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The Relationship between Loneliness and Positive Affect in Older Adults

Eliza J. Davidson, M.S.[a,b], **Charles T. Taylor, Ph.D.**[b,d], **Catherine R. Ayers, Ph.D.**[c,d], **Natalie E. Quach**[e], **Xin M. Tu, PhD**[e], **Ellen E. Lee, M.D.**[c,d,f]

[a]Research Service, VA San Diego Healthcare System

[b]San Diego State University/ University of California, San Diego Joint Doctoral Program in Clinical Psychology

[c]Mental Healthcare Line, VA San Diego Healthcare System

[d]Department of Psychiatry, University of California, San Diego School of Medicine

[e]Division of Biostatistics and Bioinformatics, Herbert Wertheim School of Public Health and Human Longevity Science, University of California, San Diego

[f]Desert-Pacific Mental Illness Research Education and Clinical Center, Veterans Affairs San Diego Healthcare System, San Diego, CA

Abstract

Objectives: To establish whether positive affect (PA) is uniquely associated with loneliness and other social functioning variables beyond negative affect (NA) among older adults.

Methods: Four hundred and twenty-eight participants (aged 60+ years old, 82% White, and 48% female) were recruited using random digit-dialing and completed scales for loneliness (UCLA Loneliness Scale), companionship (PROMIS scale), satisfaction with discretionary social activities (PROMIS scale), PA (Center for Epidemiologic Studies [CES] Happiness Scale), and NA (CES-Depression scale and Brief Symptom Inventory-Anxiety Subscale).

Results: Multiple linear regression models found PA to be a significant predictor of lower loneliness where the effect of PA on loneliness is dependent on the level of NA; a large effect size at the mean level of NA, which becomes attenuated when NA increases. Although the direction of effect of PA on loneliness will change for NA > 5.10, which is 5 standard deviations away from 0, based on the model estimates, the percent of subjects with this large NA levels is practically

Corresponding Author: Ellen E. Lee, M.D., Assistant Professor in Residence, Department of Psychiatry, University of California San Diego, 9500 Gilman Drive #0603, La Jolla, CA 92023-0603, Fax: (858) 534-5475, Telephone: (858) 246-2574, eel013@health.ucsd.edu.

Author Contributions

E. J. Davidson took the lead in drafting the manuscript. C. T. Taylor conceptualized the research question and assisted with drafting the manuscript. C. R. Ayers oversaw and assisted with drafting the manuscript. N. Quach and X.M. Tu conducted statistical analyses and assisted with results interpretation and editing the manuscript. E. E. Lee conducted statistical analyses and assisted with drafting the manuscript.

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0. Thus, higher PA is associated with lower loneliness, however this effect is attenuated for larger NA. Similarly, multiple linear regression models found that companionship was associated with PA and NA where the effect of PA is dependent on the level of NA; a medium effect size at the mean level of NA, which becomes attenuated when NA increases. As in the case of loneliness, the direction of effect of PA on companionship will change for NA > 3.52, which is 3.5 standard deviation away from 0, based on the model estimates, but the percent of subjects with this large NA levels is practically 0. Thus, higher PA is associated with increased companionship, and this effect is attenuated with greater NA. Satisfaction with social activities was associated with PA only (medium effect size).

Conclusions: Results suggest PA appears to be uniquely associated with social functioning among older adults. These findings support the potential for treatments that target PA to decrease loneliness among older adults, or vice versa.

Keywords

negative affect; positive affect; aging; loneliness; social functioning; social support

Objectives

Loneliness is highly prevalent among older adults who are at greater risk for negative cognitive, psychological, and physical health consequences from loneliness, including early mortality (1–5). Older adults may be coping with medical illnesses while concurrently experiencing diminishing social networks (6), and social role and identity changes (7). Loneliness has a particularly detrimental impact on mental health in comparison with other functional and physical health variables (8). Identifying factors associated with increased loneliness in older adults may point to modifiable targets that could improve overall health and well-being.

Positive affect (PA; e.g., interest, contentment, joy) facilitates positive social connections (9–12), by guiding people toward making attachments and enhancing responsiveness to rewarding social situations (10,13–16). Older adults who spend more time with friends appear to experience greater PA over time (17) and in comparison with those in unhappy marriages, older adults who are happily married report experiencing more PA (18). In contrast, among the “oldest old” (such as those is their 80s and above), time spent alone has been associated with lower momentary ratings of PA (19).

