

An Update on Social Activity and Depression in the Elderly: A Brief Review of Recent Findings and Key Issues

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ABSTRACT: Literature examining social activity levels and depression in older adulthood has grown rapidly over the past decade in the hope it may lead to effective preventative or treatment options. To provide an update on this rapidly developing field, this article briefly reviews recent (2010–present) results reported in observational studies, randomized controlled trials (RCTs), and a meta-analysis examining social activity and depression in older adults. A total of 13 recent observational studies suggest small- to medium-strength relationships between social activity and depression in older adults, as does a recent meta-analysis. However, RCTs suggest little effect of social activities on depression status during the intervention, but possibly a small benefit at three-month follow-up. Additional studies are required to further examine the specific features of depression (eg mood, self-worth) related to social activity and whether an effect of social activity on depression in older adults exists beyond alternative explanations for the relationship (eg an effect of depression on social activity).

KEYWORDS: depressive, older adults, group, treatment, prevention

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Introduction

The impact of depression in older adulthood is extensive—it is associated with considerable patient and caregiver burden, substantial public health costs, and an increased risk of vascular dementia and Alzheimer's disease.^{1,2} These and other adverse consequences associated with depression have prompted recent research efforts on treatment and prevention options for elderly populations. A range of strategies continue to be examined,^{3–5} though the relationship between loneliness and depression status in older adults^{6,7} suggests social activities may provide a particularly useful avenue for alleviating or preventing depression in this population. To draw further attention to this important and rapidly developing subject, the following article briefly reviews the most recent (2010–present) observational (cross-sectional and longitudinal), randomized controlled trial (RCT), and meta-analytic results pertaining to social activity and depression in older adults, and discusses some recent key issues in the literature.

Observational Studies

Nine recent cross-sectional studies continue to support the existence of a relationship between social activity and depression (see Table 1), such that higher levels of social activity are associated with lower levels of depression.^{8–16} This relationship transpires despite differences between studies in how depression and social activity are operationalized. For recent studies reporting zero-order relationships between depression and social activity (or that provide the data necessary for calculating them), group differences and correlations suggest consistent, small- to medium-sized effects.^{8–10,12,14–16} Of course, such results do not signify the existence of a causal relationship between social activity and depression but the consistency of the relationships reported continues to support the possibility of viable treatment or preventative approaches.

These recent cross-sectional studies vary considerably with regard to how social activity was measured (see Table 1). Three studies utilized subjective reports of degree of

**Table 1.** Recent cross-sectional studies examining social activity and depression in the elderly.

STUDY	N (AGE)	MEASURES		ANALYSIS	RESULT
		SOCIAL ACTIVITY	DEPRESSION		
Chan et al ⁸	4489 (60+)	Involved (Y/N)	CES-D	<i>t</i> -test	<i>d</i> = 0.28***
Jang and Chiriboga ⁹	675 (60+)	Composite score	CES-D	Bivariate correlation	<i>r</i> = 0.20***
Kim and Chen ¹⁰	148 (60+)	Frequency (1–4)	CES-D	Bivariate correlation	<i>r</i> = 0.29***
Kim et al ¹¹	210 (65+)	LSNS	GDS-SF	Increase in <i>R</i> ² (multiple regression)	↑ <i>R</i> ^{2,a} = 0.08**
Litwin ¹⁴	1350 ^b (65–85)	Several	CES-D	Odds ratios (ORs) (logistic regressions)	OR = 1–0.62**
Luppa et al ¹²	1006 (75+)	SNI	CES-D	OR (logistic regression)	OR = 1.93***
Oddone et al ¹⁶	211 (60+)	DSSI	MAD-RS	<i>t</i> -tests	<i>d</i> = 0.31*–0.84***
Park et al ¹³	674 (60+)	Frequency (0–3)	GDS-SF	Beta values (mediation analysis)	β ^a = 0.14*–0.18***
Sonnenberg et al ¹⁵	2823 (55–85)	Network size	CES-D	OR (logistic regression)	OR ^a = 1.51**

P* < 0.05. *P* < 0.01. ****P* < 0.001.

^aAdjusted for other variables. ^bNot all participants included in each analyses.

Note: Direction of effect sizes omitted—all relationships suggested lower depression severity with more involvement in social activities.

