HHS Public Access

Author manuscript

Psychiatry Res. Author manuscript; available in PMC 2019 December 01.

Published in final edited form as:

Psychiatry Res. 2018 December ; 270: 160–167. doi:10.1016/j.psychres.2018.09.032.

Risk-taking behaviors and stressors differentially predict suicidal preparation, non-fatal suicide attempts, and suicide deaths

Alison Athey[a,*], **James Overholser**[a], **Courtney Bagge**[b], **Lesa Dieter**[a], **Eric Vallender**[b], and **Craig A. Stockmeier**[a,b]

[a]Department of Psychological Sciences, Case Western Reserve University, 11220 Bellflower Road Cleveland, OH 44106-7123, USA

[b]Department of Psychiatry and Human Behavior, Center for Psychiatric Neuroscience, University of Mississippi Medical Center, 2500 N State Street, Jackson, MS 39216, USA

Abstract

Negative life events are elevated in suicidal populations. Diathesis-stress and kindling effects models suggest different mechanisms by which negative life events increase suicide risk. Different forms of negative life events – risk-taking behaviors and stressors – may have different effects on non-fatal suicide attempts and suicide. We assessed the effects of risk-taking behaviors and stressors on suicide, history of non-fatal suicide attempts, and active preparation for suicide in a sample of adults who died by suicide or other causes ($N = 377$). Psychological autopsy procedures using family member interviews and collateral record review were used to complete a risk-taking behaviors composite measure from the Structured Interview for DSM-IV Personality Disorders, the Modified Life Experiences Scale, and the planning subscale of the Suicide Intent Scale. Stressors were significantly associated with death by suicide, even when accounting for demographic and diagnostic characteristics. Risk-taking behaviors were significantly associated with non-fatal suicide attempts, even when accounting for demographic and diagnostic characteristics. Suicide decedents who did not actively prepare for suicide showed significantly higher risk-taking scores than suicide decedents who actively planned for suicide. Our results suggest that risk-taking behaviors and stressors impact suicide risk through separate mechanisms. Risk-taking behaviors may represent a longstanding vulnerability to act impulsively on suicidal thoughts. Stressors may impact risk for fatal suicidal behaviors in mood disordered populations.

Keywords

suicide; suicide, attempted; stress, psychological; risk-taking; dangerous behavior; hazardous behavior

[*]Corresponding author at: Department of Psychological Sciences, Case Western Reserve University, 11220 Bellflower Road Cleveland, OH 44106-7123 USA.

Declarations of interests: none.

1. Introduction

Fatal and non-fatal suicidal behavior represents a significant and growing public health crisis. Suicide accounts for nearly 800,000 deaths each year (World Health Organization, 2017) and for each suicide fatality, approximately 25 individuals will experience a non-fatal suicide attempt (Nock et al., 2008). Suicidal ideation and non-fatal suicide attempts prospectively predict both fatal and non-fatal suicidal outcomes (Ribeiro et al., 2016). As many as 56% of suicide decedents die during their first suicide attempt (Isometsa and Lonnqvist, 1998). However, most individuals who experience non-fatal suicide attempts will not go on to die by suicide (Ribeiro et al., 2016). Suicide risk may not simply increase in a linear fashion with individuals traveling along a trajectory from low-risk experiences of passive suicidal ideation to high-risk experiences that produce fatal outcomes (Witte et al., 2017). Instead, single and multiple suicide attempters, fatal and non-fatal, may represent partially overlapping groups with some distinct features (DeJong et al., 2010). In the current study, we address the need for research evaluating potential differences in the relationship between theoretically relevant psychological constructs and risk for non-fatal suicide attempts, recovery from non-fatal suicide attempts, and death by suicide.

Negative life events may serve as the precipitant that triggers a suicidal crisis. Negative life events are more common among individuals who experience fatal and non-fatal suicide attempts than among individuals in the general population (Buchman-Schmitt et al., 2017; McFeeters et al., 2015). Suicidal ideation and suicidal actions have been associated with the number, severity (Buchman-Schmitt et al., 2017), type (DeJong et al., 2010), and timing (Bagge et al., 2014) of negative life experiences. Diathesis-stress models suggest that individuals who engage in suicidal behaviors are more sensitive to negative life experiences due to chronic tendencies to overreact to feelings of distress (Mann et al., 1999). Kindling effect models (Joiner et al., 2009) suggest that individuals become sensitized to specific threatening negative life experiences. In this conceptualization, negative life events increase suicide risk by facilitating habituation to physical pain and fear of life-threatening, dangerous, or extremely upsetting experiences (Smith and Cukrowicz, 2010).

Negative life events include a broad range of experiences including both stressors and risk-taking behaviors. Research evaluating negative life events is complicated by heterogeneous assessment methods across studies. Negative life events have been operationalized as adverse childhood experiences (e.g., sexual abuse; May and Klonsky, 2016), total score on composite measures of stressors (e.g., events from the Psychiatric Epidemiology Research Interview Life Events Scale; Bagge et al., 2012), rationally derived assessments of painful and provocative events (Bender et al., 2011), and self-reported assessments of risk-taking behaviors (dangerous events associated with “tempting fate”; Nock et al., 2018). These methods reflect the effects of both stressors and risk-taking behaviors. Stressors and risk-taking behaviors may be separate but related constructs which affect non-fatal and fatal suicidal behaviors differently. Stressors can be defined as adverse events which are not necessarily the consequences of maladaptive behaviors and are potentially distressing. For example, childhood sexual abuse represents a stressor which is more prevalent among suicide attempters (May and Klonsky, 2016). Stressors are related to non-fatal suicide

attempts (Bagge et al., 2012; McFeeters et al., 2015) and suicide (Foster, 2011). By contrast, risk-taking behaviors represent self-determined acts which are characterized by recklessness and have the potential to result in dangerous or adverse consequences. For example, engaging in unprotected or promiscuous sexual activity or illicit drug use (i.e., risk-taking behaviors) may be associated with non-fatal suicide attempts (Ammerman et al., 2018).

Adolescent (Hallfors et al., 2004; Hantouche et al., 2010; Pena JB et al., 2012) and adult samples (Olfson et al., 2017) of non-fatal suicide attempters show higher rates of risk-taking behaviors than are observed in the general population. There are some indications that risk-taking behaviors are independently associated with non-fatal suicide attempts beyond the effects of stressors (King et al., 2001). However, it is not clear if stressors and risk-taking behaviors are differentially related to fatal suicidal behaviors or if they increase suicide risk through different mechanisms.

Risk-taking behaviors may increase risk of engaging in non-fatal and fatal suicidal behaviors in a subset of individuals who show a pattern of reckless behaviors and who struggle to cope with disruptive life events. The relationship between risk-taking behaviors and suicide may represent a marker of a long-standing deficit in risk-sensitive decision making (Clark et al., 2011) which inhibits the ability to engage in adaptive behaviors or may result from increased exposure to life stress which precipitate suicidal behaviors (Zouk et al., 2006). Alternatively, risk-taking could function to reduce risk of fatal suicidal behaviors, as individuals who are ambivalent about death initiate reckless behaviors to “tempt fate” as an alternative to suicidal behaviors. Thus, risk-taking may function as a form of non-suicidal self-injury which serves as an anti-suicidal alternative among self-injurers who experience suicidal ideation (Klonsky et al., 2015), as a reflection of a long-standing deficit in the ability to appreciate the painful consequences of self-destructive behaviors (Nock et al., 2006), or as a catalyst for the transition from suicidal ideation to potentially fatal suicidal behaviors among individuals who become sensitized to self-harm (Anestis et al., 2015).

