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When the solution is part of the problem: problem solving in elderly suicide attempters

Lawrence M. Gibbs, Alexandre Y. Dombrovski, Jennifer Morse, Greg J. Siegle, Patricia R. Houck, and Katalin Szanto*

Western Psychiatric Institute and Clinic, Department of Psychiatry, University of Pittsburgh School of Medicine, Pittsburgh, PA, USA

SUMMARY

Objectives—Depression, loss, and physical illness are associated with suicide in the elderly. However, the nature of individual vulnerability remains poorly understood. Poor problem solving has been suggested as a risk factor for suicide in younger adults. Unresolved problems may create an accumulation of stressors. Thus, those with perceived deficits in problem-solving ability may be predisposed to suicidal behavior. To test this hypothesis, we investigated whether elderly suicide attempters perceived their problem solving as deficient.

Methods—Sixty-four individuals aged 60 and older participated in the study including depressed suicide attempters, depressed non-attempters, and non-depressed controls. The social problem solving inventory-revised: short-version was used to measure participants' perceived social problem solving, assessing both adaptive problem-solving dimensions (positive problem orientation and rational problem solving) and dysfunctional dimensions (negative problem orientation, impulsivity/carelessness, and avoidance).

Results—Depressed elderly who had attempted suicide perceived their overall problem solving as deficient, compared to non-suicidal depressed and non-depressed elderly. Suicide attempters perceived their problems more negatively and approached them in a more impulsive manner. On rational problem solving and avoidant style sub-scales, suicide attempters did not differ from non-suicidal depressed. However, both depressed groups reported lower rational problem solving and higher avoidance compared to non-depressed controls.

Conclusions—A perception of life problems as threatening and unsolvable and an impulsive approach to problem solving appear to predispose vulnerable elderly to suicide attempts.

Keywords

social problem solving; elderly; suicide attempt; depression

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*Correspondence to: Dr K. Szanto, Western Psychiatric Institute and Clinic, Department of Psychiatry, University of Pittsburgh School of Medicine, 100 N Bellefield Ave, Pittsburgh, PA 15213, USA. szantok@upmc.edu.

CONFLICT OF INTEREST

None declared.

SUPPORTING INFORMATION

Supporting information may be found in the online version of this article.

INTRODUCTION

Suicide accounted for almost 32 000 deaths in the United States in 2004 (CDC, 2005). The elderly make up a disproportionately high number of these suicide deaths and are more likely to succeed in their suicide attempts (Goldsmith *et al.*, 2002). Depression is the most important established risk factor for suicide in late life (Conwell *et al.*, 1996; Skoog *et al.*, 1996; Turvey *et al.*, 2002; Sokero *et al.*, 2003; and Waern *et al.*, 2002), however, most depressed elderly do not become suicidal. Thus, it is important to identify characteristics that distinguish suicidal elderly from other people with depression and that are potentially modifiable by targeted interventions.

It is believed that unresolved problems create an accumulation of stressors (Nezu and Ronan, 1988), and those with deficits in problem-solving ability are likely predisposed to hopelessness and suicidal behavior (Schotte and Clum, 1982, 1987; Evans *et al.*, 1992; Priester and Clum 1993; and Rudd *et al.*, 1994). Indeed, studies of young and mid-age suicide attempters (Evans *et al.*, 1992; Levenson and Neuringer, 1971; Schotte and Clum, 1982, Linehan *et al.*, 1987 and Pollock and Williams, 2004) and of adults with suicidal ideation (Linehan *et al.*, 1987 and Schotte and Clum, 1987) find that suicidal individuals are poorer problem solvers, generating fewer solution options than do depressed non-suicidal individuals and healthy controls. A diathesis–stress–hopelessness model of suicidal behavior has been proposed by Schotte and Clum (1982, 1987) where problem-solving deficits contribute to hopelessness and depression, which, in turn, increase suicidal risk. In this model, the relationships among these constructs, rather than a single construct, are central to suicidal predisposition (Reinecke *et al.*, 2001).

One's perception of his/her problem-solving ability may be particularly germane to suicidal behavior: in a mid-life suicidal psychiatric sample, deficits in perceived problem solving accounted for 55.4% of the variance in suicidal risk (D'Zurilla *et al.*, 2004). Suicidal individuals tended to view problems as significant threats to their well-being and exhibited increased self-blame while doubting their ability to solve problems successfully. Ultimately, when they did attempt to solve problems, these individuals were prone to making attempts that tended to be narrowed, impulsive, careless, and incomplete (D'Zurilla *et al.*, 1998).