Abbreviations: CES-D, Center for Epidemiologic Studies-Depression Scale; DSSI, Duke Social Support Index; GDS-SF, Geriatric Depression Scale-Short Form; LSNS, Lubben's Social Network Scale; MAD-RS, Montgomery-Åsberg Depression Rating Scale; SNI, Wenger and Tucker's Social Network Index.

involvement in social activities, two using a four-point Likert scale^{10,13} and one using self-reports of involvement versus no involvement.⁸ The remaining six studies all assessed social activity using different methods. Three used previously established measures of social activity,^{11,12,16} namely Lubben's Social Network Scale,¹⁷ the Social Network Index,¹⁸ and Duke's Social Support Index.¹⁹ One study used a range of measures derived from subjective reports of relationship quality with friends, family, and the participant's spouse.¹⁴ Another used a composite score derived from Likert-scale responses pertaining to religious activities, social gatherings, senior centre participation, leisure and sporting activities, volunteer activities, and educational activities.⁹ The final cross-sectional study measured social activity by the number of people in the participant's network with whom they maintained regular contact.¹⁵

With regard to depression measures, there was much greater consistency among the cross-sectional studies. All nine utilized a previously established measure of depression severity. Of the nine studies, six^{8–10,12,14,15} used the Center for Epidemiologic Studies-Depression Scale (CES-D), a widely used, valid, and reliable measure of depression severity.^{20–22} Two studies^{11,13} used the Geriatric Depression Scale-Short Form (GDS-SF), another valid and reliable measure of depression severity.^{23,24} One final study¹⁶ used the Montgomery-Åsberg Depression Rating Scale (MAD-RS)²⁵ to assess depression severity. No clear differences in effect sizes (for those available or that could be calculated) were evident for studies utilizing different measures of depression severity.

Four recent longitudinal studies on older adults also suggest that those who are more socially active tend to exhibit fewer or less severe symptoms of depression at later

time points,^{26–29} again with small to medium effect sizes (see Table 2). In addition, two of these longitudinal studies reported that changes in social activity levels were followed by changes in depression severity,^{26,27} such that increases in social activity were accompanied by a (small) decrease in depression severity. While the findings reported in these studies are still based on observational data, they hint at the possibility of an effect of social activity on depression.

As with recent cross-sectional research, all four recent longitudinal studies utilized different measures of social activity. Two studies used simple self-report measures of involvement in social activities, one via a four-point Likert scale pertaining to degree of involvement²⁸ and the other as a dichotomous yes or no response.²⁹ A third study measured participation in social activity using three methods,²⁷ including self-reports of involvement in various activities (ie hobby clubs, religious affiliations, political groups, retirement activities, and volunteer groups) and how long they had been involved in them. A third measure was also used that categorized participants into one of five groups (ie continued participation during the study, ceased participation during the study, initiated participation during the study, never participated during the study, or dropped out of the study). A fourth study²⁶ assessed social activity participation using the Index of Social Engagement (ISE),³⁰ a six-item scale that provides a measure of the extent of involvement in social activities. Again, no clear differences in the strength of the relationship between social activity and depression were observed according to the method used to assess social activity.

For measures of depression, three of the longitudinal studies^{27–29} utilized the CES-D²² and one study²⁶ used the Depression Rating Scale (DRS).³¹ The DRS is a less widely used measure of depression than the CES-D and exhibits

**Table 2.** Recent longitudinal studies examining social activity and depression in the elderly.

STUDY	N (AGE)	FOLLOW-UP (YEARS)	MEASURES		ANALYSIS	RESULT
			SOCIAL ACTIVITY	DEPRESSION		
Chao ²⁸	4049 (60+)	14	Frequency (0–4)	CES-D	Likelihood est. (ML model)	MLE ^a = 0.052***
Chiao et al ^{27,b}	1388 (60–64)	18	Several	CES-D	Growth curve models	$\beta^a = 0.003^{**} - 1.41^{***}$
Hsu ^{29,b}	1918 (60+)	18	Yes/No	CES-D	ORs (logistic regression)	OR ^a = 0.85–0.47*
Lou et al ²⁶	1184 (M = 81.67)	6	ISE	DRS	Growth curve models	$\beta^a = 0.07^{**} - 0.11^{***}$

* $P < 0.05$. ** $P < 0.01$. *** $P < 0.001$.

