Published in final edited form as:
Am J Geriatr Psychiatry. 2008 November ; 16(11): 905–913. doi:10.1097/JGP.0b013e3181860034.

Sex Differences in Correlates of Suicide Attempt Lethality in Late Life

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Abstract

Objective—Suicide attempts are more lethal in men than in women and this sex difference is more pronounced in old age, when suicide rates in men are highest in most countries, including the United States. To understand this sex difference, the authors assessed correlates of suicide attempt lethality in older men and women.

Method—Our cross-sectional study enrolled 125 adults (84 aged 50–69 and 41 aged 70 and older) with major depression and a suicide attempt admitted to community and university hospitals in Rochester, NY. and Pittsburgh, PA. Assessments included a structured diagnostic interview, the Lethality Scale, the Suicide Intent Scale, the Cumulative Illness Rating Scale (CIRS) measuring burden of physical illness, and the Mini-Mental Status Examination (MMSE).

Results—Attempt lethality was higher in older (70+) than in younger (50–69) men and lower in older than in younger women. Association between suicidal intent and attempt lethality was the strongest in older men compared with the other groups. Higher attempt lethality in older men was partly explained by their higher levels of intent, and not by CIRS, MMSE, substance use disorders, or living alone. In younger, but not in older women, suicide intent was correlated with attempt lethality.

Conclusion—Older men act more decisively on their suicidal intent than older women and this difference is more pronounced with increasing age. These findings might partially explain the sex differences in suicide deaths worldwide.

Keywords

Suicide; suicide attempted; depressive disorder; aged; aged 80 and over; sex; risk factors

Even though older people make fewer suicide attempts than younger adults,[1] they are more likely to die by suicide in almost all countries.[2] Indeed, the lethality—or the medical seriousness—of suicide attempts is highest in older adults,[3,4] perhaps because a more serious intent to kill oneself leads to a choice of more lethal means.[5–8] In addition, older people often live alone and may, thus, be less likely to receive prompt treatment after a suicide attempt, and their preexisting physical illness may also increase the likelihood of death.

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The increase in suicide rates in old age is largely because of suicides in older men. In the United States, the suicide rate sharply increases in men aged 70 and older in all races with highest absolute rates in white men. In women, the suicide rates peak in the 40s and 50s and decline afterward. Therefore, the sex difference in rates increases with age. This is true almost everywhere worldwide, even in China where overall suicide rates are higher in women, due to higher rates in younger women than in younger men.[2] Although sex differences in risk factors for suicide attempts have been documented, for example, in major depression,[9] to our knowledge no published reports have addressed sex differences in factors determining lethality of suicide attempts in late life.

In younger and mixed-age groups of suicide attempters, preexisting factors such as male sex,[10–13] presence of melancholia[14] or bipolar illness,[15] physical disease,[12] executive function impairment,[16] impaired decision-making,[17] and disruption in ventromedial prefrontal cortical function[3] have been associated with more lethal attempts. Among these, physical illness[18–21] and cognitive impairment[22–24] are common in older adults and, thus, warrant particular attention as potential risk markers. Not surprisingly, people who make more lethal suicide attempts are those with greater intent to die during a suicidal crisis[10–13] and those with a more accurate expectation of lethality.[25] Suicidal intent, in turn, seems to be partially determined by the same factors[6,7,12,13,26] and may be thought of as partially mediating the lethality of the suicide attempt.

In this study, we examined factors associated with suicide attempt lethality and suicidal intent in 125 older men and women with major depression who were hospitalized after a suicide attempt. We hypothesized that[1] age-related increases in attempt lethality and in suicidal intent will be modified by sex and that[2] correlates of attempt lethality and suicidal intent will differ between men and women.

METHOD

All participants provided written informed consent. The University of Rochester or the University of Pittsburgh institutional review board approved the study in each institution.

