

Received: 2014.05.25
Accepted: 2014.06.16
Published: 2015.01.09

Association of Depression and Loneliness with Specific Cognitive Performance in Non-Demented Elderly Males

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Source of support: This work was supported by grant NSC 101-2314-B-075-040 from the National Science Council, Taiwan and grants V103C-048 and VGHUST103-G1-4-1 from Taipei Veterans General Hospital, Taiwan

Background: Loneliness and depression are very common in the aged population. Both have negative impacts on cognition in the elderly. The present study aimed to investigate the effect of loneliness and depression on total as well as specific cognitive domains in cognitively normal male subjects.





Material/Methods: A total of 189 cognitively normal male subjects were recruited and underwent Cognitive Abilities Screening Instrument (CASI) and Wechsler Digit Span Task tests. Depression was assessed by the Geriatric Depression Scale-Short Form (GDS-SF) and loneliness by UCLA loneliness scales. Partial correlation test was used to explore the correlation between loneliness/depression and total as well as specific cognition function, with the controlled factors of age and education.

Results: Both depression and loneliness are negatively correlated with global cognitive function as evaluated with CASI ($r=-0.227$, $p=0.002$; $r=-0.214$, $p=0.003$, respectively). The domains of Attention, Orientation, Abstraction and judgment, and List-generating fluency of cognitive function were specifically associated with loneliness, and the domain of orientation was associated with depression after controlling the factors age and years of education.

Conclusions: Our findings suggest that loneliness and depression may have negative impacts on global and specific domains of cognitive function in non-demented elderly males. Both loneliness and depression should be actively recognized earlier and appropriately treated because they are significant sources of cognitive impairment in the elderly.

MeSH Keywords: **Aged • Cognition • Depression • Loneliness**

Full-text PDF: <http://www.medscimonit.com/abstract/index/idArt/891086>

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Background

Depression is very common in elderly people, with prevalence ranging from 1% to 16% in elderly living in private households or institutions [1]. There is increasing evidence showing that depression is associated with cognitive impairment and even with dementia in later life [2]. In a study of 61 depressed subjects over age 60, O'Brien et al. reported that depressed subjects had multiple impairments in attention, working memory, visual memory, verbal memory, new learning, and executive function in relation to comparison subjects [3]. In an age-stratified sample of 1982 community-dwelling individuals aged 65+ years, the number of depressive symptoms had strong, statistically significant associations with performance in most cognitive domains such as memory and visuospatial domains [4]. Similarly, another study found that increased depressive symptoms were associated with poor cognitive functioning in multiple domains [5]. In the Monongahela-Youghiogheny Healthy Aging Team study of 2036 individuals aged 65+ years, depressive symptoms remained associated with lower performance on all cognitive composites except attention, most strongly with executive function [4]. In a study of Chinese elderly with late-onset depression, Tam and Lam found that the depression group had a similar cognitive profile to those with mild cognitive impairment, except that its subjects had slightly better performance in the Categorical Verbal Fluency Test and delayed recall testing [6]. In a companion report, they showed that increasingly severe depression was associated with lower scores in the Mini-Mental State Examination and delayed recall, and poorer performance in the Trail Making Test-Part A [7]. A strong association between depression and decreased cognition was found in 2 studies: Rosenberg et al. observed scores on 6 examinations during a 9-year period and reported that higher Geriatric Depression scale (GDS) baseline score was highly related to cognitive decline by [8], and a study of 501 women age 70–74 years showed depression co-occurred with worse cognitive performance [9], but the cognitive performance did not decline in individuals with previous depression, suggesting that cognitive dysfunction is a state phenomenon in depression [9].

In addition to depression, loneliness is also commonly found in elderly people; this emotionally unpleasant experience is a crucial marker of social relationship deficits. Holmén et al. studied elderly people from rural areas in Sweden and showed that 35% of them reported they experienced loneliness (by asking the simple question: “Do you experience loneliness?”) [10]. A study in Israel, based on home interviews of 70-year-olds, showed that 46.3% of females and 21.3% of males reported being lonely [11]. While loneliness can be a normative experience, it also has the potential to be pathological, with adverse health consequences and cognitive effects in older people [12,13]. In an elderly population, it was found that feeling lonely is a predictor of significant cognitive decline [14]. In 2007, Wilson et al.

examined the risk of developing Alzheimer’s disease (AD) in a cohort of older adults over a 4-year period and found that the risk of developing AD was substantially increased in those who were lonely compared to those who were not lonely, even when controlling for the level of social activities [15].

