2020

Clinical and Neuropsychological Differences in Low and High Worst-point Suicide Ideators

Nahal Destiny Heydari

CLINICAL AND NEUROPSYCHOLOGICAL DIFFERENCES IN HIGH AND LOW WORST-POINT SUICIDE IDEATORS

A thesis submitted in partial fulfillment
of the requirements for the degree of

MASTER OF ARTS

to the faculty of the

DEPARTMENT OF PSYCHOLOGY

of

ST. JOHN'S COLLEGE OF LIBERAL ARTS AND SCIENCES

at

ST JOHN'S UNIVERSITY

New York

by

Nahal Heydari

Date Submitted _____ Date Approved _____

_____ _____

Nahal Heydari Dr. Allison Jaeger

ABSTRACT

CLINICAL AND NEUROPSYCHOLOGICAL DIFFERENCES IN HIGH AND LOW WORST-POINT SUICIDE IDEATORS

Nahal Heydari

Suicide is a major public health concern that is complicated by the multidimensional nature of suicidal behaviors. Uncovering markers of vulnerability to acting on suicidal thoughts can aid in creating prevention interventions. Previous studies have found that serious and significant suicidal ideation in the past may be a predictor of later risk for suicide attempt. This paper examined worst-point suicide ideation (lifetime) in depressed patients who have never made an attempt. Depressed patients were divided on the basis of worst-point ideation to determine if these groups differed on a variety of clinical measures and neurocognitive tasks known to be associated with suicide attempt. Patients with high worst-point ideation – comparable to that in past suicide attempters – exhibited greater depression severity, as well as greater feelings of entrapment, stronger propensity to rumination, less mindful awareness, and poorer social problem-solving skills. They performed significantly worse on tests of attention and working memory that had previously been found to be poorer in suicide attempters. These results suggest the presence of both cognitive and clinical vulnerabilities to later suicide attempt in severe suicide ideators who have yet to make an attempt and suggest possible means of identifying these high-risk individuals with greater precision.

DEDICATION

To S.H.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Suicide is the tenth leading cause of death in the United States and accounts for one million deaths each year worldwide (World Health Organization, 2018). These deaths are in addition to an even greater number of individuals who express suicidal thoughts and those who make attempts but do not die (Crosby, Gfroerer, Han, Ortega, & Parks, 2011). The prevalence of suicide and suicidal behaviors has not declined appreciably despite greater awareness of potential risk factors. Prevention efforts begin with accurate clinical assessment of people who are at risk. Many clinicians take on the challenging task of predicting and preventing suicide by relying on "clinical indicators" with little empirical basis (Belsher et al., 2019). Even with more extensive clinical information, however, efforts to predict suicide beyond the likelihood of developing thoughts of self-harm have been less than successful (Franklin et al., 2017). Given that as many as 67% of patients have contact with primary health providers prior to suicide death, and one-third of suicide victims have contact with mental health services within the year of suicide (Luoma et al., 2002), it is reasonable to assume that there is additional information that might be gathered from patients to improve prediction of the likelihood of suicidal behavior. The potential targets for these assessments, however, are unclear at present (Franklin et al., 2017; Runeson et al., 2017).

The most robust risk factor for predicting suicidal behavior is a prior history of an attempt (Forman, Berk, Henriques, Brown, & Beck, 2004). However, suicide risk assessments must also be geared towards preventing initial attempts, as approximately one half of suicidal deaths occur after the first attempt (Suokas, Suominen, Isometsä, Ostamo, & Lönnqvist, 2001). Given that suicide attempts almost always take place in the

context of suicidal thinking, an area of growing interest is the transition between such suicidal thoughts and suicidal behaviors (May & Klonsky, 2016).

Current suicide assessments rely heavily on current suicidal ideation and resolved plans when assessing acute risk, while largely overlooking a person's lifetime suicide ideation severity. Suicidal ideation (SI) is a multidimensional construct that can exist on a continuum ranging from passive thoughts of one's own death, to active thoughts of killing oneself and concrete plans (Simon, 2014). Because of the fluctuating nature of SI, a single individual can have different levels of SI depending on temporal, psychological and environmental factors. To better understand the factors that lead to severe SI and subsequent suicide attempts, the different vulnerabilities that exist within different levels of SI must be studied systematically.

