DECIDING TO DIE: DECISION MAKING STYLES AND SUICIDE

by

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B.A., University of Cambridge, 2015

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS OF THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES
(Psychology)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)

August 2017

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Abstract

**Aim:** Despite decades of intervention efforts, suicide rates have remained largely unchanged. A key reason for this is that most identified risk factors for suicide (e.g. depression, hopelessness) predict suicidal thoughts, but not acts. Neurocognitive abilities mediate the relationship between thoughts and behaviours, and thus may be involved in the transition from suicidal thoughts to suicidal acts. The current project is the first to examine decision making styles in relations to suicidal thoughts and suicidal acts.

**Methods:** A total of 600 participants (191 suicide attempters, 201 suicidal ideators, 208 non-suicidal controls) were recruited using Amazon's Mechanical Turk (MTurk.com). Participants who passed a brief pre-screen questionnaire were invited to complete the full set of questionnaires that measured five different decision making styles (Spontaneous, Intuitive, Avoidant, Dependent, Rational), suicidality, among other psychological, cognitive and psychiatric variables.

**Results:** Replicating prior findings, common predictors such as hopelessness and impulsivity were strongly associated with suicidal ideation but not attempts. Rational decision making style differentiated attempters from ideators as well as or better than any of the other predictors, with attempters exhibiting lower rational decision making style. Avoidant and dependent styles also distinguished attempters from ideators, with dependent decision makers less likely to be attempters, while the reverse was true for avoidant decision makers.

**Discussion:** Decision making styles may help to distinguish individuals who act upon their suicidal thoughts and make an attempt from those who do not. Decision making may not only contribute to suicide risk assessment but also serve as potential intervention targets in reducing suicidality.
Lay Abstract

Suicide is a leading cause of global mortality. However, despite decades of scientific and policy efforts, rates of suicide attempts have remained largely unchanged. A key reason for this is that most identified risk factors predict suicidal thoughts, but not acts. Understanding how people decide to die may help elucidate why some individuals act on their suicidal thoughts whereas others do not. The current project examined decision making styles in relations to suicidal thoughts and suicidal acts.

Results showed rational decision making style differentiated attempters from ideators, with attempters exhibiting lower rational decision making style. Avoidant and dependent styles also distinguished attempters from ideators, with dependent decision makers less likely to be attempters, while the reverse was true for avoidant decision makers. As such, decision making styles may help to distinguish active suicide attempters vs. passive suicidal ideators, thus potentially contributing not only to suicide risk assessment but also intervention.
Preface

This dissertation is original, unpublished, independent work by the author, Tianyou Qiu.

Approval for this study was obtained from the Behavioural Research Ethics Board of the University of British Columbia (UBC BREB Number: H14-02018).
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Acknowledgements

I first wish to express my deep gratitude to my supervisor, Dr. E David Klonsky. His knowledge, insights, and stimulating comments have been a source of inspiration for me. More importantly, I am deeply grateful for his enthusiasm, support and encouragement, without which this thesis would not have been possible.

I would like to thank Dr. Luke Clark and Dr. Paul Hewitt for agreeing to be part of my thesis committee. Their thoughtful suggestions and comments were much appreciated.

My heartfelt thanks also go out to my fellow members of the Personality, Emotion, and Behaviour Lab: Ms. Alexis May, Ms. Sarah Victor, Ms. Anita Hibbert, and Mr. Boaz Saffer in particular, who have generously and readily provided invaluable mentorship, guidance, advice, and insights throughout the course of this thesis.

Lastly, and most importantly, I would like to thank my family and my friends Ms. Amalie Lambert, Ms. Nicole Tischler and Ms. Emilia Halton-Hernandez, whose patience, unwavering love and support, and wonderful company mean the world to me.
Chapter One: Introduction

Suicide is a leading cause of global mortality. Worldwide, more than 800,000 die by
suicide each year, equaling one death by suicide approximately every 40 seconds (World Health
Organisation (WHO), 2014). In Canada, more deaths were caused by suicide than by accidents,
homicide, influenza, HIV, and war combined (Statistics Canada, 2015). Beyond lethal attempts,
a much larger number of people make non-fatal suicide attempts: it is estimated that
approximately 25 attempts occur for every suicide death (Goldsmith, Pellmar, Kleinman, &
Bunney, 2002). As such, suicide constitutes an immense public health problem.

However, despite decades of scientific and policy efforts directed at suicide prevention,
rates of suicide attempts have remained largely unchanged (Klonsky, May & Saffer, 2016). A
key reason for limited understanding and prevention is that most identified risk factors for
suicide – including depression, hopelessness, impulsivity, and the presence of mental disorders –
predict suicidal thoughts, but not acts (Klonsky & May, 2014). As such, the current literature
affords no effective way of identifying those at greatest risk for acting upon suicidal thoughts.
Given that only 1 out of 3 individuals who considered suicide will attempt (Nock et al., 2008), a
pressing task for suicide researchers and preventionists is to better understand when and why
suicidal thoughts progress to suicidal behaviours.

Neurocognitive abilities may help explain when and why suicide ideation transitions to
suicide attempts. This is because, as suggested in the general literature, these abilities
importantly mediate thought-action relationships (Bredemeier & Miller, 2015). Consequently,
certain neurocognitive characteristics may dispose some ideators but not others to act on their
thoughts and make a suicide attempt. Of particular interests is decision making, or the
neurocognitive abilities that enable us to select a belief or a course of action among several
alternative possibilities (Holyoak & Morrison, 2012). As suicidal acts follow a decision to act, it has been postulated that neurocognitive processes involved in decision making may be implicated in suicidal behavior (Dombrovski, Szanto, Clark, Reynolds, & Siegle, 2013).

To elucidate the links between decision making and suicide, this thesis will first review prior studies that have examined decision making in relation to suicide attempts. Specifically, I will trace two important shifts in the current literature, and point out several conceptual and operational limitations. Next, I will present findings from a large cross-sectional dataset, which tested whether decision making styles distinguish individuals with a history of suicide attempts from individuals with a history of suicide ideation. Specifically, I will introduce the research plan, recruitment procedure, analytical strategies, report the results of the statistical analyses, and discuss the implications of my findings in the sections below.

**Decision Making and Suicide: Literature Review**

In this review, I will critically evaluate the extant literature on decision making and suicide attempts. Specifically, my discussion will be grouped into four sections. The first section consists largely of early studies. These studies share the assertion that decision making are impaired in suicidal individual, constituting what I termed as ‘the deficit account’. In the next section, I will outline key critiques and summarize the limitations of this approach. In the third section, I will note a recent shift away from the deficit account, followed by a review on latest findings from studies exemplifying this trend. In the last section, I will argue that this emerging literature also suffers from key limitations and articulate the need for a more sophisticated account that emphasizes multiple pathways to suicide, characterized by different decision making styles.
The Deficit Account

According to the deficit account, decision making is impaired in suicidal individuals: people who engage in suicidal behavior, for example, may misestimate future outcomes and see suicide as unrealistically attractive relative to other options (Dombrovski et al., 2013). As a result, these deficits increase the likelihood that suicidal thoughts progress to attempts.

Such a perspective is consistent with several theoretical accounts of suicide (Beck, Kovacs, & Weissman, 1975; Joiner, 2009; Shneidman, 1996), which converge on a rational theory of choice (Holyoak & Morrison, 2012). Although these theories differ in reasons offered (e.g. intolerable psychache, hopelessness, burdensomeness/failed-belongingness), suicide is essentially theorized as a deliberate choice, where the Expected Utility for staying alive is judged negative, such that non-existence (Expected Utility=0) is preferable. Echoing the notion of suicide as an escape from self (Baumeister, 1990) and as a reaction to entrapment (Taylor, Gooding, Wood, & Tarrier, 2011), suicidal behaviors can be viewed as instrumental attempts to achieve the subjectively preferred outcome in a desperate situation.