Very few studies evaluate how negative life events differentially relate to suicidal ideation, non-fatal, fatal, and repeated suicide attempts or recovery from suicide (i.e., eventual death by natural causes). Meta-analysis (May and Klonsky, 2016) indicates that non-fatal suicide attempters have experienced sexual abuse more frequently than individuals who experience suicidal ideation ($d = 0.52$); however, sexual abuse is more common among individuals who experience suicidal ideation than in non-suicidal individuals ($d = 0.34$). Nock and colleagues (2018) found that dangerous events associated with extreme risk-taking behaviors uniquely predict non-fatal suicide attempts in military service members who report suicidal ideation. Some research suggests that suicide decedents are more likely than non-fatal suicide attempters to have experienced life stressors, including more medical problems (Mills et al., 2016), financial problems, and occupational problems (DeJong et al., 2010). Other studies, however, indicate that suicide decedents show similar rates of negative life events (Bush et al., 2013) or fewer stressors (Innamorati et al., 2008) when compared to non-fatal suicide attempters. Buchman-Schmitt and colleagues (2017) investigated two samples of suicide decedents and found that lower intensity stressors are more common among suicide decedents who died on their first suicide attempts than among decedents who died after multiple suicide attempts. There may be no relationship between the number of stressors and

number of non-fatal suicide attempts among suicide decedents (Buchman-Schmitt et al., 2017). Post-mortem research may be especially important for comparing ultimate outcomes of non-fatal and fatal suicidal behaviors and assessing potential differences in the underlying relationship between stressors and risk-taking behaviors on different suicidal outcomes.

The primary aim of the present study is to evaluate the relationship between negative life events and non-fatal and fatal suicidal behavior among decedents. Consistent with diathesis-stress theories of suicide, we hypothesize that stressors and risk-taking behaviors are more common among suicide decedents and non-fatal suicide attempters than control subjects. We also hypothesize that risk-taking behaviors would represent a chronic vulnerability to suicide and thus would be independently associated with non-fatal and fatal suicidal behaviors over and above the effects of stressors. We also thought that risk-taking behaviors will increase risk of suicide-related behaviors, perhaps by increasing the likelihood that individuals will act in a maladaptive manner when they experience distress. Thus, we hypothesize that individuals who showed elevated rates of risk-taking behavior would also show lower levels of suicidal planning. We predict that individuals who chronically engaged in risk-taking behaviors were less likely to engage in behaviors which reflect active preparation for suicide.

2. Methods

2.1 Subjects

The present study evaluated stressors and risk-taking behaviors in 571 adults who died in a large, urban area during the years 1989–2013. Subjects were recruited from the Cuyahoga County Medical Examiner's office as part of a larger psychological autopsy study which involved post-mortem tissue collection and structured interviews with next-of-kin and other collateral informants regarding decedents' psychosocial functioning (Mahajan et al., 2018). Decedents who presented to the Medical Examiner's office with a history of intravenous drug use were excluded from the study in order to reduce risk of disease transmission to study staff who were collecting tissue samples. Subjects were excluded from the analysis if next-of-kin consented to tissue collection but did not complete psychological autopsy interviews ($n = 131$), subjects were minors ($n = 3$), death resulted from homicide ($n = 5$), or if there was insufficient information available to complete the measures included in this study ($n = 55$). The final sample included 377 subjects categorized as: (1) suicide with no prior non-fatal suicide attempts ($n = 79$), (2) suicide with at least one prior non-fatal suicide attempt ($n = 57$), (3) death by other causes (natural causes or accident) with no prior non-fatal suicide attempts ($n = 215$), (4) death by other causes with at least one prior non-fatal suicide attempt ($n = 26$).

2.2 Measures

The Structured Clinical Interview for DSM-IV (SCID-I; First et al., 1995) was used to assess for the presence of major mental illness according to DSM-IV-TR criteria at the time of death and throughout the lifetime (American Psychiatric Association, 2000). The SCID-I was adapted for psychological autopsy by changing each question to third-person phrasing such that they referred to symptoms experienced by the study subjects and not the

informants. SCID-I items were rated based on a consensus of informant report and collateral record review. Psychometric analysis supports the wide use of the SCID-I for the assessment of DSM-IV Axis I diagnoses in research and treatment settings. Interrater reliability for the SCID-I is in the adequate to excellent range with an average Kappa of 0.71 (range = 0.60 – 0.83; (Lobbestael et al., 2011). The use of the SCID-I in psychological autopsy is supported by evidence of high levels of agreement between personal and proxy report on the measure (KappaAny Axis 1 = 0.68, mean Kappa = 0.74, range = 0.65 – 0.87; (Schneider et al., 2004). There is an excellent level of correspondence on the SCID-I between the reports of suicide attempters as compared to family member informants (Kappa = 1.0; (DeJong and Overholser, 2009). The SCID-I shows excellent inter-rater reliability with Kappa values ranging from 0.96 to 1.0 in co-rated interviews with proxy informants for suicide decedents and age matched controls (Dumais et al., 2005).

Risk-taking behaviors were measured using a composite score created by selecting items from the Structured Interview for DSM-IV Personality Disorders (SIDP-IV; Pfohl et al., 1997). The SIDP-IV is a psychometrically sound (Bernstein et al., 1997) semi-structured personality disorder assessment which assesses functioning in a variety of domains over five years prior to death (Pfohl et al., 1997). The SIDP-IV was adapted for psychological autopsy such that items were rated based on a consensus between informant report and collateral records about decedents' functioning. Five SIDP-IV risk-taking items were selected by the authors (AA, JO, and CB) because they reflected a tendency to engage in reckless behavior that could result in potentially adverse outcomes for physical, financial, interpersonal, or psychological well-being. Items included SIDP-IV ANT-1 (criminal behavior; e.g., theft, selling drugs, prostitution), ANT-3 (behavior resulting from failure to plan ahead; e.g., quitting a job with no backup plan, moving without securing housing), ANT-4 (assaultive behavior; e.g., repeated physical fights, throwing objects during repeated angry outbursts), ANT-5 (reckless and unsafe behaviors; e.g., reckless driving, repeated reprimands at work for engaging in dangerous behaviors), and BPD-4 (non-suicide self-damaging impulsivity; e.g., sexual promiscuity, gambling, shoplifting, and substance misuse). A sixth item, BPD-5 (recurrent non-suicidal self-injury or suicidal behavior, gestures or threats) was considered to reflect risk-taking but was not included in the composite because it reflected recurrent suicidal behavior which is an outcome variable in the present study. Scores on the final risk-taking behaviors composite can range from 0 to 15. Higher scores represent higher propensity to engage in reckless and potentially self-destructive behavior across a variety of domains. A similar risk-taking composite showed good psychometric properties in a sample of outpatient veterans with post-traumatic stress disorder (Lusk et al., 2017). In the present study, the risk-taking behaviors composite showed acceptable levels of internal consistency, $\alpha = 0.76$.