Family interactions, more frequent contact with friends, and social network quality have been associated with greater PA for older adults (1,20,21). Greater PA has also been associated with lower perception of social losses (22) and greater perception of more satisfying relationships (23). Similarly, PA and/or happiness were found to be associated with loneliness in three studies involving older adults (1,23,24). Several PA-focused interventions have reported improvements in depressive symptoms (25,26), perceived stress (27,28), and resilience (29,30). Few studies, however, have examined the association between PA and loneliness independent of negative affect (NA) for older adults, nor have they examined the interaction of PA and NA in relation to loneliness. To this end, our primary aim was to establish whether PA is uniquely associated with loneliness beyond NA,

which itself is an established correlate of loneliness for older adults (7,31). Secondarily, we aimed to examine the association between PA and complementary aspects of social functioning: companionship and satisfaction with social activities. We also explored the interaction between PA and NA in predicting loneliness, companionship, and satisfaction with social activities given evidence suggesting that especially high levels of NA may attenuate the PA-connectedness link (32).

Methods

Participants

The study participants (428 older adults, aged 60+ years old) were recruited from the UCSD Successful AGing Evaluation (SAGE) study across the adult lifespan, which has been described previously (33,34). List-assisted random digit dialing was used to recruit participants from San Diego County between July 2012 and February 2020 who met the following inclusion criteria: 1) living in the community, 2) aged 21–100+ years, 3) provision of written informed consent to participate in the study, 3) fluency in English, 4) telephone line at home, 5) physical and mental abilities to complete the study assessments, and 6) no known diagnosis of dementia. Exclusion criteria were: 1) residing in nursing homes or requiring daily nursing care, and 2) having a terminal illness. All participants provided written informed consent. The study protocol was approved by the UC San Diego Human Research Protections Program (HRPP).

Measures

Assessments included a 25-minute initial screening phone interview with trained research staff members as well as a survey that was mailed or completed online. Sociodemographic data included age, sex, education level, race/ethnicity, marital status, living situation, and income. All the scales presented below were self-administered.

Positive Affect

PA was assessed using the 4-item Center for Epidemiologic Studies (CES) Happiness scale (35), with scores ranging from 0–12 (higher values indicating greater PA) and high internal consistency (.92–.98) (36). PA scores were normalized ($M = 0$ and $SD = 1$) for the linear models.

Negative Affect

NA was assessed using the 8 negatively valenced items from the 10-item CES Depression Scale (CES-D) (37,38), and the 6-item Brief Symptom Inventory—Anxiety Subscale (BSIA) (39). For the CES-D, scores ranged from 0 to 24, with higher scores indicated greater depression. Prior studies reported a high Cronbach's α (.85 - .90) for the negative CES-D items (40,41). For the BSIA, scores ranged from 0 to 24, with higher score indicating greater anxiety. The BSIA has been shown to have high internal consistency in older adults (Cronbach's α =.81) (42).The CES-D and BSIA scores were normalized ($M = 0$ and $SD = 1$) and averaged to create a composite score of NA.

Loneliness and Social Functioning Measures

The 20-item UCLA Loneliness Scale (Version 3; UCLA-3) is a commonly used assessment of loneliness, with strong test-retest reliability as well as high internal consistency and validity (Cronbach's α of .89 to .94). Participants rate the frequency of experiences (e.g., "How often do you feel left out?") on a 4-point scale (ranging from "never" to "often"). Cut-offs for loneliness severity on the UCLA-3 scale were adapted from Cacioppo and Patrick (4,43,44).

The 6-item PROMIS Companionship scale assessed perceived availability of someone to engage in social activities (Cronbach's α = .95) (45). The 7-item PROMIS Satisfaction with Participation in Discretionary Social Activities scale measured contentment with leisure interests and relationships with friends (Cronbach's α > .88) (45,46).

Statistical Analyses

Sociodemographic factors were examined in the study sample. PA and NA were standardized. We conducted three multiple linear regression models to examine the relationship of PA, NA, and a PA × NA interaction with the following outcomes: loneliness, companionship, and satisfaction with discretionary social activities. Models also included age, sex, marital status, education, and race/ethnicity. In the presence of a significant PA × NA interaction, effects of PA (NA) on the outcome depend on the level of NA (PA). To illustrate the nature of interaction, simple slopes analyses were conducted. When the PA × NA interaction was non-significant, we removed this from the model and presented the main effects.

We present effect sizes and p-values for all of these statistical tests. Effect sizes were categorized for multiple regression: $\eta^2 = 0.02$ indicates a small effect; $\eta^2 = 0.13$ indicates a medium effect; $\eta^2 = 0.26$ indicates a large effect (47).Statistical significance was defined as alpha = 0.05 (two-tailed). Variance Inflation Factors (VIFs) were used to assess for multi-collinearity. VIF values were under 2.5 for all the independent variables for all three regression models, indicating that multicollinearity is not a major issue. All analyses were completed in SPSS Version 28 (48).