Beyond theoretical considerations, the deficit account is also consistent with the larger empirical picture. There is evidence linking suicidal behavior to disruptions of signaling pathways in the basal ganglia (Ahearn et al., 2001; Dombrovski et al., 2013; Kumar, Dagher, Hutchison, Lang, & Lozano, 1999; Soulas et al., 2008; Vang, Ryding, Trskman-Bendz, van Westen, & Lindstrm, 2010), disruptions that severely and somewhat selectively impair decision-making processes. More broadly, suicidal behavior has also been associated with problem gambling (Wong, Cheung, Conner, & Conwell, 2010) and drug addiction (Vijayakumar, Kumar, & Vijayakumar, 2011), behaviors defined by disadvantageous choice.
Direct evidence for decision making impairments in suicidal individuals, however, is less consistent. Most early studies directly investigating decision making in relation to suicide tend to rely on the Iowa Gambling Task (IGT) (Bechara, Damasio, Damasio, & Anderson, 1994). In this task, the subject chooses cards from four decks, with each card choice winning or losing the subject some money. Decks A and B (i.e. risky decks) offer high wins, but occasional massive losses so that the subject ends up in debt. Decks C and D (i.e. safe decks) offer lower wins, but small losses, so that the subject gradually makes a profit. While healthy controls develop a preference towards the safe decks, patients with lesions in ventromedial prefrontal cortex persist in sampling the risky decks. As such, the IGT is postulated to assess real-world high-risk decision making underpinned by distinct bio-cognitive mechanisms (Bechara, Damasio, Tranel, & Damasio, 2005).

Since Jollant et al.'s (2005) pioneering study, a total of 17 studies administered the IGT to individuals with a history of suicide attempts. These studies provide mixed evidence for the deficit account. Out of the total 17 studies, nine reported an association between impaired performance on the IGT and suicide attempt (Bridge et al., 2012; Jollant et al., 2005, 2007, 2010, 2013; Loyo et al., 2013; Malloy-Diniz et al., 2009; Martino et al., 2011; Richard-Devantoy et al., 2014). Specifically, suicide attempters underperformed on IGT compared to clinical controls (Bridge et al., 2012; Jollant et al., 2005, 2007, 2010, 2013; Loyo et al., 2013; Malloy-Diniz et al., 2009; Martino et al., 2011) and healthy controls (Jollant et al., 2005, 2010, 2013; Loyo et al., 2013; Malloy-Diniz et al., 2009). Reduced IGT performance was associated with a history of violent suicide attempts (Jollant et al., 2005) and suicidal ideation among those with a history of suicide attempt (Westheide et al., 2008). However, as indicated below, the remaining 8 studies failed to find such relationships.
Challenges to the Deficit Account

There are several problems with the deficit account. The most fundamental of which is perhaps that empirical evidence for such a perspective is far from consistent. Notably, more than half of the seventeen studies mentioned above \((n = 8)\) failed to find a relationship between suicide attempts and the IGT (Gilbert et al., 2011; Gorlyn et al., 2013; Homaifar et al., 2012; Legris et al., 2012; Oldershaw et al., 2009; Olié et al., 2015; Richard-Devantoy et al., 2014; Wyart et al., 2015). Importantly, this null effect was not limited to a specific population, but observable across an impressive age span (Mean Age ranges from 15.8 (Oldershaw et al., 2009) to 79.9 (Wyart et al., 2015)) and a diverse range of samples, including affective disorders samples (Gilbert et al., 2011; Gorlyn et al., 2013; Olié et al., 2015; Richard-Devantoy et al., 2014; Wyart et al., 2015), Traumatic Brain Injuries sample (TBIs; Homaifar et al., 2012), borderline personality disorder sample (BPD; Legris et al., 2012), and individuals with histories of nonsuicidal self-injury and/or suicide attempts (Oldershaw et al., 2009). Taken together, the evidence for the deficit account is inconclusive at best.

Similarly, a recent meta-analysis of 10 studies that investigated performance on IGT and suicide revealed a complex picture. Seemingly consistent with the deficit account, Richard-Devantoy et al.'s (2014) analysis reported significantly impaired decision-making (indexed by IGT) with moderate effect sizes in unipolar and bipolar disorder suicide attempters compared to unipolar and bipolar non-attempters \((g = -.39, .95CI [-.58 to – .20])\), and compared to healthy controls \((g = -.52, .95CI [-.86 to – .19])\). However, a much larger effect size \((g = – 1.39, .95CI \ [-1.89 to – .91])\) was found comparing unipolar and bipolar non-attempters to healthy controls. These findings thus render it difficult to interpret if IGT performance is impaired in suicide
attempters above and beyond neurocognitive impairments associated with mood-related psychopathology.

Taken together, findings regarding decision-making deficits in suicide attempters are mixed at best. However, these findings do not necessarily invalidate the deficit account. There are at least three possible explanations for the mixed findings beyond the possibility that the deficit account is incorrect: a statistical explanation, a psychometric explanation, and a heterogeneity explanation.

First, samples in most studies on suicidal populations tend to be small. Thus, the lack of consistent differences in IGT performances could be due to a lack of statistical power.

Second, the IGT itself may not be an ideal index of decision making processes in suicide attempters. It has been noted that IGT is likely to be a complex task that recruits multiple cognitive processes (Clark et al., 2009). For example, in a modified IGT task, Fellows and Farah (2005) rearranged the initial reward/punishment schedule such that the two disadvantageous decks no longer had an initial advantage in the opening trials. Following this shuffling of the opening trials, the performance of vmPFC patients was the same as that of controls. This suggests that it might be a difficulty in reversing early learning that is underpinning the behavioural profile of vmPFC patients on the IGT, rather than impaired decision making. Alternatively or additionally, other studies have observed risky betting behavioural in tasks without a learning load (Clark et al., 2008) and impulsive temporal decisions (Sellitto et al., 2010) in vmPFC/OFC patients, suggesting that rather than a lack of awareness of the potential negative consequences of risky decks, the persistent risky choices seen on IGT may instead indicate a preference for the higher risk decks. In other words, the mixed findings may be partly
attributable to IGT as a problematic measure of decision making, occurring as a result of IGT’s lumping multiple processes together.

Third, the inconsistency in findings may mirror the heterogeneity in the sample. For example, Richard-Devantoy et al. (2016) found that unipolar non-attempters performed better on the IGT than unipolar suicide attempters, but only among women, whereas performances were similar in bipolar patients regardless of history of suicide attempt. It should be noted that the sample size of this study is small, such that its results should be considered with caution. Nevertheless, these findings highlight the possibility that decision making impairments may be implicated in different ways in different populations, and that there may be multiple pathways to the final suicidal act.

Despite the multiplicity of co-existing explanations, the mixed and conflicting results do suggest that the deficit account inadequately accounts for decision making processes that lead to suicide attempts. Several conceptual limitations may explain why the deficit account falls short. First, decision making being a multi-faceted process rather than a unitary trait. Thus, attributing suicide to ‘decision making deficits’ is essentially a black-box explanation. Instead, a more useful account needs to spell out the specific mechanisms through which different processes in decision making are involved in suicide. Second, the deficit account offers a blanket explanation of how decision making processes operate all suicide attempters. This perspective is problematic, as the heterogeneity in suicide attempters reviewed below and widely acknowledged in literature suggests that different decision making processes may be involved in different neurocognitive pathways to suicide acts.
Developments from the Deficit Account

Fortunately, recent studies are beginning to move beyond a simplistic, unitary deficit account by adopting more diverse measures of decision making, more nuanced approach in characterizing suicide attempts, and examining factors mediating and moderating the relationships between decision making and suicide attempts. Below I will attempt to describe two fruitful developments.

The first development is the recognition that there may be multiple neurocognitive pathways to suicide. For example, there is converging evidence that pathways to suicidal acts seem to differ based on impulsivity and planning. Distinguishing different groups of elderly suicidal attempters based on the lethality and the planning of their attempts, Dombrovski et al. (2011) found that different groups of attempters displayed distinct patterns of delay discounting performance: Low-lethality attempters displayed an exaggerated preference for immediate rewards compared with non-suicidal depressed and healthy controls, whereas high-lethality attempters were more willing to delay future rewards. Similarly, performance on delayed discounting also varied by degree of planning, with better planned suicide attempts associated with willingness to wait for larger rewards. This distinction parallels the wider literature indicating the cognitive heterogeneity in suicide attempters. Several studies converged to show that distinct cognitive control patterns characterizing high- and low-lethality suicide attempters: compared to low-lethality attempters and controls, high-lethality attempters took longer to complete inhibition trials (Richard-Devantoy, Olie, Guillaume, & Courtet, 2016), demonstrated poor conceptual reasoning, and made more perseverative errors and total errors (McGirr, Dombrovski, Butters, Clark, & Szanto, 2012). These findings are consistent with recent qualitative studies describing distinct pathways leading to a suicide attempt in elder adults.
(experiencing life as a struggle when growing older; losing control over life; and feeling invisible or disconnected from others; Bonnewyn et al., 2014; Crocker, Clare, & Evans, 2006). Collectively, these studies provide encouraging evidence for the utility of decision making as a neurocognitive marker in characterizing different pathways to suicide attempts.

