44$</td>
<td>-0.11</td>
<td></td>
</tr>
<tr>
<td>Pre- Hurt Self</td>
<td>2.5 (1.9)</td>
<td>2.3 (1.8)</td>
<td>1.0 (0.2)</td>
<td>$t = 0.23$</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Post- Mood</td>
<td>6.0 (1.7)</td>
<td>5.0 (2.0)</td>
<td>7.9 (1.8)</td>
<td>$t = 2.03*$</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Post- Desire to Die</td>
<td>2.1 (1.5)</td>
<td>2.4 (2.0)</td>
<td>1.0 (0.0)</td>
<td>$t = -0.71$</td>
<td>-0.18</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2 (Continued).

<table>
<thead>
<tr>
<th></th>
<th>Post- Hurt Self</th>
<th>Clinical Self Report and Hospitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.1 (1.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0 (1.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.0 (0.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( t = 0.16 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

**Clinical Self Report and Hospitalization \( M(SD) \)**

**Past Month**

**Problematic Drug/Alcohol Use**

| \( N(\%) \) | 14.0 (46.7) | 13.0 (41.9) | 7.0 (20.6) | \( \chi^2 = 0.14 \) | >0.01 |

**Beck Depression Inventory**

| \( N(\%) \) | 34.2 (13.8) | 32.8 (12.0) | 5.9 (8.7)  | \( t = 0.42 \) | 0.11 |

**Beck Suicide Scale for Ideation**

| \( N(\%) \) | 14.9 (11.9) | 11.5 (8.2)  | 0.2 (0.7)  | \( t = 1.32 \) | 0.33 |

**Beck Hopelessness Scale**

| \( N(\%) \) | 6.4 (6.4)   | 5.2 (5.2)   | 2.1 (2.1)  | \( t = -1.45 \) | -0.36 |

**Number of Psych Hospitalizations**

| \( N(\%) \) | 1.7 (1.0)   | 1.5 (0.9)   | 0.2 (0.9)  | \( t = 0.34 \) | 0.09 |

| \( N(\%) \) | 12.1 (11.1) | 7.5 (4.5)   | 0.6 (2.6)  | \( t = 1.49 \) | 0.38 |

\(^a\)Comparisons are between attempters and ideators only

\(^b\)Degrees of Freedom for \( \chi^2 = 1, N = 61 \) and for \( t \)-test = 59

\(^c\)Effect sizes are Cramer's \( V \) for \( \chi^2 \), and Cohen's \( d \) for \( t \)-tests

\(^d\)SNRI = Serotonin-norepinephrine reuptake inhibitors and SSRI = Selective serotonin reuptake inhibitors

*Denotes significant differences, \( p < .05 \)
Behavioral Tasks of Impulsiveness

The results of the ANOVAs for the behavioral tasks are presented in Table 3.3 and Figure 3.1A-D. We failed to detect differences between the three groups on any behavioral measure of impulsiveness. The only significant result was an effect of Condition for P[Correct] in the Information Sampling Task (IST; $F(1,91) = 270.57, p < .001$, Generalized $\eta^2 = 0.50$). Thus, all participants showed increased P[Correct] during the Free condition ($M = 0.91, SD = 0.12$), when they were not charged for opening boxes versus the Cost condition ($M = 0.71, SD = 0.09$), when they were charged points to open boxes. We would have been concerned if we did not find this effect. For the IST were no Group x Condition effects for P[Correct] [$F(3,91) = 1.84, p > .15$, Generalized $\eta^2 = 0.04$] or Expected Value [$F(3,91) = 1.18, p > .30$, Generalized $\eta^2 = 0.02$]. For each of effects of interest (i.e. Group effects), the null results were accompanied by small effect sizes. Overall, we find no relationship between attempting suicide or thinking about suicide and impulsive action or impulsive choice.

Given the significant difference in SES between the groups, driven by high-earning (>100,000) attempters, we removed these attempters from the dataset and re-ran the analyses. After removing the high-earning attempters from dataset, there were no significant differences between ideators (n = 31) and attempters (n = 23) on SES, however both suicidal groups still had significantly higher SES than controls (n = 34). After removing high-earning attempters, Group effects for the same analyses of the 4 behavioral tasks continued to be insignificant.
Figure 3.1. Behavioral tasks of impulsiveness by group. Overall, there were no significant differences among any of the groups across all behavioral tasks of impulsiveness. For the Monetary Delay Questionnaire, less negative values represent increased preference for immediate rewards (i.e. higher impulsiveness). Error bars are ± standard error.
Table 3.3

ANOVA results comparing attempters, ideators and controls on behavioral tasks of impulsiveness.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Task</th>
<th>Dependent Variable</th>
<th>Test Statistic</th>
<th>ESa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulsive Action</td>
<td>Continuous Performance</td>
<td>d'</td>
<td>F(2, 92) = 1.33</td>
<td>0.03</td>
</tr>
<tr>
<td>Impulsive Action</td>
<td>Stop-Signal Reaction</td>
<td>SSRT</td>
<td>F(2, 82) = 0.28</td>
<td>0.01</td>
</tr>
<tr>
<td>Impulsive Action</td>
<td>Monetary Delay</td>
<td>log(k)</td>
<td>F(2, 91) = 1.52</td>
<td>0.03</td>
</tr>
<tr>
<td>Reflection</td>
<td>Information Sampling</td>
<td>P[Correct]</td>
<td>F(3, 91) = 2.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>Task</td>
<td>Expected Value</td>
<td>F(3, 91) = 1.65</td>
<td>0.01</td>
</tr>
</tbody>
</table>

In keeping with recommended practice, effect sizes are Generalized $\eta^2$, which is identical to Partial $\eta^2$ for ANOVAs without repeated measures (Bakeman, 2005).

Test of Order Effects

The 2 Group (Attempter, Ideator) X 2 Order (Clinical Scales Completed First, Impulsiveness/Sensation Seeking/Hostility Scales Completed First) for the UPPS Premeditation scale revealed a significant Group x Order interaction [$F(1,57) = 5.74, p < .05, Partial \eta^2 = .09$] (Figure 3.2A). Follow-up Tukey tests revealed that when clinical questionnaires were completed first, attempters reported significantly increased impulsiveness on the UPPS Premeditation scale compared with ideators but there were no group differences when the impulsiveness scales were
presented first. For the BIS-11 the Group x Order interaction failed to reach significance (Figure 3.2B) but showed a similar pattern as the UPPS Premeditation scale \[F(1,57) = 2.69, p = .11, \text{Partial } \eta^2 = .05\]. The main effect of Order was insignificant for both the UPPS Premeditation scale \[F(1,57) = 0.22, p > .5, \text{Partial } \eta^2 = .004\] and the BIS-11 \[F(1,57) = 0.31, p > .5, \text{Partial } \eta^2 = .005\].

The ANOVA assessing the Hostility subscale of the BPAQ (Figure 3.2C) revealed a main effect of Order \[F(1,57) = 4.86, p < .05, \text{Partial } \eta^2 = .08\] but a non-significant Group x Order interaction \[F(1,57) = 2.29, p = .14, \text{Partial } \eta^2 = .04\]. Follow-up tests revealed that across attempters and ideators, those that completed impulsiveness scales first, showed increased hostility compared with those that completed the clinical scales first.

For UPPS Sensation Seeking, there were no effects of Order \[F(1,57) = 0.06, p > .50, \text{Partial } \eta^2 = .001\] or a Group x Order interaction \[F(1,57) = 1.65, p > .2, \text{Partial } \eta^2 = .03\]. It should be noted that the UPPS Sensation Seeking did show the same general pattern as the BIS-11 and UPPS Premeditation, although it was far from significant \((p = .20)\).

For UPPS Negative Urgency (Figure 3.2D), there were no significant effects for Order \[F(1,57) = 0.28, p > .5, \text{Partial } \eta^2 = .005\] or a Group x Order interaction \[F(1,57) = 0.34, p > .5, \text{Partial } \eta^2 = .006\]. Given no evidence of order effects for negative urgency we proceeded to testing differences between the groups.

**Self-reported Sensation Seeking and Negative Urgency**

For sensation seeking, the one-way Group (Attempter, Ideator, Control) ANOVA revealed a main effect for Group \[F(2,92) = 2.46, p = .09, \text{Partial } \eta^2 = 0.05\].
Figure 3.2. Self-report scales by group and order of administration. (A) The UPPS (lack of) Premeditation shows a significant difference between attempters and ideators when the clinical scales were administered prior to the impulsiveness scales but not when the impulsiveness scales were administered first ($p < .05$). (B) The Barratt Impulsiveness Scale shows the same pattern, although it is not significant ($p = .10$). (C) Buss-Perry Aggression Questionnaire shows a different pattern: there is a main effect ($p < .05$) of questionnaire order such that both groups
Figure 3.2 (Continued).

together report reduced aggression after filling out clinical questionnaires compared with filling out the impulsiveness and aggression questionnaires first. (D) Negative Urgency shows no order effects. Error bars are ± standard error.

The one-way *Group* (Attempter, Ideator, Control) ANOVA revealed a main effect for *Group* \( F(2,92) = 22.13, p < .001, \text{Partial } \eta^2 = 0.32 \). Post-hoc Tukey HSD tests revealed that urgency scores were significantly increased among both ideators and attempters, compared with controls but there was no difference between the two suicidal groups (see Figure 3.3).

**Exploratory Analyses**

To test whether several variables (planning: planned versus unplanned, lethality: high and low lethality attempts or attempt history: attempter with multiple versus a single prior attempt) moderated the relationship between attempting suicide and impulsiveness, we dichotomized attempters group by each of these variables.