The Modified Life Experiences Scale (MLES) assesses the presence of potentially stressful life events in a variety of domains. The measure was derived from the Life Experiences Survey (LES; Sarason et al., 1978) which shows good to excellent rates of test-retest reliability ($r = 0.64$) over a 5- to 6-week interval. In the present study, the presence (1) or absence (0) of ten categories of stressors within three months of death were assessed using the MLES. Categories included bereavement, financial problems, occupational difficulties, health problems, family conflicts, inpatient hospitalization, inpatient hospitalization of a

family member, conflict in intimate relationships, legal problems, and other stressors (e.g., moving to a city ≥ 50 miles from hometown, loss of housing). MLES stressors were rated based on a consensus between information gathered through the psychological autopsy interview and review of collateral records. Total scores ranged from 0 (no stressors) to 10 (all categories present within past three months). The MLES has previously been used successfully with suicide attempters and decedents (Fisher and Overholser, 2014; Overholser et al., 2012).

The Suicide Intent Scale (SIS; Beck et al., 1974) is a 15-item measure of the desire to die by suicide. Suicidal planning was assessed in the present study using a seven-item subscale which has been identified through factor analyses in clinical samples of suicide attempters (SIS-P; Beck, 1976). The SIS-P was completed for all suicide decedents (n = 136) through a retrospective chart review of all psychological autopsy records including the consensus diagnosis reports, SCID-I, SIDP-IV, suicide notes (if available), police reports, autopsy and toxicology reports, and medical and legal records. The chart review was completed by the primary author (AA) and a master's level research assistant who was blinded to the hypotheses of the study. Raters completed a standardized data capture form which contained SIS-P items assessing characteristics of suicidal planning including isolation, timing, precautions against discovery/intervention, final acts, active preparation for suicide, the presence of a suicide note, and overt communication of intent to die by suicide during the fatal attempt. Excellent levels of absolute agreement amongst the two independent raters were observed for the SIS-P on a subsample of 20% of subjects in the present study, ICC = 0.92. However, we observed poor levels of internal consistency, $\alpha = 0.46$, in the SIS-P for the current sample. Given the psychometric limitations of the composite measure, and consistent with previous studies (Bagge et al., 2012), we used a single item (suicide preparation [item 6]) to assess the relationship between risk-taking behaviors and behaviors which reflect active preparation for fatal suicide attempts. Suicidal preparation was scored 0 (49.2%, *no preparation*), 1 (30%, *at least some minimal to moderate preparation*; e.g., conducting an internet search for toxic doses of medication on the day of the suicide attempt), or 2 (20.8%, *extensive preparation*; e.g., stockpiling prescription medication to use for an overdose).

2.3 Procedures

Data were collected using psychological autopsy procedures as part of an ongoing multi-site, IRB-approved study examining biological factors associated with depression and suicide (Mahajan et al., 2018). Potentially eligible subjects who died by suicide or other causes presented to the Cuyahoga County Medical Examiner's Office. Publicly available records were used to identify decedents' legally-defined next-of-kin. Family members were recruited to provide written informed consent for post-mortem tissue collection and psychological autopsy interview procedures. Standardized psychological autopsy procedures (Conner et al., 2012) were followed by a master's level social worker who conducted modified structured interviews with next-of-kin and any other collateral reporters. Diagnostic interviews evaluated decedents' psychosocial diagnoses, psychological functioning, and treatment history. Collateral medical, psychological, legal, autopsy and toxicology records were collected to support evaluation of decedents' physical health, mental health, and

personality characteristics. The interviewer integrated psychosocial information from the psychological autopsy interview and collateral records in order to prepare a case report containing diagnostic and item-level data for variables of interest. Psychological autopsy case reports, interviews, and collateral materials were presented to a board certified licensed clinical psychologist, a board-certified psychiatrist, and a neuroscientist during a group meeting. The interdisciplinary team of reviewers was not blinded to decedents' cause of death because the consensus meeting was used to assess potential exclusion criteria for a larger post-mortem tissue study (e.g., damage to the pre-frontal cortex due to self-inflicted gunshot wound) which focused on neurobiological risk factors for suicide. However, all members of the interdisciplinary team have terminal degrees in their professional area and extensive experience with psychological autopsy studies. Consensus agreement between the interdisciplinary team was reached through discussion for diagnoses and item-level data.

2.4 Data analyses

First, we evaluated the differential relationship between fatal and non-fatal suicidal behaviors and demographic differences, major DSM-IV-TR Axis I diagnostic categories present in at least 5% of the sample (e.g., Any Anxiety Disorder instead of Generalized Anxiety Disorder), risk-taking behaviors, and stressors. A series of chi-square comparisons evaluated the relationship between categorical variables and cause of death (suicide or other causes) and history of non-fatal suicide attempts prior to death (present or absent). Main and interaction effects of suicide and non-fatal suicide attempts on continuous variables were assessed using a series of 2 × 2 analyses of variance (ANOVA). Between-group analyses were used to evaluate the hypotheses that stressors and risk-taking behaviors would be significantly more common among suicide decedents (compared to individuals who died by other causes) and decedents who engaged in non-fatal suicide attempts (compared to decedents who never experienced non-fatal suicide attempts).

Next, a hierarchical binomial logistic regression was conducted to evaluate the independent relationship between death by suicide and risk-taking behaviors (step 4), over and above the effects of demographic characteristics (step 1), Axis I diagnostic category (step 2), and stressors (step 3). A similar hierarchical binomial logistic regression evaluated the relationship between history of non-fatal suicide attempts (present or absent) and risk-taking behaviors, over and above the effects of demographic characteristics, diagnoses, and stressors. Finally, hierarchical ordinal regression evaluated the effects of risk-taking behaviors on active preparation for suicide which were not accounted for by demographic characteristics, diagnoses, and stressors in a subsample of suicide decedents ($n = 136$). Demographic and diagnostic characteristics which were significantly different in between-group analyses of death by suicide, history of non-fatal suicide attempt, or active preparation for suicide were entered as covariates in each of the models. Statistical analyses were performed using IBM SPSS statistical software package version 21 with all subjects for whom complete data were available.

3. Results

3.1 Death by suicide or other causes

When compared to subjects who died by other causes, suicide decedents were more likely to be male ($p = 0.01$), to be white ($p = 0.009$), and to be educated beyond high school ($p < 0.05$). No main or interaction effects of age were observed based on cause of death or non-fatal suicide attempt history (see Table 1).

Suicide decedents were significantly more likely to have a mood disorder ($p < 0.001$) compared to subjects who died by other causes. No other between-group diagnostic differences were observed in comparisons between subjects who died by suicide or other causes (see Table 2).

A 2 × 2 ANOVA assessing the relationship between fatal and non-fatal suicidal behaviors and stressors revealed significant main effects of cause of death ($F(1, 369) = 8.35$, $p = 0.004$, partial $\eta^2 = 0.02$) but no significant interaction effect with non-fatal suicide attempts ($p =$ *ns*). Suicide decedents showed significantly higher levels of stressors compared to natural deaths. A 2 × 2 ANOVA assessing the relationship between cause of death and non-fatal suicidal behaviors and risk-taking behaviors revealed no main effects of cause of death ($p =$ *ns*) or interaction effects ($p =$ *ns*), perhaps because subjects who died by suicide and subjects who died by other causes showed similar rates of risk-taking behaviors.

