# Gender and Risk Factors for Suicide: Evidence for Heterogeneity in Predisposing Mechanisms in a Psychological Autopsy Study

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***Objective:*** It is unclear whether clinical and behavioral suicide risk factors, identified primarily among men, can be extended to women. We therefore explored sex differences in psychopathology and personality variants among suicide completers.

***Method:*** Using the psychological autopsy method, we compared personality variants and the prevalence of psychopathology as a function of sex among 351 consecutive suicides in a large, urban community. Psychiatric diagnoses were obtained using the Structured Clinical Interview for DSM-IV-TR Axis I Disorders and the Structured Clinical Interview for DSM-IV Axis II Personality Disorders, and measures of impulsive aggression, temperament, and character were administered. Subsequently, we carried out secondary analyses between male and female suicides matched 2:1 for age, current depression, and number of lifetime depressive episodes. The study was conducted from late 2000 to 2005.

***Results:*** Females were less likely to meet criteria for current and lifetime alcohol abuse, but those who did were less likely than males to have concurrent depression. On average, females were less impulsive, yet similar proportions of males and females were highly impulsive and impulsivity was associated with alcohol abuse irrespective of gender. Females were more likely to meet criteria for lifetime anxiety disorders; these were associated with nonviolent suicide methods, irrespective of gender.

***Conclusions:*** Despite a lower prevalence among females, high levels of impulsivity and alcohol abuse appear to be valid risk factors for both sexes. Researchers should focus on females for the identification of other suicide mediators.

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With few notable exceptions,[1,2] men are more likely than women to die by suicide. The majority of studies examining risk factors for completed suicide have done so in unselected, predominantly male, suicide victims. In part due to small female samples, studies have not controlled for gender differences; as such, it is unclear whether predictors of completed suicide among males can be generalized to females.

The verification of risk factors for completed suicide among females is of tremendous significance as female suicide also constitutes an important health problem. Research on suicide completion among unselected suicides has unveiled several clinical and behavioral risk factors.[3,4] It is becoming increasingly clear that the increased risk for suicide associated with underlying psychopathology and personality variants[5–10] and suicidal behavior[11,12] are moderated by gender. For instance, male suicides have been found to be more likely to meet criteria for substance, personality, and childhood disorders, whereas female suicides are more likely to meet criteria for major depression. However, examinations of gender differences in risk factors for completed suicide have, for the most part, focused on younger suicides[6,7] or have not examined unselected suicides.[9,10]

The goal of the current study, therefore, is to explore the gender differences in clinical and behavioral characteristics, as well as the temperament and character, of a large sample of unselected suicides to further refine the profile of female suicide completers.

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Table 1. Suicide Methods in Consecutive Suicides[a]

| Method | Male (N = 288) | Female (N = 63) |
|---|---|---|
| Violent suicide method[b] | 84.0 | 54.0 |
| Cutting | 4.2 | 0.0 |
| Firearm | 16.0 | 1.6 |
| Hanging | 53.1 | 38.1 |
| Jumping | 3.8 | 7.9 |
| Other (ie, electrocution, traffic, plastic bag suffocation) | 6.9 | 6.4 |
| Nonviolent suicide method | 16.0 | 46.1 |
| Carbon monoxide | 9.0 | 1.6 |
| Drowning | 2.1 | 3.2 |
| Overdose | 4.9 | 41.3 |

[a]Values expressed as percentages of subjects.
[b]$\chi^2 = 22.682$, p = .000, OR = 0.253, 95% CI = 0.140 to 0.457.
Abbreviation: OR = odds ratio.

## METHOD

Our primarily white sample originates from the Greater Montreal area. From late 2000 to 2005, we examined 351 consecutive suicides (63 females) from the Quebec Coroner's Office. Information pertaining to suicide method was obtained from this office. Participating suicide families (72%) did not differ from nonparticipating families with regard to the age (p > .86), marital status (p > .65), or race (p > .14) of the deceased. Our local institutional review board approved the project, and we obtained written informed consent.