"Worst-point suicidal ideation" is based on a retrospective report of that point in a patient's life when suicidal thoughts and desires were most severe. Worst-point SI has demonstrated better prediction than current SI for future suicide attempt, identifying a particularly high-risk subgroup (Beck et al., 1999; Joiner et al., 2003; Van Orden et al., 2013). The superior predictive value of worst-point SI, compared to current SI, may be because current SI is known to fluctuate, while the most severe point of SI represents a person's lifetime experiences with suicidal thoughts and a single point when it was at its worst. More severe suicidal thinking at any point in time may allow for greater habituation to the idea of actually carrying out those suicidal acts and reduce fear of suicide, part of the "acquired capability" for suicidal behavior highlighted in the Interpersonal Theory of Suicide (Joiner & Rudd, 2000).

As noted above, past suicide attempt remains the best single predictor of future suicidal behavior, and one may argue that worst-point SI may simply be a proxy for past attempt, since by definition those who have made attempts in the past will have had at least one episode of very severe past SI leading up to that attempt. However, worst-point SI appears to have predictive value beyond past behavior alone and may be particularly valuable for identifying individuals at exceptionally high risk of a first attempt.

Cognitive and Clinical Vulnerabilities of Suicide

Several clinical risk factors that increase risk for suicidal behavior include the diagnosis of a major depressive disorder (Hawton, Comabella, Haw, & Saunders, 2013), combined with greater aggression/impulsivity (Oquendo et al., 2004), hopelessness (Brown, Beck, Steer, & Grisham, 2000), and the severity and frequency of suicide ideation (Horwitz, Czyz, & King, 2015). Impaired cognitive functioning can also serve to increase risk. Patients with prior suicide attempts have exhibited deficits in decision-making, problem-solving, verbal fluency, and cognitive control (Dieserud, Røysamb, Ekeberg, & Kraft, 2001; Kielp et al., 2001; Malloy-Diniz et al., 2009; Westheide et al., 2008). This may reflect neurobiological factors involved in suicidal behavior, which have included brain areas involving the anterior cingulate gyrus, and the ventral, orbital and dorsolateral prefrontal cortex (Jollant, Lawrence, Olié, Guillaume, & Courtet, 2011; Oquendo et al., 2003). These brain areas have been related to emotional response inhibition (Goldstein et al., 2007), cognitive control (Kouneiher et al., 2009), judgments of one's current mental state (Ochsner et al., 2005), and problem solving (Van Heeringen, Bijttebier, & Godfrin, 2011).

Cognitive risk factors may be a part of inherited vulnerabilities that can be acted upon by stress and disrupt cognitive processes in both the content and information-processing capabilities of thought (Wenzel & Beck, 2008). The thoughts that typically precede a suicidal act may include a sense of hopelessness, helplessness, unlovability, and an inability to cope with distress (Rudd et al., 2001, Weishaar & Beck, 1990). Poor decision-making and problem-solving skills may thus contribute to enhancing these maladaptive cognitions (Wishaar & Beck, 1990).

Certain domains of cognitive functioning may serve as markers for suicidal risk. These also include more basic cognitive functions such as attentional control and learning/memory (Keilp et al., 2013; Richard-Devantoy et al., 2014). Impairment in these domains may increase suicidal risk by creating problematic thought patterns, limiting problem solving skills, and increasing the risk of interpersonal difficulties (Richard-Devantoy et al., 2014). However, it is unclear if worst-point SI itself is related to these cognitive risk factors. Past studies have found that many of these cognitive risk factors are not related to current SI (Keilp et al., 2013; Richard-Devantoy et al., 2014). Part of the reason for this lack of association may be that current SI does not represent how severe this ideation can become over a longer period of time.

The current study aims to determine whether patients with more severe worst-point SI and no past history of attempt differ in clinical characteristics and neuropsychological performance from those patients who have not experienced such severe SI in the past. From a sample of currently depressed patients with no past history of suicidal behavior (N=91), we identified a sub-group (high worst-point SIs) with severe past suicidal ideation that matched the levels of suicidal ideation in a group of

participants who had attempted suicide in the past. We hypothesized that these high worst-point suicide ideators would differ from other depressed individuals with no past history of suicidal behavior in a manner similar to suicide attempters, including by exhibiting greater subjective depression, impulsiveness, and aggression, as well as poorer neuropsychological performance on neurocognitive tasks of attention, memory, working memory, language fluency, and reversal learning.