Participants

At both sites, clinical staff of the psychiatric inpatient units referred all age-eligible patients who made a suicide attempt; the current analysis includes participants with attempts within 1 month before assessment. The study in Monroe County (Rochester), NY, enrolled 101[27] participants aged 50 years and older from four area hospital psychiatric inpatient units. All had major depressive disorder by Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised,* Axis I Disorders[28,29] (SCID/DSM-IIIR). The study carried out at the inpatient unit of the Western Psychiatric Institute and Clinic in Pittsburgh, PA, enrolled participants aged 60 and older with a score of 18 or greater on the Mini-Mental State Examination (MMSE)[30]; only participants with major depression by SCID/*DSM–IV* were included in this analysis. We excluded patients with bipolar disorder, schizophrenia, and schizoaffective disorder. The Pittsburgh, PA, study also excluded patients with sensory disorders that precluded cognitive testing, stroke, epilepsy, brain tumors, and those receiving electroconvulsive therapy in the previous 6 months. The mean interval between the suicide attempt and study assessment was 8.4 days (SD: 7.6; median: 7).

Lethality of Attempts

Medical lethality of suicide attempts was the principal outcome measure, assessed with Beck's Lethality Scale (LS).[31] The LS is completed by an interviewer based on clinical examination, medical records, and information from the treatment team. It measures the medical lethality of

a suicide attempt for one of eight possible methods (sedative drugs, nonsedative drugs and other substances, shooting, immolation, drowning, cutting, jumping, hanging) on an ordinal scale from 0 (no or minimal damage) to 8 (death). The LS has demonstrated good interrater reliability (intraclass correlation coefficient = 0.80).[32]

Suicidal Intent

Suicidal intent was measured with the Suicide Intent Scale (SIS).[31] This 15-item scale assesses patient's behavior and thoughts before a recent suicide attempt, yielding a total score from 0 to 30. The first eight items of the SIS assess the objective circumstances of the suicide attempt (isolation, timing, precautions, help-seeking, final arrangements, preparation, note, communication of intent). The following seven items assess the patient's subjective view of the attempt (purpose, expectations of fatality, conception of method's lethality, seriousness, attitude toward living/dying, medical rescuability, premeditation). The SIS possessed good internal consistency in our sample: Cronbach alpha = 0.82. It has been reported to possess good-to-excellent interrater reliability ($0.81 \leq$ intraclass correlation coefficient ≤ 0.95).[33,34]

Correlates of Lethality

Along with age and sex, independent variables of interest were burden of physical illness, lifetime prevalence of substance use disorders, isolation at the time of attempt, and the MMSE[30] score. Burden of physical illness before the suicide attempt was assessed with the Cumulative Illness Rating Scale (CIRS)[35] for the Rochester site and the CIRS adapted for Geriatrics (CIRS-G),[36] for the Pittsburgh, PA, site. To combine the data from the two sites, we obtained a modified score using the common items of the scales and omitted the hematopoietic item of the CIRS-G. The psychiatric item was omitted from both scales. The presence of lifetime substance use disorders was assessed using *DSM–III–R*/*DSM–IV* criteria for any substance abuse or dependence as determined by the SCID. With respect to living arrangements, we distinguished those living alone from all others (living with family or friends, in personal care homes and in long-term care). We established living arrangements by interviewing patients and their family members or friends, and verified them through the hospital's clinical and demographic records. For descriptive purposes, depression severity in this sample was measured with the 17-item Hamilton Rating Scale for Depression (HRSD17).[37]