*Behavioral tasks*

For behavior tasks, all 4 *Group* ANOVAs with dichotomized attempter groups (planned versus unplanned attempts, high and low lethality attempters, multiple and single suicide attempters) failed to reach significance \( Fs = 0.17-2.66, ps > .05, \text{Partial } \eta^2 = .007-.08 \).

*Negative Urgency and Sensation Seeking*
Figure 3.3. UPPS Negative Urgency by group. Attempters and ideators show increased Negative Urgency compared with controls ($p < .05$) but there were no differences between attempters and ideators after correcting for multiple post-hoc tests. Error bars are ± SE.

For negative urgency, the 4 Group ANOVAs with dichotomized attempter groups based on potential moderators had similar results to the main analysis. Post-hoc Tukey HSD tests revealed increased negative urgency among all attempters and ideators, compared with control participants [$F$s =14.8-15.91, $ps < .05$, Partial $\eta^2 = .32-.34$] but no differences between the two attempter groups and ideators with one exception: attempters who were considered “planned attempters” (defined by the Pathway Composite Score (see Paper 2)) had significantly increased negative urgency compared with suicide ideators and controls (Tukey HSD; $ps < .05$).
For sensation seeking, none of the Group ANOVAs reached significance [$Fs = 1.66-1.78$, $ps > .15$ $\eta^2 = .05-.06$].

**Discussion**

There were three main findings in this study. First, suicide attempters, ideators, and nonsuicidal participants did not differ significantly on any of the six different dimensions of impulsiveness tested in this study, with one exception. The negative urgency subscale of the UPPS self-report measure differed between nonsuicidal and suicidal groups, with no difference between attempters and ideators. In addition, an exploratory analysis tentatively suggests that planned attempters display increased negative urgency compared with ideators. Second, we conducted exploratory analyses where we divided attempters by variables that have moderated effects of impulsiveness in prior studies, such as high versus low lethality attempters (Dombrovski et al., 2011), planned versus unplanned attempts (Wojnar et al., 2009), and multiple versus single-attempters (Dougherty et al., 2004) and continued to find no group differences. Third, there was evidence that the order in which self-report questionnaires are completed can alter responses. Specifically, we found that, when clinical questionnaires were completed prior to scales of impulsiveness, attempters showed increased lack of premeditation on the UPPS compared with ideators. However, when the impulsiveness questionnaires were completed first, there was no difference between the groups. For the hostility subscale of the BPAQ, completing the clinical measures first was associated with reduced hostility across both ideators and attempters compared to completing impulsiveness measures first. Each of these findings is discussed in more detail below.
Prior research on the role of impulsiveness in the occurrence of suicidal ideation and attempts has yielded mixed findings. This study provided a more thorough assessment of multiple facets of impulsiveness than prior studies, as well as a more careful assessment of different parts of the pathway to suicide. The consistent lack of differences among suicide attempters, suicide ideators, and non-suicidal participants was surprising given prior mixed findings (Dougherty et al., 2004; Horesh, 2001; Swann et al., 2005; Wojnar et al., 2009). Comparing the means of the behavioral tasks from the current study with means from the same tasks in prior studies with healthy participants suggests that the lack of group differences observed in this study is due to a lack of impulsiveness in suicide attempters and ideators, rather than to underperformance by the non-suicidal participants. For example, in a study with healthy participants examining aspects of attention using the identical CPT-Go/NoGo task in the current study, the false alarm rate (i.e. commission errors) was 26% (Esterman et al., 2013). In the current study all three groups had between a 24.9-25.7% false error rates. Similarly, a study looking at variation in the SSRT task across several experiments found SSRTs between 233 and 259 ms (Verbruggen & Logan, 2009). For the current study, group mean SSRTs ranged from 219-235 ms.

We found that negative urgency was increased among ideators and attempters, compared with controls, but there was no statistical difference between the suicidal groups. This is consistent with previous research that also found increased negative urgency among suicidal individuals but no difference between ideators and attempters (Klonsky & May, 2010). However, when we dichotomized attempters by whether their recent attempt was planned or unplanned, we found that attempters with a plan – those that took longer and made more preparations – but not unplanned attempters, showed increased negative urgency compared with ideators. However,
these results are tentative both because of the number of exploratory tests we conducted and the small sample size, given that one of the attempter groups had only 11 participants.

It is notable that this is one of only a handful of studies to compare suicidal ideators and attempters on behavioral tasks of impulsiveness. We found no significant differences in impulsive choice, impulsive action or reflection impulsiveness between the groups. These two suicidal samples were roughly equivalent on several clinical characteristics, including medical chart diagnosis, medications, and depression (i.e. BDI) and suicidal ideation (i.e. SSI). In clinical science, randomizing people to a psychopathology group is not feasible and statistically controlling for covariates that differ between non-randomized groups is almost always problematic (Miller & Chapman, 2001). Therefore, having well-matched groups provides confidence that group differences in impulsiveness would have been due to attempter status and not due to clinical severity, or other confounding group difference. However, if the general population of suicide attempters is more likely to have an impulsive-control diagnosis, for example, than having matched groups provides a biased sample potentially eliminating an effect that might exist at the population level.

We did not accomplish full matching on SES indicators with increased SES among attempters and ideators compared with controls. This difference may have resulted in the lack of detection of group differences, given that SES has been found to be related to less impulsive choice (Stanger et al., 2012). However, removing high-earning attempters did not change the results.

One potential explanation for why the study results showed non-significant findings and small effect sizes were that none of the measures used included negative affective material that is likely present when suicidal ideation and suicidal decision-making is taking place. The two tasks
of impulsive action did not contain valenced material. Thus, if impulsive action is involved in the transition from ideation to attempt, perhaps this impulsive tendency only emerges when strong, negative affect is present. A task that included negative affective material may have subtly tapped this underlying process and provoked behavioral differences that were absent for the current tasks. The impulsive choice tasks both included reward in the form of monetary compensation. However, suicidal decision-making processes likely consist of attempting to remove an aversive feeling, rather than approaching reward. At this point, there are debates about the degree to which approach-reward behavior and escape-pain behavior rely on similar underlying neural and psychological processes (Navratilova et al., 2012) and therefore perhaps utilizing a task that assesses escape would reveal that suicidal individuals show impulsive choice when the options involve escaping negative circumstances rather than approach reward.

Regardless, given that the only measure of impulsiveness to reveal differences was negative urgency, it suggests that task that tap into decision-making under aversive states may reveal dysfunctional processes in suicidal samples.

One novel and potentially important finding for understanding the inconsistent results observed in prior studies is that multiple self-report scales seemed to be influenced by the order in which they were completed. To our knowledge, this is the first study to examine this effect. It has been suggested that people may be biased toward reporting increased impulsiveness in the presence of suicidal behavior (Conner, 2004). Consistent with this notion, we found that having suicide attempters fill out scales of depression and suicidal ideation prior to impulsiveness scales was associated with increased levels of self-reported impulsiveness on the UPPS Premeditation scale with a similar marginal trend showing the same pattern on the BIS-11. One interpretation of these results is that orienting attempters’ attention toward their recent suicide attempt primes
them to inflate their self-reported impulsiveness. On the other hand, suicide ideators, the majority of whom had carried out a recent aborted attempt in which they stopped themselves from attempting suicide, reported lower levels of impulsiveness after filling out clinical measures first. This may be the same process in reverse: providing a cue for ideators to think about the fact that they had an urge to attempt suicide but had the self-restraint to stop themselves may have primed them to understate their level of impulsiveness. For a measure of BPAQ hostility, both attempters and ideators reported lower levels of hostility when they completed the questionnaire following the clinical measures and this effect was higher in attempters than in ideators, although follow-up comparisons examining order effects within each group were non-significant. There are at least two possible interpretations of these results that are not necessarily mutually exclusive. First, having participants fill out questionnaires about their depression and suicidality may lead them to understate their hostility. Second, all participants filled out at least one scale of impulsiveness prior to completing the BPAQ and therefore, filling out an impulsiveness measure cues people to attend to their hostility leading to inflated BPAQ scores. Finally, we found that negative urgency and sensation seeking were uninfluenced order effects, however, sensation seeking showed a similar pattern to the UPPS and BIS-11. Regardless, without the influence of order effects, we proceeded with group analyses of these UPPS negative urgency and sensation seeking, the results of which are discussed above.

Randomizing the order of self-report measures at the end of a multiple hour study focused on suicide and impulsiveness provided a relatively weak manipulation compared with a study where participants filled out impulsiveness questionnaires without any mention of suicidal behaviors. Instead, in the current study, participants were informed the study was about suicide during recruitment and informed consent and answered several in-depth, specific questions about
suicidal thoughts and behaviors prior to completing the self-report measures. Therefore, the study had already oriented them to attend to their suicidal thoughts and behaviors and potentially provided priming. On the other hand, all participants completed behavioral measures just prior to the self-report questionnaires, which provided a break from the discussion of suicide-related topics. Regardless, the 4 groups (i.e. ideation, attempter x two orders) have small sample sizes and therefore this effect needs to be replicated with a stronger manipulation in a much larger sample. If confirmed, particularly in the BIS-11, this effect would undermine years of research that has used self-reported measures of impulsiveness in suicidal samples. It would also undermine recent studies using the UPPS. For example, a recent study found significant differences between ideators and attempters in UPPS Premeditation (Klonsky & May, 2010). However, depending whether when in the sequence of measures questions about suicide and the items from the UPPS were completed, this finding might be a false positive.

For the statistical analyses, we tried to balance Type I and Type II error. We conducted 12 ANOVAs across the several measures without correcting for these multiple comparisons to maintain power and because each assessed separate constructs. At the same time, conducting several tests increases the chance of false positives. Therefore, we moved several constructs/measures without strong a priori hypotheses to the exploratory section, in order to preserve an element of statistical restraint. Findings from the exploratory section should be considered tenuous, given the number of tests conducted.