^aAdjusted for other variables. ^bStudies based on data from same survey.

Note: Direction of effect sizes omitted—all relationships suggested lower depression severity with more involvement in social activities.

Abbreviations: CES-D, Center for Epidemiologic Studies-Depression Scale; DRS, Depression Rating Scale; ISE, Index of Social Engagement; ML, maximum likelihood; MLE, maximum likelihood coefficient.

some problems with its psychometric properties.^{31,32} Despite the use of two different measures of depression, results from all four longitudinal studies consistently suggested that higher levels of social activity were associated with lower levels of depression at later time points.

RCTs and Meta-analyses

Perhaps the highest quality piece of research conducted recently was an RCT examining the effect of a senior center group program (designed to increase social support) on depressive symptoms in older adults.³³ The intervention involved weekly three-hour meetings over a 12-month period that addressed the topics of depression, loneliness, and isolation as well as a physical training program and a self-help group that discussed topics such as safety, social relations, aging, and humor. The control group continued daily activities as per normal and was offered the same services as those for the intervention group after 12 months. The study assessed scores on the Oslo-3 Social Support Scale³⁴ (OSS-3) and Beck Depression Inventory³⁵ (BDI) in both control and intervention groups before and after the 12-month intervention. The study reported small, comparable increases in OSS-3 scores in both the intervention (Cohen's $d = 0.12$) and control groups, but this did not translate to reductions in BDI scores (negligible increases in BDI scores were observed in both groups).

Interestingly, an earlier RCT³⁶ reported almost identical results from pre- to post-intervention for the effect of a different social activity intervention on depressive symptoms (assessed via the GDS).³⁷ For this earlier study, the intervention group (which involved teaching English language skills to English-as-a-second-language students) also showed a trivial increase in depression severity from pre- to post-intervention. However, this earlier RCT reported a reduction in depression severity in the three months after the intervention ceased.³⁶ Thus, it may be the case that such social activity interventions take time to reduce depression severity or that such interventions are only effective if relationships are maintained between participants beyond completion of the study (this was not monitored in either of the RCTs). That is, social activity

interventions might only serve to reduce feelings of loneliness (which plays an important role in depression in older adults)¹³ when relationships between participants are maintained beyond social interactions organized in accordance with the research. It is reasonable to assume that continued interactions with other people would do more to curb loneliness and increase self-esteem if it was willingly planned, rather than obliged to satisfy the needs of a research project.

The effect of social activities on depression was also supported in a recently published meta-analytic review⁴ (which included one of the RCTs discussed earlier).³⁶ The meta-analysis reported that social activities lead to the greatest (and only significant) reduction in depression severity (standard mean difference = -0.41 , 95% CI $[-0.72, -0.10]$, $P = 0.009$) across a range of interventions. Other interventions, including physical exercise (standard mean difference = -0.10 , 95% CI $[-0.36, 0.16]$, $P = 0.46$), skill training (standard mean difference = -0.12 , 95% CI $[-0.56, 0.32]$, $P = 0.59$), reminiscence (standard mean difference = -0.24 , 95% CI $[-0.62, 0.13]$, $P = 0.33$), and multi-component approaches (standard mean difference = -0.16 , 95% CI $[-0.41, 0.10]$, $P = 0.24$) failed to impact significantly on depression in older adults. However, despite the quality of the social activity intervention studies reviewed in the meta-analysis, the results were based on only two studies and 194 participants, and so should be interpreted with some caution. Still, these results offer support for the notion that social activity interventions may be of some use for alleviating depression in older adulthood.

Key Issues

Despite a wide range of different methodologies and analytic approaches across a relatively small number of studies, recent literature examining the link between social activity and depression severity provides quite a consistent picture of their association. Despite samples across observational studies differing with regard to nationality, immigration status, age, and living arrangements, results almost invariably suggest that social activity is associated with depression severity. However, based on the results of RCTs, this association appears not to



be the result of a direct effect of social activity on depression severity, given the lack of effect of social activity interventions on depression severity. In contrast, a recent meta-analysis suggests social activity interventions are an effective method for improving depression outcomes among elderly populations, suggesting a need for additional RCTs before drawing any firm conclusions about the effect of social activity on depression status or severity.