Statistical Analysis

We provide descriptive data stratified by sex and age group (50–69, 70+). We chose our age cutoff based on US population data on completed suicide; crude suicide rates in men begin increasing sharply after age 69.[38] Using SPSS 15.0 (SPSS Inc., Chicago), we applied general linear models to test our hypotheses that 1) the increase in attempt lethality and in suicidal intent with age is modified by sex and 2) there are sex differences in correlates of lethality. We measured the effect sizes (ESs) using the partial eta squared: a partial eta squared ES of 0.01 is considered small, 0.06 is considered medium, and 0.14 is considered large.[39] Before pooling data for analyses, we examined site differences: reflecting the age cutoff of 60 for Pittsburgh, PA, and 50 for Rochester; the Pittsburgh, PA, participants were older (72.8 [9.4] versus 63.4 [11.1] years, t [123] = −3.87, $p < 0.0001$), more medically ill (modified CIRS 9.4 [4.7] versus 5.5 [3.5], t [122] = −4.62, $p < 0.0001$), and more cognitively impaired (MMSE 25.4 [2.9] versus 26.9 [2.7], t [109] = 2.28, $p = 0.025$). Furthermore, even after accounting for age differences, the Pittsburgh, PA, participants had higher attempt lethality (3.1 [2.7] versus 2.0 [1.7], F [124] = 4.36, $p = 0.04$) and suicidal intent (18.9 [4.7] versus 15.5 [6.0], F [1,123] = 8.44, $p = 0.005$). Thus, we accounted for site in our analyses. Since severity of depression was measured up to a month after the suicide attempt and, more importantly, patients with more serious attempts typically had longer recovery times before being able to provide consent and complete

assessments, we did not use HRS17 scores in our analyses as a measure of preattempt depressive severity. We did verify, however, that despite using *DSM–IV* criteria for major depression at the Pittsburgh, PA, site and *DSM–III–R* criteria at the Rochester site, mean HRS17 scores were similar between groups (22.6 [6.5] and 23.61 [6.1], t [123] = 0.734, p = 0.46). We examined the distribution of LS scores, finding it acceptable for the application of the general linear model. To further ascertain the robustness of our results, we used ordinal regression as a sensitivity analysis. In the subsequent sex-stratified analyses, we first assessed the role of preexisting factors, including age group, burden of physical illness, lifetime substance use disorders, living alone, and MMSE score. Then, we accounted for suicidal intent —a factor operating during the suicidal crisis—in our models. We also examined correlates of suicidal intent, including age group, burden of physical illness, lifetime prevalence of substance use disorders, MMSE score, and living alone.

RESULTS

Participants

Mean age of our participants was 65 years (SD = 11.3, range = 50–91 years); 109 subjects had nonpsychotic major depression and 16 had psychotic depression. Table 1 presents participants' demographic and clinical characteristics and data about the suicide attempts. Suicide attempts were by overdose on sedative (N = 76), nonsedative (N = 12), or unknown (N = 3) substances, shooting (N = 4), drowning (N = 1), cutting (N = 20), jumping (N = 2), hanging (N = 5), or unknown method (N = 2). Men had a higher lifetime prevalence of substance use disorders than women (logistic regression controlling for age group, odds ratio = 2.87, df = 1, χ^2 = 6.70, p = 0.010). Half of the participants had previous suicide attempts, including 25% with two or more (Table 2); men and women did not differ in the number of previous suicide attempts (Mann-Whitney U [125] = 1628, p = 0.29). Burden of physical illness (analysis of variance controlling for sex, F [1,120] = 36.23, p < 0.0001) was higher and MMSE score (analysis of variance controlling for sex, F [1,107] = 41.90, p < 0.0001) was lower in the older group.

Age Group, Sex, and Attempt Lethality

In addition to the main effect of suicidal intent (F [1,104] = 7.06, p = 0.009) on attempt lethality, there was a significant age group by sex interaction (F [1,104] = 14.41, p < 0.001, partial eta squared ES: 0.13) after accounting for burden of physical illness, living alone, lifetime substance use disorders, MMSE score, and site. Performed as a sensitivity analysis, ordinal regression revealed a similar interactive effect of age group and sex on attempt lethality (df = 1, Wald χ^2 = 8.79, p = 0.003).