Despite the apparent effects of loneliness on global cognitive function in the normal elderly, there are few studies exploring their effects on specific cognitive function. In a cross-sectional study of 466 elderly community-dwelling subjects, it was found that loneliness was significantly associated with impaired global cognition, independent of social networks and depression [16]. The cognitive domains of psychomotor processing speed and delayed visual memory were particularly associated with self-reported loneliness [16]. The study was done in a Western population and loneliness was ascertained using the single question “How often do you feel lonely?”, with participants selecting 1 of the following responses: never, rarely, sometimes, or often. The aim of this study was to investigate the impact of depression and loneliness on objective performance on tests of several cognitive domains in older Chinese subjects without dementia. The loneliness was assessed by the Loneliness Scale. To minimize the confounding effects of gender [17,18], a homogenous group was constructed, composed entirely of healthy aged Han Chinese males.

Material and Methods

Participants and data collection

This study included a total of 189 participants recruited from a Veteran’s Home in Taiwan, as reported in our previous study [19]. A trained research nurse checked initial evaluation data, including self-reported current and past medical status, as well as medical records of each participant. A board-certified psychiatrist evaluated every participant’s neurological state and psychiatric diagnosis by structured interviewing with the Mini-International Neuropsychiatric Interview (MINI) [20]. Daily activities and cognitive functions were assessed by using the Clinical Dementia Rating scale (CDR).

These criteria for recruiting a group of non-demented elderly subjects with normal daily activities included sufficient visual and auditory acuity for cognitive testing. Therefore, exclusion criteria included the following: (1) presence of diagnoses on Axis I of the DSM-IV; (2) chronic medical illness under medical control (e.g., malignancy, heart failure, lung disease, diabetes); (3) neurobiological disorders (e.g., stroke or Parkinson’s disease); (4) subjects with CDR >0.5 or Mini-Mental Status Examination (MMSE) <24 to exclude possible dementia. The cut-off point of 24/30 in MMSE was chosen because of worldwide usage and as the best compromise between sensitivity and specificity for screening for dementia [21].

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Taipei Veterans General Hospital. Informed consent was obtained from all subjects prior to commencement.

Measurement

Cognitive ability

All participants were administered the Cognitive Abilities Screening Instrument Chinese version (CA2.SI C-2.0) test [22] and the Wechsler Digit Span Task test. These cognitive tests were conducted by a trained research nurse. The CASI C-2.0 test, a 100-point cognitive test designed for cross-cultural studies and adapted in Chinese for individuals with little or no formal education [23], also provided quantitative assessment in 9 domains of cognitive function (long-term memory, short-term memory, attention, concentration/mental manipulation, orientation, abstraction and judgement, language, visual construction, and list-generating fluency).

The Wechsler Digit Span Task test requires the examiner to verbally present digits at a rate of 1 digit per second. The forward test requires the participant to repeat the digits verbatim; the backward test requires the participant to repeat the digits in reverse order. The number of digits increases by 1 until the participant consecutively fails 2 trials of the same digit span length. Forward and backward digit span recall abilities have been widely used to assess short-term memory and working memory, respectively, in neuropsychological research and clinical evaluation [24].

Depression

Depression was assessed by the Chinese version of the Geriatric Depression Scale-short form (GDS-SF) [25]. Scores on the GDS-SF showed a high validity in accordance with the original version [26].

Loneliness

We use the Loneliness Scale (University of California, Los Angeles, UCLA version 3) [27] to assess loneliness. The UCLA Loneliness Scale contains 20 items. The participants used a 4-point Likert scale (ranging from 'never' to 'often') to assess how often they felt the way described in the loneliness items.