We used the psychological autopsy method, whereby the person best acquainted with the deceased (spouse, sibling, child, or parent) is selected as an informant. Psychological autopsies have been validated for psychiatric diagnoses,[13–15] and we have previously shown that our methods are valid for the assessment of personality pathology and personality variants.[16] In addition, we have shown that the relationship between the deceased and the informant does not influence the rate of specific disorders identified.[17] Moreover, we have previously shown that the information provided by multiple informants reporting on the same subject does not vary.[18]

Psychiatric diagnoses were obtained using the Structured Clinical Interview for DSM-IV-TR Axis I Disorders[19] and the Structured Clinical Interview for DSM-IV Axis II Personality Disorders.[20] Two or more interviewers were asked to rate the same subject (Axis I: N = 36; Axis II: N = 38). Kappa coefficients ranged from very good to excellent: 0.87, depressive disorders; 0.87, substance abuse/dependence; 1.0, schizophrenia; 0.80, cluster B personality disorders; and 0.78, generalized anxiety disorder and panic disorder.

Behavioral characteristics were assessed using informant versions of the Brown-Goodwin Lifetime History of Aggression,[21] the Barratt Impulsiveness Scale,[22] the Buss-Durkee Hostility Inventory,[23] and the Temperament and Character Inventory (TCI).[24] The internal consistency estimates were overall excellent for the Brown-Goodwin History of Aggression ($\alpha = .88$), the Barratt Impulsiveness Scale ($\alpha = .90$), the Buss-Durkee Hostility Inventory ($\alpha = .86$), and the TCI ($\alpha$ between .73 and .88 for each of the scales). The literature on the validity of behavioral assessments by means of informants consistently demonstrates the similarity between information obtained with an informant and the subject.[13–16,18]

The goal of the current study was to examine sex differences in psychopathology, as well as behavior, temperament, and character, among suicide completers to better understand female suicide completers. As such, our primary analyses examined these variables among a sample of unselected suicides as a function of sex. We then conducted secondary analyses among male and female suicides matched 2:1 for age, current depression, and number of lifetime depressive episodes to determine whether behavioral characteristics, personality variants, or psychopathology associated with impulse dyscontrol differentiated male and female suicides while directly controlling for major psychopathologic diagnoses. Statistical analyses were performed using the SPSS statistical package version 11.5 (SPSS Inc., Chicago, Ill.). We used t tests to examine group differences with respect to continuous variables that met the underlying assumptions, while Mann-Whitney U tests were used for examinations of continuous variables with skewed distributions. Chi-square analysis and odds ratio (OR) (with exact limit test to evaluate the 95% confidence interval) were used to compare categorical variables. To examine the independence of significant univariate predictors, we used partial correlations to examine the relationship between gender and the predictor, while controlling for all other significant variables. Multivariate regression examined the relationship between impulsivity and impulse dyscontrol psychopathology while controlling for gender.

## RESULTS

The suicide methods used by male and female suicide completers are presented in Table 1. Female suicides were less likely to have used a violent suicide method (OR = 0.253, 95% CI = 0.140 to 0.457).

The characteristics of male and female suicides are presented in Table 2. Female suicides were more likely to have attended university (OR = 2.273, 95% CI = 1.319 to 3.915) and to have been employed (OR = 1.937, 95% CI = 1.125 to 3.335). Females were more likely to have met criteria for depressive (OR = 1.744, 95% CI = 0.978 to 3.113) and anxiety (OR = 2.020, 95% CI = 0.989 to 4.124) disorders in their lifetimes. They were less likely to have had an alcohol abuse disorder in their lifetime (OR = 0.456, 95% CI = 0.246 to 0.845) and marginally less likely to have a current alcohol abuse disorder (OR = 0.506, 95% CI = 0.251 to 1.277). Moreover, females who