Hierarchical binomial logistic regression indicated that risk-taking behaviors were not significantly associated with death by suicide, over and above the effects of demographic characteristics, mood disorders, and stressors (see Table 3). Stressors (*OR* = 1.36, *95% CI* = 1.13 – 1.64), mood disorders (*OR* = 7.89, *95% CI* = 4.61 – 13.50), and male gender (*OR* = 2.64, *95% CI* = 1.16 – 4.77) were significantly associated with increased risk of death by suicide in the final model. However, white race ($p =$ *ns*) and educational attainment ($p =$ *ns*) were no longer significantly related to death by suicide when risk-taking behaviors were added to the model. The final model appeared to fit the data well (χ^2 (5, $N = 377$) = 115.62, $p < 0.001$) and explained a significant proportion of variance in death by suicide, Nagelkerke $R^2 = 0.36$.

3.2 Presence or absence of non-fatal suicide attempts among all decedents

Decedents with a history of non-fatal suicide attempts were more likely to be single ($p = 0.001$) and unemployed ($p = 0.005$) when compared to subjects who had no history of non-fatal suicide attempt. When compared to decedents with no history of non-fatal suicide attempts, decedents with a history of non-fatal suicide attempts were significantly more likely to meet diagnostic criteria for all Axis I diagnostic categories evaluated in the present study.

A 2 × 2 ANOVA assessing the relationship between fatal and non-fatal suicidal behaviors revealed significant main effects of suicide attempt history on stressors ($F(1, 369) = 13.44$, $p < 0.001$, partial $\eta^2 = 0.03$). Non-fatal suicide attempters showed significantly higher levels of stressors compared to decedents who had no history of non-fatal suicide attempts. When compared to decedents with no prior non-fatal suicide attempts, decedents who had histories

of non-fatal suicide attempts also showed significantly higher scores on the risk-taking behaviors composite, $F(1, 373) = 17.17$, $p < 0.001$, partial $\eta^2 = 0.04$.

A history of non-fatal suicide attempts among decedents was associated with risk-taking behaviors (*OR* = 1.24, *95% CI* = 1.10 – 1.39), over and above the effects of demographic characteristics, diagnostic category, and stressors in hierarchical binomial logistic regression (see Table 4). In the final model, mood disorders (*OR* = 7.77, *95% CI* = 3.36 – 17.88) and psychotic disorders (*OR* = 19.44, *95% CI* = 6.16 – 61.40) were significantly associated with a history of non-fatal suicide attempts among decedents. Substance use disorders were significantly associated with non-fatal suicide attempts over and above the effects of demographic characteristics (i.e., in step 2; *OR* = 1.91, *95% CI* = 1.08 – 3.39) but not when modeled with stressors (i.e., in step 3; *OR* = 1.30, *95% CI* = 1.76, *95% CI* = 0.98 – 3.15). Similarly, stressors were significantly associated with a history of non-fatal suicide attempts when controlling for the effects of demographic and diagnostic characteristics (i.e., in step 3; *OR* = 1.30, *95% CI* = 1.06 – 1.60), but the relationship between non-fatal suicide attempts and stressors failed to reach the level of statistical significance when risk-taking behaviors were added to the final model (i.e., in step 4; *OR* = 1.22, *95% CI* = 1.10 – 1.39, *p* = *ns*). The final model appeared to fit the data well (χ^2 (8, *N* = 377) = 93.55, $p < 0.001$) and explained a significant proportion of variance in death by suicide, Nagelkerke $R^2 = 0.35$.

It is possible that there was some overlap between the Axis I substance use disorders category and the risk-taking behaviors composite item assessing illegal behaviors (ANT-1). In order to address possible criterion overlap, we conducted a sensitivity analysis by repeating the hierarchical binomial logistic regression evaluating non-fatal suicide attempts without the substance use disorders covariate. Covariates in the repeated model included demographic characteristics (step 1: marital status, employment status), Axis I diagnostic categories (step 2: mood disorders, anxiety disorders, psychotic disorders), stressors (step 3), and risk-taking behaviors (step 4). A similar pattern of results was observed in that non-fatal suicide attempts were significantly related to risk-taking behaviors (*OR* = 1.23, *95% CI* = 1.11–1.36), mood disorders (*OR* = 7.72, *95% CI* = 3.38 – 17.62), and psychotic disorders (*OR* = 20.05, *95% CI* = 6.41 – 62.66) but no other covariates in the final model (χ^2 (7, *N* = 377) = 92.61, $p < 0.001$, Nagelkerke's $R^2 = 0.34$).

3.3 Active preparation for death by suicide

We planned to use a hierarchical ordinal regression to evaluate the independent relationship between active preparation for suicide (absent, minimal/moderate, extreme) with risk-taking behaviors. It was not possible to fit a hierarchical ordinal logistic regression model to the data because very few suicide decedents with high-risk taking behavior scores showed higher levels of suicidal planning.

Two post-hoc analyses used one-way analysis of variance (ANOVA) to assess statistically reliable differences in the level of risk-taking or stressors at different levels of active preparation for suicide. Suicide decedents with different levels of active suicidal preparation showed significantly different levels of risk-taking behaviors (*Welch's F*(2, 70.58) = 6.65, $p < 0.01$). Suicide decedents who show no active preparation for suicide (SIS-6 = 0) had significantly higher risk-taking scores (*M* = 2.78, *SD* = 3.53) compared to suicide decedents

who took extreme measures to prepare for suicide ($M = .91$, $SD = 1.27$; $p < 0.05$) in the Bonferroni follow-up analyses. No relationship between active preparation for suicide and stressors was observed ($F(2, 116) = 0.07$, $p = ns$).

4. Discussion

There is a dearth of research evaluating the differential effects of stressors and risk-taking behaviors on non-fatal and fatal suicide attempts. In the present study, risk-taking behaviors were associated with increased risk of non-fatal suicide attempt history. Regardless of the cause of death, subjects who had non-fatal suicide attempts showed more than double the rates of risk-taking behavior than subjects without non-fatal suicide attempts. Risk-taking behaviors may differentiate individuals who will engage in non-fatal suicide attempts and go on to die by other causes. Although risk-taking behaviors were related to suicide attempts, risk-taking behaviors were not associated with increased risk of death by suicide over and above the effects of life stress, diagnostic category, and demographic characteristics. Notably, there appeared to be a somewhat restricted range of risk-taking scores in the sample. The present results suggest that the addition of even one SIDP-IV risk-taking trait may have a meaningful impact on patterns of non-fatal suicide attempts, suicide, and suicidal preparation. Risk-taking behaviors may represent a vulnerability which increases the likelihood that an individual will engage in suicidal behavior but do not appear to sensitize individuals to highly lethal or to ongoing suicidal behaviors.