There are several important limitations to the current study. First, this sample was collected at a psychiatric hospital whose patient population may not be representative of suicidal ideators and attempters generally. In addition, the sample was largely white and fairly young (mean age = 26.73) and therefore impulsiveness may be relevant in different suicidal
populations. Second, as mentioned, there were significant differences in SES between the groups and the suicidal population may have been particularly high functioning psychiatric sample. However, we removed several high earning attempters and it did not change the results. Third, the sample size was only powerful enough to detect medium-to-large effect sizes. Fourth, null findings can be due to several factors including experimenter error. However, analyses of behavioral data were written in computer code and thus, every step - from the raw data through the final plots and ANOVA results - is catalogued and findings can be easily reproduced. Furthermore, we have followed rigorous research practices, plotting and thoroughly checking data and excluding participants prior to group analyses, selecting all dependent measures and tests \textit{a priori}, and reporting all tests we conducted. These fairly conservative practices may increase the probability of failing to detect a difference when one truly exists (i.e. Type II error). Despite these limitations, the results suggest that impulsive choice, impulsive action and negative urgency are not associated with suicide attempts among ideators. The results further suggest that prior reports of increased self-reported impulsiveness among suicide attempters may be false because of biases induced by the experimental procedure.
General Discussion

Summary of main findings

There were several key findings from the three papers of this dissertation. In Paper 1 I found that single-item questions can cause misclassification and, under particular circumstances, can increase the probability of both Type I and Type II statistical errors. In addition, I found that people that endorse single-item suicidal behaviors have actually engaged in a variety of thoughts and behaviors that are neglected by the single-item approach. In Paper 2, in terms of “suicide planning” prior to a suicide attempt, I found that many people have long term (i.e. 1-5 years) ideation or tentative planning behaviors (e.g. thinking of a method) prior a suicide attempt. However, almost all proximal planning occurs within two weeks prior to an attempt with the majority occurring within 12 hours. The modal response for several planning behaviors was within a minute of attempting suggesting that it is not uncommon for parts of a suicide plan to come together at the last minute. I also found that a composite measuring combining several planning aspects fell on a bimodal distribution suggesting a “natural” break between “unplanned” and “planned” attempts. In Paper 3 among the five different dimensions of impulsiveness, I found only one dimension – negative urgency – associated with suicidal behaviors. Negative urgency was associated with suicidal ideation but not with attempts among ideators. Exploratory analyses revealed that negative urgency was highest in attempters who carried out “planned” attempts, which ran counter to my hypothesis in which increased impulsiveness would be associated with decreased suicide attempt planning. Finally, I found that having attempters complete scales regarding suicide first led to subsequent increased self-reported impulsiveness compared with ideators and this effect was not present when both groups completed impulsiveness questionnaires first followed by questions about suicide. This suggests
that drawing attempters attention to suicide – which likely occurs in most studies on suicide – can potentially increase the degree to which they perceive themselves as impulsive.

**Scientific Implications**

Each paper introduces important methodological issues. First, some of the methodological concerns have implications for research, in general, beyond studies examining suicidal behavior. The statistical simulation from Paper 1 suggests that measurement techniques that produce misclassification – even misclassification at 10% false positives and 10% false negatives – can interfere with discovering associations by producing erroneous statistical results. In addition, research that uses different methodologies to assess a single construct, as is the case with suicide planning, is unlikely to advance understanding. This diversity of approaches prevents direct replication of prior findings. In addition, although one approach can produce a significant finding, a second approach can fail to find the same result (Baca–Garcia et al., 2005). This could tempt researchers to only report measurement approaches that result in significant findings, which increases the likelihood of false positives (Simmons et al., 2011). Furthermore, the effect of questionnaire order in Paper 3 suggests that the order in which participants receive questionnaires could represent a large threat to the validity of self-report. Clinical researchers need to pay close attention to how questions regarding depression or suicide or other clinical topics can bias responses on self-report measures that appear unrelated. Certain topics could also cause bias in behavioral tasks as well, although this dissertation did not test that possibility.

Overall, these methodological concerns illustrate that there are several avenues through which the scientific process can be threatened (i.e. inaccurate assessment, a lack of operationalization, introducing bias), impeding understanding of the phenomenon under examination. These challenges to validity are particularly pernicious because they are hidden to
the researcher. For example, flawed methods can produce seemingly reliable and “valid” results (i.e. they might show reliable correlations and demonstrate construct validity (Cronbach & Meehl, 1955)) and still be specious. Therefore, continual testing and refining methods is a crucial part of the scientific process to advance understanding.

Second, these methodological concerns also hinder discoveries that could improve the understanding and prevention of suicide specifically. For the reasons stated above regarding erroneous statistical results, the continued reliance on single-item assessment may hinder progress understanding suicidal behaviors. Similarly, the field needs to arrive at a valid, consensus approach to study suicide planning in order to make progress understanding the construct. Generally, a full delineation and operationalization of steps along the pathway to suicide – from passive ideation through a suicide attempt – will provide the field with a more precise approach that increases validity and reliability and allows for replication across studies as researchers discover important factors associated with different steps along the pathway. Overall, methodological improvements could advance the understanding of suicide and improve prevention efforts.

The majority of suicide research utilizes self-report and I know of no prior study that has examined whether questions about suicide influence self-perception or reporting on psychological constructs measured with self-report. It could be the case that activating these biases in suicide research could be an advantage in discovering important variables or predicting future risk but it is important to know whether these biases exist and which measures they influence in order to best understand their implications. In the case of impulsiveness, the case is often made that attempters exhibit more impulsive behaviors in general compared with ideators and this predisposition makes them more inclined to act on their suicidal thoughts (Mann et al.,
1999). However, this argument is undermined when attempters and ideators show the same levels of impulsiveness when the topic of suicide is absent (in the case of the study in Paper 3, suicide was not discussed for about an hour prior to the self-report measures).

In addition to criticisms, the dissertation contains potential approaches for improved measurement. In Paper 1, providing multiple response options for people to place suicidal behaviors and embedding definitions for these behaviors in the questions reduced both false positives and false negatives. Furthermore, multiple response options provide data collection on behaviors, such as aborted and interrupted attempts, that are rarely measured currently. In Paper 2, I developed a new approach to measuring suicide “planning” that provides descriptive data that can be used to collect flexible and informative data about this construct. For example, although I binned the data to make it more manageable and established a composite measure based on reasonable assumptions, the underlying data contain just basic time values (e.g. the decision to attempt occurred 10 minutes prior to the attempt) that can be reanalyzed in a variety of different approaches. Furthermore, I hope this straightforward and flexible approach provides researchers with a tool that is commonly used and allows for replication and comparison among studies.

**Clinical Implications**

These findings also have implications for the clinical assessment, classification of risk, and treatment of suicidal patients. First, asking about a “suicide plan” is a recommended practice for assessment in clinical practice (Fowler, 2012). Paper 1 suggests that this provides much less information than clinicians may think because patients’ can have different interpretations of this term. Paper 2 provides several more fine-grained behaviors that clinicians could utilize to query different aspects of a plan making this part of the assessment process more consistent across
patients. In addition, Paper 1 provides several more subtle suicidal behaviors to query and language to help both clinicians and patients differentiate these unique behaviors.

Second, these additional questions and constructs can provide clinicians with an improved picture of a person’s position on the pathway to suicide and their potential risk. Although it is currently unknown the degree to which aborted and interrupted attempts increase the risk of a future attempts, as these items are included in future studies this information will become available and should be incorporated into clinical practice. Even without this understanding of future risk, more information about patients’ suicide history combined with clinical expertise and decision-making could result in an improve risk assessment process.

Third, better understanding the subtle steps people take as they transition from thinking about suicide to suicidal actions can help provide more precise targets for treatment. Currently, treatments such as Dialectical Behavior Therapy and Cognitive Therapy effectively reduce suicide attempts but do not appear to reduce ideation (Brown et al., 2005; Linehan et al., 2006). This suggests that these therapies target the final step in the pathway to suicide but their effect on other steps is unknown. Understanding which treatments target which parts of the pathway can better help clinicians and researchers identify potential mechanisms and better combine treatment components to maximize treatment.

In addition, characterizing the ways in which people move through the pathway to suicide – for example, “unplanned” and “planned” attempters – may help guide treatment as well. Different characterizations of the pathway may reveal different underlying mechanisms that may have unique treatment targets. For example, if future research reliably shows associations between depression and planned, but not unplanned, attempts, then perhaps treatment targeted at ameliorating depression could reduce risk of a future attempt but only for the planned attempters.
Characterizations of the pathway may also moderate the relationship between suicide prevention and successful strategies to mitigate risk. For instance, means restriction might improve the prevention of a future attempt for someone with a history of unplanned suicide attempts but not for someone with more planned attempts (Conner, 2004).

**Limitations and future directions**

The main limitation of this dissertation is that several instruments, particularly the online survey and the PSAI were novel and therefore previously untested. There may be errors or the precise wording of the questions may not have been as clear as intended. We spent numerous hours and involved several people to maximize the clarity and precision of the questions but future studies may discover flaws in these instruments. An additional limitation was that the study samples were not representative limiting the generalizability of these findings.