Much research in the area of social problem-solving has been done in adolescents and young adults (Chang *et al.*, 2007). While the elderly face the often intractable problems of loss and increasing dependence on caregivers, we are aware of only one study examining the relationship of problem solving and suicide in old age (Howat and Davidson, 2002). The authors found no differences on most measures of problem solving outcomes between suicide attempters, depressed elderly, and community controls. However, elderly suicide attempters were poorer at generating relevant means of reaching given outcomes to *interpersonal* problems than community controls. We believe that Howat and Davidson's mixed findings may be explained by the choice of the means-ends problem-solving procedure (MEPS), which assesses the outcomes of problem-solving, rather than one's self-perception of problem-solving ability: depressed elderly who *perceive* themselves as unable to solve problem may be primarily at risk for suicide. The inclusion of a few past suicide attempters in the comparison groups may have also diminished the study's ability to detect group differences.

To understand whether perceived deficits in problem solving were associated with suicidal behavior in late-life depression, we assessed self-perceptions of problem solving in a carefully clinically characterized group of 64 elderly with and without suicide attempts and depression. We hypothesized that depressed elderly with past suicide attempts would

demonstrate poorer self-reported social problem-solving compared to never-suicidal depressed elderly and to non-depressed elderly controls.

METHODS

Participants

Sixty-four individuals, aged 60 and older, with a score of at least 18 on the mini-mental state exam (Folstein *et al.*, 1975) participated in the study. All participants provided written informed consent as required by the University of Pittsburgh Institutional Review Board. Clinical and demographic characteristics of the three groups are given in Table 1. We compared depressed elderly attempters to (1) non-suicidal depressed elders and (2) non-depressed controls in order to assess the effect of depression and suicidality on perceived problem-solving abilities.

Non-suicidal depressed participants and depressed suicide attempters met criteria for major depressive disorder or depressive disorder NOS as diagnosed by Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (SCID/DSM-IV), and they were recruited from the inpatient psychogeriatric unit and from the late-life depression research clinic at the University of Pittsburgh. Depressed participants were assessed at the beginning of treatment for the index depressive episode. Patients were excluded from the study if they had bipolar disorder, schizophrenia, schizoaffective disorder, or sensory disorders that precluded cognitive testing.

Depressed Suicide Attempters—Eighteen elderly participants who either (1) attempted suicide during the index episode or (2) had a previous suicide attempt and severe suicidal ideation in the current episode, requiring an inpatient admission or an increase in the level of care.

Non-Suicidal Depressed Participants—Twenty-seven comparison participants with no lifetime history of suicide attempts and no current suicidal ideation as defined by scores of 0 on the Beck's scale for suicidal ideation (Beck *et al.*, 1999).

Non-depressed Controls—Nineteen elderly with no lifetime diagnosis of any SCID/DSM-IV Axis I disorder were recruited from university and community primary care practices. Care was taken to equate physical illness burden with those in the other two study groups. As with the non-suicidal depressed participants, they were required to have no lifetime history of suicide attempts and no current suicidal ideation as defined by scores on the Beck's scale for suicidal ideation.

Problem solving measures

The Social Problem Solving Inventory-revised Short-version (SPSI-R:S)—SPSI-R:S was used to measure participants' perceptions of their social problem-solving ability. This 25-item, self-report instrument assesses both constructive/adaptive problem-solving dimensions (positive problem orientation and rational problem solving) and three dysfunctional dimensions (negative problem orientation, impulsivity/carelessness, and avoidance). Positive problem-solving orientation captures a sense of one's constructive, cognitive schema: challenge, self-efficacy, and optimism. Negative problem-solving orientation assesses inhibitive cognitions and emotions: threat, self-blame, self-inefficacy, pessimism, and anger. Rational problem solving includes the systematic utilization of effective problem-solving principles and techniques: problem definition and formulation, generation of alternative solutions. The impulsive/careless style is described as narrow, hurried, and inadequate, and avoidance is characterized by procrastination, passivity/

inactivity, and dependency on others to solve one's problems (D'Zurilla *et al.*, 1998, 2002, 2004). High scores on positive problem-solving orientation and rational problem-solving and low scores on negative problem-solving orientation, impulsivity/carelessness, and avoidance indicate of positive evaluations of social problem solving ability. Normative data for the SPSI-R come from over 2350 individuals, including healthy elderly, depressed adults, and suicidal adults. Plotted raw scores are converted to standard scores. Previous psychometric evaluation of SPSI-R among a variety of patient populations suggests strong internal consistency (Cronbach's $\alpha > 0.9$) that is stable over time (D'Zurilla *et al.*, 2002).