Statistical analyses

Partial correlations were calculated to estimate the independent associations between the depression/loneliness and cognitive parameters. GDS-S scores of depression and the cognitive parameters of cognitive function were used to explore

their partial correlations after controlling for their mutual association with age and education years. For the partial correlations between loneliness and the cognitive functions, we also controlled the depression score in terms of age and education. To minimize chance occurrence of significant statistical difference with multiple comparisons (12 comparisons), Bonferroni correction was applied to find the appropriate level of p value for statistical significance. The p value for significant statistical difference for each test was lowered to 0.0042 to bring the p value overall back to 0.05 for multiple comparisons performed in the present study. All statistical analyses were conducted using SPSS v15.0 (SPSS Inc., Chicago, IL, USA). Data are presented as means (SD).

Results

The subjects were 189 males, ages 65–98 years (mean=80.2; SD=4.5), with an average of 5.2 years of education (SD=4.2; range, 0–16 years of schooling). Cognitive function tests showed that the mean CASI score was 85.9 ± 10.4 (range, 57–100).

Partial correlations between depression, loneliness, and total/specific cognitive parameters are presented in Table 1. Both depression and loneliness are negatively correlated with global cognitive function as evaluated with CASI C-2.0 ($r=-0.227$, $p=0.002$; $r=-0.214$, $p=0.003$, respectively). Further analysis of the 9 domains of CASI scores demonstrated that depression is specifically negatively correlated with Orientation. For loneliness, it is negatively correlated with Attention, Orientation, Abstraction and judgment, and List-generating fluency (Table 1).

Discussion

The principle finding of this study is that, in our sample of elderly Chinese males, loneliness correlated negatively with global cognitive function (Total CASI) after controlling age, education, and depression scores (Table 1). Further analysis demonstrated that loneliness correlated negatively specifically with Attention, Orientation, Abstraction and judgment, and List-generating fluency. These results replicate previous studies reporting that loneliness is negatively correlated with cognitive function [14,15], and extended prior findings that loneliness has impacts on specific cognitive domains [16]. A previous study of loneliness and specific cognitive functions showed that cognitive domains of psychomotor processing speed and delayed visual memory were particularly associated with self-reported loneliness [16]. The difference in findings between this study and our study could be due to differences in cognitive evaluation (cognitive test battery vs. CASI), loneliness evaluation (single question vs. UCLA Loneliness Scale), ethnicity (Irish vs. Chinese) and gender (both genders vs. male

Table 1. Partial correlations between depression/loneliness and total/specific cognitive functions. Data represent correlation coefficient *r* (p value).

	GDS-SF	UCLA loneliness scales
CASI		
Long-term memory	-0.151 (0.040)	-0.154 (0.036)
Short-term memory	-0.054 (0.463)	-0.141 (0.054)
Attention	-0.156 (0.033)	-0.215 (0.003)
Concentration/mental manipulation	-0.168 (0.021)	-0.103 (0.161)
Orientation	-0.259 (<0.001)	-0.209 (0.004)
Abstraction and judgement	-0.095 (0.194)	-0.218 (0.003)
Language	-0.088 (0.233)	-0.070 (0.346)
Visual construction	-0.064 (0.383)	-0.104 (0.157)
List-generating fluency	-0.082 (0.266)	-0.204 (0.005)
Total CASI	-0.227 (0.002)	-0.214 (0.003)
Wechsler Digit Span Task		
Forward	-0.062 (0.400)	-0.125 (0.089)
Backward	-0.046 (0.534)	-0.133 (0.070)

GDS-SF – Geriatric Depression Scale-Short Form. Partial correlations between depression/loneliness and specific cognitive functions were performed after controlling for age and education years. For partial correlations between loneliness and specific cognitive functions, depression scores were also controlled. Boldface indicates a p-value lower than 0.0042.

gender). The mechanisms of the associations between specific cognitive functions and loneliness were unclear and warrant further investigation.

In this study we also found that depression is negatively correlated with global cognition, which is in line with the findings in earlier studies [2,8,9]. In further analysis of the correlations with specific CASI domains, the strongest correlation was with the Orientation domain. Previous studies of older patients with depressive disorders suggest a consistent pattern of association with diminished processing speed and executive function [28–30]. Our results extend those of previous findings and suggest that depression may also affect Orientation cognitive domains.