There are several avenues of future research that can build off of the studies in this dissertation. First, the inclusion of more subtle suicidal behaviors, such interrupted and aborted attempts in large-scale self-report surveys, such as studies including the CIDI or YRBS, would provide prevalence rates for these behaviors as well as the possibility of exploring factors that predict aborted attempts among ideators versus those associated actual attempts among ideators. This could include resiliency factors that prevent people from fully carrying through with a suicide action or factors that are associated with people transitioning from thinking about suicide to starting to act on their suicidal thoughts, leading to a further understanding of steps along the pathway to suicide. Furthermore, given that one of the strongest predictors of a suicide attempt is a prior attempt (Borges, Angst, Nock, Ruscio, & Kessler, 2008), the inclusion of these subtle suicidal behaviors in longitudinal studies is crucial for understanding the extent to which these behaviors increase risk of future suicide actions. There are similar reasons to continue to
investigate planning steps prior to a suicide attempt. First, increased assessment of different planning steps can contribute to an understanding of the population-level distribution of these steps and help discover factors associated with how people move from thinking to acting. Second, longitudinal studies can assess the degree to which certain planning steps may greatly increase the risk of an attempt. For example, perhaps settling on a method and place to attempt suicide—even if a person denies that they will act on it—is a large risk factor for a future attempt.

Although the results from Paper 3 suggest that attempters are not more impulsive than ideators, there are several ways in which, under some circumstances, impulsive tendencies could be activated and influence some ideators to move forward and attempt suicide. Paper 2 shows that the modal decision point to attempt suicide was within a minute of attempting. This suggests an impulsive decision-making process but one that has yet to be fully understood by research. Therefore, rather than concluding that attempters are not more impulsive than ideators, researchers should continue to probe different well-operationalized dimensions of impulsiveness under different circumstances. For example, rather than testing impulsive choice with immediate or delayed rewards, future research could probe attempters’ decision-making under an aversive context when the outcome is the removal of the negative stimulus. This is a closer approximation of suicidal processes, in which the decision is often to remove pain rather than achieve some reward.

All three papers of this dissertation argue for the collection of more fine-grained data on suicidal thoughts and behaviors and related constructs. With this increased rigor comes a significant drawback: an increased amount of time required to gather data. Researchers may have to reduce the number of other measures in a study because of the additional time it takes to
thoroughly assess suicidal outcomes. In one sense, the fewer measures, the less potential to produce knowledge. On the other hand, faster but flawed methodology has a higher potential of producing false findings. Although there are no data that can specifically address a philosophy of science (Borsboom, 2005), I contend that using rigorous, slower methods – assuming the faster approach is truly flawed and the slower approach is truly more accurate - will generate more knowledge over time. The value of these projects is based on the extent to which these criticisms and suggested changes eventually help to reduce error and generate true findings that eventually lead to the understanding of why people try to kill themselves and how we can better stop it from happening.
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Appendix A.
Questions from online survey

The online survey for Paper 1 contains several electronic functions, such as automatic skip logic and “piped” text (i.e. when a response from one item is place in the question of another item or when certain words are displayed depending on prior responses), which are difficult to show on paper. I did not create a Microsoft Word version of the entire survey. I made a “guidebook,” which is in Microsoft Excel format and is available for download (available [here](#) and full web address pasted below). In addition, in Appendix A, I included several of the main sections and examples of questions, although it is not exhaustive.

The Excel file guidebook contains two worksheets, called “AllItems_ColorCoded” and “AllItems_Original.” AllItems_ColorCoded is the guidebook. Column A contains the column number for each item in the raw data output from Qualtrics, the survey software. Column B contains 0 for empty or unimportant data fields, which are usually colored pink. Column C contains a variable name for each item that was used in analysis. Column D contains the question for each item. Fields for piped text in a question appear between braces (a.k.a. curly brackets). Column E contains the first response option or refers to “text” if the item was a free response item. Columns to the right of column E are the remaining response options for each item. The different sections are color coded for readability. Cells colored white near the end were rows with the results of analyses, such as coding, and were not items in the survey.

The AllItems_Original contains only the questions and response options. Occasionally response options appear below the question, such as is the case with race. Blank rows are variables from the raw output that are of no interest. The Excel spreadsheet is available at the following web address:
Table A1. Instructions and gate questions

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>These questions apply to your entire life, including</td>
</tr>
<tr>
<td>a long time ago or when you were a child.</td>
</tr>
<tr>
<td>Have you ever seriously thought about killing yourself?</td>
</tr>
<tr>
<td>Have you ever made a plan to kill yourself?</td>
</tr>
<tr>
<td>Have you ever attempted to kill yourself?</td>
</tr>
</tbody>
</table>

*aPossible responses were (1) Yes (2) No*
Table A2. Instructions and follow-up questions for ideation

The next series of items will be similar to the previous questions. Please answer as accurately as possible, regardless of your responses to previous questions.\(^a\)

These questions apply to your entire life, even when you were a child or a long time ago.

Please read each question carefully.

Have you ever thought of any of the following for longer than a few minutes (more than passing thoughts):

<table>
<thead>
<tr>
<th>Question</th>
<th>Possible responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>What happens to people when they die?</td>
<td>(1) Yes (2) No (3) Prefer not to respond</td>
</tr>
<tr>
<td>What will it be like when I die?</td>
<td></td>
</tr>
<tr>
<td>I wish I could disappear or not exist</td>
<td></td>
</tr>
<tr>
<td>I wish I was never born</td>
<td></td>
</tr>
<tr>
<td>My life is not worth living</td>
<td></td>
</tr>
<tr>
<td>I wish I was dead (for example go to sleep and not wake up again)</td>
<td></td>
</tr>
<tr>
<td>Maybe I should kill myself</td>
<td></td>
</tr>
<tr>
<td>I should kill myself</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\)Possible responses were (1) Yes (2) No (3) Prefer not to respond
Table A3. Instructions and follow-up questions for actions

Please answer as accurately as possible, regardless of your responses to previous questions.¹

These questions apply to your entire life, including a long time ago or when you were a child.

Select one button for each time something happened. If you think one incident falls into multiple categories pick the one that best describes what happened.

Please read each question carefully.

Have you ever:

Done something to hurt yourself on purpose without intending to die? (e.g., cutting yourself, hitting yourself, or burning yourself)

Done something to make it look like you were trying to kill yourself, when you did NOT intend to die? (e.g. let people know that you were in distress, get revenge or a reaction)

Started to take steps to kill yourself and, at the last minute, you stopped because you decided not to kill yourself? (e.g., (1) you went to a bridge but did not jump off, (2) took out pills but did not take them, (3) took out a gun but did not pull the trigger)

Started to take steps to kill yourself and, at the last minute, someone or something else stopped you? (e.g., (1) you went to a bridge but someone stopped you before you jumped off, (2) took out pills but someone stopped you before you took them, (3) took out a gun but someone stopped you before you pulled the trigger)

Tried to kill yourself; meaning you engaged in a potentially deadly behavior to end your life with some intention of dying? (e.g., (1) you went to a bridge and jumped off, (2) took out pills and you took them, (3) took out a gun and pulled the trigger)

¹Possible responses were (1) Yes (2) No (3) Prefer not to respond
Table A4. Questions for planning prior to a suicide action

When asked how you tried to kill yourself, you said: {Previously Entered Method}

How long was it from the first time you thought of this method to when you actually tried to kill yourself? (It could be any amount of time; such as 5 years, 3 months, 4 weeks, 2 days, 3 hours, 4 minutes or 30 seconds)\(^a\)

When asked where you tried to kill yourself, you said: {Previously Entered Place}

How long was it from the first time you thought of this as a place where you could kill yourself to when you actually tried to kill yourself? (It could be any amount of time; such as 5 years, 3 months, 4 weeks, 2 days, 3 hours, 4 minutes or 30 seconds)\(^a\)

”Mulling over” is when you are very strongly considering killing yourself or, perhaps, going back and forth in your mind about whether you should actually do it or not. When you are mulling, you are close to trying to kill yourself but have not yet decided that you will try.

How long did you mull over the decision to try to kill yourself? (It could be any amount of time; such as 2 days, 3 hours, 4 minutes or 30 seconds)\(^a\)

If you never mulled over your decision, enter a 0

How long was it from the time you decided you were going to try to kill yourself to when you actually tried to kill yourself? (It could be any amount of time; such as 2 days, 3 hours, 4 minutes or 30 seconds)\(^a\)

Think back to the most recent time you tried to kill yourself.

Beforehand, did you do anything to prepare for the suicide attempt?\(^b\)

Did you: try to get away from other people, check your insurance, clean up your house or apartment, give things away, make a will, say goodbye to people, or write a suicide note, or do anything like that to prepare for the attempt or because you thought you might be dead soon?

Please list all actions below:

You said, the most recent time you tried to kill yourself, you used: {Previously Entered Method}

Perhaps, at first you had only a rough idea that you would use this method but then, at some point, you were SURE you would use this method if you tried to kill yourself.

How long was it from the point you were SURE you would try to kill yourself using this method to when you attempted to kill yourself? (It could be any amount of time; such as 5 years, 3 months, 4 weeks, 2 days, 3 hours, 4 minutes or 30 seconds)\(^a\)

We apologize if you included this in your answer regarding preparation

Did you have to do something to obtain this method (e.g., go out of your way to get pills or a weapon)?\(^c\)
When you were obtaining this method, were you intending to use it to kill yourself or was it obtained for some other reason?

The most recent time you tried to kill yourself, you were: {Previously Entered Place}

Perhaps, at first you had only a rough idea that you would be in this place but then, at some point, you were SURE you would try to kill yourself in this place.

How long was it from the point you were SURE you would try to kill yourself in this place to when you attempted to kill yourself? (It could be any amount of time; such as 5 years, 3 months, 4 weeks, 2 days, 3 hours, 4 minutes or 30 seconds)

We apologize if you included this in your answer regarding preparation.

Did you have to travel to this place?

Did you travel with the goal of going somewhere to kill yourself?

Responses consisted of a text box to enter a number and a drop-down list containing the time units listed in the question.

Participants could respond in a free response text box.