Clinical characterization

The 17-item Hamilton Depression Rating Scale (HAM-D)—HAM-D was used to assess presence and severity of current depressive symptoms (Hamilton, 1967). In analyses, we omitted the HAM-D item assessing suicidality in order to reduce potential co-linearity with group status.

Beck Hopelessness Scale (BHS)—BHS was used to measure participants' hopelessness. The instrument consists of 20 statements that describe positive and negative thoughts about the future (Beck *et al.*, 1993).

Beck's Scale for Suicidal Ideation (SSI)—SSI was used to measure suicidal ideation. This 19-item, interviewer-rated measure of suicidal ideation was shown to predict eventual suicide (Beck *et al.*, 1999), and has been validated in older depressed patients (Bruce *et al.*, 2004).

Suicidal Intent Scale (SIS)—SIS was used to assess the severity of suicidal intent associated with the suicide attempts (Beck *et al.*, 1974). This 15-item questionnaire yields a total score of 0–30, where higher scores indicate high intent.

Beck Suicide Lethality Scale (LS)—LS was used to assess medical lethality of suicide attempts (Beck *et al.*, 1974).

Cumulative Illness Rating Scale adapted for Geriatrics (CIRS-G)—CIRS-G was used to assess illness burden in each of 13 different organ systems (Miller *et al.*, 1992). CIRS-G data were gathered from participants' electronic health records and verified by personal interviews.

Mini-mental status examination (MMSE) (Folstein *et al.*, 1975), and the Mattis dementia rating scale (DRS) were used to assess global cognition (Mattis, 1988).

Intra-class correlation coefficients measuring inter-rater reliability among our assessors in 2007 were: 0.95 for Hamilton rating scale of depression, 0.94 for cumulative illness rating scale for geriatrics, 0.98 for MMSE, 0.997 for DRS. SCID diagnoses were reviewed at consensus case conferences attended by at least two board-certified psychiatrists.

Statistical analysis

Data analysis was performed using SAS software v 9.2 (SAS Institute, Cary, NC). We compared groups on demographic and clinical characteristics using analysis of variance (ANOVA) for continuous measures and χ^2 test for categorical measures. Correlations between SPSI-R subscores were calculated and, subsequently, factor analysis was performed using promax rotation since all factors were from same the instrument. Analysis of covariance (ANCOVA) was used to compare SPSI-R and subscale scores between the three groups controlling for education. Square root transformation was made on scores measuring

avoidant and impulsive/careless problem solving prior to statistical comparison. Age was not used as a covariate as raw scores on the SPSI-R were converted to age-specific scores using previously validated conversions for this instrument (found in D'Zurilla *et al.*, 2002). Tukey post-hoc tests are reported on significant results.

RESULTS

Group characteristics

There were no significant differences between groups in sex, race, or marital status (Table 1). As at post-hoc comparison there was a significant difference between groups with respect to age and there was a trend for education being different among groups, we used education as a covariate in the analyses of SPSI-R scores, as age is taken into account when converting from raw to scaled scores.

The groups did not differ in the burden of physical illness (CIRS-G) and general cognitive functioning (MMSE and DRS). The two depressed groups were not different in the severity of depression measured by the HAM-D (excluding the suicide item) nor in level of hopelessness, measured by BHS. With regard to comorbidities, 7/18 (39%) suicide attempters and 3/27 (11%) non-suicidal depressed had a lifetime diagnosis of substance use disorder ($\chi^2=4.82$, $df=1$, $p=.028$), while 5/18 (28%) suicide attempters and 12/27 (44%) non-suicidal depressed had a lifetime diagnosis of anxiety disorder ($\chi^2=1.28$, $df=1$, $p=.26$).

Suicide attempters were characterized by high lethality of suicide attempts (mean[SD]=3.7[2.0]), with 8/16 scoring 4 or higher (0=minimal damage, 3 or higher=hospitalization, 8=death). The attempts were also characterized by strong suicidal intent (mean[SD]=16.8[5.1]), median of 17. Current suicidal ideation among attempters was also high (mean[SD]=22.2[7.7]).