Second, several studies have also begun to move beyond identifying risk factors, toward elucidating their underlying mechanisms. For example, examining probabilistic reversal learning in an elder sample, Dombrovski et al. (2013) found that impulsivity and a history of suicide attempts (particularly poorly planned ones) were associated with a weakened expected reward signal in the paralimbic cortex (an area important for guiding approach behavior by racking the value of available options in dynamic environment), which in turn predicted the behavioral insensitivity to contingency change. This tendency to perseverate in approach behavior even when it no longer paid off in unplanned attempters nicely dovetails prior evidence for a negative association between the quality of decision-making and impulsive/careless problem-solving in elder suicide attempters (Clark et al., 2011). Although mediation analysis was not directly tested in Dombrovski et al. (2013), their findings showed that individuals with high impulsivity and suicide attempt shared a failure in updating the value of the option that was no longer rewarded, thereby providing one way of unpacking the mechanisms underlying the poorly specified link between impulsive decision making and suicide attempts. Coupled with evidence for distinct cognitive control patterns discussed in this review earlier (McGirr, Dombrovski, Butters, Clark, & Szanto, 2012; Richard-Devantoy, Olie, Guillaume, & Courtet, 2016), these findings led Richard-Devantoy, Szanto, Butters, Kalkus, & Dombrovski (2015) to articulate the neurocognitive mechanisms underpinning the two distinct decision making pathways to making a suicide attempt: a cognitive control/frontoparietal pathway that involves an inability to find
and implement alternative solutions in a crisis, and a value/paralimbic pathway that involves impulsivity, a low threshold for suicidal acts, and a disregard of deterre rents.

**Beyond A Deficit Account**

Despite these advances, the current research on decision making processes in suicide is limited in important ways. Deficits, even when examined in appropriate detail, are likely only part of the story. As Dombrovski et al.'s (2011) studies illustrate, certain suicide attempters, in particular those who carried out well-planned, highly lethal suicide attempts, demonstrated superior rather than inferior delay discounting as compared to controls and lower-lethality attempters. Deficit models cannot account for the possibility that some attempters may have superior rather than inferior decision-making abilities.

Indeed, there is increasing evidence to suggest that not all decision making styles implicated in suicide pathways are maladaptive. For example, using behavioral decision tests, Szanto et al. (2015) found that suicide attempters tended to rely on intuitive decision making -- as indicated by a greater susceptibility to the framing effect and the sunk cost -- to a greater extent than suicide ideators, non-suicidal depressed controls, and healthy participants. Note, however, such intuitive decision making in itself is not indicative of deficits/impairments. Instead, it exists in parallel to the rational decision making processes as part of normal decision making system (Evans & Stanovich, 2013). Indeed, extensive evidence indicates intuitive decision making can be observed across clinical and community populations (De Martino, Kumaran, Seymour & Dolan, 2006; Stacy & Wiers, 2010; Tversky & Kahneman, 1974). In fact, researchers such as Gigerenzer et al (2011) have argued that such intuitive decision making styles, characterized by a reliance on heuristics, is positively adaptive, because they are effective
responses to the bias/variance dilemma – the statistical problem of simultaneously minimizing two sources of error – bias and variance. For example, Take The Best heuristic (TTB, i.e. choosing the option based on the first attribute that distinguishes it from the rest of the options) was found to have better predicative ability than regression models (Gigerenzer, 2011). This ‘less-is-more effect’ suggests that heuristics-dependent decision making can lead to better outcomes, reducing the estimation errors, and better predicting new instance. A critical task for future research, therefore, is to move beyond the current focus on deficits/impairments in decision making, and consider through a more holistic lens how different decision making styles may interact with other factors to characterize different pathways to suicide.

**Differences, Not Deficits**

One way to conceptualize individual differences in decision making characteristics is through decision making styles, defined as ‘a habitual pattern individuals use in decision making’ (Driver, 1979). This construct was developed and operationalized by Scott and Bruce (General Decision-Making Style Inventory; 1995). Specifically, the authors derived a priori construct definitions conceptually from prior theories, and composed items to assess four decision making styles: (1) the rational style, which emphasizes a thorough search for and logical evaluation of alternatives; (2) the avoidant style, or a tendency to postpone and avoid decisions; (3) the dependent style, which is characterized by a search for advice and direction from others; and (4) the intuitive style, which relies on hunches and feelings. These items were then administered to four independent samples and revised. During the course of scale development factor analysis identified a fifth decision making style, which was named the spontaneous style,
characterized by a sense of immediacy and a desire to get through the decision-making process as soon as possible.

The five decision making styles were postulated to be distinct but not mutually exclusive: in other words, individuals do not rely on a single decision making style, but draw on a combination of decision making styles (Scott & Bruce, 1995). For example, dependent decision making style was shown to be positively correlated with avoidant decision making style (Scott, Bruce, 1995), suggesting that dependent decision makers tend also to passively avoid decision making. Empirically, the relationships between the five decision making styles were examined by Loo (2000). The author reported that intuitive scale was positively correlated with both the spontaneous ($r = .30$) and dependent ($r = .30$) styles. By contrast, rational decision making style was negatively correlated with the avoidant ($r = – .33$), spontaneous ($r = – .30$) and intuitive ($r = – .23$) styles. Furthermore, Loo (2000) also found that the dependent and avoidant styles were independent ($r = .08$), suggesting that specific decision making styles captures unique characteristics in decision making. Collectively, these results seem to support Scott & Bruce’s (1995) original conceptualization of decision making styles as independent but co-existing tendencies.

Very little is known as to how decision making styles may be related to suicide and psychopathology in general. Most research on decision making styles has been conducted in relations to topics in social and occupational psychology, such as locus of control (Baiocco, Laghi & D'Alessio, 2009), leadership ability (Russ, Mcneilly & Comer, 1996), and career choices (Gati et al., 2010). There is some evidence that decision making styles may have significant clinical implications. Thunholm (2008), for example, found that avoidant decision
making style was correlated with higher stress, indicated by cortisol response. However, to date few studies have directly examined the roles of decision making styles in psychopathology.

**Summary of Research Project**

The present study aims to contribute to the existing literature by investigating how different decision making styles may be implicated in the progression from suicidal ideation to attempt. Specifically, five distinct decision making styles are examined: rational, avoidant, dependent, intuitive, and spontaneous styles. As such, the current study will be the first to comprehensively evaluate different dimensions of decision making in their relations to suicide.

As this is the first study of its kind, all hypotheses are necessarily exploratory. Nevertheless, there are reasons to speculate that all the five decision making styles may be implicated in the progression from suicidal ideation to attempt, but in different ways. Specifically, the rational decision making style may characterize well-planned, highly-lethal suicide attempts. By contrast, impulsive, low-lethality attempts may be associated with a spontaneous decision making style. Distinct from rational and the spontaneous style, intuitive style may be involved in a heuristic pathway to suicide, serving as the prominent decision making styles of attempters experiencing considerable psychological pain. The avoidant and dependent decision making styles, on the other hand, may serve as protective decision styles in this context, which buffer against the escalation of suicidal ideation to attempts.

It is further hypothesized that the relationship of each of the five decision making styles to suicide may not be straightforward but moderated by other factors, such as suicide motivation, psychological pain, hopelessness, belongingness, impulsivity etc. Specifically, decision making styles that are based on internal feelings and hunches (i.e. intuitive style) and/or responsive to situational demands (i.e. spontaneous style) may, by definition, become particularly salient in the
presence of strong negative emotion. Thus, it is hypothesized that intuitive and/or spontaneous decision making styles may most strongly distinguish attempters from ideators among those experiencing high levels of negative emotion (as indexed by measures of depression, psychological pain, and hopelessness). In addition, dependent decision making style, defined as a tendency to rely on others for decision making, may be only protective against the escalation of suicide risk where there is actual social support. Thus, it is predicted that the relationship between dependent decision making and suicide attempt might also be moderated by social support (as indexed by belongingness). By testing these potential moderators and understanding these complex relationships, this study represents the first step in elucidating and characterizing the multiple pathways in the progression from ideation to attempt.
Chapter 2: Methods

Procedure

Participants were recruited from Amazon’s Mechanical Turk (MTurk). Participation in the study was limited to individuals who had at least 90% approval in completing 100 or more Human Intelligence Tasks (HITs). Participants were told the study would take between 1 to 3 minutes to complete and that they would receive $0.15 for their participation. Eligible participants were provided with a link to a screening questionnaire hosted by Qualtrics.