Indeed, from a treatment and prevention perspective, the most notable limitation with recent literature on social activity and depression in older adults is the small number of empirical studies able to examine causality. Several observational studies continue to support the presence of a relationship between social activity and depression, yet these studies cannot discount (1) the effect of depression severity on social activity or (2) the effect of one or more underlying moderator variables on both. Extraversion, for example, is negatively associated with depression³⁸ and positively associated with participation in social activities,³⁹ and as a result will engender a relationship between social activities and depression even in the absence of a causal relationship between them. For this reason, further RCTs are required to investigate the effect of social activities on depression severity rather than observational studies that simply observe the strength of the relationship between them.

As well as additional RCTs to examine the effect of social activity on depression, further research is also required to explore what particular aspects of depression are influenced by social activities. That is, do social activities have an effect on mood, sleep quality, fatigue, self-worth, suicidality, relevant neurotransmitters (eg dopamine or serotonin), or other important features associated with depression? Studies have found that older adults with better social networks tend to have higher levels of self-esteem,⁴⁰ and are less likely to attempt suicide,⁴¹ although additional studies are required to further examine the intricacies of these relationships. Such studies will provide valuable data for guiding the design of preventative programs. Alternatively, the relationship between social activities and depression may be better accounted for via a range of other factors. For example, a recent study found loneliness mediated the relationship between social activity and depression,¹³ suggesting interventions that are able to establish enduring relationships between participants may provide an effective method for preventing depression or for limiting its severity beyond the intervention.

A third important issue that recently emerged in the depression literature is the notion that depression may “spread” from person-to-person within social groups (ie among friends, co-workers, siblings, spouses, and neighbors).⁴² The study found that depression severity in one individual was associated with depression severity in the person’s social networks and that the more distant the relationship, the weaker the association. This finding has important implications for studies examining social activities and depression. It suggests that, although more socially active older adults tend to exhibit fewer or less severe symptoms of depression,

providing a forum for people with depression to engage in social activities (in the hope that it may alleviate symptoms) may in fact worsen depression severity in some participants (ie in those interacting with participants with greater depression severity than themselves). Besides the obvious risk for individuals, this would have important implications for the results of empirical studies examining the relationship between social activity and depression. Indeed, it may partially explain why RCTs^{33,36} have found social activities to exhibit little or no effect on depression severity during the intervention period—perhaps gains from interventions are partially negated by the “spread” of depressive symptoms among participants.

Finally, consideration should also be given to formally defining the concept of social activity and to developing measures designed to assess it. Currently, there are few validated assessments of social activity available. A range of formal and informal measures of social activity continue to be utilized across observational studies, though no gold standard measure has been identified to date and few measures, if any, have undergone rigorous psychometric testing. Without a clear definition of social activity or a gold standard measure of it, it will remain difficult to draw comparisons between results obtained across observational studies. Furthermore, a clear definition of social activity will help to guide interventions utilized in RCTs.

Summary

The relationship between social activities and depression severity in older adulthood remains an important topic, both on an individual level and a public health level. Recent observational studies examining the link between social activity and depression severity suggest small- to medium-strength relationships between them. Results from RCTs, however, suggest social activity interventions do little to reduce depression severity over the course of the intervention, suggesting the relationship detected in observational studies might be attributable to the effect of depression on social activities or one or more underlying variables (eg personality characteristics) influencing both. Despite RCTs finding no effect of social activity on depression from pre- to post-intervention, one RCT that assessed depression severity three months following cessation of the intervention found reductions in depression severity at this point. In addition, a recent meta-analysis reported an effect of social activity on depression in two studies. Such results support continued research efforts into social activity and depression, particularly RCTs to rule out alternative explanations for the association between them. In addition, further studies are required to examine what specific aspects of depression are related to social activities and what impact, if any, the “spread” of depression plays in research outcomes. Finally, consideration should be given to formally defining social activity and developing psychometrically validated measures of it.



Author Contributions

Conceived and designed the experiments: MM. Analyzed the data: MM. Wrote the first draft of the manuscript: MM. Contributed to the writing of the manuscript: MM. Agree with manuscript results and conclusions: MM. Jointly developed the structure and arguments for the paper: MM. Made critical revisions and approved final version: MM. All authors reviewed and approved of the final manuscript.

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As a requirement of publication the author has provided signed confirmation of compliance with ethical and legal obligations including but not limited to compliance with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants (if applicable), and that permission has been obtained for reproduction of any copyrighted material. This article was subject to blind, independent, expert peer review. The reviewers reported no competing interests. Provenance: the author was invited to submit this paper.