Method

Participants

The study group consisted of 91 depressed patients who met DSM-V criteria for current major depressive disorder (30 males, 61 females). Participants ranged in age from 16-80, and were sampled across the entire age spectrum, as a major goal of the parent study was to assess suicidal behavior risk factors across the lifespan. All patients had current major depression determined via the Structured Interview for DSM-5 (SCID) and a minimum score of 14 on the 24-item Hamilton Depression Rating Scale (HDRS; Hamilton, 1960). Scores of 14 on the HDRS indicate the threshold into a mild to moderate level of depression. All patients were free of neurological disease, gross organic brain dysfunction, current psychosis, or current substance abuse/dependence. All participants had an estimated IQ greater than 80, determined by an average of scaled scores on the WAIS-IV Vocabulary and Matrix Reasoning subtests of greater than or equal to 6. These subtests are the best correlates of overall intelligence on the WAIS-IV and have been found to be resistant to the effects of depression when estimating premorbid ability (Gorlyn et al., 2006).

Worst-point suicide ideation was determined using the Scale for Suicide Ideation (SSI; Beck et al., 1979). Patients were asked to imagine the worst-point of suicide ideation in their lives and answer the questions based on this experience. The scale consists of 19 items rated on a 3-point scale from 0 to 2, with higher scores indicating greater severity of suicide ideation. Mean values of worst-point ideation scores in a past attempter sample (n=108) compared to the full non-attempter sample to be analyzed here are presented in Table 1. In this comparison sample of

individuals with past suicide attempt not reported here, the lowest score obtained by these past attempters was 16. This score was established as the threshold for determining high worst-point SI among the non-attempters (given that it was as bad as individuals who had made a past attempt) in the present study. Thirty-two patients had scores of 16 or above on worst-point SSI and were classified as high worst-point ideators, while 59 patients had scores below that level and were classified as low worst-point ideators.

Instruments

Clinical Assessments

Depression severity was assessed using both the Hamilton Depression Rating Scale (HDRS) and Beck Depression Inventory (BDI; Beck et al., 1961). Both depression scales were used because the HDRS is a clinician-administered scale that focuses on more "objective" and observable symptoms of depression, while the BDI is a self-report that focuses on "subjective" symptoms. The BDI has been found to be more sensitive to suicide risk (Mann et al., 1999; Grunebaum et al., 2005). The Scale for Suicide Ideation (SSI, Beck et al., 1979) measured both current and worst-point suicidal ideation, varying the time frame for questions from the last week (current) to the worst it has ever been in life (worst-point). The Personality Assessment Inventory-Borderline Scale (PAI-BOR; Morey, 2014) was used to evaluate characteristics of borderline personality disorder, including poor coping and interpersonal problems. Participants were also characterized on traits associated with suicidal behavior, including hopelessness (Beck Hopelessness Scale; Beck, Weissman, Lester, & Trexler, 1974), impulsiveness (Barratt Impulsiveness Scale; Barratt, Patton, & Stanford, 1975), and aggression (Brown-Goodwin Aggression

History; Brown, Goodwin, Ballenger, Goyer, & Major, 1979; Buss-Perry Aggression Questionnaire; Buss & Perry, 1992).

A number of other clinical/behavioral characteristics of these depressed patients were assessed and examined in exploratory fashion. These included ruminative thinking (Rumination Response Scale; Nolen-Hoeksema & Morrow, 1991), sense of feeling trapped by internal or external circumstances that are inescapable or uncontrollable (Entrapment Scale; Gilbert & Allan, 1998), mindfulness (Mindful Attention Awareness Scale; Brown & Ryan, 2003), and characteristic social problem solving strategies (Social Problem-Solving Inventory; D'Zurilla & Nezu, 1990).

Neuropsychological Assessments

The neuropsychological battery included measures of motor functioning, processing speed, attention, memory, working memory, language fluency, and reversal learning. These factors have all shown some association to either the presence of depression (motor functioning and processing speed tasks) or suicidal behavior in previous studies. All tasks used to measure these neuropsychological factors have been used in our previous studies (Keilp et al., 2001, 2005, 2013), with the exception of the Reversal Learning Task, which was developed specifically for this study based on existing paradigms.

Motor Functioning was assessed using a computerized Choice Reaction Time task (Keilp, Sackeim, & Mann, 2005), in which participants use a finger press response (two fingers and four keys) to indicate the location of a target that can occur in one of four locations on the computer screen as quickly as possible. Processing Speed was

assessed using the WAIS-IV Digit Symbol subtest (Wechsler, 2008). The task requires participants to rapidly transcribe symbols within a fixed time limit.