**Table 2. Risk Factors for Completed Suicide Among Consecutive Male and Female Suicides**

| Factor | Male (N = 288) | Female (N = 63) | Statistic | p | Odds Ratio | 95% CI |
|---|---|---|---|---|---|---|
| Demographics | | | | | | |
| Age, mean ± SD, y | 42.32 ± 14.32 | 41.74 ± 13.68 | t = 0.354 | .724 | | |
| University education, % | 30.4 | 50.0 | $\chi^2$ = 9.024 | .003 | 2.273 | 1.319 to 3.915 |
| Employed, % | 45.8 | 62.1 | $\chi^2$ = 5.817 | .016 | 1.937 | 1.125 to 3.335 |
| Married, % | 35.3 | 39.5 | $\chi^2$ = 0.518 | .472 | 1.199 | 0.731 to 1.966 |
| Axis I—current (past 6 months) | | | | | | |
| Depressive disorder, % | 52.1 | 55.6 | $\chi^2$ = 0.250 | .617 | 1.150 | 0.665 to 1.989 |
| Alcohol abuse, % | 30.7 | 18.3 | $\chi^2$ = 3.715 | .054 | 0.506 | 0.251 to 1.277 |
| Anxiety disorder, % | 10.7 | 15.8 | $\chi^2$ = 1.214 | .271 | 1.569 | 0.700 to 3.514 |
| No. of comorbid Axis I disorders, mean ± SD | 1.59 ± 1.05 | 1.61 ± 1.12 | t = 0.158 | .875 | | |
| Axis I—lifetime | | | | | | |
| Depressive disorder, % | 55.2 | 68.3 | $\chi^2$ = 3.601 | .058 | 1.744 | 0.978 to 3.113 |
| Alcohol abuse, % | 43.8 | 26.2 | $\chi^2$ = 6.431 | .011 | 0.456 | 0.246 to 0.845 |
| Anxiety disorder, % | 12.0 | 21.7 | $\chi^2$ = 3.838 | .050 | 2.020 | 0.989 to 4.124 |
| Psychotic disorder, % | 10.9 | 14.3 | $\chi^2$ = 0.589 | .443 | 1.366 | 0.615 to 3.033 |
| No. of comorbid Axis I disorders, mean ± SD | 1.50 ± 1.21 | 1.71 ± 1.33 | t = 1.162 | .249 | | |
| Axis II | | | | | | |
| Cluster A, % | 6.8 | 4.9 | $\chi^2$ = 0.303 | .582 | 0.706 | 0.203 to 2.455 |
| Cluster B, % | 21.2 | 23.0 | $\chi^2$ = 0.096 | .757 | 1.110 | 0.574 to 2.146 |
| Cluster C, % | 16.0 | 19.7 | $\chi^2$ = 0.479 | .489 | 1.282 | 0.634 to 2.592 |
| Behavioral measures, mean ± SD | | | | | | |
| BIS-11 | 66.79 ± 14.29 | 62.44 ± 15.58 | t = –1.976 | .049 | | |
| BDHI | 35.14 ± 13.70 | 38.11 ± 12.80 | t = 1.396 | .164 | | |
| BGLHA | 9.32 ± 10.97 | 7.90 ± 9.52 | Z = –1.446[a] | .148 | | |
| Temperament and character, mean ± SD | | | | | | |
| Self-directedness | 26.46 ± 8.59 | 25.58 ± 7.66 | t = –0.620 | .536 | | |
| Cooperativeness | 28.63 ± 8.10 | 29.98 ± 7.78 | Z = –1.070[a] | .285 | | |
| Self-transcendence | 11.44 ± 6.76 | 13.35 ± 6.95 | Z = –1.666[a] | .096 | | |
| Novelty seeking | 21.05 ± 6.97 | 18.91 ± 7.32 | t = –1.827 | .069 | | |
| Harm avoidance | 17.98 ± 7.73 | 20.42 ± 7.63 | t = 1.894 | .059 | | |
| Reward dependence | 12.54 ± 4.59 | 15.42 ± 3.69 | t = –3.868 | < .001 | | |
| Persistence | 4.95 ± 2.40 | 5.72 ± 2.19 | Z = –1.957[a] | .050 | | |

[a]Mann-Whitney U test.
Abbreviations: BDHI = Buss-Durkee Hostility Inventory, BGLHA = Brown-Goodwin Lifetime History of Aggression, BIS-11 = Barratt Impulsiveness Scale, CI = confidence interval.

abused alcohol were less likely than their male counterparts to have concurrently met the criteria for a depressive disorder (45.5% vs. 60.0%, Fisher p = .036). Anxiety disorders were associated with nonviolent methods irrespective of gender (OR = 2.138, 95% CI = 1.080 to 4.231, p = .029). Males and females also differed with respect to their scores on behavioral and temperament measures: females scored lower than males on measures of impulsivity ($p < .05$) and higher on the reward dependence ($p < .001$) and persistence (p = .05) subscales of the TCI, as well as marginally higher on the harm avoidance subscale of the TCI (p = .059).