Results

The study sample was 48% women and primarily White (82%), married/partnered (56%), and with some college-level education (87%). Within this sample, 124 older adults (29%) had high loneliness scores (UCLA-3 scores ≥ 40). Mean CES Happiness scores were 9.96 (SD = 2.63); mean CES-D (depression) and mean BSIA (anxiety) scores were 3.48 (SD = 3.59) and 1.42 (SD = 2.53), respectively. Mean loneliness, companionship, and satisfaction with discretionary activities scores were 35.1 (SD = 9.6), 51.8 (SD = 8.1), and 54.1 (SD = 7.9), respectively.

In the first linear regression model, we found significant main effects of PA and NA and a significant interaction between the two, while controlling for age, gender, and loneliness-relevant demographic factors (marital status, education, race/ethnicity (Table 1). Because of the significant interaction with NA, the relationship of PA with loneliness would depend on

levels of NA (Supplemental Figure 1A) such that the relationship between PA and loneliness becomes attenuated with larger NA. Although the direction of effect of PA on loneliness will change for NA > 5.10, which is 5 standard deviation away from 0, based on the model estimates, the percent of subjects with this large NA levels was practically 0. Thus, as expected NA was significantly associated with higher loneliness, albeit with attenuated effect for larger N.

Similarly, there was a significant PA × NA interaction for the linear regression model predicting companionship (Table 1, Supplemental Figure 1B). As in the case of the loneliness outcome, the effect of PA on companionship also depends on the level of NA and becomes attenuated with larger NA. As in the case of loneliness, the direction of effect of PA on companionship will also change for NA > 3.52, which is 3.5 standard deviation away from 0, based on the model estimates, but the percent of subjects with this large NA levels is again practically 0. Thus, higher PA is associated with increased companionship, and this effect is attenuated for greater NA. The PA × NA interaction for the linear regression model predicting satisfaction with social activities was not significant, and the trimmed model with only main effects found PA to be significantly associated with higher satisfaction with social activities (Table 1).

Conclusions

We found PA to be significantly predictive of social functioning variables of loneliness, companionship, and satisfaction with social activities with medium to large effects and independent of NA. Nearly a third of the sample endorsed high loneliness scores and as expected, NA predicted worse loneliness and lower companionship scores when controlling for relevant demographic characteristics. Interestingly, the interaction of PA and NA was significantly predictive of loneliness and companionship, indicating that the PA-loneliness link was attenuated at high levels of NA. A previous investigation among younger individuals found a PA × NA interaction such that those higher in NA evidenced a diminished association between PA and social connectedness over the course of a social affiliation task (32), and PA targeted intervention (49); thus it may be beneficial to replicate these findings in a subsequent or larger sample of older adults. Overall, PA appears to be uniquely associated with social functioning among this group, though additional and longitudinal research is needed to establish the causal association between PA and loneliness for older adults. Given that PA likely facilitates greater social connectedness (9–12), diminished PA may represent a candidate mechanism in increasing vulnerability to loneliness. Theoretically speaking, PA-targeted interventions may therefore improve social connectedness and reduce loneliness for older adults. Conversely, reducing loneliness may also improve PA.

Some existing interventions focusing on savoring, gratitude, and participation in meaningful activities have demonstrated beneficial effects for older adults (25–30; 50–53), however most of these focused on outcomes pertaining to NA, such as depression and stress. Only a few trials have led to improvements in PA and aspects of social functioning such as loneliness (54–57); however, these studies did not specifically target PA to improve social functioning and its mechanistic role remains unclear. In general, literature reviews note the

poor quality of existing interventions for loneliness as many trials reported small sample sizes and/or lacked a theoretical basis, control condition, validated assessment tools, and did not specify the mechanism of action targeted by their intervention (58–62). The development and rigorous evaluation of PA-focused interventions to reduce loneliness is critical given the detrimental impact of loneliness on older adults' wellbeing.