Upon providing informed consent, participants completed a brief online survey which included the Youth Risk Behaviour Survey – Suicide Screening Questionnaire (YRBS; Grunbaum et al., 2002; Kolbe, Kann, & Collins, 1993), which assessed lifetime and past 12-month history of suicidal ideation and suicide attempts, followed by items from the Self-Injurious Thoughts and Behaviours Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007) and the Beck Scale for Suicidal Ideation (BSI; Beck, Kovacs, & Weissman, 1979; Beck, Steer, & Ranieri, 1988), which assessed suicide plan, suicide intent, and suicide severity. This was followed by Anxiety short-form 4a and Depression short-form 4a instruments, which assessed anxiety- and depression-related symptoms occurring during the previous seven days. Participants’ responses to the YRBS suicide items determined their membership into one of three groups: participants who reported no lifetime history of suicidal ideation or suicide attempts were classified as nonsuicidal controls; participants who endorsed a lifetime history of suicidal ideation but no history of suicide attempts were classified as ideators; and participants with a history of suicidal ideation and suicide attempts were categorized as attempters. Participants who reported no history of suicidal ideation but endorsed a history of suicide attempts were excluded.
from further participation in the study since suicidal ideation necessarily precedes suicide attempt.

Upon successfully completion of the screening questionnaire, participants were invited to participate in a longer 30-minute survey for an additional payment of $1.20. Recruitment was limited to 200 nonsuicidal controls, 200 ideators, and 200 attempters. Once the quota for a particular group was met, further recruitment of similar participants was blocked. Participants were given the option to decline further participation in the longer survey, and were given a unique code to enter into MTurk indicating that they had completed the short screening.

Participants who agreed to participate in the longer survey were required to provide informed consent to prior to participating in the longer study. Upon providing consent, participants first completed a demographics questionnaire alongside several clinical measures. This includes sequentially: (1) General Decision Making Style (GDMS; Scott & Bruce, 1995), (2) UPPS-P Impulse Behaviour Scale (Cyders et al., 2007), (3) the Frontal Systems Behaviour Scale (FrSBe; Grace & Malloy, 2001), (4) the Behavioural Rating Inventory of Executive Functions – Adult version (BRIEF-A; Roth et al., 2005), (5) the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner, 2012), (6) the Beck Hopelessness Scale - Short Form (BHS; Beck, Weissman, Lester, & Trexler, 1974), (7) the Psychache Scale (Holden, Mehta, Cunningham, & McLeod, 2001), and (8) the Depression, Anxiety, and Stress Scale (DASS-42; Lovibond & Lovibond, 1995). Attention checking questions that instructed the participants to select a particular answer (“Please select Sometimes”) were used to ensure that participants were paying attention when they were answering the questions. Before completing the study, participants were first asked to go through an extensive list of mental health resource. They were then provided with their unique code for completing the long survey.
Ethical approval for this study was obtained from the Behavioural Research Ethics Board of the University of British Columbia (UBC BREB Number: H14-02018).

**Participants**

2,825 attempts were made to access the screening survey. Of those, 1 participant did not consent, and 38 did not complete the screening. Of the 2,786 participants who completed the screening questionnaires, 618 participants were offered to further participate in the longer 30-minute study. A total of 600 participants consented and completed the longer survey, including 191 attempters, 201 ideators, 208 non-suicidal controls.

Demographic information for all participants is outlined in Table 1. Participants reported an average 33.7 years of age ($SD = 10.8$). Over half of participants were male (49.8%, $n = 299$) and single (55.7%, $n = 334$), with 34.8% ($n = 209$) of participants reported being married. Most participants were of Caucasian ethnicity (70.7%, $n = 424$) and heterosexual sexual orientation (78.2%, $n = 469$). Highest level of obtained education and yearly reported household income varied, with 36.5% ($n = 219$) participants obtaining at least some college or university education, and 14.7% ($n = 88$) participants reporting earning between 20,000-$29,000 annually.

**Measures**

**Demographic Measures**

Demographic information was obtained using a lab-based questionnaire (See Appendix A. PEBL Demographics Questionnaire). The questionnaire includes 12 questions asking participants to report their date of birth, gender, race/ethnicity, sexual orientation, and current
marital status. The questionnaire also assesses highest level of education, yearly household income, occupation, weekly working hours, and number of people residing in the household.

**Measures of Decision Making Styles**

Decision making styles were assessed using the General Decision Making Style (GDMS; Scott & Bruce, 1995). The GDMS is a validated 25-items validated measure designed to assess how individuals approach decision situations. It distinguishes between 5 decision styles: (1) the rational style, which emphasizes a thorough search for and logical evaluation of alternatives; (2) the avoidant style, or a tendency to postpone and avoid decisions; (3) the dependent style, which is characterized by a search for advice and direction from others; (4) the intuitive style, which relies on hunches and feelings; and (5) the spontaneous style, which is characterised by a sense of immediacy and a desire to get through the decision-making process as soon as possible. The GDMS has shown good reliability and validity (Loo, 2002).

**Measures of Suicidality**

*Suicidal ideation and attempt*

Life time suicidal ideation and attempt were measured by Youth Risk Behavior Survey Suicide Screening (Brener et al., 2002; Kolbe, Kann, & Collins, 1993). These 10 items are taken from the Youth Risk Behavior Survey, a longstanding measure used by the Centers for Disease Control to track health behaviors among American adolescents. These items have been shown to demonstrate good reliability and good convergent and discriminant validity (Brener et al., 2002; May & Klonsky, 2011).
Suicide Intent

Suicide intent was assessed using an item taking from the National Comorbidity Survey (NCS). Specifically, participants were asked to describe the intent of the attempt by indicating which of the following three statements best described their attempt: “I made a serious attempt to kill myself, and it was only luck that I did not succeed.” “I tried to kill myself, but knew the method was not fool-proof.” “My attempt was a cry for help. I did not intend to die.”

Suicide Attempt Medical Severity

Suicide severity was measured by a single item taking from the Youth Risk Behavior Survey Suicide Screening (Brener et al., 2002; Kolbe, Kann, & Collins, 1993): “if you attempted suicide, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?”.

Suicide Attempt Planning

Suicide planning was assessed using a single item: “Did you plan your suicide attempt or was it an impulsive act?”.

Covariate Measures

Executive Functioning

Executive Functioning was examined using the Frontal Systems Behaviour Scale (FrSBe; Grace & Malloy, 2001). The FrSBe is a 46 item measure of three frontal systems behavioral syndromes: apathy, disinhibition, and executive dysfunction. The FrsBe have demonstrated high internal consistency and excellent convergent and discriminant validity (Grace, 2011). The
rationale for including executive functioning in this study is to delineate whether differences in decision-making styles may explain additional variance in suicidal behaviors above and beyond differences in general cognitive functioning.

**Impulsivity**

Impulsivity was assessed using the UPPS-SF Impulsive Behaviour Scale (Whiteside & Lynam, 2001). The UPPS-SF is a shortened 16-item version of the factor-analytically derived UPPS 45-item self-report scale (UPPS; Whiteside & Lynam, 2001). The UPPS-SF retains the four-factor structure of the UPPS, measuring the following four facets of impulsivity: (1) Urgency: behaviours exhibited in the presence of negative affect, (2) Perseverance (lack of): the ability to persist in completing a task, (3) Premeditation (lack of): the ability to plan ahead and consider the potential consequences of various behaviours, and (4) Sensation seeking: the tendency to seek excitement, stimulation, and adventure. The UPPS has been shown to have good internal consistency reliability (Cyders, 2011), and has been validated for use in both non-clinical and clinical samples (Cyders et al., 2007). The UPPS-SF was included in this study to determine whether differences in decision-making styles may explain additional variance in suicidal behaviors above and beyond differences in impulsivity.

**Depression**

Depression was measured using the Depression and Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995). The DASS is a 42-item self-report instrument designed to measure the three related negative emotional states of depression, anxiety and tension/stress, showing good reliability and validity compared with SCID diagnoses of anxiety and mood
disorders (Dahm, Wong, & Ponsford, 2013). Depression was included as a control variable to investigate whether the differences in decision making styles observed in suicidal vs. non-suicidal individuals may be attributable to general distress or general psychopathological disturbances.

**Borderline Personality Traits**

Borderline personality traits were measured using the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2013), a 10-item self-report measure of the DSM-IV BPD criteria. The MSI-BPD exhibited sensitivity and specificity above .90 in young adults when compared to a validated structured interview (Zanarini et al. 2003). To avoid confounding the relationship of BPD and suicide ideation/attempts, the item “Have you deliberately hurt yourself physically (e.g., punched yourself, cut yourself, burned yourself)? Or, how about made a suicide attempt?” was excluded from the total BPD score. Borderline personality trait was included as a control variable in this study.