Possible responses were (1) Yes (2) No (3) Other (please explain)

Possible responses were (1) Obtained to kill myself (2) Some other reason (3) Both. It was obtained for another reason, but I was also thinking I could use it to kill myself (4) Other (please explain)

Possible responses were (1) Yes, I traveled to go to a place to kill myself (2) No, I was traveling for some other reason (3) Both. I was traveling for another reason but thought I might also try to kill myself (4) Other (please explain)
Table A5. Follow-up questions to elicit narrative responses regarding the most recent suicidal incident$^a$

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Think back to the most recent time you tried to kill yourself.</td>
<td></td>
</tr>
<tr>
<td>What exactly happened? Please give as many specific details as possible about the period leading up to your decision to do this and what you did. For example, if you took pills, what kind of pills did you take and how many?</td>
<td></td>
</tr>
<tr>
<td>Think back to the most recent time you tried to kill yourself.</td>
<td></td>
</tr>
<tr>
<td>Did you sustain any injuries or have any physical problems as a result? (e.g., internal injuries, such as stomach or other organ problems, a bruise, a headache, or a loss of consciousness)</td>
<td></td>
</tr>
<tr>
<td>Think back to the most recent time you tried to kill yourself.</td>
<td></td>
</tr>
<tr>
<td>Why did you try to kill yourself?</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ All responses were free response text boxes
Appendix B.
Pathway to Suicidal Action Interview (PSAI)

See Paper 2 methods section for a description of the PSAI. The PSAI is presented below although only the attempt follow-up interview is displayed (i.e. the follow-up interview for aborted/interrupted attempts and planning/ideation are omitted as responses from these interviews were not used in this dissertation). The PSAI is displayed without page numbers for formatting reasons.

A pdf version of the PSAI is available for download at:
http://www.people.fas.harvard.edu/~amillner/Millner_Dissertation_Appendix_PSAI.pdf
Introduction

In this interview, I’m going to ask you questions about suicidal thoughts and actions. If you find yourself feeling uncomfortable or it is difficult to answer some of the questions, we can skip any questions or stop the study.

These questions apply to your entire life, including a long time ago or when you were a child.

<table>
<thead>
<tr>
<th>Section: Single item questions</th>
<th>1.1 Have you ever seriously thought about killing yourself?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Have you ever made a plan to kill yourself?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>(If yes) Can you briefly describe a plan you’ve had?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Have you ever attempted to kill yourself?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Now I’m going to back up and ask you about some less severe thoughts. Have you ever thought of any of the following for longer than a few minutes - they’ve been more than passing thoughts?

| 2.1 Have you ever thought, “I wish I could disappear or not exist?” | Yes | No |
| 2.2 Have you thought, “I wish I was never born?” | Yes | No |
| 2.3 Have you ever thought, “My life is not worth living?” | Yes | No |
| 2.4 Have you ever thought, “I wish I was dead (for example go to sleep and not wake up again)” | Yes | No |
| 2.5 Have you ever thought, “Maybe I should kill myself?” | Yes | No |
| 2.6 Have you ever thought, “I should kill myself?” | Yes | No |

If more than 1 item is YES, go to #2.7
If only #2.5 or #2.6 is YES, SKIP to #2.9

| 2.7 Among the thoughts that you just endorsed, which one do you think you had first? | |
| Which thought | |

| 2.8 When was the first time, in your life, when you had this thought? | |
| First: Age or Season Year | |

If most severe thought is “Maybe I should kill myself” then say that here in place of “I should kill myself”

| 2.9 When was the first time you thought “I should kill myself”? When was the most recent time? | |
| First: Age or Season Year | |
| Most recent: Age or Season Year | |

| 2.10 Which best describes the number provided in your previous answer (for most severe): | |
| 1 Completely accurate; it is the exact age | 2 Fairly accurate; may be off by 1 to 2 years |
| 3 Somewhat accurate; may be off by 3 to 5 years | 4 Unsure of accuracy; guessed completely |

2.11 Use Timeline Chart to assess duration and intensity of suicidal thoughts from onset
### Section: Actions

Now I’m going to ask about different actions:

3.1 Have you ever done something to hurt yourself on purpose without intending to die?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image] Yes</td>
<td>![Image] No</td>
</tr>
</tbody>
</table>

   (If yes)  
   How many times have you hurt yourself without wanting to die ____________
   
   (If s doesn’t know – ask, less than 5, 5-10, 11-25, 25-50, 50-100, 100+)

   | ![Image] When was the first time this happened? (Age or Season/Year) ____________ |
   | ![Image] When was the most recent time this happened? ____________ |

   (If more than 1)  
   Can you tell me a little about the time(s) you did/have done this? (what method(s)?)

3.2 Have you ever done something to make it look like you were trying to kill yourself, when you did not intend to die?  

   | ![Image] Yes | ![Image] No |
   | ![Image] If necessary: let people know that you were in distress, get revenge or a reaction |

   (If yes)  
   How many times has this happened? ____________
   
   (If s doesn’t know – ask, less than 5, 5-10, 11-25, 25-50, 50-100, 100+)

   | ![Image] How old were you the first time this happened? ____________ |
   | ![Image] How old were you the most recent time this happened? ____________ |

   (If less than 5)  
   Can you tell me a little about the most recent time you did this?  
   (confirm gesture) (Follow-up: And no part of you intended to die from (action)?)

Refer to Intro Actions Diagram: This diagram shows examples of things people might do on the way to attempting suicide.  
Maybe the first thing someone that’s thinking about taking pills does is… go to the medicine cabinet (point), then they get closer, they take out the pills out of the bottle, and put them in their hand (point), then this (point to “Take pills”) is the potentially harmful or potentially lethal action. I’m going to ask about actions prior to this (use your finger to draw a line between the “Make Attempt” box and the “Get close” box). So things along the way to attempting suicide but not the potentially harmful or lethal action itself. OK?

Note: If it becomes clear that the person has been chronically suicidal and there are too many suicidal events to keep track of, do not ask the “Can you tell me about…” question except for the most severe behavior

3.3 Have you ever started to take steps to kill yourself and at the last minute you stopped (before you got here (“Make Attempt”)) because you decided not to kill yourself?  

   | ![Image] Yes | ![Image] No |
   | ![Image] because you decided not to kill yourself |

   (If yes)  
   How many times has this happened? ____________
   
   (If s doesn’t know – ask, less than 5, 5-10, 11-25, 25-50, 50-100, 100+)

   | ![Image] How old were you the first time this happened? ____________ |
   | ![Image] How old were you the most recent time this happened? ____________ |

   (If more than 1)  
   Can you tell me a little about the most recent time you did this? (confirm aborted)
3.4 Have you ever started to take steps to kill yourself and at the last minute someone or something else stopped you (before you got here (“Make Attempt”))?  

Yes  No  

(If yes) How many times has this happened?  

(If s doesn’t know – ask, less than 5, 5-10, 11-25, 25-50, 50-100, 100+)  

How old were you the first time this happened?  

(If more than 1) How old were you the most recent time this happened?  

Can you tell me a little about the most recent time you did this? (confirm interrupted)  

3.5 Have you ever tried to kill yourself; meaning you engaged in a potentially deadly behavior to end your life with some intention of dying  

Yes  No  

(If yes) How many times has this happened?  

(If s doesn’t know – ask, less than 5, 5-10, 11-25, 25-50, 50-100, 100+)  

How old were you the first time this happened?  

(If more than 1) How old were you the most recent time this happened?  

Can you tell me a little about the most recent time you did this? (confirm attempt)  

For most severe behavior, {recount the most recent incident (e.g. the time you…)}  

3.6 Just to be clear, you had some intent to die from (this method)?  

Yes  No  

Use interview from most severe lifetime behavior and assess most recent incident of most severe behavior  

Pick interview for most severe behavior  

If Attempt is most severe behavior, use Attempt Interview  

If Interrupt or Aborted is most severe behavior, use Interrupted/Aborted Interview (Interrupted is more severe than Aborted)  

If Gesture or no history of suicidal action, use Mulling/Gesture/Ideation Interview
Attempt Interview

Section: Open-ended

For interview: Refer to the most recent suicide attempt. The most recent attempt will be referred to as (this attempt) throughout. You can refer to it as “the most recent attempt” or “the time you did X” or “the time X happened.”

4.1 Thinking about the (most recent) attempt, what exactly happened? What was going on leading up to the attempt?

The point is to paint a timeline of the string of events leading up to the suicide attempt. What happened in the few days or hours before the attempt? Where were they, what were the circumstances, etc. Ask follow up questions – What happened next? How many pills, how long were you in garage or in water?
### Section: Method

**Instructions.** Read. Now I'm going to ask you about different aspects of planning.

5

You told me that you (reiterate method) to attempt suicide (this attempt).

For interviewer:

1) own prescription drugs 7) hanging 13) drowning
2) illicit drugs (not rx) 8) sharp object (e.g., cutting) 14) suffocation
3) over-counter drugs 9) auto exhaust 15) other's rx drugs
4) poison 10) other gases 16) other____
5) firearms 11) train/ car 17) multiple methods _______
6) immolation 12) jump from height 88) not applicable

5.1 When was the first time in your life you ever thought of using (method)? (Not just during this attempt)

Age or Season/year or

Seconds, minutes, days, weeks, months, years before attempt

5.2 Thinking about (this attempt), when did you first come up with (method)?

Seconds, minutes, days, weeks, months, years before attempt

5.3 (If appropriate) Sometimes people are unsure of the method they will use and are only sure a few seconds or minutes before attempting suicide. Other times people may have settled on a method weeks or months in advance. When were you sure that you were going use (this method) to attempt? (If nec) or when had you settled on using (this method)?

Age or Season/year or

Seconds, minutes, days, weeks, months, years before attempt

5.4 How did you come up with this way of killing yourself? (e.g., research methods, etc… doesn’t need to be this instance, could be ever)

If necessary: Do you any research on how to kill yourself? When?