Sex and Correlates of Attempt Lethality

The association between suicidal intent and attempt lethality was greater in men than in women, reflected in the significant sex by suicidal intent interaction (F [1,102] = 4.84, p = 0.03, partial eta squared ES: 0.05), accounting for other predictors. Furthermore, the association between suicidal intent and attempt lethality was the strongest in older men compared with the other groups, reflected in the significant sex by age group (50–69 versus 70+) by suicidal intent interaction (F [1,101] = 6.64, p = 0.002, partial eta squared ES: 0.12; Fig. 1). The impact of burden of physical illness (F [1,101] = 1.21, p = 0.27), living alone (F [1,101] = 0.577, p = 0.45), lifetime substance use disorders (F [1,101] = 0.478, p = 0.49), or MMSE score (F [1,101] = 0.114, p = 0.74) did not differ by sex.

These results were mirrored by sex-stratified analyses. Men in the older age group made more lethal suicide attempts than younger men (Table 2, model 1). This relationship between age group and lethality was partially accounted for by the effect of suicidal intent in older men (Table 2, model 2). By contrast, attempt lethality was lower in older (70+) than in younger

(50–69) women (Table 2, model 1). The relationship between age group and lethality persisted after accounting for suicidal intent, which was not significantly correlated with attempt lethality in women (Table 2, model 2).

Figure 1 illustrates the relationships between suicidal intent and lethality in men and women by age group.

Sex and Correlates of Suicidal Intent

The impact of clinical predictors on suicidal intent did not differ significantly between men and women, as shown by the lack of interactions between sex and age group (F [1,103] = 0.08, p = 0.92), burden of physical illness (F [1,103] = 1.21, p = 0.27), living alone (F [1,103] = 0.59, p = 0.56), lifetime substance use disorders (F [1,103] = 0.03, p = 0.97), or MMSE score (F [1,103] = 0.09, p = 0.76). Stratified by sex, in men, older age group (F [1,33] = 5.68, p = 0.023, partial eta squared ES = 0.15) and higher MMSE score (F [1,33] = 5.38, p = 0.027, partial eta squared ES = 0.14), but not burden of physical illness (F [1,33] = 2,42, p = 0.13), lifetime substance use disorders (F [1,33] < 0.01, p = 0.97) or living alone (F [1,33] < 0.01, p = 0.93) were associated with higher suicidal intent, controlling for site (F [1,33] = 1.36, p = 0.25). In women, age group (F [1,65] = 0.33, p = 0.57), MMSE score (F [1,65] = 1.14, p = 0.29), burden of physical illness (F [1,65] = 0.84, p = 0.36) or lifetime substance use disorders (F [1,65] = 0.21, p = 0.65) were not associated with higher suicidal intent, controlling for site (F [1,65] = 5.78, p = 0.019). The correlation between living alone and suicidal intent was not significant in women (F [1,65] = 0.33, p = 0.070, partial eta squared ES = 0.05).

Post hoc Analyses

Since attempt lethality was lower in older women than in the younger group after accounting for suicidal intent, we further examined the correlates of attempt lethality in each of the age groups, using general linear models. In women aged 50–69, only suicidal intent (F [1,39] = 4.54, p = 0.039, partial eta squared ES = 0.10), but not cognitive functioning (F [1,39] = 0.07, p = 0.80), burden of physical illness (F [1,39] < 0.01, p = 0.96), substance use (F [1,39] = 2.56, p = 0.12, partial eta squared ES = 0.06), or living alone (F [1,39] = 0.09, p = 0.76) was associated with higher attempt lethality, controlling for site. In women aged 70 and older, neither suicidal intent (F [1,13] = 0.04, p = 0.84, partial eta squared ES < 0.01) nor burden of physical illness (F [1,13] = 1.85, p = 0.20, partial eta squared ES = 0.12), living alone (F [1,13] = 3.45, p = 0.086, partial eta squared ES = 0.21), substance use (F [1,13] = 0.03, p = 0.86, partial eta squared ES < 0.01), or cognitive functioning (F [1,13] = 4.56, p = 0.052, partial eta squared ES = 0.26) were associated with higher attempt lethality controlling for site.