**Measures of Other Clinical Variables**

**Psychological Pain**

Psychological pain was measured using 3 items taking from the Psychache Scale (Holden, Mehta, Cunningham, & McLeod, 2001). The original 13-item measure is widely used to assess psychological pain, with strong reliability and validity (Holden et al., 2001). Psychological pain may be an important moderator of the relationship between intuitive decision making and suicide.
Hopelessness

Hopelessness was assessed using the Beck Hopelessness Scale - Short Form (BHS; Beck, Weissman, Lester, & Trexler, 1974). This 4 item measure is a shortened version of the 20 item BHS designed to measure feelings of hopelessness. The BHS has demonstrated sound reliability and validity (Beck, Brown, & Steer, 1989; Beck, Steer, & Carbin, 1988). Hopelessness was investigated in this study as a potential moderator of relationships between decision making styles and suicide.

Belongingness

Belonging was measured using the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner, 2012), a 15-item INQ is a validated measure for levels of belongingness and perceived burdensomeness. The INQ has been shown to have good internal consistency reliability and convergent validity (Gutierrez et al., 2016). Belongingness is hypothesized to moderate the link between dependent decision making and suicide.
Chapter Three: Results

Results are examined across lifetime nonsuicidal, ideators, and attempters. Lifetime groups were created according to reported (1) lifetime history of suicide attempt (attempters), (2) history of suicidal ideation but no history of attempts (ideators) and (3) no history of either ideation or attempts (nonsuicidal). t-tests were used to compare nonsuicidal individuals to ideators, and ideators to attempters.

Demographics

Demographic information for lifetime non-suicidal, ideators and attempters is presented in Table 2. There was no significant age difference across these groups, as indicated by ANOVA, $F(600) = 1.12, p = .26$. Due to the low endorsement rate, demographic categories were merged for inferential analyses. Specifically, sex (male vs. female), race/ethnicity (European/Caucasian vs. Non-European/Caucasian), sexual orientation (heterosexual vs. non-heterosexual), marital status (married vs. single), and yearly household income (below $39,999, above $40,000) were transformed into dichotomous categories. Highest level of education was turned into a three-category variable (no college/university degree, college/university degree, postgraduate degree). Chi-square tests found significant differences in sex, $\chi^2(2) = 7.36, p = .03$, sexual orientation, $\chi^2(2) = 23.28, p < .001$, highest level of education, $\chi^2(4) = 19.43, p = .001$, and yearly household income, $\chi^2(2) = 7.52, p = .02$. No differences in Race/Ethnicity, $\chi^2(2) = 1.31, p = .52$, and marital status, $\chi^2(2) = 3.78, p = .15$, were observed between the three groups.

The attempter group had a greater proportion of female participants (56.9%) than ideators (49.7%) and nonsuicidal controls (43.3%), but much lesser proportion of heterosexual participants (67.5%) than ideators (78.6%) and nonsuicidal controls (87.5%). The attempters
tended also to fall into the lower income category (i.e. below $39,999; 59.7%) compared to ideators (47.8%) and nonsuicidal controls (47.6%). In terms of education level, the attempters tended to fall into lower educational categories, with 52.9% without a college/university degree and 37.2% with college/university degree, compared to ideators (37.8% and 44.8%, respectively) and attempters (34.1% and 44.2% respectively).

**Traditional Correlates**

Several traditionally cited risk factors for suicidal ideation and attempt were included in the analyses, as they may potentially influence the relationships between decision making styles and suicide. These factors include: depression, anxiety, hopelessness, belongingness, burdensomeness, borderline personality traits, psychological pain, executive functioning, and impulsivity (premeditation, perseverance, urgency, sensation seeking). These variables were examined here as correlates, and in later analyses as covariates.

**Non-Suicidal vs. Ideators**

As outlined in Table 3, non-suicidal individuals and suicidal ideators significantly differed on almost all the traditional predictors, with moderate to strong effect sizes. These include borderline personality traits ($d = .98$), depression ($d = .83$), burdensomeness ($d = .83$), hopelessness ($d = .76$), anxiety ($d = .72$), psychological pain ($d = .66$), executive functioning ($d = .55$), belongingness ($d = .47$), impulsivity (urgency) ($d = .40$), and impulsivity (perseverance) ($d = .36$). $t$-tests further indicated that all the observed differences were highly significant ($p < .001$).
Ideators vs. Attempters

As outlined in Table 3, when ideators were compared with attempters, the differences in traditional predictors were small, with most effect sizes ranging from small to negligible. The few exceptions included borderline personality traits ($d = .35, p < .01$) and impulsivity, specifically the premeditation subscale ($d = .38, p < .001$), the urgency subscale ($d = .31, p < .01$), and the sensation seeking subcale ($d = .24, p < .05$) of impulsivity. T-tests also indicated that burdensomeness ($d = .29, p < .01$), executive functioning ($d = .23, p < .05$), and anxiety ($d = .16, p < .05$) were slightly higher in attempters compared to ideators.

Decision Making Styles

Table 4 summarizes the effect size differences in five decision making styles (1) between nonsuicidal individuals vs. lifetime ideators, and between (2) lifetime ideators vs. attempters. Next, for each of the two comparisons, all the five decision making styles were entered into logistic regressions to examine the unique contributions of each of the decision making styles over and above each other. These results are presented in Table 5. Finally, decision making styles that were shown to substantially discriminate ideators from nonsuicidal individuals or attempters from ideators entered into separate logistic regressions to examine their unique contributions over and above traditional predictors. Results coming from these analyses can be found in Table 6 – 8.

Nonsuicidal vs. Ideators

As indicated in Table 4, between non-suicidal individuals and suicidal ideators, there were some differences in decision making styles, although the effect sizes for these differences
were relatively small \((d \text{ range} = .08 – .27)\). The two decision making styles that most strongly distinguished non-suicidal individuals from suicidal ideators were avoidant decision making style \((d = .27, p < .01)\) and dependent decision making style \((d = .25, p < .05)\), with individuals with higher avoidant and/or dependent decision making tendencies more likely to be ideators than non-suicidal. Individuals with spontaneous \((d = .19, p = .05)\) and intuitive \((d = .13, p = .18)\) decision making styles were also slightly more likely to report suicidal ideation. However only the difference in spontaneous style reached statistical significance. There is no evidence for a difference in rational decision making style between non-suicidal individuals and ideators \((d = .08, p = .41)\).

As presented in Table 5, when all the five decision making styles were simultaneously entered into a binary logistic regression, they together explained 3% of the variance in nonsuicidal vs. ideator status. However, none of the five decision making styles accounted for unique variance in differentiating ideators from non-suicidal individuals. In addition, as shown in Table 6 – 8, none of the decision-making styles accounted for significance variance in nonsuicidal vs. ideator status over and above traditional predictors including depression, anxiety, hopelessness, belongingness, burdensomeness, borderline personality traits, psychological pain, executive functioning, and two impulsivity subscales (perseverance and urgency).

**Ideators vs. Attempters**

As indicated in Table 4, suicidal ideators and attempters exhibited several differences in decision making styles, with moderate to negligible effect sizes. The two decision making styles that most strongly distinguished suicidal ideators from attempters were rational decision making style \((d = -.41, p < .001)\) and avoidant decision making style \((d = .30, p < .01)\); specifically,
individuals with lower rational decision making tendency and/or higher avoidant decision making tendency more likely to be attempters than ideators. Individuals with higher spontaneous decision making tendency ($d = .17, p = .10$) and/or lower dependent decision making tendency ($d = -.15, p = .13$) were slightly more likely to be attempters than ideators, however neither of the differences were statistically significant. There is no evidence for a difference in intuitive decision making style between ideators and attempters ($d = .09, p = .35$).

As presented in Table 5, when all the five decision making styles were entered into a binary logistic regression at the same time, they together explained 8% of the variance in attempter vs. ideator group status. Three decision making styles accounted for unique variance in differentiating suicidal ideators from attempters above and beyond other decision making styles: avoidant (Odds Ratio $= 1.11$, 95% CI [1.01 – 1.22]), dependent (Odds Ratio $= .93$, 95% CI [.87 – .99]), and rational (Odds Ratio $= .91$, 95% CI [.84 – .99]).

Finally, the contributions of these three decision making styles – avoidant, dependent, and rational decision making styles – were examined over and above traditional predictors shown to distinguish ideators from attempters at .01 significance level, including burdensomeness, borderline personality traits, sex, and two impulsivity subscales (premeditation and urgency). As shown in Table 8, dependent decision making style ($\Delta R^2 = 1.8\%, p < .01$) accounted for statistically significant variance above and beyond common predictors. As presented in Table 7, rational decision making style also accounted for statistically significant variance above and beyond common predictors ($\Delta R^2 = 1.0\%, p < .05$), although the additional variance explained was small. As indicated in Table 6, avoidant decision making style was not shown to explain unique variance above and beyond common predictors.
**Attempter Subgroups**

To examine the hypothesis that different decision making styles may characterize different types of attempts, attempters were further divided into attempters with high vs. low medical severity. T-tests failed to show statistically significant differences in any of the five decision making styles.