The independence of prediction for clinical and behavioral variables was determined using partial correlation. Partial correlations between the above-listed significant univariate predictors and sex were tested while controlling for every other significant predictor. Four variables were independently associated with the sex of suicide completers: females were more likely to meet criteria for an anxiety disorder in their lifetime (r = 0.172, p = .006) and to have higher scores on the reward dependence (r = 0.230, p = .000) and harm avoidance subscales (r = 0.181, p = .004) of the TCI, as well as lower scores on the Barratt Impulsiveness Scale (r = –0.148, p = .018).

A multivariate linear model was constructed to examine the relationship between impulsivity and alcohol abuse, while controlling for sex. Impulsivity was a significant predictor of lifetime alcohol abuse (F = 26.62, df = 1,257; $p < .001$) when sex (F = 4.90, df = 1,257; $p < .05$) was taken into account.

We also conducted secondary analyses among male and female suicides matched 2:1 for age, current depression, and number of lifetime depressive episodes to determine whether behavioral characteristics, personality variants, or psychopathology associated with impulse dyscontrol differentiated male and female suicides while controlling for major psychopathologic diagnoses.

Our examination of gender differences among unselected suicides revealed several psychopathologic, behavioral, and temperament differences. To test whether these differences were related to impulse dyscontrol, we carried out secondary analyses directly controlling for important psychopathologic diagnoses and history. Male and female suicide completers were randomly matched 2:1 for

Table 3. Risk Factors for Completed Suicide Among Matched Male and Female Suicides[a]

| Factor | Male (N = 82) | Female (N = 41) | Statistic | p | Odds Ratio | 95% CI |
|---|---|---|---|---|---|---|
| Demographics | | | | | | |
| Age, mean ± SD, y | 39.32 ± 11.50 | 39.44 ± 11.58 | t = –0.055 | .956 | | |
| University education, % | 30.4 | 45.9 | $\chi^2$ = 2.672 | .102 | 1.948 | 0.871 to 4.357 |
| Employed, % | 32.1 | 53.7 | $\chi^2$ = 8.566 | .003 | 3.455 | 1.478 to 8.076 |
| Married, % | 43.2 | 39.0 | $\chi^2$ = 0.196 | .658 | 0.841 | 0.391 to 1.810 |
| Axis I—current (past 6 months) | | | | | | |
| Alcohol abuse, % | 29.3 | 17.1 | $\chi^2$ = 2.156 | .142 | 0.498 | 0.194 to 1.277 |
| Anxiety disorder, % | 18.3 | 19.5 | $\chi^2$ = 0.027 | .870 | 1.083 | 0.417 to 2.811 |
| No. of comorbid Axis I disorders, mean ± SD | 1.54 ± 1.05 | 1.46 ± 0.86 | t = 0.447 | .656 | | |
| Axis I—lifetime | | | | | | |
| Alcohol abuse, % | 45.1 | 26.8 | $\chi^2$ = 3.844 | .050 | 0.446 | 0.197 to 1.009 |
| Anxiety disorder, % | 18.3 | 22.0 | $\chi^2$ = 0.233 | .629 | 1.256 | 0.497 to 3.176 |
| Psychotic disorder, % | 9.8 | 17.1 | $\chi^2$ = 1.367 | .242 | 1.904 | 0.639 to 5.679 |
| No of comorbid Axis I disorders, mean ± SD | 1.52 ± 1.29 | 1.53 ± 1.12 | t = 0.051 | .959 | | |
| Axis II | | | | | | |
| Cluster A, % | 6.1 | 5.4 | $\chi^2$ = 0.022 | .882 | 0.880 | 0.163 to 4.759 |
| Cluster B, % | 28.0 | 24.3 | $\chi^2$ = 0.180 | .671 | 0.825 | 0.338 to 2.012 |
| Cluster C, % | 11.0 | 16.2 | $\chi^2$ = 0.636 | .425 | 1.570 | 0.515 to 4.788 |
| Behavioral measures, mean ± SD | | | | | | |
| BIS-11 | 64.48 ± 14.84 | 61.54 ± 15.04 | t = 0.947 | .346 | | |
| BDHI | 34.17 ± 14.82 | 36.16 ± 11.72 | t = 0.702 | .485 | | |
| BGLHA | 11.95 ± 22.93 | 7.37 ± 9.42 | Z = –1.483[b] | .138 | | |
| Temperament and character, mean ± SD | | | | | | |
| Self-directedness | 36.21 ± 6.90 | 35.17 ± 5.74 | t = –0.648 | .519 | | |
| Cooperativeness | 41.01 ± 4.31 | 40.54 ± 3.94 | Z = –1.149[b] | .251 | | |
| Self-transcendence | 50.97 ± 6.54 | 49.12 ± 6.88 | Z = –1.164[b] | .244 | | |
| Novelty seeking | 20.04 ± 7.96 | 18.63 ± 7.34 | t = 0.868 | .388 | | |
| Harm avoidance | 16.60 ± 7.60 | 18.89 ± 8.12 | t = 1.404 | .164 | | |
| Reward dependence | 12.74 ± 4.12 | 16.16 ± 3.54 | t = 4.183 | < .001 | | |
| Persistence | 5.61 ± 2.16 | 6.05 ± 2.11 | Z = –1.095[b] | .273 | | |