Stressors appear to increase the risk of suicidal behaviors but sensitization may not explain this association in suicide decedents. A dose-response relationship between the number of stressors and suicidal behaviors was observed in the present study. Subjects who engaged in any non-fatal or fatal suicidal behaviors experienced stress in approximately one additional domain of life more than subjects who never engaged in suicidal behavior. Results of the present study are consistent with evidence that elevated levels of life stress differentiate suicide decedents from living non-fatal suicide attempters (DeJong et al., 2010). In the present study, suicide decedents who had previously attempted suicide showed the highest levels of life stress ($M = 2.58$, $SD = 1.67$). These findings suggest that suicidality may not be associated with a kindling effect, such that fewer stressors are required to produce suicidal behaviors, but rather are more consistent with the hypothesis that vulnerable individuals may engage in suicidal behaviors when confronted with life stress (Mann et al., 1999). Stressors were associated with risk of non-fatal and fatal suicidal behaviors over and above the effects of risk-taking behaviors, diagnostic category, and demographic characteristics.

Risk-taking may represent a behavioral marker for an underlying tendency towards trait-like impulsivity or the tendency to act impulsively on suicidal thoughts. Shelef and colleagues (2018) found that impulsive suicide decedents showed higher levels of risk-taking behaviors (e.g., aggression), as well as lower levels of suicidal planning when compared to suicide decedents without longstanding patterns of impulsivity. High risk-takers may have significant difficulty conceptualizing the possible consequences of dangerous or reckless behaviors. In the present study, suicide decedents who showed no signs of active preparation for suicide showed significantly higher levels of risk-taking behaviors. Suicidal planning is associated with lower perceptions of lethality of suicidal behavior among medically attended

non-fatal suicide attempters (Bagge et al., 2013). However, it is not clear whether impulsive suicide attempts result in lower levels medical lethality (Horesh et al., 2012) or similar levels of medical lethality (Spokas et al., 2012) when compared to more highly planned suicide attempts. As in the present study, a subset of impulsive suicide attempts among high risk-takers will be fatal. It is possible that the lethality of suicide attempts depends less on risk-takers' habituation to painful and life-threatening situations and more on their familiarity with and access to lethal means of suicide.

Risk-taking may alternatively represent a behavioral marker of poor distress tolerance or sensitization to stressors which facilitates suicidal behaviors. Impulsive suicide attempters (Brown et al., 1991) and decedents (Shelef et al., 2018) show lower levels of depression and hopelessness compared to non-fatal suicide attempters who show higher levels of suicidal planning. Suicide decedents with a history of risk-taking behaviors may experience more stressors in the days before suicide (Shelef et al., 2018) and repeated non-fatal suicide attempts are associated with the interaction between early childhood adversity, recent negative life experiences, and recent psychopharmalogical treatment (Pompili et al., 2011). However, results from the present study suggest that risk-taking behaviors increase risk of non-fatal suicide attempts over and above the effects of stressors. Risk-taking behaviors may identify distressed individuals who are at risk of engaging in non-fatal suicide attempts and repeated suicidal behaviors in the context of mood or psychotic disorders.

The present results suggest that stressors and risk-taking behaviors may be related constructs which affect risk for suicidal behaviors differently. Whereas risk-taking behaviors may increase risk for non-fatal suicidal behaviors by reducing suicidal planning in a subset of decedents who cope poorly with negative life experiences, stressors may precipitate highly lethal suicidal behaviors through some other mechanism. Our findings are consistent with evidence that stressors are associated with death by suicide (Foster, 2011). Stressors may affect the desire to die in vulnerable populations or may exacerbate underlying psychiatric conditions. Stressors precipitate suicidal ideation in the 24-hours before highly lethal suicide attempts among non-fatal suicide attempters who require medical attention – perhaps the only population to suicide decedents that can provide information on suicidal beliefs (Bagge et al., 2014). Stressed suicide decedents are more likely than non-fatal to suicide attempters to leave a suicide note, perhaps indicating higher levels of suicidal intent (DeJong et al., 2010).

The findings of the present study should be evaluated in the context of several limitations. The retrospective, cross-sectional nature of this study precludes an evaluation of the direction of the relationship between suicidal behaviors, risk-taking behaviors, and life stress. It is possible that suicidal behaviors produce a cascade of medical, psychological, social, and other stressors among non-fatal suicide attempters or increase risk-taking behaviors among individuals who continue to show ambivalence about death following a suicide attempt. Some evidence indicates that risk-taking behaviors mediate the relationship between psychiatric symptoms and stressors in clinical populations (Lusk et al., 2017). However, the present results indicate that clinical diagnostic categories, stressors and risk-taking behaviors display separate, independent effects on non-fatal suicide attempts, suicide deaths, and active preparation for suicide.

While not expected, our sampling and data collection methods may have introduced bias into the results. Intravenous drug users were excluded from the larger study from which this sample is drawn in order to limit risk of the transmission of infectious diseases during the collection, storage, and analyses of post-mortem tissue. Excluding intravenous drug users may have resulted in an underestimate of the level of risk-taking observed among individuals who died by other causes and suicide because substance abuse is associated with elevated rates of risk-taking in other domains (Ritchwood et al., 2015). However, the relationship between non-fatal suicide attempts and risk-taking behaviors appeared to be independent of the effects of substance use disorders in the present study. Individuals who died by homicide were excluded to reduce possible complications in data collection and adverse effects experienced by family member informants during homicide investigations and media coverage. It is not clear how excluding murder victims may have affected the results because risk-taking behaviors among murder victims are poorly characterized. Statistically reliable associations between suicidal behaviors and risk-taking behaviors were observed despite a possible underestimation of population-wide levels of risk-taking behaviors due to the exclusion of intravenous drug users and homicide victims.

The interdisciplinary team which assessed diagnostic characteristics and the personality traits used to construct the risk-taking assessment were not blinded to cause of death because they were also evaluating any damage to post-mortem tissue which may have occurred as a result of the manner of death. Diagnoses reached through consensus in psychological autopsy studies using similar methods show good psychometric properties, thus it is not clear how the lack of blinding in the present study may have affected the results. We attempted to address any bias introduced by our sampling methods by including diagnostic characteristics as covariates in our multivariable models.

The present study indicates that risk-taking behaviors and stressors may be separate but related negative life experiences which increase risk for suicidal behaviors. Trait-like tendencies to engage in risk-taking behavior may be a marker of chronic risk of entering into suicidal crisis and may reduce suicidal premeditation. Stressors may elevate chronic risk of engaging in entering fatal suicidal behaviors. Individuals who experience mood and psychotic disorders may be vulnerable to suicidal behaviors in the context of negative life experiences like stressors and risk-taking behaviors. Clinicians can incorporate risk-taking behaviors and stressors into suicide risk assessments. Clinicians can consider how to tailor safety planning and other interventions to patients given that individuals with a history of risk-taking behaviors may be at greater risk of an impulsive, unpredictable suicide attempt and individuals with lower levels of risk-taking behaviors may be at greater risk of a highly lethal, premeditated suicide. Clinicians may also help patients develop adaptive strategies for coping with life stress, given evidence that the accumulation of life stress over time may precipitate suicidal behavior. Additional research may help to replicate and clarify the mechanisms underlying the relationship between stressors and suicide in vulnerable populations, given results from the present study which do not support kindling hypotheses of suicide or provide evidence that stressors precipitate suicide in vulnerable populations by activating suicidal planning.