REFERENCES

- Zivin K, Wharton T, Rostant O. The economic, public health, and caregiver burden of late-life depression. *Psychiatr Clin North Am*. 2013;36(4):631–649.
- Diniz BS, Butters MA, Albert SM, Dew MA, Reynolds CF. Late-life depression and risk of vascular dementia and Alzheimer's disease: systematic review and meta-analysis of community-based cohort studies. *Br J Psychiatry*. 2013;202(5):329–335.
- Walker JG, Mackinnon AJ, Batterham P, et al. Mental health literacy, folic acid and vitamin B12, and physical activity for the prevention of depression in older adults: randomised controlled trial. *Br J Psychiatry*. 2010;197(1):45–54.
- Forsman AK, Schierenbeck I, Wahlbeck K. Psychosocial interventions for the prevention of depression in older adults: systematic review and meta-analysis. *J Aging Health*. 2011;23(3):387–416.
- Rondanelli M, Giacosa A, Opizzi A, et al. Long chain omega 3 polyunsaturated fatty acids supplementation in the treatment of elderly depression: Effects on depressive symptoms, on phospholipids fatty acids profile and on health-related quality of life. *J Nutr Health Aging*. 2011;15(1):37–44.
- Golden J, Conroy RM, Bruce I, et al. Loneliness, social support networks, mood and wellbeing in community-dwelling elderly. *Int J Geriatr Psychiatry*. 2009;24(7):694–700.
- Cacioppo JT, Hughes ME, Waite LJ, Hawkley LC, Thisted RA. Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychol Aging*. 2006;21(1):140–151.
- Chan A, Malhotra C, Malhotra R, Østbye T. Living arrangements, social networks and depressive symptoms among older men and women in Singapore. *Int J Geriatr Psychiatry*. 2011;26(6):630–639.
- Jang Y, Chiriboga DA. Social activity and depressive symptoms in Korean American older adults: the conditioning role of acculturation. *J Aging Health*. 2011;23(5):767–781.
- Kim W, Chen Y-L. The social determinants of depression in elderly Korean immigrants in Canada: does acculturation matter. *Int J Aging Human Dev*. 2011;73(4):283–298.
- Kim BJ, Sangalang CC, Kihl T. Effects of acculturation and social network support on depression among elderly Korean immigrants. *Aging Ment Health*. 2012;16(6):787–794.
- Luppa M, Sikorski C, Luck T, et al. Prevalence and risk factors of depressive symptoms in latest life—results of the Leipzig Longitudinal Study of the Aged (LEILA 75+). *Int J Geriatr Psychiatry*. 2012;27(3):286–295.
- Park NS, Jang Y, Lee BS, Haley WE, Chiriboga DA. The mediating role of loneliness in the relation between social engagement and depressive symptoms among older Korean Americans. *J Gerontol B Psychol Sci Soc Sci*. 2013;68(2):193–201.
- Litwin H. The association between social network relationships and depressive symptoms among older Americans: what matters most? *Int Psychogeriatr*. 2011;23(6):930–940.
- Sonnenberg CM, Deeg DH, van Tilburg TG, Vink D, Stek ML, Beekman AT. Gender differences in the relation between depression and social support in later life. *Int Psychogeriatr*. 2013;25(1):61–70.
- Oddone CG, Hybels CF, McQuoid DR, Steffens DC. Social support modifies the relationship between personality and depressive symptoms in older adults. *Am J Geriatr Psychiatry*. 2011;19(2):123–131.
- Lubben J, Gironde M. Measuring social networks and assessing their benefits. In: Phillipson C, Allan G, Morgan D, eds. *Social Networks and Social Exclusion: Sociological and Policy Perspectives*. United Kingdom: Ashgate; 2004.
- Wenger GC, Tucker I. Using network variation in practice: identification of support network type. *Health Soc Care Community*. 2002;10:28–35.
- George LK, Blazer DG, Hughes DC, Fowler N. Social support and the outcome of major depression. *Br J Psychiatry*. 1989;154:478–485.
- Dozeman E, van Schaik DJ, van Marwijk HW, Stek ML, van der Horst HE, Beekman AT. The center for epidemiological studies depression scale (CES-D) is an adequate screening instrument for depressive and anxiety disorders in a very old population living in residential homes. *Int J Geriatr Psychiatry*. 2011;26(3):239–246.