5.5 Why did you choose (this method)?

5.6 (if nec) Did you consider the pain (or lack of pain) involved?

5.7 Have you thought of other methods/ways to attempt suicide or only (this method)?

### If appropriate

5.8 Thinking about (this attempt): Did you do something to (to obtain or have access to) (this method)?

**If necessary:** For example, go out of your way to get (method)

<table>
<thead>
<tr>
<th>Yes – Go to #5.9</th>
<th>No – Go to next section</th>
</tr>
</thead>
</table>

5.9 When you (took this action/obtained method) were you sure you were going to use it to attempt suicide?

Yes – #5.11 No – Go to #5.9

If #5.9 is no

5.10 When you were obtaining (the method), were you thinking (at all) that you could use it to attempt suicide?

**Yes**

No

If #5.10 is yes

5.11 What did you do to obtain (this method)? How long did it take to obtain (this method)?

5.12 (If unclear) When did you do that?
Section: Place

6.1 [If interviewer does not know] Thinking about (this attempt): Where were you?

Instructions. Read: Some people may attempt suicide in a certain place because they just happen to be there. Others think about the place to attempt suicide in advance.

6.2 When was the first time in your life you ever thought of attempting suicide (in the place)?

Age or Season/year or
Seconds, minutes, days, weeks, months, years before attempt

6.3 Thinking about (this attempt): when did you first come up attempting (in this place)?

Seconds, minutes, days, weeks, months, years before attempt

6.4 (If appropriate) Sometimes people are SURE of where they’ll attempt suicide – they have settled on a certain place. When were you SURE you would attempt suicide (in this place)? When had you settled on (the place)?

Age or Season/year or
Seconds, minutes, days, weeks, months, years before attempt

6.5 Thinking about (this attempt): Did you have to travel to (place) before the attempt?

Yes – Go to #6.6 No – Go to next section

6.6 Did you travel to (the place) with the goal of going somewhere to kill yourself?

Yes – Go to #6.8 No – Go to #6.8

6.7 Were you thinking you might attempt suicide (a) before you started traveling or (b) along the way? Or (c) did you not think of suicide before or while you were traveling?

6.8 How long did you travel after were thinking you were going to attempt?
Section: Time
Instructions. Read. Now I’m going to ask you about when you attempted suicide.

7.1 Thinking about (this attempt): What time was it approximately?

7.2 How far in advance did you first plan this time to attempt suicide?
If necessary (For example, you may have thought “tonight,” “tomorrow morning,” or “right now.”)

Age or Season/year or
Seconds, minutes, days, weeks, months, years before attempt_________________________________

If #7.2 is more than a few minutes:

7.3 On/at (the moment that person was planning a time), how sure were you that you were going to attempt suicide at that planned time?

7.4 Did you ever think about an event that would cause you to attempt suicide? For example, some people might say, “When my wife leaves me” or “if my son were to die, I would kill myself”?

Notes:
Section: Attempt Trajectory
Take out Diagram 2 and Timeline Chart

Instructions. Read. You may have told me some of what we’re about to talk about but I’m going to ask these questions just to make sure I have everything correct.

This goes from thinking about suicide on the left to making an attempt on the right. For some people, they think about killing themselves, then they start seriously mulling over the decision. We define mulling as strongly considering killing yourself but still are unsure if you will actually try to do it. For example, going back and forth in their mind about whether they try to kill themselves or not. Then, at some point, you may have decided that you will attempt suicide and they make a first step towards attempting – maybe they get something or drive somewhere - and then they make an attempt. It might not have happened in this order but thinking about your (most recent) attempt, would you say you went through all of these stages? (There should not be a break in time (i.e. greater than a week) between any two stages). If p is unsure about “thinking”, ask about the last time they went without thinking about suicide – how long before the attempt was that period)

8.1 Thinking about suicide
Yes – Go to #8.2
No – Go to #8.3

If #8.1 is yes
8.2 Thinking of this arrow as continuous with no breaks or periods when you weren’t thinking about suicide, when did you first start thinking about suicide, as shown in the left-most box?
Minutes, days, weeks, months before attempt________________________

8.3 Mulling/Strongly considering
Yes – Go to #8.4
No – Go to #8.8

If #8.3 is yes
8.4 When did you first start mulling or strongly considering killing yourself (but were still not sure if you would actually try to do it)? Perhaps going back and forth in your mind about whether you should do it?
Seconds, minutes, days, weeks, months before attempt________________________

8.5 In the weeks before this happened, did you ever mull over whether to kill yourself and did not act on your thoughts of killing yourself?
Yes
No

If 8.5 is yes
8.6 Roughly how many times did you mull over whether to kill yourself and not act?
________________________

8.7 Decision point
Yes – Go to #8.6
No – Go to #8.7

If #8.7 is yes
8.8 When did you make the decision to attempt suicide? How much time passed between your decision and the attempt?
Seconds, minutes, days, weeks before attempt________________________

8.8 First Action
Yes – Go to #8.8
No – Go to Next Section

If #8.8 is yes
8.9 What was the first thing you did to start making an attempt? (Show Intro Actions Diagrams, if necessary)

8.9 How long after that did you make the attempt?
Seconds, minutes, days, weeks before attempt________________________
**Take out Diagram 3.**

*Instructions.* Please look at this diagram. It goes from being totally sure you would not attempt suicide to totally sure you would attempt suicide. In the middle here is unsure whether you were going to attempt suicide or not.

**IF THERE WAS NO DECISION POINT**

9.1  Do you remember when you crossed this line from thinking you were not going to attempt to thinking you were going to attempt?

Seconds, minutes, days, weeks before attempt______________________________

Skip to #9.3

9.2  At the point when you decided to attempt, would you say you were leaning towards it, pretty sure or sure you were going to do it?

<table>
<thead>
<tr>
<th>Leaning</th>
<th>Pretty sure</th>
<th>Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

If #9.2 is leaning or pretty sure

9.3  Was there a time before you acted when you were sure you would attempt suicide?

Yes        No – ask if it was just seconds before, then go to 9.5

If #9.3 is yes

9.4  About how much time passed from the time you were sure you would attempt until you made the attempt?

Seconds, minutes, days, weeks before attempt______________________________
Section: Preparation

10.1 Still thinking about (this attempt): Beforehand, did you do anything to prepare for the suicide attempt?

Yes – Go to #10.2  No – Go to #10.3

If #10.1 is yes

10.2 What did you do?

Go to 10.4

If #10.1 is No or if p is having trouble thinking of anything

10.3 I’m going to list some things people do to prepare for a suicide attempt. Please let me know if you did any of these. Did you: try to get away from other people, check your insurance, clean up your house or apartment, give things away, make a will, say goodbye to people, or write a suicide note, or do anything like that to prepare for the attempt or because you thought you might be dead soon?

10.4 Did you think about doing anything else to prepare for attempting suicide?

Yes – Go to #10.5  No – Go to #10.6

If #10.4 is yes

10.5 What did you think about doing?

Go to next section

If #10.4 is no or p is having trouble thinking of anything

10.6 Did you think of any think about doing any of the things I previously mentioned (#10.3)?
### Section: Drug Use

**11.1** Thinking about (this attempt): Just prior to this, had you consumed drugs alcohol or any other intoxicating substance? Had you stopped taking any prescription medications that you should have been taking prior to attempting?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Go to</th>
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<tbody>
<tr>
<td>Yes</td>
<td>#11.2</td>
</tr>
<tr>
<td>No</td>
<td>#12.1</td>
</tr>
</tbody>
</table>

If #11.1 is yes

**11.2** Before (this attempt), How many/How long had you been drinking/taking drugs/not taking your prescription?

Number, Days, hours, minutes _____________________________________________________

**11.3** Did you decide to attempt suicide before or after you started drinking/taking drugs/not taking your prescription?

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<thead>
<tr>
<th>Answer</th>
<th>Go to</th>
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</thead>
<tbody>
<tr>
<td>Before</td>
<td>#11.5</td>
</tr>
<tr>
<td>After</td>
<td>#11.4</td>
</tr>
</tbody>
</table>

If #11.3 is after

**11.4** How (many drinks had you had/how much drugs had you taken) before deciding to attempt? How long had (you been drinking/you taken drugs) before deciding to attempt?

**11.5** How (many more drinks/much drugs) did you take after deciding to attempt? How long did (you continue to drink/you take drugs) before deciding to attempt?

**Notes:**
### Section: Consideration of Consequences

**12.1** In the period leading up to the (this attempt), did you think about the future or the consequences of attempting suicide?  
Yes – Go to #12.2  
No – Go to #12.3

If #12.1 is yes

**12.2** What did you think about?

Take out Sheet 3. Please use this sheet to

**12.3** When thinking about attempting (during this attempt), how much did you think about your family and/or friends?

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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</table>

What specifically did you think about?

Did these thoughts make you...?  
1 -Want  2-Not want  3-Both  4-Neither

**12.4** Thinking about (this attempt): When thinking about attempting, how much did you think about what it means to die? (some people are scared to die, others are indifferent, others might think it’s peaceful or restful)

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</table>

What specifically did you think about?

Did these thoughts make you...?  
1 -Want  2-Not want  3-Both  4-Neither

**12.5** What do you think will happen to you after you die? (make sure you assess what will happen to the person specifically. If they are not sure = neutral)

<table>
<thead>
<tr>
<th></th>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
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</table>

**12.6** When thinking about attempting, how much did you think about what happens after you die?

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<th>3</th>
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</table>

Did these thoughts make you...?  
1 -Want  2-Not want  3-Both  4-Neither

**12.7** Thinking about (this attempt): When thinking about attempting, how much did you think about the pain, blood, or violence involved with making an attempt?