References:

- Djernes JK: Prevalence and predictors of depression in populations of elderly: a review. *Acta Psychiatr Scand*, 2006; 113: 372–87
- Panza F, Frisardi V, Capurso C et al: Late-life depression, mild cognitive impairment, and dementia: possible continuum? *Am J Geriatr Psychiatry*, 2010; 18: 98–116

A previous study of loneliness and depression in the elderly showed that the 2 strongly co-occur with each other [31], although another report suggested that both appear to be distinct phenomena [32]. Intense loneliness might result in diminished feelings of self-worth and lack of confidence in interpersonal relationships, thus leading to depression. In this study, after adjusting for depressive severity, the loneliness rating remained correlated with lower performance on global cognitive function and has more correlation with composites than depression (4 items vs. 1 item). Our study demonstrates that the impact of loneliness on cognitive function is independent of depression and may have more effects than depression on specific cognitive domains. Interventions to alleviate loneliness in the elderly, such as interventions addressing maladaptive social cognition, may be particularly beneficial to prevent cognitive impairment [33].

The strengths of the study include use of a rather homogeneous population-based sample and availability of multiple cognitive parameters. Limitations include that this study had a cross-sectional design. A prospective study would better address the causal relation between cognitive function and geriatric depressive symptoms and loneliness. An additional limitation is that our sample represents elderly male veterans living in veteran housing, and the findings of the association between the specific cognitive functions and depression/loneliness may need to be further validated in younger adults, females, or other populations.

Conclusions

Our findings suggest that loneliness and depression are negatively correlated with global as well as specific cognitive function in cognitively normal elderly males. Both loneliness and depression should be actively recognized and appropriately treated because they are significant sources of cognitive impairment in the elderly.

Acknowledgments

The authors would like to thank Dr. D.W. Russell for agreeing to allow the use of the UCLA Loneliness Scale (Version 3).

Conflict of interest

None declared.