- Haringsma R, Engels GI, Beekman AT, Spinhoven P. The criterion validity of the Center for Epidemiological Studies Depression Scale (CES-D) in a sample of self-referred elders with depressive symptomatology. *Int J Geriatr Psychiatry*. 2004;19(6):558–563.
- Lewinsohn PM, Sleeley JR, Roberts RE, Allen NB. Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychol Aging*. 1997;12(2):277–287.
- Friedman, Marnin D, Heisel J, Delavan RL. Psychometric properties of the 15-Item Geriatric Depression Scale in functionally impaired, cognitively intact, community-dwelling elderly primary care patients. *J Am Geriatr Soc*. 2005;53(9):1570–1576.
- Lopez MN, Quan NM, Carvajal PM. A psychometric study of the Geriatric Depression Scale. *Eur J Psychol Assess*. 2010;26(1):55–60.
- Engedala K, Kvaal K, Korsnes M, et al. The validity of the Montgomery-Åsberg depression rating scale as a screening tool for depression in later life. *J Affect Disord*. 2012;141(2–3):227–232.
- Lou VW, Chi I, Kwan CW, Leung AY. Trajectories of social engagement and depressive symptoms among long-term care facility residents in Hong Kong. *Age Ageing*. 2013;42:215–222.
- Chiao C, Weng L-J, Botticello AL. Social participation reduces depressive symptoms among older adults: an 18-year longitudinal analysis in Taiwan. *BMC Public Health*. 2011;11:292.
- Chao SF. Assessing social support and depressive symptoms in older Chinese adults: a longitudinal perspective. *Aging Ment Health*. 2011;15(6):764–774.
- Hsu H-C. Group-based trajectories of depressive symptoms and the predictors in the older population. *Int J Geriatr Psychiatry*. 2012;27:854–862.
- Mor V, Branco K, Fleishman J, et al. The structure of social engagement among nursing home residents. *J Gerontol B Psychol Sci Soc Sci*. 1995;50(1):1–8.
- Anderson RI, Buckwalter KC, Buchanan RJ, Maas ML, Imhof SL. Validity and reliability of the minimum data set depression rating scale (MDSDRS) for older adults in nursing homes. *Age Ageing*. 2003;32:435–438.
- Snowdon MB. The minimum data set depression rating scale (MDSDRS) lacks reliability for identifying depression among older adults living in nursing homes. *Evid Based Ment Health*. 2004;7(1):7.
- Bøen H, Dalgard OS, Johansen R, Nord E. A randomized controlled trial of a senior centre group programme for increasing social support and preventing depression in elderly people. *BMC Geriatr*. 2012;12:20.
- Meltzer H. Development of a common instrument for mental health. In: Nosikov A, Gudex C, eds. *EUROHIS: Developing Common Instruments for Health Surveys*. Amsterdam: IOS Press; 2003.
- Beck AT. *Beck Depression Inventory*. San Antonio: Psychological Corporation; 1987.
- Yuen HK, Huang P, Bunk JK, Smith TG. Impact of participating in volunteer activities for residents living in long-term-care facilities. *Am J Occup Ther*. 2008;62(1):71–76.
- Yesavage JA, Brink TL, Rose TL, et al. Development and validation of a geriatric depression screening scale: a preliminary report. *J Psychiatr Res*. 1982;17(1):37–49.
- Kotov R, Gamez W, Schmidt F, Watson D. Linking “big” personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. *Psychol Bull*. 2010;136(5):768–821.
- James BD, Wilson RS, Barnes LL, Bennet DA. Late-life social activity and cognitive decline in old age. *J Int Neuropsychol Soc*. 2011;17(6):998–1005.
- Lee GA, Shehan CL. Social relations and the self-esteem of older persons. *Res Aging*. 1989;11(4):427–442.
- Szanto K, Dombrowski AY, Sahakian BJ, et al. Social emotion recognition, social functioning, and attempted suicide in late-life depression. *Am J Geriatr Psychiatry*. 2012;20(3):257–265.
- Rosenquist JN, Fowler JH, Christakis NA. Social network determinants of depression. *Mol Psychiatry*. 2011;16:273–281.