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<th>4</th>
<th>5</th>
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</table>

What specifically did you think about?

Did these thoughts make you...?  
1 -Want  2-Not want  3-Both  4-Neither
12.8 Thinking about (this attempt): When thinking about attempting, how much did you think about how other people would react when they discovered that you attempted suicide?

1  2  3  4  5

What specifically did you think about?

Did these thoughts make you...?

1 -Want  2-Not want  3-Both  4-Neither

12.10 Thinking about (this attempt): When thinking about attempting, did you think about responsibilities that you have (e.g. work, taking care of family)?

1  2  3  4  5

What specifically did you think about?

Did these thoughts make you...?

1 -Want  2-Not want  3-Both  4-Neither

12.9 Which best describes how you feel about dying by suicide? (moral or religious objections)

1  2  3  4  5

Did these thoughts make you...?

1 -Want  2-Not want  3-Both  4-Neither

12.11 Thinking about (this attempt): Why did you attempt suicide?

Follow ups: 1) Had you felt this bad in the past? (if yes) Why did you attempt suicide this time and not those others? What was different?
2) There might be other options when a person is not feeling well? Why suicide? Why not seek help?
What were the circumstances that contributed most to this attempt? Put in order of importance.

1) job stress
2) problem with coworker/other person (e.g., conflict, bullying)
3) problem with family
4) problem with spouse/partner
5) financial problem
6) health problem (self)
7) health problem/death (other)
8) psychiatric symptoms
9) psychological problem (e.g., lonely, hopeless, desire to escape)
10) legal/criminal problem
11) other: __________________
12) refuses to answer

Put in order of importance.

1) job stress
2) problem with coworker/other person (e.g., conflict, bullying)
3) problem with family
4) problem with spouse/partner
5) financial problem
6) health problem (self)
7) health problem/death (other)
8) psychiatric symptoms
9) psychological problem (e.g., lonely, hopeless, desire to escape)
10) legal/criminal problem
11) other: __________________
12) refuses to answer

How long had this problem been going on? a. ___________ b. ___________ c. ___________

Did you think how long the problem might last before you felt better?

12.14 Did you feel so sad or depressed that you couldn’t concentrate or felt worthless everyday for the two weeks right before {this attempt}?

During the {this attempt}, how sure were you that you wanted to die right before you engaged in the act? (show them options)

After {this attempt}, how did you feel when you realized you had not died? (show them options)

During {this attempt}, which option best describes the method you used? (show them options)

What kind of injuries did you have as a result of {this attempt}?

Lethality Scale for: ________________ Rating (00-10; 99): ________________

Specific drug (if took pills or drugs): ________________

Read. THE INTERVIEW IS OVER. THANK YOU FOR ANSWERING THESE QUESTIONS.

DO YOU NEED A BREAK OR ARE YOU DOING OK?
**Start to act**
- Go to medicine cabinet get pills
- Go get gun
- Go to place (bridge, water)
- Get equipment

**Get close**
- Take pills out
- Get away from people
- Lock door
- Write a note
- Hold knife to body

**Make Attempt**
- Take pills
- Pull trigger
- Jump off bridge
- Broke skin with knife

**Action After**
- Call 911 or friend
- Try to get help
Thinking about suicide ➔ Strongly considering suicide \ mulling it over ➔ Decision to act ➔ Start to act ➔ Action
Diagram 2

How sure were you that you were going to attempt?

Completely unsure

Sure you were *NOT* going to  Pretty sure you were *NOT* going to  Uncertain but leaning towards *NOT*  Uncertain but leaning towards  Pretty sure you were going to  Sure you were going to

WOULD *NOT* ATTEMPT SUICIDE  \hspace{1cm}  WOULD ATTEMPT SUICIDE

170
Multiple Choice Questions 3

How much did you think about…..?

1) None
2) A little
3) Medium
4) A lot
5) All the time (it was a main concern)

Did these thoughts make you….? 

1) Want to attempt suicide
2) Not want to attempt suicide
3) Both - you had mixed feelings
4) Neither – they had no effect on you

How do you feel about dying by suicide?

1) Completely acceptable
2) Somewhat acceptable
3) Indifferent
4) Somewhat unacceptable
5) Completely unacceptable
Multiple Choice Questions 4

How sure were you that you wanted to die ...?

1) Definitely did NOT
2) Pretty sure I did NOT
3) Not sure to live or die
4) Pretty sure DID
5) Definitely DID

How did you feel right after...?

1) Very relieved
2) Pretty relieved
3) Not sure if relieved or disappointed
4) Pretty disappointed
5) Very disappointed

Which option best describes the method you were going to use?

1) Very sure method would NOT kill me
2) Might die but good chance of survival
3) Unsure whether I would live or die
4) Might survive but good chance of death
5) Very sure method would kill me
Appendix C.
Beck Suicide Intent Scale modified by Army STARRS study (Ursano et al., 2015)
SUICIDE INTENT SCALE (SIS)
(Adapted from Beck, Schuyler, & Herman, 1974)

Directions

- Please ask the following questions in regard to the participant’s most recent suicide attempt (i.e., the one leading to hospitalization).
- For all items in this scale, use code number “9” for “Don’t know.” A score of “9” is not counted when calculating the total score.

Read to subject: “Now I’d like to ask a few questions about your recent suicide attempt.”
IF NEEDED: “That is, the one that led to your coming to this hospital.”
IF NEEDED: “In this section, I will ask questions about the most recent attempt and I ask that you please just give me a short, one-sentence response.”

1) “Was anyone present or nearby (for example, within visual or vocal contact) when this happened?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Was someone in the same room as you when this happened? Were other people within 10 feet of you?</td>
</tr>
<tr>
<td></td>
<td>o Was someone in visual or vocal contact when this happened?</td>
</tr>
<tr>
<td></td>
<td>o Were you all alone when this happened?</td>
</tr>
</tbody>
</table>

Isolation

0. Somebody present (endorse if someone was in the same room [or within 10 feet if outdoors])
1. Somebody nearby, or in visual or vocal contact (endorse if someone was in the same dwelling but NOT in the same room [or >10 feet away if outdoors])
2. No one nearby or in visual or vocal contact (endorse if the person was alone in the dwelling [or outdoors, in a car, etc.])
9. Don’t know

RESPONSE 1)

2) “When you made the attempt, how likely was it that you would be discovered by someone else?”

Additional note to interviewers: Score should be based on subject’s behavior, regardless of whether intervention occurred.
- Mark appropriate response based upon how likely it was that intervention could have occurred, with no regard to whether or not intervention actually happened.

As noted above, the score should be based on target person’s behavior, regardless of whether intervention occurred.

→ Example follow-up questions

| o Were you with other people who easily could have intervened when this happened? |
| o Were you alone, but could have been interrupted? |
| o Were you alone with very little chance of interruption? For example, everyone you lived with was out of town. |
Timing

0. Intervention was probable (endorse if it was probable/likely that someone could have intervened [for example, another person in the house])
1. Intervention was not likely (endorse if it was unlikely someone would intervene [for example, No one home but someone could have come in at any time])
2. Intervention was highly unlikely (endorse if very unlikely that someone could intervene [for example, Alone in the woods, Home while family is away on vacation])
9. Don’t know

RESPONSE 2)

3) “Did you do anything to avoid being discovered and possibly stopped while making your attempt?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Did you do anything to actively protect against being discovered? For example, locked the door, went to a secluded place.</td>
</tr>
<tr>
<td></td>
<td>o Did you avoid other people?</td>
</tr>
</tbody>
</table>

Precautions against Discovery/Intervention

0. No precautions
1. Passive precautions (endorse if no evidence that they actively sought to prevent discovery or intervention, but the event did occur in a manner that made discovery/intervention less likely [that is, avoided others, was alone in a room but didn’t lock the doors])
2. Active precautions (endorse if the individual took action to guard against discovery such as locking a door, going to a secluded place, etc.)
9. Don’t know

RESPONSE 3)

4) “Did you contact a potential helper before or during the attempt? If so, did you notify the potential helper about the attempt?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
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<tr>
<td></td>
<td>o Did you tell anyone about what you had done? For example, called 911, called a friend or family member to tell them what had happened.</td>
</tr>
<tr>
<td></td>
<td>o Did you contact someone, but not explicitly tell the person about the suicide attempt?</td>
</tr>
<tr>
<td></td>
<td>o Did you choose not to notify anyone about the attempt?</td>
</tr>
</tbody>
</table>

***Only select (2) if it is explicitly stated that the subject did not contact or notify anyone regarding the attempt. Otherwise, if (0) and (1) do not apply, select (9) “Don’t know.”

Acting to Get Help During/After Attempt

0. Notified potential helper regarding attempt (endorse if, for example, called or told somebody about what they had done, that is, dialed 911)
1. Contacted but did not specifically notify potential helper regarding attempt (endorse if, for example, they contacted someone but did not mention the event)
2. Did not contact or notify potential helper (unless explicitly stated that no contact occurred select “don’t know”)  
9. Don’t know
RESPONSE 4)

5) “Did you make any preparations in case you died, like making out a will or giving away things that were special to you?”

<table>
<thead>
<tr>
<th>If YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you talk about or make any informal arrangements for death? For example, gave possessions away to friends or family, talked about a will.</td>
</tr>
<tr>
<td>o Did you make any definite arrangements for death? For example, wrote a will, took out life insurance.</td>
</tr>
</tbody>
</table>

***Only select (0) if it is explicitly stated that the subject did not make any arrangements. Otherwise, if (1) and (2) do not apply, select (9) “Don’t know.”