Due to an administrative error, the responses to the item examining suicide planning were not valid. As a result this thesis was unable to examine different attempter subgroups based on level of planning.

**Moderation Analysis**

This study also examined several potential moderators of the relationships between decision making styles and suicide, including depression, psychological pain, hopelessness and belongingness. Specifically, interaction terms of decision making styles and each of these variables were entered into logistic regressions. Contrary to our hypotheses, no moderation effect was found in this study.
Chapter Four: Discussion

This study examined the relationship of self-reported decision making styles to histories of suicidal ideation and suicide attempts using a large online sample. Decision making was chosen because it has been shown to mediate thought-behaviour relationships, and thus may potentially distinguish those who act on suicidal thoughts from those who do not. While previous studies have focused on impairments or deficits in decision making, to our knowledge this is the first study to examine whether decision making styles may be related to the transition from suicidal ideation to suicide attempts.

Results suggest there are differences in decision making styles both between non-suicidal individuals and ideators and between ideators and attempters. However, when common predictors of suicidality were taken into consideration, decision making styles distinguished attempters vs. ideators, while no differences in decision making styles were observed between ideators vs. non-suicidal controls. This pattern suggests that differences in self-reported decision making styles may be uniquely associated with a lifetime history of suicidal attempts, above and beyond lifetime suicidal ideation.

Regarding specific decision making styles, rational decision making style helped to differentiate attempters from ideators as well as or better than any of the other predictors. Specifically, individuals higher on self-reported rational decision making were less likely to act on their suicidal thoughts. This difference in rational decision making between ideators and attempters was moderate ($d = .41$), and remained robust even when controlling for other decision making styles and commonly cited risk factors for suicide attempts, including burdensomeness, borderline personality traits, sex, and impulsivity. In addition, unlike rational decision making style, a measure of executive functioning did not distinguish attempters from ideators. Taken
together, findings suggest that the rational decision making style has a potentially unique and specific relationship to suicide attempts.

It is unclear why decision making style may have this unique relationship to suicide attempt. One possibility may be that individuals who experience suicidal thoughts but tend to make decisions by systematically and thoroughly searching for alternatives and logically evaluating their respective pros and cons may be less likely to foreclose their decision making processes and settle on suicide as their optimal choice. These results are not inconsistent with the broader literature on decision making and suicide, which has documented a greater susceptibility to affect- and/or heuristic-based decision making in suicide attempters compared to suicidal ideators (Szanto et al., 2015; Dombrovski et al., 2011). These results also fit with the suicide treatment literature supporting the utility of problem-solving therapy (Hatcher et al., 2011) and cognitive-behavioural treatments (e.g. Cognitive Behavioural Therapy, Dialectical Behavioural Therapy) in reducing suicidality, as these treatments include elements that may enhance rational decision making, such as cognitive restructuring (e.g. Brown et al., 2005), problem solving skills training (Priebe et al., 2012), and contingency building (Linehan et al., 2006; for reviews, see: Tarrier, Taylor & Gooding, 2008; Hawton et al., 2016).

In addition to rational decision making style, dependent decision making style was also shown to discriminate attempters from ideators. Specifically, individuals with higher dependent decision making tendencies were less likely to be suicide attempters vs. ideators. However, while this relationship remained statistically significant when controlling for other decision making styles and other risk factors for suicide, the size of the difference in dependent decision making style between ideators and attempters was small ($d = .15$). This finding may suggest that a tendency to reach out to others is protective against progression from suicide ideation to
attempts, perhaps because reaching out to others is itself protective, or perhaps because people with this decision making style are more likely to maintain close relationships, which is protective. These explanations fit well with the wider literature showing that belongingness and connectedness can protect against suicide (Joiner, 2005; Klonsky & May, 2015) and be helpful in the treatment of suicide risk (Whitlock et al., 2014; CDC, 2017).

A third decision making style – avoidant decision making style – was also shown to help discriminating suicidal ideators from attempters: individuals higher on this decision making styles were more likely to be attempters rather than ideators. The effect size for this difference was relatively moderate ($d = .30$); however, when other common risk factors for suicide attempters were controlled for, the association between avoidant decision making style and suicide attempt ceased to be statistically significant. Thus, the link between avoidant decision making and suicide attempts might be fully accounted for by shared overlap with other clinical characteristics.

The overall pattern of results highlights the need to move beyond an ‘impairment’ model of decision making in suicide. For example, some prior studies suggest that impairments in decision making and related domains (e.g., executive functioning) can facilitate progression from suicidal thoughts to behaviour (Saffer & Klonsky, in press). While this work is undoubtedly useful, findings from the current study suggest that style may matter as much as impairment. Specifically, the dependent decision making style is generally considered a less optimal style (Parker, De Bruin, & Fischhoff, 2007), yet was found in the current study to protect against suicide attempts among ideators. At the same time, the largest protective effect was found for the rational decision making style, which his regarded as an adaptive style (Evans, Over & Manktelow, 1993).
Two decision making styles – spontaneous and intuitive decision making styles – were not shown to be different in suicide attempters compared to ideators. This poses an interesting contrast with dependent and avoidant decision making styles. Spontaneous, intuitive, dependent, and avoidant decision making styles all differ from rational decision making style in that they draw on less cognitively demanding processes of decision making, rather than rigorously searching and comparing different alternatives (Scott & Bruce, 1995). However, they exhibited different relationships to suicide attempts among ideators. This pattern suggests that decision making is a multi-faceted construct, and that different facets may have different relevance for the progression from suicide ideation to attempts. Thus, it is important for future research on suicide risk to consider and assess nuances in decision making tendencies, as oppose to global decision making competency or impairment.

This paper has also examined several potential moderators. It was hypothesized that individuals with more affect-based decision making styles may be particularly prone to acting upon their suicidal thoughts in the presence of strong negative emotion. Consequently, we hypothesized that decision making styles such as intuitive and/or spontaneous decision making styles may most strongly distinguish attempters from ideators among those experiencing high levels of negative emotion (as indexed by measures of depression, psychological pain, and hopelessness). This hypothesis, however, was not supported – the abilities of both intuitive and spontaneous decision making styles in distinguishing ideators vs. attempters were not moderated by depression, psychological pain, or hopelessness. Another possibility examined in this paper was that the relationship between dependent decision making and suicide attempt might be moderated by social support, such that dependent decision making would be most protective among those with more social connections (as indexed by belongingness). Again, data
from this study did not provide support for this hypothesis – no moderation effect of social connectedness, indexed by belongingness, was found.
Chapter Five: Conclusion

Implications

Findings from this study have important clinical implications. A central aim of suicide risk assessment is to identify who among those thinking about suicide is most likely to act on their thoughts. Current suicide risk assessment protocols largely focus on assessing variables such as depression, anxiety, and emotional dysregulation, variables that has been shown by increasing body of research to be more predictive of suicidal thoughts than suicidal acts (Kessler, Borges, & Walters, 1999; Klonsky & May, 2016; Nock et al., 2013; Nock, Borges, & Ono, 2012). Indeed, these results were replicated in the current study, which similarly reported that these common predictors distinguished ideators from non-suicidal individuals, but could not meaningfully distinguish attempters from ideators. In contrast, our findings suggest that a rational decision making style, and possibly also dependent and avoidant decision making styles – help differentiate suicide attempters from ideators. Risk assessment of ideators might therefore benefit from moving beyond questions about commonly cited risk factors such as depression and hopelessness, and target domains likely to be relevant to the progression from ideation to attempts, such as decision making style.

Findings also inform suicide theory in at least two ways. First, contemporary theories of suicide recognize that a) the development of suicidal ideation and b) the progression from ideation to attempts are separate processes with separate explanations and predictors; however, the field lacks knowledge about the explanations and predictors for the latter (Klonsky & May, 2014; Klonsky et al., 2016; but see Klonsky et al., 2017). Thus, our findings contribute new knowledge to help further clarify factors that facilitate or impede progression from ideation to attempts. Second, while many theories and models of suicide embrace a deficit account, our
findings suggest that other kinds of factors can also be important in understanding and characterizing suicide risk, and that variation in normal and adaptive characteristics can also be relevant to the attempter-ideator distinction

**Limitations & Future Directions**

There are several limitations to this study. First, this study examined the relationships between decision making styles and a history of lifetime suicide ideation and attempt. As such, the focus was on retrospective relationships; analyses did not address the more recent or concurrent relationships between decision making styles and suicidality. Future studies may consider extending the results of this study by examining if similar patterns also hold for decision making styles and recent histories of suicide ideation and attempts.