Acknowledgments

This work was supported by grants from the National Institute of Mental Health (MH67996) and the IDeA/COBRE Program of NIGMS (P30 GM103328; PI: C. Stockmeier). The authors thank the Cuyahoga County Medical Examiner's Office and the families of our subjects. The authors thank George Jurjus, M.D. for his crucial role in reviewing psychological autopsy cases for consensus diagnosis. The authors thank Claudia Ford, MCMH, MBA for her invaluable support with data collection.

References

American Psychiatric Association, 2000 Dsm-Iv-Tr, Diagnostic and Statistical Manual of Mental Disorders 4th edition TR. https://doi.org/10.1176

Ammerman BA, Steinberg L, McCloskey MS, 2018 Risk-Taking Behavior and Suicidality: The Unique Role of Adolescent Drug Use. J. Clin. Child Adolesc. 47, 131–141. https://doi.org/10.1080/15374416.2016.1220313

Anestis MD, Khazem LR, Law KC, 2015 How Many Times and How Many Ways: The Impact of Number of Nonsuicidal Self-Injury Methods on the Relationship Between Nonsuicidal Self-Injury Frequency and Suicidal Behavior. Suicide Life-Threat. 45, 164–177. https://doi.org/10.1111/sltb.12120

Bagge CL, Glenn CR, Lee H-J, 2012 Quantifying the Impact of Recent Negative Life Events on Suicide Attempts. J. Abnorm. Psychol 122, 359–368. https://doi.org/10.1037/a0030371 [PubMed: 23088374]

Bagge CL, Littlefield AK, Conner KR, Schumacher JA, Lee HJ, 2014 Near-term predictors of the intensity of suicidal ideation: An examination of the 24 h prior to a recent suicide attempt. J. Affect. Disord 165, 53–58. https://doi.org/10.1016/j.jad.2014.04.010 [PubMed: 24882177]

Bagge CL, Littlefield AK, Lee HJ, 2013 Correlates of proximal premeditation among recently hospitalized suicide attempters. J. Affect. Disord 150, 559–564. https://doi.org/10.1016/j.jad.2013.02.004 [PubMed: 23507371]

Beck AT, 1976 Classification of Suicidal Behaviors. Arch. Gen. Psychiat 33, 835 https://doi.org/10.1001/archpsyc.1976.01770070065006 [PubMed: 942287]

Beck RW, Morris JB, Beck AT, 1974 Cross-Validation of the Suicidal Intent Scale. Psychol. Rep 34, 445–446. https://doi.org/10.2466/pr0.1974.34.2.445 [PubMed: 4820501]

Bender TW, Gordon KH, Bresin K, Joiner TE, 2011 Impulsivity and suicidality: The mediating role of painful and provocative experiences. J. Affect. Disord 129, 301–307. https://doi.org/10.1016/j.jad.2010.07.023 [PubMed: 20719393]

Bernstein DP, Kasapis C, Bergman A, Weld E, Mitropoulou V, Horvath T, et al., 1997 Assessing Axis II Disorders by Informant Interview. J. Pers. Disord 11, 158–167. https://doi.org/10.1521/pedi.1997.11.2.158 [PubMed: 9203110]

Brown LK, Overholser J, Spirito A, Fritz GK, 1991 The Correlates of Planning in Adolescent Suicide Attempts. J. Am. Acad. Child Adolesc. Psy 30, 95–99. https://doi.org/10.1097/00004583-199101000-00014

Buchman-Schmitt JM, Chu C, Michaels MS, Hames JL, Silva C, Hagan CR, et al., 2017 The role of stressful life events preceding death by suicide: Evidence from two samples of suicide decedents. Psychiat. Res 256, 345–352. https://doi.org/10.1016/j.psychres.2017.06.078

Bush NE, Reger MA, Luxton DD, Skopp NA, Kinn J, Smolenski D, et al., 2013 Suicides and Suicide Attempts in the U.S. Military, 2008–2010. Suicide Life-Threat. 43, 262–273. https://doi.org/10.1111/sltb.12012

Clark L, Dombrovski AY, Siegle GJ, Butters MA, Shollenberger CL, Sahakian BJ, et al., 2011 Impairment in risk-sensitive decision-making in older suicide attempters with depression. Psychol. Aging 26, 321–330. https://doi.org/http://dx.doi.org/10.1037/a0021646 [PubMed: 21443349]

Conner KR, Beautrais AL, Brent DA, Conwell Y, Phillips MR, Schneider B, 2012 The next generation of psychological autopsy studies: Part 2. Interview procedures. Suicide Life-Threat. 42, 86–103. https://doi.org/10.1111/j.1943-278X.2011.00073.x

DeJong TM, Overholser JC, 2009 Assessment of depression and suicidal actions: agreement between suicide attempters and informant reports. Suicide Life-Threat. 39, 38–46. https://doi.org/10.1521/suli.2009.39.1.38

DeJong TM, Overholser JC, Stockmeier CA, 2010 Apples to oranges?: A direct comparison between suicide attempters and suicide completers. J. Affect. Disord 124, 90–97. https://doi.org/10.1016/j.jad.2009.10.020 [PubMed: 19903573]

Dumais A, Lesage AD, Alda M, Rouleau G, Dumont M, Chawky N, et al., 2005 Risk Factors for Suicide Completion in Major Depression: A Case-Control Study of Impulsive and Aggressive Behaviors in Men. Am. J. Psychiat 162, 2116–2124. https://doi.org/10.1176/appi.ajp.162.11.2116 [PubMed: 16263852]

First M, Spitzer A, Gibbon M, Williams J, 1995 Structured Clinical Interview for DSM-IV Axis I Disorders (SCID Patient Edition), version 2.0.0. New York Psychiatric Institute, New York.

Fisher LB, Overholser JC, 2014 The Measurement of Positive Attitudes: The Glass is Half Full. J. Ration-Emot. Cogn-B. 32, 121–138. https://doi.org/10.1007/s10942-013-0173-0

Foster T, 2011 Adverse Life Events Proximal to Adult Suicide: A Synthesis of Findings from Psychological Autopsy Studies. Arch. Suicide Res. 15, 1–15. https://doi.org/10.1080/13811118.2011.540213 [PubMed: 21293996]

Hallfors DD, Waller MW, Ford CA, Halpern CT, Brodish PH, Iritani B, 2004 Adolescent depression and suicide risk: Association with sex and drug behavior. Am. J. Prev. Med 27, 224–231. https://doi.org/10.1016/j.amepre.2004.06.001 [PubMed: 15450635]

Hantouche E, Angst J, Azorin JM, 2010 Explained factors of suicide attempts in major depression. J. Affect. Disord 127, 305–308. https://doi.org/10.1016/j.jad.2010.04.032 [PubMed: 20554011]

Horesh N, Levi Y, Apter A, 2012 Medically serious versus non-serious suicide attempts: Relationships of lethality and intent to clinical and interpersonal characteristics. J. Affect. Disord 136, 286–293. https://doi.org/10.1016/j.jad.2011.11.035 [PubMed: 22197510]

Innamorati M, Pompili M, Masotti V, Personé F, Lester D, Tatarelli R, et al., 2008 Completed versus attempted suicide in psychiatric patients: A psychological autopsy study. J. Psychiatr. Pract 14, 216–224. https://doi.org/10.1097/01.pra.0000327311.04153.01 [PubMed: 18664890]

Isometsa E, Lonnqvist J, 1998 Suicide attempts preceding completed suicide. Br. J. Psychiat 173, 531–535. https://doi.org/10.1007/s13398-014-0173-7.2