Problem solving and suicidal behavior

Self-reported aggregate perceptions of problem-solving ability were poorer in suicide attempters than in non-suicidal depressed and highest in non-depressed controls (Figure 1). Suicide attempters (A) did not differ from non-suicidal depressed elderly (D) in positive problem orientation, but both depressed groups exhibited lower scores than non-depressed controls (C) (A : mean[SD]=94.2[14.9], D: 98.4[11.4], C : 110.9[10.9], $F[2,60]=8.16$, $p=0.0007$). Suicide attempters reported higher negative problem solving orientation than either depressed or non-depressed controls (A : 106.2 [16.7], D : 96.1[11.2], C : 91.1[9.8], $F[2,60] = 4.75$ $p=0.012$). Suicide attempters perceived themselves as more impulsive/careless than non-suicidal depressed and non-depressed participants (A=107.7[19.9], D: 93.0[15.0], C: 89.8[11.5], $F[2,60]=5.39$, $p=0.007$).

On rational problem solving and avoidant style sub-scales, suicide attempters did not differ from non-suicidal depressed. However, attempters reported lower rational problem solving and higher avoidant style compared to non-depressed controls (rational problem solving, A : 93.2[16.9], D: 99.1[15.0], C: 108.6[10.7], $F[1,60] = 4.85$, $p=0.011$; avoidant style, A : 106.1[19.1], D: 97.7[14.1], C: 85.4[11.4], $F[2,60] = 7.73$, $p = 0.001$).

Effect sizes for differences between suicide attempters and non-suicidal depressed proved to be large for SPSI total (Cohen's $d=-0.76$), impulsivity/carelessness (0.86), and negative problem orientation (0.74). Small to medium effect sizes were found for the statistically insignificant differences in rational problem-solving (-0.37), positive problem orientation (-0.33), and avoidance (0.52).

Data reduction: dysfunctional and adaptive problem solving factors

To account for high inter-correlations between subscales of (1) negative orientation, impulsivity, and avoidance and (2) positive orientation and rational problem solving (data not shown) and to control type I error, we further reduced the data with an exploratory factor analysis. The scree plot and the eigen criteria suggested that a two factor model should be retained. Mirroring our findings with single subscale scores, suicide attempters scored higher on the 'dysfunctional problem-solving factor' (negative problem orientation, impulsivity/carelessness, and avoidance; accounted for 41% of variance before rotation) than either non-suicidal depressed or non-depressed elderly ($F[2,61]=8.93, p=0.0004$). In contrast, both depressed groups scored lower on the 'adaptive problem-solving factor' (positive problem-solving orientation, rational problem-solving; accounted for 29% of variance) than non-depressed elderly ($F[2,61]=7.93, p=0.0009$).

Substance use disorders, anxiety, and problem solving

Sensitivity analyses examining lifetime diagnoses of substance use or anxiety disorders as covariates did not qualitatively change any of the results for total problem solving or subscale scores. Specifically, the lifetime diagnosis of a substance use disorder predicted lower total problem solving scores and higher negative problem orientation, impulsivity, and avoidance scores. However, the inclusion of substance use disorders in the model did not change the relationship between suicidal behavior and measures of problem solving. Lifetime anxiety disorders were not significantly related to any of the problem solving measures (data not shown).

DISCUSSION

Depressed elderly who had attempted suicide perceived their overall problem-solving as dysfunctional, compared to non-suicidal depressed and non-depressed elderly. Suicide attempters perceived their problems more negatively and approached them in a more impulsive manner. These results parallel those seen in younger populations (Dixon *et al.*, 1991; Rudd *et al.*, 1994; and Schotte and Clum, 1987), suggesting that perceived problem-solving deficits are an important correlate of attempted suicide in the elderly.