Second, this study utilized a cross-sectional design. As such, it was not able to tease apart the temporal relationships or causal directions between the measured variables of interest and the onset of suicidal ideation and attempts. Consequently, this study cannot determine whether the observed differences in decision making styles among suicidal attempters, ideators, and non-suicidal controls constituted predisposing factors for suicidal ideation and attempts, or the consequences of having engaged in suicidal thoughts and behaviours, or both. Prospective longitudinal research is needed to elucidate whether individual differences in decision making styles may predict future suicidal ideation and attempts.

Third, all study variables were assessed by self-report questionnaire. While we used measures with good psychometric properties, self-report methods can be susceptible to social desirability bias and other self-presentation and memory biases. Furthermore, the use of self-reported decision making styles also limits the comparisons that can be drawn between this study
and the wider literature, which primarily utilizes behavioral measures to assess decision making in relation to suicide. Future studies will benefit from a multi-method approach that includes both self-report and behavioral measures of decision making to more comprehensively assess the relationships of decision making to suicidal ideation vs. suicide attempts.

Finally, this study is of exploratory nature. As such, several potential moderators (e.g. social connectedness) were not directly measured and tested. In addition, time frame may be a critical issue. The main relationships examined in this study were stable decision making tendencies and lifetime suicidal thoughts and behaviours. However, the moderators examined in this paper focused on current psychological states, and thus may not correspond to participants’ psychological states at the time of suicidal ideation and/or attempt. This mismatch in time frames may be an important potential explanation for the lack of moderation effect in this study, especially if decision-making styles can change in conjunction with distressing emotions, thoughts, and experiences that contribute to instances of suicidal ideation and attempts. Future studies using longitudinal and daily diary methodologies can address the temporal course of decision-making style in relation to the temporal course of suicide ideation, attempts, and related psychosocial variables.
Table 1. Demographic Information for All Participants ($n = 600$)

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**Highest Level of Education**

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</tr>
<tr>
<td>Master’s degree</td>
<td>78</td>
<td>13.0</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>21</td>
<td>3.5</td>
</tr>
</tbody>
</table>

**Yearly Household Income**

<table>
<thead>
<tr>
<th>Income</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>34</td>
<td>5.7</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>29</td>
<td>4.8</td>
</tr>
<tr>
<td>$10,000 - $19,999</td>
<td>76</td>
<td>12.7</td>
</tr>
<tr>
<td>$20,000 - $29,999</td>
<td>88</td>
<td>14.7</td>
</tr>
<tr>
<td>$30,000 - $39,999</td>
<td>82</td>
<td>13.7</td>
</tr>
<tr>
<td>$40,000 - $49,999</td>
<td>63</td>
<td>10.5</td>
</tr>
<tr>
<td>$50,000 - $59,999</td>
<td>47</td>
<td>7.8</td>
</tr>
<tr>
<td>$60,000 - $74,999</td>
<td>61</td>
<td>10.2</td>
</tr>
<tr>
<td>More than $75,000</td>
<td>102</td>
<td>17.0</td>
</tr>
<tr>
<td>Do not wish to answer</td>
<td>18</td>
<td>3.0</td>
</tr>
</tbody>
</table>
Table 2. Demographic Information for Lifetime Nonsuicidal Controls, Ideators, and Attempters ($n = 600$)

<table>
<thead>
<tr>
<th></th>
<th>Nonsuicidal ($n = 208$)</th>
<th>Ideators ($n = 201$)</th>
<th>Attempter ($n = 191$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Age</td>
<td>36.0</td>
<td>12.4</td>
<td>32.7</td>
</tr>
<tr>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>118</td>
<td>46.7</td>
<td>100</td>
</tr>
<tr>
<td>Female</td>
<td>90</td>
<td>43.3</td>
<td>99</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>.0</td>
<td>2</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African</td>
<td>10</td>
<td>4.8</td>
<td>10</td>
</tr>
<tr>
<td>East-Asian</td>
<td>12</td>
<td>5.8</td>
<td>10</td>
</tr>
<tr>
<td>European/Caucasian</td>
<td>141</td>
<td>67.8</td>
<td>146</td>
</tr>
<tr>
<td>Indian/South Asian</td>
<td>20</td>
<td>9.6</td>
<td>13</td>
</tr>
<tr>
<td>Latin-American/Hispanic</td>
<td>14</td>
<td>6.7</td>
<td>11</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>2</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Native American</td>
<td>2</td>
<td>1.0</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>3.4</td>
<td>6</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bisexual</td>
<td>17</td>
<td>8.2</td>
<td>24</td>
</tr>
<tr>
<td>Homosexual</td>
<td>5</td>
<td>2.4</td>
<td>10</td>
</tr>
<tr>
<td>Questioning</td>
<td>1</td>
<td>.5</td>
<td>3</td>
</tr>
<tr>
<td>Heterosexual</td>
<td>182</td>
<td>87.5</td>
<td>158</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1.4</td>
<td>6</td>
</tr>
</tbody>
</table>
### Marital Status

<table>
<thead>
<tr>
<th>Status</th>
<th>107</th>
<th>51.4</th>
<th>116</th>
<th>57.7</th>
<th>111</th>
<th>57.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>107</td>
<td>51.4</td>
<td>116</td>
<td>57.7</td>
<td>111</td>
<td>57.7</td>
</tr>
<tr>
<td>Married/Common-law</td>
<td>84</td>
<td>40.4</td>
<td>65</td>
<td>32.3</td>
<td>60</td>
<td>32.3</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>11</td>
<td>5.3</td>
<td>17</td>
<td>8.5</td>
<td>15</td>
<td>8.5</td>
</tr>
<tr>
<td>Widowed</td>
<td>3</td>
<td>1.4</td>
<td>1</td>
<td>.5</td>
<td>0</td>
<td>.0</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>1.4</td>
<td>2</td>
<td>1.0</td>
<td>5</td>
<td>1.0</td>
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</tbody>
</table>

### Highest Level of Education

<table>
<thead>
<tr>
<th>Level</th>
<th>3</th>
<th>1.4</th>
<th>1</th>
<th>5</th>
<th>0</th>
<th>2.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some high school</td>
<td>3</td>
<td>1.4</td>
<td>1</td>
<td>.5</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>High school graduate/GED</td>
<td>16</td>
<td>7.7</td>
<td>16</td>
<td>8.0</td>
<td>29</td>
<td>15.2</td>
</tr>
<tr>
<td>Some college or university</td>
<td>52</td>
<td>25.0</td>
<td>59</td>
<td>29.4</td>
<td>68</td>
<td>35.6</td>
</tr>
<tr>
<td>College or university graduate</td>
<td>81</td>
<td>38.9</td>
<td>76</td>
<td>37.8</td>
<td>62</td>
<td>32.5</td>
</tr>
<tr>
<td>Some graduate or professional school after college</td>
<td>11</td>
<td>5.3</td>
<td>14</td>
<td>7.0</td>
<td>9</td>
<td>4.7</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>37</td>
<td>17.8</td>
<td>27</td>
<td>13.4</td>
<td>14</td>
<td>7.3</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>8</td>
<td>3.8</td>
<td>8</td>
<td>4.0</td>
<td>5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

### Yearly Household Income

<table>
<thead>
<tr>
<th>Income Range</th>
<th>15</th>
<th>7.2</th>
<th>6</th>
<th>3.0</th>
<th>13</th>
<th>6.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>15</td>
<td>7.2</td>
<td>6</td>
<td>3.0</td>
<td>13</td>
<td>6.8</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>10</td>
<td>4.8</td>
<td>8</td>
<td>4.0</td>
<td>11</td>
<td>5.8</td>
</tr>
<tr>
<td>$10,000 - $19,999</td>
<td>18</td>
<td>8.7</td>
<td>25</td>
<td>12.4</td>
<td>33</td>
<td>17.3</td>
</tr>
<tr>
<td>$20,000 - $29,999</td>
<td>24</td>
<td>11.5</td>
<td>30</td>
<td>14.9</td>
<td>34</td>
<td>17.8</td>
</tr>
<tr>
<td>$30,000 - $39,999</td>
<td>32</td>
<td>15.4</td>
<td>27</td>
<td>13.4</td>
<td>23</td>
<td>12.0</td>
</tr>
<tr>
<td>$40,000 - $49,999</td>
<td>18</td>
<td>8.7</td>
<td>23</td>
<td>11.4</td>
<td>22</td>
<td>11.5</td>
</tr>
<tr>
<td>$50,000 - $59,999</td>
<td>15</td>
<td>7.2</td>
<td>21</td>
<td>10.4</td>
<td>11</td>
<td>5.8</td>
</tr>
<tr>
<td>$60,000 - $74,999</td>
<td>25</td>
<td>12.0</td>
<td>18</td>
<td>9.0</td>
<td>18</td>
<td>9.4</td>
</tr>
<tr>
<td>More than $75,000</td>
<td>46</td>
<td>22.1</td>
<td>36</td>
<td>17.9</td>
<td>20</td>
<td>10.5</td>
</tr>
<tr>
<td>Do not wish to answer</td>
<td>5</td>
<td>2.4</td>
<td>7</td>
<td>3.5</td>
<td>6</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Table 3. The abilities of common predictors in distinguishing non-suicidal vs. ideators and ideators vs. attempters (in Cohen’s d).