Final Acts in Anticipation of Death (e.g., will, gifts, insurance)

0. None (endorse if it is stated explicitly that the person did not make arrangements)
1. Thought about or made some arrangements (endorse if there is evidence that the person thought about or made informal arrangements [for example, talked about making a will, gave possessions to family/friends])
2. Made definite plans or completed arrangements (endorse if Soldier wrote a will, took out/cancelled life insurance, or some other formal procedure)
9. Don’t know

RESPONSE 5)

6) “How much planning had gone into this? How far along had you gotten in (…storing the pills; buying, loading, aiming the gun; etc.)?”

<table>
<thead>
<tr>
<th>If YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you make any preparations for the attempt? For example, researched methods on the Internet, purchased aspirin.</td>
</tr>
<tr>
<td>o How extensive was the preparation? For example, did you save pills for a few weeks or purchase a gun, etc.?</td>
</tr>
</tbody>
</table>

Active Preparation for Attempt

0. No preparation (endorse if there is no evidence that the individual did anything to prepare for the event)
1. Partial/mild to moderate preparation (endorse if for example, researching methods on the Internet, going to the infirmary or store and purchasing aspirin)
2. Complete/extensive preparation (endorse if, for example, saving pills for a few weeks, seeing several psychiatrists to get extra pills, purchasing a gun)
9. Don’t know

RESPONSE 6)

7) “Did you write a note or letter to anyone, or put something in a diary about your plans? Did you think about doing so?”

<table>
<thead>
<tr>
<th>If YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you write, or think about writing, a note, letter, or diary entry?</td>
</tr>
<tr>
<td>o Did you try to destroy the note/letter/diary entry in any way? For example, tear it up, cross it out.</td>
</tr>
</tbody>
</table>

Suicide Note, Letter, or Diary Entry

0. Absence of note, letter, or diary entry
1. Note or letter written, but torn up; diary entry crossed out; note, letter or diary entry thought about
2. Presence of note, letter or diary entry
9. Don’t know
8) “Other than a note, whom did you tell of your plans? What did you say? Did you do or say anything that might have caused people in retrospect to say “I should have known”?"

<table>
<thead>
<tr>
<th>IF YES ➔ Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o What did you say?</td>
</tr>
<tr>
<td>o Based on what you said, do you think that the person you talked with could have known of your suicide plans?</td>
</tr>
</tbody>
</table>

**Overt Communication of Intent Before Attempt**

Other than a note, whom did you tell of your plans? What did you say? Did you do or say anything that might have caused people in retrospect to say “I should have known”?

0. None
1. Equivocal communication
2. Unequivocal communication
9. Don’t know

RESPONSE 8)

**Self-Report (Interviewer Administered)**

9) “Why did you try to kill yourself?”

<table>
<thead>
<tr>
<th>IF YES ➔ Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you do it in order to get attention or revenge or to manipulate your environment in some way?</td>
</tr>
<tr>
<td>o Did you do it in order to escape from or solve problems?</td>
</tr>
</tbody>
</table>

**Alleged Purpose of Attempt**

0. To manipulate environment, get attention, revenge
1. Components of "0" and "2"
2. To escape, surcease, solve problems
9. Don’t know

RESPONSE 9)

10) “Did you think that you were going to die?”

<table>
<thead>
<tr>
<th>IF YES ➔ Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you think that death was unlikely?</td>
</tr>
<tr>
<td>o Did you think that death was possible but not probable?</td>
</tr>
</tbody>
</table>

**Expectations of Fatality**

Did you think that you were going to die?

0. Thought that death was unlikely
1. Thought that death was possible but not probable
2. Thought that death was probable or certain
9. Don’t know

RESPONSE 10)
11) **Did you think that the method you used was severe enough to lead to death?**

<table>
<thead>
<tr>
<th>IF YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you do less to yourself than you thought would be necessary to die?</td>
</tr>
<tr>
<td>o Were you uncertain as to whether what you did would lead to your death?</td>
</tr>
<tr>
<td>o Did you do enough to yourself so that you thought you would die?</td>
</tr>
</tbody>
</table>

**Conception of Method's Lethality**
0. Did less to self than he/she thought would be lethal
1. Wasn't sure if what he/she did would be lethal
2. Equaled or exceeded what he/she thought would be lethal
9. Don’t know

**RESPONSE 11)**

12) **“How serious was your suicide attempt?”**

<table>
<thead>
<tr>
<th>IF YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you want to end your life?</td>
</tr>
<tr>
<td>o Were you unsure whether or not you wanted to end your life?</td>
</tr>
</tbody>
</table>

**Seriousness of Attempt**
0. Did not attempt to end life
1. Uncertain about seriousness to end life
2. Seriously attempted to end life
9. Don’t know

**RESPONSE 12)**

13) **“How certain were you about wanting to die?”**

<table>
<thead>
<tr>
<th>IF YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you want to die?</td>
</tr>
<tr>
<td>o Were you unsure whether or not you wanted to die?</td>
</tr>
</tbody>
</table>

**Attitude toward Living/Dying**
0. Did not want to die
1. Components of “0” and “2”
2. Wanted to die
9. Don’t know

**RESPONSE 13)**

14) Conception of medical rescuability: Ask subject, **“Did you think that a doctor could help you stay alive after you tried to kill yourself?”** Probe as necessary (see below for examples) and record response.

<table>
<thead>
<tr>
<th>IF YES → Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Did you think that death would be unlikely if you got medical attention?</td>
</tr>
<tr>
<td>o Were you unsure whether or not death could be prevented by medical attention?</td>
</tr>
<tr>
<td>o Did you think that death was certain, even if you got medical attention?</td>
</tr>
</tbody>
</table>

**Conception of Medical Rescuability**
0. Thought that death would be unlikely if he/she received medical attention
1. Was uncertain whether death could be averted by medical attention
2. Was certain of death even if he/she received medical attention
9. Don’t know
RESPONSE 14)

15) “How much did you plan/think about your attempt to kill yourself before you tried?”
NOTE: “planning/thinking” includes any suicidal ideation (thoughts about killing oneself) that occurred before attempt.

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Did you plan or think about the attempt at all before you acted?</td>
</tr>
<tr>
<td></td>
<td>o Did you plan or think about the attempt for 3 hours or less before you acted?</td>
</tr>
<tr>
<td></td>
<td>o Did you plan or think about the attempt for more than 3 hours before you acted?</td>
</tr>
</tbody>
</table>

Degree of Premeditation
0. None; impulsive
1. Suicide contemplated for three hours or less prior to attempt
2. Suicide contemplated for more than three hours prior to attempt
9. Don’t know

RESPONSE 15)

Other Aspects (Not included in total score)

16) “How do you feel about having made the attempt?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Do you feel sorry or ashamed about having made the attempt?</td>
</tr>
<tr>
<td></td>
<td>o Do you feel accepting of the attempt and its failure?</td>
</tr>
<tr>
<td></td>
<td>o Do you regret that the attempt failed?</td>
</tr>
</tbody>
</table>

Reaction to Attempt
0. Sorry that he/she made attempt; feels foolish, ashamed (circle which one)
1. Accepts both attempt and its failure
2. Regrets failure of attempt
9. Don’t know

RESPONSE 16)

17) “What do you think will happen to you after you die?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Do you have any thoughts about what happens after death?</td>
</tr>
<tr>
<td></td>
<td>o Do you think there is a never ending sleep or darkness?</td>
</tr>
<tr>
<td></td>
<td>o Do you think there is any kind of life-after-death or reunion with loved ones?</td>
</tr>
</tbody>
</table>

Visualization of Death
0. Life-after-death, reunion with ancestors
1. Never ending sleep, darkness, end-of-things
2. No conceptions of, or thoughts about, death
9. Don’t know

RESPONSE 17)
18) “How many suicide attempts have you made in your lifetime?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o None?</td>
</tr>
<tr>
<td></td>
<td>o Three or more?</td>
</tr>
</tbody>
</table>

Number of Previous Attempts

0. None
1. One or two
2. Three or more
9. Don’t know

RESPONSE 18)

19) Did you drink any alcohol prior to the attempt? If so, did it change your judgment or actions? Was your consumption of alcohol related to your attempt to kill yourself?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Was your judgment or concept of reality impaired?</td>
</tr>
<tr>
<td></td>
<td>o Did you consume alcohol on purpose in order to help you make the attempt?</td>
</tr>
</tbody>
</table>

Notes:
“1” = the drinking impaired one’s thinking (e.g., “I started drinking and then decided to make the attempt.” “I drank so that I would have the courage to make the attempt, but I didn’t think that the alcohol would directly facilitate death.”)
“2” = the drinking was thought to physiologically facilitate death (e.g., “I took a bunch of pills and then drank alcohol to increase the likelihood of dying.”)

C19. Relationship between Alcohol Intake and Attempt

0. Some alcohol intake prior to but not related to attempt, reportedly not enough to impair judgment, reality testing
1. Enough alcohol intake to impair judgment, reality testing and diminish responsibility
2. Intentional intake of alcohol in order to facilitate implementation of attempt
9. Don’t know
8. Not Applicable

RESPONSE 19)

20) Did you take any drugs prior to the attempt? If so, did it change your judgment or actions? Was using drugs related to your attempt to kill yourself?”

<table>
<thead>
<tr>
<th>IF YES</th>
<th>Example follow-up questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>o Was your judgment or concept of reality impaired?</td>
</tr>
<tr>
<td></td>
<td>o Did you take drugs on purpose in order to help you make the attempt?</td>
</tr>
</tbody>
</table>

C20. Relationship between Drug Intake and Attempt

0. Some drug intake prior to but not related to attempt, reportedly not enough to impair judgment, reality testing
1. Enough drug intake to impair judgment, reality testing and diminish responsibility
2. Intentional drug intake in order to facilitate implementation of attempt
9. Don’t know
8. Not Applicable

RESPONSE 20)