Joiner TE, Van Orden KA, Witte TK, Selby EA, Ribeiro JD, Lewis R, et al., 2009 Main Predictions of the Interpersonal-Psychological Theory of Suicidal Behavior: Empirical Tests in Two Samples of Young Adults. J. Abnorm. Psychol 118, 634–646. https://doi.org/10.1037/a0016500 [PubMed: 19685959]

King RA, Schwab-Stone M, Flisher AJ, Greenwald S, Kramer RA, Goodman SH, et al., 2001 Psychosocial and risk behavior correlates of youth suicide attempts and suicidal ideation. J. Am. Acad. Child. Psychiatry 40, 837–846. https://doi.org/10.1097/00004583-200107000-00019

Klonsky ED, Glenn CR, Styer DM, Olino TM, Washburn JJ, 2015 The functions of nonsuicidal self-injury: converging evidence for a two-factor structure. Child Adolesc. Psych. Men 9, 44 https://doi.org/10.1186/s13034-015-0073-4

Lobbestael J, Leurgans M, Arntz A, 2011 Inter-rater reliability of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID I) and Axis II Disorders (SCID II). Clin. Psychol. Psychot 18, 75–79. https://doi.org/10.1002/cpp.693

Lusk JD, Sadeh N, Wolf EJ, Miller MW, 2017 Reckless Self-Destructive Behavior and PTSD in Veterans: The Mediating Role of New Adverse Events. J. Trauma. Stress 30, 270–278. https://doi.org/10.1002/jts.22182 [PubMed: 28471014]

Mahajan GJ, Vallender EJ, Garrett MR, Challagundla L, Overholser JC, Jurjus G, et al., 2018 Altered neuro-inflammatory gene expression in hippocampus in major depressive disorder. Prog. Neuro-Psychoph. 82, 177–186. https://doi.org/10.1016/j.pnpbp.2017.11.017

Mann JJ, Waternaux C, Haas GL, Malone KM, 1999 Toward a clinical model of suicidal behavior in psychiatric patients. Am. J. Psychiat 156, 181–189. https://doi.org/10.1176/ajp.156.2.181;pageGroup:string:Publication [PubMed: 9989552]

May AM, Klonsky ED, 2016 What Distinguishes Suicide Attempters From Suicide Ideators? A Meta-Analysis of Potential Factors. Clin. Psychol.-Sci. Pr 23, 5–20. https://doi.org/10.1111/cpsp.12136

McFeeters D, Boyda D, O`Neill S, 2015 Patterns of Stressful Life Events: Distinguishing Suicide Ideators from Suicide Attempters. J. Affect. Disord 175, 192–198. https://doi.org/10.1016/j.jad.2014.12.034 [PubMed: 25638792]

Mills PD, Gallimore BI, Watts BV, Hemphill RR, 2016 Suicide attempts and completions in Veterans Affairs nursing home care units and long-term care facilities: a review of root-cause analysis reports. Int. J. Geriatr. Psych 31, 518–525. https://doi.org/10.1002/gps.4357

Nock MK, Borges G, Bromet EJ, Cha CB, Kessler RC, Lee S, 2008 Suicide and suicidal behavior. Epidemiol. Rev https://doi.org/10.1093/epirev/mxn002

Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E, Prinstein MJ, 2006 Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. Psychiat. Res 144, 65–72. https://doi.org/10.1016/j.psychres.2006.05.010

Nock MK, Millner AJ, Joiner TE, Gutierrez PM, Han G, Hwang I, et al., 2018 Risk factors for the transition from suicide ideation to suicide attempt: Results from the army study to assess risk and resilience in Servicemembers (Army STARRS). J. Abnorm. Psychol 127, 139–149. https://doi.org/10.1037/abn0000317 [PubMed: 29528668]

Olfson M, Blanco C, Wall M, Liu S-M, Saha TD, Pickering RP, et al., 2017 National Trends in Suicide Attempts Among Adults in the United States. JAMA Psychiat. 74, 1095 https://doi.org/10.1001/jamapsychiatry.2017.2582

Overholser JC, Braden A, Dieter L, 2012 Understanding suicide risk: identification of high-risk groups during high-risk times. J. Clin. Psychol 68, 349–361. https://doi.org/10.1002/jclp.20859

Pena JB, Matthieu MM, Zayas LH, Masyn KE, Caine ED., 2012 Co-occurring risk behaviors among White, Black, and Hispanic US high school adolescents. Soc. Psychiatry Psychiatr. Epidemiol 47, 29–42. [PubMed: 21153018]

Pfohl B, Blum N, Zimmerman M, 1997 Structured interview for DSM-IV personality: Sidp-IV.

Pompili M, Innamorati M, Szanto K, Di C, Conwell Y, Lester D, Tatarelli R, et al., 2011 Life events as precipitants of suicide attempts among first-time suicide attempters, repeaters, and non-attempters. Psychiat. Res 186, 300–305. https://doi.org/10.1016/j.psychres.2010.09.003

Ribeiro JD, Franklin JC, Fox KR, Bentley KH, Kleiman EM, Chang BP, et al., 2016 Self-injurious thoughts and behaviors as risk factors for future suicide ideation, attempts, and death: a meta-analysis of longitudinal studies. Psychol. Med 46, 225–236. https://doi.org/10.1017/S0033291715001804 [PubMed: 26370729]

Ritchwood TD, Ford H, DeCoster J, Sutton M, Lochman JE, 2015 Risky sexual behavior and substance use among adolescents: A meta-analysis. Child. Youth Serv. Rev 52, 74–88. https://doi.org/10.1016/j.childyouth.2015.03.005 [PubMed: 25825550]

Sarason IG, Johnson JH, Siegel JM, 1978 Assessing the impact of life changes: Development of the Life Experiences Survey. J. Consult. Clin. Psych 46, 932–946. https://doi.org/10.1037/0022-006X.46.5.932

Schneider B, Maurer K, Sargk D, Heiskel H, Weber B, Frölich L, et al., 2004 Concordance of DSM-IV Axis I and II diagnoses by personal and informant's interview. Psychiat. Res 127, 121–136. https://doi.org/10.1016/j.psychres.2004.02.015

Shelef L, Korem N, Yavnai N, Yedidya R, Ginat K, Shahar G, et al., 2018 Depression and impulsiveness among soldiers who died by suicide: A psychological autopsy study. J. Affect. Disord 235, 341–347. https://doi.org/10.1016/j.jad.2018.04.068 [PubMed: 29665517]

Smith PN, Cukrowicz KC, 2010 Capable of Suicide: A Functional Model of the Acquired Capability Component of the Interpersonal-Psychological Theory of Suicide. Suicide Life-Threat. 40, 266–275. https://doi.org/10.1521/suli.2010.40.3.266

Spokas M, Wenzel A, Brown GK, Beck AT, 2012 Characteristics of individuals who make impulsive suicide attempts. J. Affect. Disord 136, 1121–1125. https://doi.org/10.1016/j.jad.2011.10.034 [PubMed: 22119087]

Witte TK, Holm-Denoma JM, Zuromski KL, Gauthier JM, Ruscio J, 2017 Individuals at high risk for suicide are categorically distinct from those at low risk. Psychol. Assess 29, 382–393. https://doi.org/10.1037/pas0000349 [PubMed: 27280745]

World Health Organization, 2017 Depression and Other Common Mental Disorders Global Health Estimates. Geneva.