[a]Matched analyses constitute secondary analyses due to (1) the significant drop in statistical power and (2) the study's goal of better understanding female suicide.
[b]Mann-Whitney U test.
Abbreviations: BDHI = Buss-Durkee Hostility Inventory, BGLHA = Brown-Goodwin Lifetime History of Aggression, BIS-11 = Barratt Impulsiveness Scale, CI = confidence interval.

age (± 2 years), the presence of current depressive disorders, and number of lifetime depressive episodes. Comorbidity between lifetime depressive and anxiety disorders was similar for males and females (17.3% vs. 24.3%, p = .306); as such, we effectively controlled for the lifetime presence of anxiety disorders. This matched sample consisted of 41 female and 82 male suicides (39% current major depressive episodes; 0.54 ± 0.76 depressive episodes).

The characteristics of the matched suicides are presented in Table 3. Results of similar direction and magnitude emerged with respect to employment. Females were also less likely to have met criteria for alcohol abuse in their lifetime (OR = 0.446; 95% CI = 0.197 to 1.009) and had higher scores on the reward dependence subscale of the TCI (p = .000).

## DISCUSSION

To verify the overlap of risk factors between male and female suicides, we compared 351 consecutive suicides, 63 of whom were female. Few differences emerged with respect to Axis I or II characteristics. For instance, Axis I comorbidity, Axis II symptoms, and psychotic disorders were similar for males and females as were behavioral measures of aggression and hostility. Our results suggest that, in many respects, the psychopathologic and behavioral profile underlying suicide is not gender specific, yet the prevalence of anxiety and alcohol abuse disorders differentiated males and females, as did scores on measures of impulsivity and harm avoidance.

In line with previous findings,[25] females in our sample had higher levels of anxiety traits and disorders than males. Anxiety disorders, the most frequently investigated of which is panic disorder, have been reported to increase risk for suicidal behavior, yet these studies specify that this increased risk for suicidal behavior typically occurs when comorbid with a depressive disorder.[26–29] A study by our group, however, did not replicate this finding among male suicide completers.[16] Though there is debate as to the sensitivity of the psychological autopsy method in relation to anxiety disorders, it is nevertheless unclear whether anxiety disorders increase risk for suicidal behavior, but not completed suicide, or whether the risk associated with such disorders is gender specific.

Sareen et al.[30] have reported that the comorbid presence of anxiety and mood disorders increased individuals' risk for suicide attempts beyond that of mood disorders in isolation. Moreover, 2 recent studies have suggested that anxiety disorders may be associated with differential risk for suicide attempts,[30,31] with an increased risk associated with simple phobia after controlling for individual anxiety disorders. Nevertheless, it is interesting to note that in the NEMESIS study,[30] before controlling for individual anxiety disorders, the presence of any anxiety disorder was more strongly associated with an increased risk for suicide than simple phobia and that the risk was substantially higher (ORs = 3.6 vs. 2.8). Thus, while discrete anxiety disorders may be associated with differential risk for suicide, anxiety disorders as a diagnostic category seem to be more relevant for the assessment of risk for suicide.