Attention and interference processing were assessed using a computerized Stroop task used in our previous studies (Keilp et al., 2008; Keilp et al., 2005). The Stroop was administered in three separate blocks using a finger press response keyboard. Participants were asked to rapidly identify color words (red, blue, green), strings of colored X's, and strings of incongruently colored color-names. Performance was summarized using an interference score, which is the percent change in median reaction time between the incongruently-colored color words and the colored X's. Although initially created as a task to measure inhibitory processes, this task has generally been recognized as a task of attentional cognitive control (Egner & Hirsch, 2005; MacLeod, Dodd, Sheard, Wilson, & Bibi, 2003).

Short-term memory was assessed via the Buschke Selective Reminding Test (BSRT; Buschke & Fuld, 1974). Participants were asked to remember a list of 12 items presented orally and repeat back as many of the words as possible. After the first trial, every trial consisted of selectively repeating items that were not recalled by the participant on the previous trial. The trials proceed in this manner until 12 trials are completed, or until the participant can recall all 12 words on two consecutive trials. The two scores used from this task included total immediate and delayed recall.

Working memory was measured using the computerized A, Not B Logical Reasoning Test (Baddeley, 1968). The task requires participants to quickly and accurately evaluate syllogisms based on the order of two letters "A" and "B". Language fluency was assessed with both letter fluency (e.g. "name as many words as you can that

start with the letter F") and category fluency (e.g. "name as many animals as you can") tasks (Spreen & Strauss, 1998).

Reversal learning was assessed with a novel, probabilistic reversal learning task designed for this study. Reversal learning deficits have been found in elderly suicide attempters, in the form of increased sensitivity to recent probabilistic feedback (Dombrovski et al., 2010). The purpose of the new task was to address a theoretical point raised by previous reversal learning studies. Specifically, we wanted to better understand whether the problems on concept formation tasks were due to cognitive rigidity (perseverative responding) or cognitive inconsistency (set maintenance). A two-choice task (select one of two objects on a computer screen via button press, get positive feedback if correct) with 80% correct feedback and 20% misleading feedback was developed with an extended number of reversals (5) to elicit greater errors scores. Total non-probabilistic errors were totaled across all task blocks.

Procedure

All testing took place in one session and participants were paid $100 for participation. The HDRS, SSI current, and SSI worst-point were administered by a clinician immediately prior to testing. Age, gender, and education demographic variables were collected by an examiner. Participants then filled out the self-report scales. For neuropsychological testing, tasks were administered by the examiner in the same order. Pencil-and-paper tasks were administered first, which included the MMSE, WAIS-IV Vocabulary, Letter and Category Fluency, Buschke Selective Reminding Test, Digit Symbol, and WAIS-IV Matrix Reasoning, respectively. Computer tasks

were administered next, which consisted of the Choice Reaction Time, Stroop, A not B, and Reversal Learning.

Statistical Analyses

Demographic and clinical data were compared via t-tests for continuous variables and chi-squared for categorical variables. All neuropsychological performance scores were converted to age, education, and/or sex adjusted z-scores based on performance of a healthy comparison group that was assessed as part of this study. Conversion of test scores to z-scores allowed for easy comparison of effect sizes across tests. Neuropsychological performance data were compared via t-tests.

Results

Demographics and Clinical Ratings

Demographic and clinical rating data for the low worst-point ideators and high worst-point ideators are presented in Table 2. High worst-point ideators were younger than those with low worst-point ideation, but both groups were comparable in education level and estimated intelligence. Groups were comparable in sex and ethnicity. The high worst-point group had higher scores on both measures of depression severity, the HDRS (more objective) and the BDI (subjective), and high worst-point ideators exhibited a greater degree of Borderline Personality traits. As expected, worst-point suicidal ideation differed dramatically between the groups – since they were defined in this manner – but current suicidal ideation differed robustly as well. Hopelessness was greater in worst-point-ideators. Impulsiveness and aggression, however, did not differ between the groups – and these traits typically differentiate suicide attempters from non-attempters.

Supplemental clinical/behavioral characteristics assessed in this study differentiated worst-point ideators in that they exhibited stronger feelings of entrapment, a greater tendency toward rumination, lower mindful attention awareness, and poorer social problem-solving capabilities.