DISCUSSION

In our study of 125 suicide attempters aged 50 and older we observed greater lethality of attempts in older (70+ yrs) compared with younger (50–69 years) men, which was partly explained by the effect of suicidal intent, also higher in older men. By contrast, attempt lethality was greater in younger than in older women. Suicidal intent, but not burden of physical illness, isolation, substance use, or MMSE score, was associated with more lethal attempts in men. Similar to men, suicidal intent was the only correlate of attempt lethality in younger women. However, in older women the only correlate of higher attempt lethality was burden of physical illness. Observed ESs for these relationships were moderate to large.

A relatively large sample, detailed clinical characterization and an in-depth assessment of suicidal behavior add confidence in our findings. Sampling bias represents the main limitation: our data are limited to older suicide attempters receiving psychiatric treatment. Even though a number of our participants made serious suicide attempts (Fig. 1), it is difficult to say to what

extent the findings apply to completed suicide. Also, the censoring of lethal events inevitably diminished our power to examine the correlates of lethality. Further, although the racial composition of our sample is representative of suicide victims in the United States, our findings primarily apply to white men and women. The cross-sectional design of our study precludes definitive causal inferences; birth cohort effects are confounded with maturation, potentially limiting the interpretation of differences between age groups.

Our findings suggest that older men act more decisively on their suicidal intent than older women, and this difference is more pronounced with increasing age. In a broader biological sense, in humans the vulnerability to lethal suicidal behavior in older men is just one example of their decreased survival compared with women hypothesized to result from sexual selection.[40] One can speculate that sexual dimorphism in neural circuits involved in decision-making may play a role: compared with women, men display differential performance[41,42] and prefrontal activation[43] on standard decision-making tasks, and demonstrate more asymmetry in crucial ventral prefrontal regions.[44] It would be surprising if the neural circuitry involved in decision-making did not play a role in the decision to take one's life. This sexual dimorphism may be amplified by cultural notions of "manly" conduct[42] shaping the older man's behavior in a crisis.

Our finding of higher attempt lethality in women aged 50–69 compared with older women should be put in the context of population data on suicide. Suicide rates in United States women in 1999–2004 peaked between the ages of 40 to 54 and then declined in older age groups.[38] Taken together, these data suggest that middle-aged and "young-old" women are relatively more vulnerable to lethal suicidal behavior. It is interesting that women aged 50–69 in our study demonstrated a strong relationship between suicidal intent and resulting attempt lethality, similar to men. One wonders whether the rapid change in estradiol levels and other hormonal fluctuations of perimenopause[45] counter the effect of protective factors otherwise present in women.

The association of MMSE score with lower suicidal intent but not with lethality has been reported in a subgroup of the current sample[46] and should be interpreted with caution for two reasons. First, it is based on the MMSE, a rather insensitive measure of cognitive function. Second, because we assessed suicidal intent only after the attempt and in some cases up to a month later, memory impairments could have distorted the report. Although it is possible that cognitive deficits interfere with conception and planning of suicidal acts, the relationship between cognitive function and suicidal behavior in older adults is more complicated. We have previously reported on poorer overall cognitive performance and executive function in particular among suicidal depressed elderly compared with nonsuicidal depressed patients[22] —these cognitive difficulties may parallel real-life problems with making decisions and adjusting to loss and health stresses.

Clinical Implications

Our findings suggest that factors responsible for the increased suicide rate in older men operate largely during the suicidal crisis itself: once a depressed older man develops serious suicidal intent, he tends to realize it with little hesitation. This may explain the failure of suicide prevention programs to reduce male suicide rates.[45] Since one cannot clinically predict the lethality of suicidal behavior in depressed older men at risk, vigilant monitoring, prompt hospitalization of patients with serious thoughts of suicide, and careful follow-up after hospital discharge[47,48] may be the most effective measures.