3. O'Brien JT, Lloyd A, McKeith I et al: A longitudinal study of hippocampal volume, cortisol levels, and cognition in older depressed subjects. *Am J Psychiatry*, 2004; 161: 2081-90
4. Ganguli M, Snitz B, Vander Bilt J, Chang CC: How much do depressive symptoms affect cognition at the population level? The Monongahela-Youghiogheny Healthy Aging Team (MYHAT) study. *Int J Geriatr Psychiatry*, 2009; 24: 1277-84
5. Dotson VM, Resnick SM, Zonderman AB: Differential association of concurrent, baseline, and average depressive symptoms with cognitive decline in older adults. *Am J Geriatr Psychiatry*, 2008; 16: 318-30
6. Tam CW, Lam LC: Cognitive and functional impairment in Chinese elderly with late-onset depression. *East Asian Arch Psychiatry*, 2012; 22: 25-30
7. Tam CW, Lam LC: Cognitive function, functional performance and severity of depression in Chinese older persons with late-onset depression. *East Asian Arch Psychiatry*, 2012; 22: 12-17
8. Rosenberg PB, Mielke MM, Xue QL, Carlson MC: Depressive symptoms predict incident cognitive impairment in cognitive healthy older women. *Am J Geriatr Psychiatry*, 2010; 18: 204-11
9. Palsson S, Larsson L, Tengelin E et al: The prevalence of depression in relation to cerebral atrophy and cognitive performance in 70- and 74-year-old women in Gothenburg. The Women's Health Study. *Psychol Med*, 2001; 31: 39-49
10. Holmén K, Ericsson K, Andersson L, Winblad B: Loneliness among elderly people living in stockholm: a population study. *J Adv Nurs*, 1992; 17: 43-51
11. Stessman J, Ginsberg G, Klein M et al: Determinants of loneliness in Jerusalem's 70-year-old population. *Isr J Med Sci*, 1996; 32: 639-48
12. Cohen GD: Loneliness in later life. *Am J Geriatr Psychiatry*, 2000; 8: 273-75
13. Luanaigh CO, Lawlor BA: Loneliness and the health of older people. *Int J Geriatr Psychiatry*, 2008; 23: 1213-21
14. Tilvis RS, Kahonen-Vare MH, Jolkkonen J et al: Predictors of cognitive decline and mortality of aged people over a 10-year period. *J Gerontol A Biol Sci Med Sci*, 2004; 59: 268-74
15. Wilson RS, Krueger KR, Arnold SE et al: Loneliness and risk of Alzheimer disease. *Arch Gen Psychiatry*, 2007; 64: 234-40
16. O'Luanaigh C, O'Connell H, Chin AV et al: Loneliness and cognition in older people: the Dublin Healthy Ageing study. *Aging Ment Health*, 2012; 16: 347-52
17. Richard-Devantoy S, Deguigne F, Annweiler C et al: Influence of gender and age on cognitive inhibition in late-onset depression: a case-control study. *Int J Geriatr Psychiatry*, 2013; 28: 1125-30
18. Fuhrer R, Antonucci TC, Dartigues JF: The co-occurrence of depressive symptoms and cognitive impairment in a French community: are there gender differences. *Eur Arch Psychiatry Clin Neurosci*, 1992; 242: 161-71
19. Tsai SJ, Hong CJ, Liu ME et al: Interleukin-1 beta (C-511T) genetic polymorphism is associated with cognitive performance in elderly males without dementia. *Neurobiol Aging*, 2010; 31: 1950-55
20. Sheehan DV, Lecrubier Y, Sheehan KH et al: The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J Clin Psychiatry*, 1998; 59(Suppl.20): 22-33;quiz 4-57
21. Grut M, Fratiglioni L, Viitanen M, Winblad B: Accuracy of the Mini-Mental Status Examination as a screening test for dementia in a Swedish elderly population. *Acta Neurol Scand*, 1993; 87: 312-17
22. Teng EL, Hasegawa K, Homma A et al: The Cognitive Abilities Screening Instrument (CASI): a practical test for cross-cultural epidemiological studies of dementia. *Int Psychogeriatr*, 1994; 6: 45-58; discussion 62
23. Liu HC, Chou P, Lin KN et al: Assessing cognitive abilities and dementia in a predominantly illiterate population of older individuals in Kinmen. *Psychol Med*, 1994; 24: 763-70
24. Hedden T, Gabrieli JD: Insights into the ageing mind: a view from cognitive neuroscience. *Nat Rev Neurosci*, 2004; 5: 87-96
25. Lee HCB, Chiu HFK, Kowk WY, Leung CM: Chinese elderly and the GDS short form: A preliminary study. *Clinical Gerontologist: The Journal of Aging and Mental Health*, 1993; 14: 37-42
26. Burke WJ, Roccaforte WH, Wengel SP: The short form of the Geriatric Depression Scale: a comparison with the 30-item form. *J Geriatr Psychiatry Neurol*, 1991; 4: 173-78
27. Russell DW: UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure. *J Pers Assess*, 1996; 66: 20-40
28. Nebes RD, Butters MA, Mulsant BH et al: Decreased working memory and processing speed mediate cognitive impairment in geriatric depression. *Psychol Med*, 2000; 30: 679-91
29. Butters MA, Whyte EM, Nebes RD et al: The nature and determinants of neuropsychological functioning in late-life depression. *Arch Gen Psychiatry*, 2004; 61: 587-95
30. Bhalla RK, Butters MA, Mulsant BH et al: Persistence of neuropsychologic deficits in the remitted state of late-life depression. *Am J Geriatr Psychiatry*, 2006; 14: 419-27
31. Luanaigh CO, Lawlor BA: Loneliness and the health of older people. *Int J Geriatr Psychiatry*, 2008; 23: 1213-21
32. Anderson CA, Harvey RJ: Discriminating between problems in living: An examination of measures of depression, loneliness, shyness, and social anxiety. *J Soc Clin Psychol*, 1988; 6: 482-91
33. Masi CM, Chen HY, Hawkey LC, Cacioppo JT: A meta-analysis of interventions to reduce loneliness. *Pers Soc Psychol Rev*, 2011; 15: 219-66