Neuropsychological Test Performance

Neuropsychological test performance is presented in Table 3. Motor functioning and processing speed did not differ between groups, despite greater depression severity in worst-point ideators. No differences between high and low worst-point-ideators were found on measures of language fluency, memory or reversal learning performance.

High and low worst-point ideators differed, however, on measures of attention/cognitive control and working memory. Performance on the Stroop task was worse in high worst-point ideators, with a significant difference in reaction time in the interference condition, and a difference at the significance threshold on the percent interference condition which adjusts for overall response time, $t(85) = -1.97$, $p = 0.05$. Working memory differed between the groups, with high worst-point ideators responding more slowly than low worst-point ideators on the A not B task, a measure of thinking speed, $t(85) = -2.17$, $p < 0.05$. A similar trend was observed on the WAIS-IV Digit symbol task, with high worst-point ideators demonstrating marginally poorer performance than low worst-point ideators, but this difference did not reach significance, $t(89) = 1.73$, $p = .087$.

Discussion

Depressed patients with no prior suicide attempt history, but high levels of past suicidal ideation, exhibited a variety of clinical and cognitive risk factors that have been associated with risk for suicide attempt. High worst-point ideators exhibited greater current levels of depression as well as higher levels of current suicidal ideation, higher levels of hopelessness, and a greater degree of borderline personality disorder traits. These results are consistent with the prior literature between suicide attempters and non-attempters. However, their higher scores on the HDRS – an objective measure of depression severity – was unexpected. Surprisingly, high and low worst-point ideators did not differ on impulsiveness or aggression, which are traits that are typically associated with suicide attempt risk in the context of depression. As hypothesized, secondary clinical and behavioral characteristics discriminated high worst-point ideators. These patients showed greater feelings of entrapment, a more pronounced tendency toward rumination, less mindfulness, and poorer social problem-solving skills.

Neuropsychologically, high worst-point ideators differed on measures of attention control (Stroop) and working memory/reasoning speed (A, Not B) that we had previously found to distinguish past suicide attempters (Keilp et al., 2001; Keilp et al.,2013). These patients did not, however, exhibit any greater problems with memory, language fluency, or reversal learning performance. Thus, neuropsychological differences reflected some correlates of past suicide attempt found in previous studies, but not all.

Overall, these patients exhibited some typical risk factors, but not all. They were no different in impulsiveness or aggression, or in memory performance, language

fluency, or reduced mental flexibility. They appear then to represent an intermediate group with a number of risk characteristics, but fewer than those found in those who have made actual attempts.

There are some limitations of the study that merit attention. First, retrospective evaluation of worst-point suicidal ideation may have been influenced by current thoughts of suicide or poor memory for events. Participants may have remembered events as more or less severe than they actually were because of current suicidal ideation. However, measuring worst-point suicide ideation may help assess suicidal tendencies in individuals who are unwilling to admit current suicidal ideation. A second limitation considers the potential confound of medication. Because medication use was not controlled, it is difficult to discern whether any differences were due to impairments in cognition or the effects of medication. Lastly, the present study is cross-sectional and only consider ideators who have never made an attempt at the time of assessment. It would be important to collect longitudinal data on whether these non-attempters remain non-attempters or become attempters in later life. Future research may consider differences between attempters and non-attempters with similarly severe ratings of past suicide ideation to better understand the characteristics that shift suicidal thoughts to suicidal behaviors. Further exploration of subtypes of suicidal behavior, such as differences in specific planning behaviors, may also allow for a better characterization and differentiation of the complexity of behaviors involved in attempts.

Although suicide ideation can range from passive to active thoughts, ideators are often viewed as a homogenous group of individuals. However, these findings demonstrate the importance of characterizing ideators by different levels of severity to

better capture suicide risk and to better understand the heterogeneity of suicidal ideation. These data improve our understanding of specific subtypes of ideators that may be more susceptible suicide attempts and helps clarify the predictive value of severe past ideation for later suicidal behavior.

The high rate of suicide attempts in the US has become a public health issue, and the best practice is to gear treatments towards early identification of risk factors. As we understand more about the complex nature of suicidal ideation, clinicians will be better equipped to create interventions that are targeted towards impaired domains of functioning to prevent future suicide attempts. Understanding the motivations for suicide through clinical factors as well as the impaired cognitive capacity of patients who think about suicide can help us better understand the factors that contribute to an act of suicide. With greater knowledge on these critical risk factors, we can better identify those who need a higher level of intervention.