In our study, only negative problem orientation and impulsive/careless style distinguished between attempters and non-suicidal depressed. Similar results were found by Reinecke *et al.*, (2001) in adolescents, where negative problem orientation, avoidance, and impulsiveness were related to suicidal behavior. Thus, negative problem orientation is consistently associated with attempted suicide. It is worth remembering that problem-orientation reflects perceived control and ability to handle and cope with a problem. As described by D'Zurilla *et al.* (2004), those with a negative problem orientation are more likely to view a problem as a threat to their well-being, have self-doubt in their problem-solving abilities, and more quickly become distressed when faced with a problem. Therefore, it is not surprising that negative problem orientation is associated with attempted suicide in depressed elderly, who face loss, illness, disability, and dependence. Our findings parallel Williams's notion of 'entrapment', where perceived inability to get away from an aversive environment is theorized to set off escape motivations that lead to suicide attempts (Williams *et al.*, 2005).

In finding that elderly suicide attempters approach their problems more impulsively than non-suicidal depressed elderly, our study is perhaps the first to contradict the common clinical view of late-life suicide attempters and those who die by suicide as being non-impulsive. It is remarkable that this difference persisted even after accounting for comorbid substance use disorders. Plausibly, impulsiveness can both lead to an accumulation of

stressors and facilitate suicidal behavior as a dysfunctional solution. On the other hand, a careless approach to problems represents only one facet of impulsivity. The complex nature of this phenomenon and varying ways of assessing it have given rise to conflicting findings in younger adults and adolescents, where some studies point to an association with suicidal behavior (Mann *et al.*, 1999), while others fail to find it (Oquendo *et al.*, 2004; Renaud *et al.*, 2008; Soloff *et al.*, 2005; and Witte *et al.*, 2008). One explanation that may account for some of the discrepancies is that in vulnerable individuals impulsivity is accentuated in a suicidal crisis, while at other times it may not be as apparent. Since we assessed our participants during a depressive episode with intense suicidal ideation, our approach may be more sensitive to state-modulated differences in impulsivity.

In our study, suicide attempters and non-suicidal depressed patients did not differ in rational problem solving. This finding is consistent with past research (D'Zurilla *et al.*, 1998 and Reinecke *et al.*, 2001) and, if not due to low power, could suggest that deficiencies in potential solution generation and problem definition may not contribute to one's ultimate decision to attempt suicide as much as negative orientation to problems and the tendency to be more impulsive. This becomes important when one considers that many therapies aimed at treating depression and preventing suicide place an emphasis on improving patients' rational problem-solving abilities (Reinecke *et al.*, 2001).

There are several strengths of the current study. The use of the SPSI-R allowed us to examine the process of problem solving as perceived by elderly suicide attempters. Assessing the process of problem-solving is important for assessing deficits, planning an individualized training program and its progress, and making predictions about adaptational outcomes (D'Zurilla and Nezu, 1990). An outcome measure like the MEPS does provide one with an overall sense of the quality of patients' solutions, but does not offer specific information about the components of social problem-solving ability (D'Zurilla and MaydeuOlivares, 1995; D'Zurilla *et al.*, 2004). Also, as pointed out by Linehan *et al.* (1987), the standard MEPS test is not sensitive enough to discern between passive and active responses which is important in determining if the individual is taking an active role in solving his/her problems versus relying on others or time to solve the problems. Additional strengths of the study include its extensive clinical and cognitive characterization of study participants and inclusion of actual suicide attempters instead of ideators, increasing the clinical relevance of our findings.

Limitations to the current study should be noted as well. The first relates to the self-report nature of the SPSI-R. Though past studies in non-elderly samples suggest that self-report measures of perceived problem-solving ability parallel observer-rated problem-solving effectiveness (Nezu and Ronan, 1988 and MacLeod *et al.*, 1992), external ratings of problem-solving abilities or behavioral observations of social problem-solving would improve validation of the current findings. An optimal design would measure the perception, the process, as well as the outcome of problem solving. Second, the cross-sectional nature of our study precludes definitive causal inferences. For instance, whether one's responses on the SPSI-R were indicative of their pre-attempt problem solving ability or were in some way affected by their suicide attempt is not entirely clear. A more prospective approach, though potentially difficult when exploring correlates of suicidal behavior, would certainly allow for cause and effect to be more clearly delineated. Third, in order to better identify if problem solving deficits are uniquely associated with suicidal behavior or these deficits are common in other depressed older adults with suicidal ideation, inclusion of a group of suicidal ideators (with no history of suicide attempt) would be necessary. Inclusion of such a group in a future prospective study could better separate ideators and attempters. Fourth, our sample, though large enough to allow important differences to be detected between attempters and depressed non-attempters in areas of orientation and impulsivity, may have

been too small to detect differences in rational problem solving skills among the depressed groups. Last, though care was taken to match demographic differences between groups, suicide attempters tended to be less educated, as seen in psychological autopsy studies (Pompili *et al.*, 2008). It is possible that increased education may confound problem-solving's actual role in suicidal risk even though we controlled for education in our analyses.