Acknowledgements

This work was supported by grants K23 MH070471, P30 MH52247, P30 MH071944, R01 MH60285, R01 MH51201, K24 MH072712, and the John A. Hartford Foundation.

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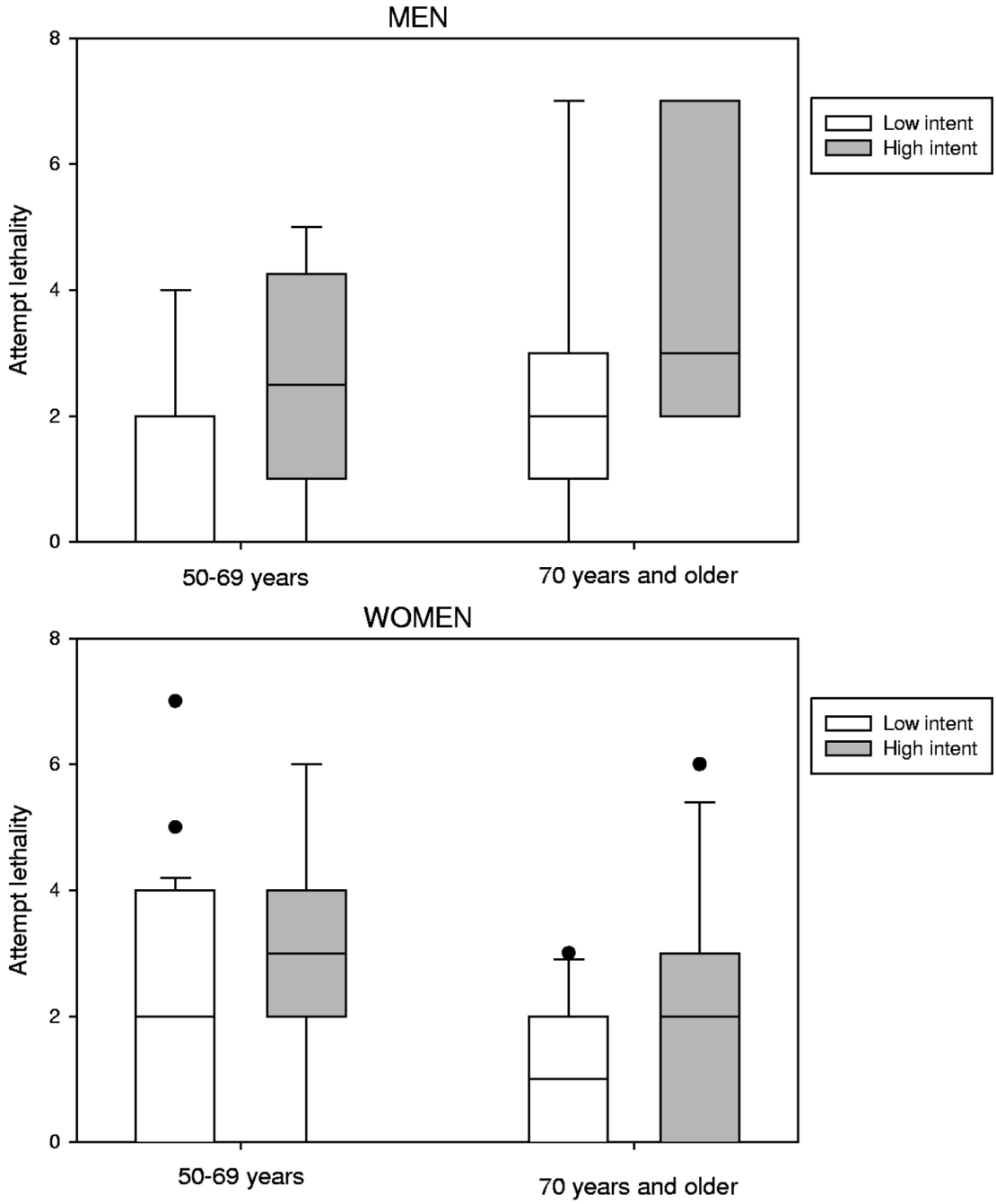