Table 1

Attempter and Non-attempter Worst-point SSI Scores

	Attempters	All Nonattempters
N	108	91
Mean (SD)	27.07 (4.64)	10.32 (11.14)
Range	16-36	0-33

Table 2

Demographics and Clinical Ratings

	Low Worst Point SI	High Worst Point SI	*P*
N	59	32	
Age	46.80 (18.02)	33.72 (15.33)	.001*
Gender (M/F)	22/37	8/24	.254
Education	15.36 (2.43)	14.69 (2.65)	.227
WAIS-IV			
Vocabulary/Matrix Reasoning	11.69 (2.32)	12.49 (2.15)	.119
MMSE	-0.41 (1.01)	-0.40 (1.39)	0.97
Hamilton Depression Scale (24-item)	22.58 (5.71)	27.19 (7.52)	.001*
Beck Depression Inventory	20.95 (8.08)	29.22 (11.00)	<.001*
Personality Assessment Inventory-Borderline Scale	30.36 (9.81)	36.81 (12.20)	.008*
Scale for Suicide Ideation: Current	1.85 (3.87)	13.91 (12.13)	<.001*
Scale for Suicide Ideation: Worst-point	3.44 (4.72)	24.38 (5.73)	<.001*
Beck Hopelessness Scale	8.1 (5.69)	12.78 (5.75)	<.001*
Barratt Impulsiveness Scale	66.72 (10.66)	69.28 (10.93)	.289
Buss-Perry Aggression History	65.39 (16.18)	72.0 (21.33)	.114
Brown-Goodwin Aggression	16.30 (4.35)	17.81 (4.85)	.143
Entrapment Scale	27.41 (16.93)	38.81 (15.64)	.002*
Rumination Response Scale	57.20 (15.97)	46.66 (13.20)	.002*
Mindful Attention Awareness Scale	55.13 (12.94)	44.97 (10.73)	<.001*
Social Problem-Solving Inventory	64.72 (8.86)	60.26 (7.87)	.021*

Table 3

Neuropsychological Test Performance (Z-Scores)

	Low Worst-point SI	High Worst-point SI	*p*
N	57	30	
Motor Functioning			
Choice Reaction Time	-0.24 (1.27)	-0.51 (1.18)	0.34
Processing Speed			
WAIS-IV Digit Symbol	11.08 (2.62)	10.13 (2.35)	0.087
Attention			
Stroop Color-Word Reaction Time	-0.31 (1.51)	-1.05 (1.54)	0.03*
Stroop Interference	-0.30 (1.32)	-0.92 (1.52)	0.05*
Memory			
Bushke Immediate Recall	-0.007 (1.04)	-0.004 (1.27)	0.99
Bushke Delayed Recall	-0.23 (1.20)	-0.11 (0.97)	0.63
Working Memory			
A not B Reaction Time	-0.06 (1.34)	-0.68 (1.11)	0.03*
Language Fluency			
Letter Fluency	-0.23 (1.04)	-0.20 (1.10)	0.88
Category Fluency	-0.20 (1.06)	0.15 (0.84)	0.11
Probabilistic Reversal Learn			
Reversal Learning errors	-0.18 (1.23)	-0.47 (1.43)	0.36

References

Baddeley, A. D. (1968). A 3 min reasoning test based on grammatical transformation. *Psychonomic Science*, *10*, 341-342.

Barratt, E. S., Patton, J., & Stanford, M. (1975). *Barratt Impulsiveness Scale*. Texas: Barratt-Psychiatry Medical Branch, University of Texas.

Beck, A. T., Brown, G. K., Steer, R. A., Dahlsgaard, K. K., & Grisham, J. R. (1999). Suicide ideation at its worst-point: A predictor of eventual suicide in psychiatric outpatients. *Suicide and Life-Threatening Behavior*, *29*, 1-9.

Beck, A. T., Kovacs, M., & Weissman, A. (1979). Assessment of suicidal intention: The Scale for Suicide Ideation. *Journal of Consulting and Clinical Psychology*, *47*, 343-352.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring. *Archives of General Psychiatry*, *4*, 561-571.

Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The hopelessness scale. *Journal of Consulting and Clinical Psychology*, *42*, 861-865.

Belsher, B. E., Smolenski, D. J., Pruitt, L. D., Bush, N. E., Beech, E. H., Workman, D. E., ... & Skopp, N. A. (2019). Prediction models for suicide attempts and deaths: a systematic review and simulation. *JAMA Psychiatry*, *76*, 642-651.