Though the increased prevalence of anxiety disorders among female suicides requires additional investigation using case-control investigations of female suicide completers and female suicide attempters, the possible implications of this finding are very interesting. Previous examinations have indicated that anxious traits may serve a protective role against suicide attempts,[32] while anxiety disorders may serve a protective role against death by suicide.[33] When taken in conjunction with the gender-independent association between anxiety disorders and less violent, and less lethal, suicide methods, one might hypothesize that an individual who meets criteria for an anxiety disorder and engages in suicidal behavior is less likely to die as a result of this behavior. This may, in part, explain the predominance of males among those who die by suicide and the converse among attempters. Due to the absence of living individuals, however, the current study does not address whether anxiety disorders are gender-specific risk factors or risk factors for suicidal behavior, but not completed suicide.

Female suicides were less likely than male suicides to have met criteria for current and lifetime alcohol abuse, while lifetime alcohol abuse differentiated males and females matched for primary psychopathology. In a meta-analysis of 3275 suicides investigated using psychological autopsy, men were more likely than women to meet criteria for substance abuse disorders.[5] In another report, however, Qin and Nordentoft[34] found that, in 2 peaks of suicide risk related to psychiatric hospitalizations, meeting criteria for a substance abuse disorder resulted in an increased risk for suicide in women but not men. Our results are interesting in light of these findings, for alcohol abuse was less prevalent among female suicides in our sample. At the same time, however, fewer female than male suicides who meet criteria for alcohol abuse concurrently meet criteria for a depressive disorder. Thus, despite its lower prevalence, alcohol abuse among women is likely to be a considerable risk factor for suicide, even in the absence of depression.

On average, female suicides exhibited lower levels of impulsivity than males. Moreover, this difference was replicated using the persistence subscale of the TCI, higher scores on which are indicative of lower levels of impulsivity, and a trend ($p = .069$) was noted on the novelty seeking subscale of the TCI, another measure of impulse dyscontrol. Nevertheless, 26.4% of female and 30.1% of male suicides scored 75 or above on the Barratt Impulsiveness Scale, compared with only 13% of individuals in the general population,[35] and impulsivity converged with alcohol abuse even when controlling for sex. Thus, despite lower prevalence among females, high levels of impulsivity and psychopathology related to impulse dyscontrol appear to be equally valid risk markers for suicide among both males and females. Our results suggest that, unlike in males, impulsivity does not mediate suicide in any but the highly impulsive females, though a future examination involving male and female controls is needed to confirm this proposition. Further, higher scores on Cloninger and colleagues' "reward dependence" temperament construct are associated with detachment, independence, and practicality,[24] in stark contrast to the affective lability and impulsivity typically associated with suicidal behavior. As such, for the identification of suicide mechanisms other than impulsivity, our results suggest that researchers should focus on female suicide.

The limitations to this study are inherent to postmortem studies involving proxy-based interviews. Past studies, however, have reported on the validity of the methodology.[13–16,18] Though family members of the deceased may exaggerate or distort information, we are comparing suicides, and this methodological limitation is not likely to influence group differences. Confirmation using a case-control study using male and female normative controls is needed to verify the stated relative risks among male and female suicides in our study.

## CONCLUSION

Many previously identified risk factors do not appear to be gender specific. Though case-control studies with both male and female controls are needed, impulsivity and psychopathology related to impulse dyscontrol appear to be valid mediators of suicide for both sexes; however, among females, this appears to be the case only among the highly impulsive. For the identification of suicide mechanisms other than impulsivity, researchers should focus on female suicide, for the prevalence of additional mechanisms of suicide appears to be most important among this population.

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*Editor's Note:* We encourage authors to submit papers for consideration as a part of our Focus on Women's Mental Health section. Please contact Marlene Freeman, M.D., at marlenef@email.arizona.edu.

  