<table>
<thead>
<tr>
<th></th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>.83***</td>
<td>.23</td>
</tr>
<tr>
<td>Anxiety</td>
<td>.72***</td>
<td>.16*</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>.76***</td>
<td>-.01</td>
</tr>
<tr>
<td>Belongingness</td>
<td>.47***</td>
<td>-.15</td>
</tr>
<tr>
<td>Burdensomeness</td>
<td>.83***</td>
<td>.29**</td>
</tr>
<tr>
<td>Psychological Pain</td>
<td>.66***</td>
<td>.19</td>
</tr>
<tr>
<td>Borderline Personality Traits</td>
<td>.98***</td>
<td>.35**</td>
</tr>
<tr>
<td>EF</td>
<td>.55***</td>
<td>.23*</td>
</tr>
<tr>
<td>Impulsivity (Premeditation)</td>
<td>-.08</td>
<td>-.38***</td>
</tr>
<tr>
<td>Impulsivity (Perseverance)</td>
<td>-.36***</td>
<td>-.11</td>
</tr>
<tr>
<td>Impulsivity (Urgency)</td>
<td>-.40***</td>
<td>-.31**</td>
</tr>
<tr>
<td>Impulsivity (Sensation Seeking)</td>
<td>.02</td>
<td>-.24*</td>
</tr>
</tbody>
</table>

*Note. Statistical significance was assessed using t-tests, *** $p < .001$, ** $p < .01$, * $p < .05$. 
Table 4. Effect size differences in decision making styles between nonsuicidal vs. ideators and between ideators vs. attempters (in Cohen’s d).

<table>
<thead>
<tr>
<th></th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidant</td>
<td>.27**</td>
<td>.30**</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>.19</td>
<td>.17</td>
</tr>
<tr>
<td>Intuitive</td>
<td>.13</td>
<td>.09</td>
</tr>
<tr>
<td>Dependent</td>
<td>.25*</td>
<td>-.15</td>
</tr>
<tr>
<td>Rational</td>
<td>-.08</td>
<td>-.41***</td>
</tr>
</tbody>
</table>

*Note.* Statistical significance was assessed using t-tests, ***$p < .001$, **$p < .01$, *$p < .05$.}
Table 5. Logistic regression indicating the unique ability of each decision making styles in distinguishing nonsuicidal vs. ideators and ideators vs. attempters (in Odds Ratio).

<table>
<thead>
<tr>
<th></th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidant</td>
<td>1.04</td>
<td>1.11*</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>1.02</td>
<td>1.02</td>
</tr>
<tr>
<td>Intuitive</td>
<td>.99</td>
<td>.97</td>
</tr>
<tr>
<td>Dependent</td>
<td>1.06</td>
<td>.93*</td>
</tr>
<tr>
<td>Rational</td>
<td>.95</td>
<td>.91*</td>
</tr>
</tbody>
</table>

*Note. * $p < .05$. 
Table 6. Logistic regression comparing the ability of avoidant style in distinguishing non-suicidal vs. ideators and ideators vs. attempters above and beyond common predictors.

<table>
<thead>
<tr>
<th></th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Predictors</td>
<td>$R^2 = .239$</td>
<td>$R^2 = .068$</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidant</td>
<td>$R^2 = .241$</td>
<td>$R^2 = .068$</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>$.002$</td>
<td>$.000$</td>
</tr>
</tbody>
</table>

*Note.* Common predictors for nonsuicidal vs ideators: Depression, Anxiety, Hopelessness, Belongingness, Burdensomeness, borderline personality traits, Psychological Pain, EF, Impulsivity (Perseverance), Impulsivity (Urgency); Common predictors for ideators vs. attempters: burdensomeness, borderline personality traits, sex, impulsivity (premeditation), impulsivity (urgency). Statistical significance level at .01.
Table 7. Logistic regression comparing the ability of rational style in distinguishing non-suicidal vs. ideators and ideators vs. attempters above and beyond common predictors.

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Predictors</td>
<td>$R^2 = .239$</td>
<td>$R^2 = .068$</td>
</tr>
<tr>
<td>Rational</td>
<td>$R^2 = .241$</td>
<td>$R^2 = .078$</td>
</tr>
<tr>
<td>$\Delta R^2 = .002$</td>
<td>$\Delta R^2 = .010$</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Common predictors for nonsuicidal vs ideators: Depression, Anxiety, Hopelessness, Belongingness, Burdensomeness, borderline personality traits, Psychological Pain, EF, Impulsivity (Perseverance), Impulsivity (Urgency); Common predictors for ideators vs. attempters: burdensomeness, borderline personality traits, sex, impulsivity (Premeditation), impulsivity (Urgency). * $p < .05$. 


Table 8. Logistic regression comparing the ability of dependent style in distinguishing non-suicidal vs. ideators and ideators vs. attempters above and beyond common predictors.

<table>
<thead>
<tr>
<th></th>
<th>Non-Suicidal vs. Ideators</th>
<th>Ideators vs. Attempters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Predictors</td>
<td>$R^2 = .239$</td>
<td>$R^2 = .068$</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent</td>
<td>$R^2 = .239$</td>
<td>$R^2 = .086$</td>
</tr>
<tr>
<td></td>
<td>$\Delta R^2 = .000$</td>
<td>$\Delta R^2 = .018$</td>
</tr>
</tbody>
</table>

*Note.* Common predictors for Non-suicidal vs ideators: Depression, Anxiety, Hopelessness, Belongingness, Burdensomeness, borderline personality traits, Psychological Pain, EF, Impulsivity (Perseverance), Impulsivity (Urgency); Common predictors for ideators vs. attempters: burdensomeness, borderline personality traits, sex, impulsivity (premeditation), impulsivity (urgency). * $p < .01$. 


References


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http://doi.org/10.1080/13607860600640905


http://doi.org/10.1037/h0087144

http://doi.org/10.1093/oxfordhb/9780199734689.001.0001


to suicide ideation and attempts: Findings from a large US-based online sample. *Archives of Suicide Research*.


Appendix

Demographics

Gender: ______________________________

Date of Birth (YYYY/MM/DD): ________________________

Were you born in the United States?  ☐ Yes  ☐ No

If no, where were you born: _______________________________________________

when did you move to the USA: ______________________________

Race/Ethnicity:  ☐ African/African Descent
☐ East Asian/East Asian Descent
☐ European/European Descent (Caucasian)
☐ Indian-South Asian/Indian-South Asian Descent
☐ Latin American-Hispanic/Latin American-Hispanic Descent
☐ Middle Eastern/Middle Eastern Descent
☐ Native American
☐ Other: ______________________________

Sexual Orientation:  ☐ Bisexual
☐ Gay
☐ Lesbian
☐ Questioning
☐ Straight
☐ Other: ______________________________

Current Marital Status:  ☐ Single
☐ Married/Common-law
☐ Divorced/Separated
☐ Widowed
☐ Other: ______________________________

Highest Level of Education  ☐ 8th grade or less
☐ Some high school
☐ High school graduate/GED
☐ Some college or university
☐ College or university graduate
☐ Some graduate or professional school after college
☐ Masters degree
☐ Doctoral degree

Yearly household income (before taxes):  ☐ less than $5,000
Occupation:____________________________________________________________

Are you currently working outside the home?  ☺ Yes  ☘ No

If yes, how many hours per week do you work:  ☺ 1-9 hours
    ☘ 10-19 hours
    ☘ 20-29 hours
    ☘ 30-39 hours
    ☘ 40-49 hours
    ☘ 50-59 hours
    ☘ 60-70 hours
    ☘ more than 70 hours

How many people (including you) live in your immediate household? _______________