Brown, G. K., Beck, A. T., Steer, R. A., & Grisham, J. R. (2000). Risk factors for suicide in psychiatric outpatients: a 20-year prospective study. *Journal of Consulting and Clinical Psychology*, *68*, 371-377.

Brown, G. L., Goodwin, F. K., Ballenger, J. C., Goyer, P. F., & Major, L. F. (1979).

Aggression in humans correlates with cerebrospinal fluid amine metabolites. *Psychiatry Research, 1*, 131-139.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822.

Buschke, H., Fuld, P. (1974). Evaluating storage, retention, and retrieval in disordered memory and learning. *Neurology*, *24*, 1019 – 1025.

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology*, *63*, 452.

Crosby, A., Gfroerer, J., Han, B., Ortega, L., & Parks, S. E. (2011). Suicidal thoughts and behaviors among adults aged>_18 Years--United States, 2008-2009.

Dieserud, G., Røysamb, E., Ekeberg, Ø., & Kraft, P. (2001). Toward an integrative model of suicide attempt: A cognitive psychological approach. *Suicide and Life-Threatening Behavior*, *31*, 153-168.

D'Zurilla, T. J., & Nezu, A. M. (1990). Development and preliminary evaluation of the Social Problem-Solving Inventory. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, *2*, 156-163.

Egner, T., & Hirsch, J. (2005). The neural correlates and functional integration of cognitive control in a Stroop task. *Neuroimage*, *24*, 539-547.

Forman, E. M., Berk, M. S., Henriques, G. R., Brown, G. K., & Beck, A. T. (2004). History of multiple suicide attempts as a behavioral marker of severe psychopathology. *American Journal of Psychiatry, 161*, 437-443.

Franklin, J. C., Ribeiro, J. D., Fox, K. R., Bentley, K. H., Kleiman, E. M., Huang, X., ...

& Nock, M. K. (2017). Risk factors for suicidal thoughts and behaviors: a meta-analysis of 50 years of research. *Psychological Bulletin, 143,* 187-232.

Gilbert, P., & Allan, S. (1998). The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychological Medicine*, *28,* 585-598.

Goldstein, M., Brendel, G., Tuescher, O., Pan, H., Epstein, J., Beutel, M., ... & Clarkin, J. (2007). Neural substrates of the interaction of emotional stimulus processing and motor inhibitory control: an emotional linguistic go/no-go fMRI study. *Neuroimage*, *36*(3), 1026-1040.

Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery, and Psychiatry*, *23*, 56-61.

Hawton, K., i Comabella, C. C., Haw, C., & Saunders, K. (2013). Risk factors for suicide in individuals with depression: a systematic review. *Journal of Affective Disorders*, *147*, 17-28.

Horwitz, A. G., Czyz, E. K., & King, C. A. (2015). Predicting future suicide attempts among adolescent and emerging adult psychiatric emergency patients. *Journal of Clinical Child & Adolescent Psychology*, *44*, 751-761.

Jollant, F., Lawrence, N. L., Olié, E., Guillaume, S., & Courtet, P. (2011). The suicidal mind and brain: a review of neuropsychological and neuroimaging studies. The World *Journal of Biological Psychiatry*, *12*, 319-339.

Keilp, J. G., Gorlyn, M., Oquendo, M. A., Burke, A. K., & Mann, J. J. (2008). Attention deficit in depressed suicide attempters. *Psychiatry Research, 159*, 7-17.

Keilp, J. G., Sackeim, H. A., Brodsky, B. S., Oquendo, M. A., Malone, K. M., & Mann,

J. J. (2001). Neuropsychological dysfunction in depressed suicide attempters. *American Journal of Psychiatry, 158*, 735-741.

Keilp, J. G., Sackeim, H. A., & Mann, J. J. (2005). Correlates of trait impulsiveness in performance measures and neuropsychological tests. *Psychiatry Research, 135*, 191-201.

Kouneiher, F., Charron, S., & Koechlin, E. (2009). Motivation and cognitive control in the human prefrontal cortex. *Nature neuroscience, 12*, 939-945.

Luoma, J. B., Martin, C. E., & Pearson, J. L. (2002). Contact with mental health and primary care providers before suicide: a review of the evidence. *American Journal of Psychiatry, 159*, 909-916.