Zouk H, Tousignant M, Seguin M, Lesage A, Turecki G, 2006 Characterization of impulsivity in suicide completers: Clinical, behavioral and psychosocial dimensions. J. Affect. Disord 92, 195–204. https://doi.org/10.1016/j.jad.2006.01.016 [PubMed: 16545465]

Highlights

- Risk-taking is elevated among suicide decedents.
- Risk-taking is associated with non-fatal suicide attempts in decedents.
- Suicide decedents who did not prepare for suicide showed higher levels of risk-taking.
- Stressors are associated with death by suicide.

Table 1.

Between-group differences on demographic characteristics based on history of non-fatal and fatal suicidal behaviors

	Suicide	Death by other Causes	Non-fatal suicide attempt history	No Non-fatal Suicide Attempt History	Suicide vs. Death by other causes	Non-fatal Suicide Attempt History vs. No Non-fatal Suicide Attempt History
N(%)	136 (36.1)	241 (63.9)	294 (78.0)	83 (22.0)		
Age *M*(SD)	46.79 (18.08)	51.16 (14.81)	46.00 (17.18)	50.59 (15.77)	2.72	2.05
Gender						
Male *N*(%)	108 (79.4)	162 (67.2)	54 (65.1)	216 (73.5)	6.36*	2.25
Race						
Caucasian *N*(%)	118	180	72 (86.7)	226	6.76**	3.37
African	(86.8)	(74.7)	10 (12.0)	(76.9)		
American *N*(%)	15 (11.0)	60 (24.9)	1 (1.2)	65 (22.1)		
Other *N*(%)	3 (2.2)	1 (0.4)		3 (1.0)		
Marital Status						
Single *N*(%)	44 (32.4)	77 (32.0)	35 (42.2)	86 (29.3)	3.20	10.31***
Married *N*(%)	47 (34.6)	106 (44.0)	21 (25.3)	132 (44.9)		
Separated *N*(%)	7 (5.1)	3 (1.2)	4 (4.8)	6 (2.0)		
Divorced *N*(%)	24 (17.6)	35 (14.5)	17 (20.5)	42 (14.3)		
Widowed *N*(%)	14 (10.3)	20 (8.3)	6 (7.2)	28 (9.5)		
Education						
< HS Diploma *N*(%)	19 (14.0)	52 (21.6)	13 (15.7)	58 (19.7)	4.10*	0.42
HS Diploma *N*(%)	43 (31.6)	84 (34.9)	28 (33.7)	99 (33.7)		
Some College *N*(%)	35 (25.7)	56 (23.2)	25 (30.1)	66 (22.4)		
Associates Degree *N*(%)	5 (3.7)	10 (4.1)	4 (4.8)	11 (3.7)		
Bachelor's Degree *N*(%)	20 (14.7)	25 (10.4)	8 (9.6)	37 (12.6)		
Advanced Degree N (%)	13 (9.6)	14 (5.8)	5 (6.0)	22 (7.5)		
Employment						
Unemployed N (%)	73 (53.7)	104 (43.2)	50 (60.2)	127 (43.2)	3.72	7 71**

Note: Chi-square analyses were conducted for categorical variables. Chi-square analyses for gender, race, marital status, education, and employment were conducted on dichotomized data.2 ×2 analyses of variance (ANOVA) were conducted for age. Test statistics for main effects are reported here and non-significant interaction effects are omitted.

* indicates $p < 0.05$.

** indicates $p < 0.01$.

*** indicates $p \leq 0.001$.

Table 2.

Between-group differences on clinical characteristics based on history of non-fatal and fatal suicidal behaviors

	Suicide	Death by other Causes	Non-fatal suicide attempt history	No Non-fatal Suicide Attempt History	Suicide vs. Death by other causes	Non-fatal Suicide Attempt History vs. No Non-fatal Suicide Attempt History
Any mood disorder *N* (%)	107 (78.7)	70 (29.2)	60 (72.3)	117 (39.9)	85.41***	27.18***
Any anxiety disorder *N* (%)	13 (9.6)	22 (9.2)	13 (15.9)	22 (7.5)	0.01	5.27**
Any psychotic disorder *N* (%)	14 (10.3)	13 (5.4)	14 (16.9)	13 (4.4)	3.10	14 99***
Any substance use disorder *N* (%)	76 (55.9)	109 (45.2)	54 (65.1)	131 (44.6)	3.50	11 17***
Stressors *M* (SD)	2.39 (143)	1.45 (139)	2.52 (164)	1.59 (136)	8.35**	13 44***
Risk-taking behaviors *M* (SD)	2.11 (3.01)	1.49 (2.41)	2.84 (3.33)	1.39 (2.35)	0.04	17 17***

Note: Chi-square analyses were conducted for categorical variables. DSM-IV Axis I diagnostic categories were conducted on dichotomized data assessing the presence of any diagnosis within the category. 2 ×2 analyses of variance (ANOVA) were conducted for continuous variables. Test statistics for main effects are reported here and non-significant interaction effects are omitted.

* indicates $p < 0.05$.

** indicates $p < 0.01$.

*** indicates $p \leq 0.001$.

Table 3.

Hierarchical binomial logistic regression predicting death by suicide

	B	*SE(B)*	*Wald*	*β*	*95% CI*	χ^2	df
Step 1						16.63***	3
Gender	0.97	0.30	10.41***	2.64	1.16–4.77		
Race	0.24	0.35	0.46	1.27	0.64–2.52		
Education	0.38	0.26	2.17	0.68	0.41–1.13		
Step 2						85.65***	1
Mood disorders	2.07	0.27	56.86***	7.89	4.61–13.50		
Step 3						13.33***	1
Stressors	0.31	0.10	10.18***	1.36	1.13–1.64		
Step 4						1.43	1
Risk-taking behaviors	0.06	0.05	1.44	1.06	0.96–1.17		

Note:

* indicates $p < 0.05$.

** indicates $p \leq 0.01$.

*** indicates $p \leq 0.001$.

Table 4.

Hierarchical binomial logistic regression predicting non-fatal suicide attempts

	B	*SE(B)*	*Wald*	*β*	*95% CI*	Step χ^2	df
Step 1						17 23***	2
Marital status	0.61	0.34	3.30	1.84	0.95–3.55		
Employment status	0.24	0.32	0.57	1.27	0.68–2.37		
Step 2						55.71***	3
Mood disorders	2.05	0.43	23.02***	7.74	3.36–17.88		
Anxiety disorders	0.73	0.46	2.52	2.07	0.84–5.09		
Substance use disorders	0.06	0.34	0.03	1.06	0.55–2.06		
Psychotic disorders	2.97	0.59	25.57***	19.44	6.16–61.40		
Step 2						6.76**	1
Stressors	0.20	0.11	3.24	1.22	0.98–1.51		
Step 3						13.85***	1
Risk-taking behaviors	0.21	0.06	13 27***	1.24	1.10–1.39		

Note:

* indicates $p < 0.05$.

** indicates $p \leq 0.01$.

*** indicates $p \leq 0.001$.