FIGURE 1. Attempt Lethality in Older and Younger Men and Women

Notes: Attempt lethality is increased in older compared with younger men and decreased in older women (significant age group by sex interaction in a model predicting lethality, F [1,110] = 14.41, p <0.001, partial eta squared ES: 0.13). men acted more decisively on their suicidal intent than women, and this fifference was greater in the older age group, reflected in the significant sex by age group (50–69 Versus 70+) by suicidal intent interaction (F [1,110] = 6.64, p = 0.002, partial eta squared ES: 0.12). High-intent attempts are represented by dark gray boxes. Suicidal intent was measured by the suicide intent scale, possible range = 0–30, actual range = 0–29, mean (SD) = 16.1 (5.9), median = 17. Attempt lethality was measured by

the lethality scale, possible range = 0 (no injury) to 8 (death), actual range = 0–7, mean (SD) = 2.2 (2.0).

TABLE 1

Demographic and Clinical Characteristics of Suicide Attempters (N = 125)

	Men		Women	
	Age 50–69 (N = 30)	**Age > 70 (N = 16)**	**Age 50–69 (N = 54)**	**Age > 70 (N = 25)**
% White	97	100	93	92
HRSD 17 total	24.4 (5.4)	21.3 (5.3)	24.5 (6.4)	21.3 (6.4)
Modified CIRS	5.2 (3.4)	9.6 (3.8)	4.7 (3.0)	8.8 (4.8)
MMSE	27.0 (1.9)	23.7 (4.2)	27.9 (2.0)	24.3 (2.5)
Living alone (%)	30	44	28	48
Lifetime prevalence of substance abuse or dependence (%)	40	50	28	8
Psychotic depression	1	0	13	2
Anxiety disorder (%)	10	25	19	4
Previous suicide attempts				
0	17	8	22	15
1	6	6	13	6
2 or more	7	2	19	4
Suicide intent scale	15.8 (4.9)	15.1 (6.6)	16.0 (6.1)	17.4 (6.1)
Lethality scale	1.7 (1.8)	3.0 (2.4)	2.6 (1.9)	1.6 (1.7)

CIRS: Cumulative Illness Rating Scale; MMSE: Mini-Mental Status Examination.

TABLE 2

Predictors of Attempt Lethality in Men and Women[a]

	Men		Women	
	Model 1, Effect Size[b] (p)	**Model 2, Effect Size (p)**	**Model 1, Effect Size (p)**	**Model 2, Effect Size (p)**
Age group: 50–69 versus 70 +	0.16 (0.019)	0.08 (0.123)	0.14 (0.002)	0.15 (0.001)
Burden of physical illness[c]	<0.01 (0.87)	<0.01 (0.71)	0.02 (0.26)	0.03 (0.17)
Mini-Mental Status Examination score	0.05 (0.21)	<0.01 (0.64)	0.03 (0.20)	0.04 (0.14)
Lifetime substance use disorders	0.15 (0.065)	0.08 (0.12)	0.03 (0.17)	0.02 (0.23)
Living alone	0.02 (0.41)	0.03 (0.37)	0.02 (0.25)	<0.01 (0.45)
Suicidal intent[d]	Not included	0.12 (0.046)	Not included	0.05 (0.072)

[a] General linear models, men: Error *df* = 33 (model 1) or 32 (model 2), women: Error *df* = 65 (model 1) or 64 (model 2).

[b] Partial eta squared, 0.01 by convention corresponds to small effect size, 0.06–medium, 0.14–large.[39]

[c] Modified Cumulative Illness Rating Scale score.

[d] Suicide Intent Scale score.