MacLeod, C. M., Dodd, M. D., Sheard, E. D., Wilson, D. E., & Bibi, U. (2003). In opposition to inhibition. *Psychology of learning and motivation, 43*, 163-215.

Malloy-Diniz, L. F., Neves, F. S., Abrantes, S. S. C., Fuentes, D., & Corrêa, H. (2009). Suicide behavior and neuropsychological assessment of type I bipolar patients. *Journal of Affective Disorders, 112*, 231-236.

May, A. M., & Klonsky, E. D. (2016). What distinguishes suicide attempters from suicide ideators? A meta-analysis of potential factors. *Clinical Psychology: Science and Practice, 23*, 5-20.

Morey, L. C. (2014). *The Personality Assessment Inventory*. Routledge/Taylor & Francis Group.

Nock, M. K., Borges, G., Bromet, E. J., Alonso, J., Angermeyer, M., Beautrais, A., ... & De Graaf, R. (2008). Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *The British Journal of Psychiatry, 192*, 98-105.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta Earthquake. *Journal of Personality and Social Psychology*, *61*, 115-121.

Ochsner, K. N., Beer, J. S., Robertson, E. R., Cooper, J. C., Gabrieli, J. D., Kihsltrom, J. F., & D'Esposito, M. (2005). The neural correlates of direct and reflected self-knowledge. *Neuroimage*, *28*, 797-814.

Oquendo, M. A., Galfalvy, H., Russo, S., Ellis, S. P., Grunebaum, M. F., Burke, A., & Mann, J. J. (2004). Prospective study of clinical predictors of suicidal acts after a major depressive episode in patients with major depressive disorder or bipolar disorder. *American Journal of Psychiatry*, *161*, 1433-1441.

Oquendo, M. A., Placidi, G. P., Malone, K. M., Campbell, C., Keilp, J., Brodsky, B., ... & Mann, J. J. (2003). Positron emission tomography of regional brain metabolic responses to a serotonergic challenge and lethality of suicide attempts in major depression. *Archives of General Psychiatry*, *60*, 14-22.

Runeson, B., Odeberg, J., Pettersson, A., Edbom, T., Adamsson, I. J., & Waern, M. (2017). Instruments for the assessment of suicide risk: a systematic review evaluating the certainty of the evidence. *PLoS one*, *12*, e0180292.

Spreen, O., & Strauss, E. (1998). A compendium of neurological tests: Administration, norms, and commentary (2nd ed.). Oxford University Press.

Van Orden, K. A., Simning, A., Conwell, Y., Skoog, I., & Waern, M. (2013). Characteristics and comorbid symptoms of older adults reporting death ideation. *The American Journal of Geriatric Psychiatry*, *21*, 803-810.

Schoenbaum, M., Kessler, R. C., Gilman, S. E., Colpe, L. J., Heeringa, S. G., Stein, M.

B., ... & Cox, K. L. (2014). Predictors of suicide and accident death in the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS): results from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS). *JAMA Psychiatry*, *71*, 493-503.

Simon, R. I. (2014). Passive suicidal ideation: Still a high-risk clinical scenario. *Current Psychiatry*, *13*, 13-15.

Suokas, J., Suominen, K., Isometsä, E., Ostamo, A., & Lönnqvist, J. (2001). Long-term risk factors for suicide mortality after attempted suicide-Findings of a 14-year follow-up study. *Acta Psychiatrica Scandinavica*, *104*, 117-121.

Van Heeringen, C., Bijttebier, S., & Godfrin, K. (2011). Suicidal brains: a review of functional and structural brain studies in association with suicidal behaviour. *Neuroscience & Biobehavioral Reviews*, *35*, 688-698.

Wechsler, D., Psychological Corporation., & Pearson Education, Inc. (2008). *WAIS-IV: Wechsler Adult Intelligence Scale*.

Westheide, J., Quednow, B. B., Kuhn, K. U., Hoppe, C., Cooper-Mahkorn, D., Hawellek, B., ... & Wagner, M. (2008). Executive performance of depressed suicide attempters: the role of suicidal ideation. *European Archives of Psychiatry and Clinical Neuroscience*, *258*, 414-421.

Vita

Name	*Nahal Heydari*
Baccalaureate Degree	*Bachelor of Arts, University of California, Santa Barbara, Major: Psychology*
Date Graduated	*September, 2014*
Other Degrees and Certificates	*Master of Arts, Teacher's College, Columbia University, New York, Major: Psychology in Education*
Date Graduated	*May, 2018*