Clinical implications

Treatments for vulnerable depressed elderly that target negative and impulsive approaches to problems may help them break the cycle of accumulating stressors, hopelessness, and suicidal behavior. One such treatment shown to improve depressive symptoms (Alexopoulos *et al.*, 2003), reduce feelings of hopelessness, and increase one's ability to cope with problems (MacLeod *et al.*, 1992 and Williams and Pollock, 1993) is problem solving therapy (PST). In the supplemental material, we present a case of an older man with depression and past suicide attempts, who received PST in our clinic. The case illustrates how PST builds on the stress-diathesis model, enabling individuals to cope with problems more effectively thereby preventing or lessening depressive symptoms and hopelessness when one faces stress (Nezu and Ronan, 1988). It also shows that psychotherapy for suicidal elderly has to not only improve rational problem solving skills, but also help them overcome the negative problem orientation and impulsive approach to problems (refer to Case Vignette in Supplementary data).

Further, our study suggests the importance, of not only actual, but perceived aspects of problem solving. Cognitive therapy (Beck, 1979) explicitly addresses individuals' perceptions of their own functioning, helping them to understand the extent to which their negative views of themselves may be inaccurate and unhelpful. Brown and colleagues showed that a cognitive intervention designed to help individuals develop adaptive ways of coping with stressors decreased severity of self-reported depression and feelings of hopelessness in younger adults with recent suicide attempts. Participants receiving cognitive therapy were approximately 50% less likely to attempt suicide during the study's 18-month follow-up period (Brown *et al.*, 2005). While our findings support the use of cognitive therapy in elderly at risk for suicide, its relative complexity may pose a challenge for these patients, who demonstrate significant cognitive impairment (Dombrovski *et al.*, 2008). Thus, adaptations, similar to those undertaken by Alexopoulos *et al.* for PST (Alexopoulos *et al.*, 2003) may be needed.

In summary, our findings of a negative and impulsive approach to problems in elderly suicide attempters point to a need for treatments that would remediate these deficits. While both problem-solving therapy and cognitive therapy provide potentially useful approaches, either therapy would require modifications to target the suicide diathesis in late life.

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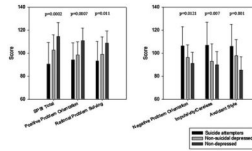


Figure 1. Problem-solving and suicidal behavior: social problem solving inventory scores and subscores with SD and p -values. Left illustrates SPSI total, positive problem orientation, and rationale problem solving (higher scores indicate adaptive problem solving). Right illustrates negative problem orientation, impulsive/careless, and avoidant style (lower scores indicate adaptive problem solving).

Table 1

Demographic and clinical characteristics (standard deviations in parentheses)

	Depressed attempter (A) n = 18	Non-suicidal depressed (D) n = 27	Non-depressed control (C) n = 19	p	Post-hoc
Age	67.9 (7.5)	74.0 (8.9)	69.2 (8.6)	.043	
Men (%)	50	41	68	.18	
White (%)	78	81	89	.62	
Married (%)	33	41	63	.16	
Education in years	13.2 (3.5)	14.3 (2.9)	15.5 (2.8)	.054	
Burden of physical illness (CIRS-G ^a total)	8.8 (3.6)	9.6 (3.5)	8.2 (3.0)	.67	
HRSD-16 ^b	22.5 (5.8)	19.0 (4.1)	2.8 (2.0)	.0001	A,D > C
MMSE ^c	27.7 (2.2)	27.6 (2.9)	27.6 (1.8)	.95	
Hopelessness (BHS ^d)	8.7 (5.2)	5.4 (5.7)	1.8 (1.7)	.0002	A,D > C
DRS ^e raw score	132.0 (4.4)	133.7 (6.6)	134 (6.1)	.68	
DRS scaled	7.3 (2.0)	8.8 (2.3)	8.3 (1.7)	.099	

^aCIRS-G—cumulative illness rating scale adapted for geriatrics.^bHamilton depression rating scale score minus the suicide item score.^cMMSE—mini-mental status examination.^dBHS—Beck hopelessness scale.^eDRS—dementia rating scale.