Strengths of this study involve the inclusion of an older adult population, random digit-dialing to recruit participants, and specific examination of the association between PA and loneliness, the PA × NA interaction, and other social functioning variables. Further, we used several well-validated measures of social functioning and controlled for important demographic characteristics. Analyses were done cross-sectionally, thus we cannot draw causal conclusions as to the relationship between PA and loneliness. There may also be a bidirectional association between these variables such that PA could lead to less loneliness and/or that reductions in loneliness could lead to greater PA, as was observed in a prior Positive Activity Intervention trial implemented among younger adults (49). Additional limitations include that data were collected via self-report measures from a well-educated and predominantly Caucasian sample. These limitations notwithstanding, our findings support the unique association between PA and loneliness for older adults.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Beller J, Wagner A. Disentangling loneliness: Differential effects of subjective loneliness, network quality, network size, and living alone on physical, mental, and cognitive health. J Aging Health. 2018;30(4):521–539. doi:10.1177/0898264316685843 [PubMed: 28553795]
2. Gierveld J de J, Havens B. Cross-national Comparisons of Social Isolation and Loneliness: Introduction and Overview. Can J Aging Rev Can Vieil. 2004;23(2):109–113. doi:10.1353/cja.2004.0021
3. Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D. Loneliness and Social Isolation as Risk Factors for Mortality: A Meta-Analytic Review. Perspect Psychol Sci. 2015;10(2):227–237. doi:10.1177/1745691614568352 [PubMed: 25910392]
4. Lee EE, Depp C, Palmer BW, et al. High Prevalence and Adverse Health Effects of Loneliness in Community-dwelling Adults Across the Lifespan: Role of Wisdom as a Protective Factor. Int Psychogeriatr. 2019;31(10):1447. doi:10.1017/S1041610218002120 [PubMed: 30560747]
5. Perissinotto CM, Stijacic Cenzer I, Covinsky KE. Loneliness in Older Persons: A Predictor of Functional Decline and Death. Arch Intern Med. 2012;172(14):1078–1084. doi:10.1001/archinternmed.2012.1993 [PubMed: 22710744]
6. Charles S, Carstensen LL. Social and Emotional Aging. Annu Rev Psychol. 2010;61:383–409. doi:10.1146/annurev.psych.093008.100448 [PubMed: 19575618]

7. Laird KT, Krause B, Funes C, Lavretsky H. Psychobiological factors of resilience and depression in late life. Transl Psychiatry. 2019;9(1):88. doi:10.1038/s41398-019-0424-7 [PubMed: 30765686]
8. Adams KB, Moon H. Subthreshold depression: Characteristics and risk factors among vulnerable elders. Aging Ment Health. 2009;13(5):682–692. doi:10.1080/13607860902774501 [PubMed: 19882406]
9. Fredrickson BL, Cohn MA, Coffey KA, Pek J, Finkel SM. Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. J Pers Soc Psychol. 2008;95(5):1045–1062. doi:10.1037/a0013262 [PubMed: 18954193]
10. Kok BE, Coffey KA, Cohn MA, et al. How Positive Emotions Build Phys$^{2–6}$ical Health: Perceiv^{2}ed Positive Social Connections Account for the Upward Spiral Between Positive Emotions and Vagal Tone. Psychol Sci. 2013;24(7):1123–1132. doi:10.1177/0956797612470827 [PubMed: 23649562]
11. Ramsey MA, Gentzler AL. An upward spiral: Bidirectional associations between positive affect and positive aspects of close relationships across the life span. Dev Rev. 2015;36:58–104. doi:10.1016/j.dr.2015.01.003
12. Waugh CE, Fredrickson BL. Nice to know you: Positive emotions, self–other overlap, and complex understanding in the formation of a new relationship. J Posit Psychol. 2006;1(2):93–106. doi:10.1080/17439760500510569 [PubMed: 21691460]
13. Fredrickson BL. Chapter One - Positive Emotions Broaden and Build. In: Devine P, Plant A, eds. Advances in Experimental Social Psychology. Vol 47. Academic Press; 2013:1–53. doi:10.1016/B978-0-12-407236-7.00001-2
14. Gable SL, Reis HT. Chapter 4 - Good News! Capitalizing on Positive Events in an Interpersonal Context. In: Advances in Experimental Social Psychology. Vol 42. Advances in Experimental Social Psychology. Academic Press; 2010:195–257. doi:10.1016/S0065-2601(10)42004-3
15. Gable SL, Strachman A. Approaching social rewards and avoiding social punishments: Appetitive and aversive social motivation. In: Handbook of Motivation Science. New York, NY, US: The Guilford Press; 2008:561–575.
16. Lyubomirsky S, King L, Diener E. The Benefits of Frequent Positive Affect: Does Happiness Lead to Success? Psychol Bull. 2005;131(6):803–855. doi:10.1037/0033-2909.131.6.803 [PubMed: 16351326]
17. Huxhold O, Miche M, Schüz B. Benefits of Having Friends in Older Ages: Differential Effects of Informal Social Activities on Well-Being in Middle-Aged and Older Adults. J Gerontol Ser B. 2014;69(3):366–375. doi:10.1093/geronb/gbt029
18. Carstensen LL, Gottman JM, Levenson RW. Emotional behavior in long-term marriage. Psychol Aging. 1995;10(1):140–149. doi:10.1037/0882-7974.10.1.140 [PubMed: 7779311]
19. Chui H, Hoppmann CA, Gerstorf D, Walker R, Luszcz MA. Social Partners and Momentary Affect in the Oldest-Old: The Presence of Others Benefits Affect Depending on Who We Are and Who We Are With. Dev Psychol. 2014;50(3):728–740. [PubMed: 23895170]
20. Cheng S-T, Lee CKL, Chow PK-Y. Social support and psychological well-being of nursing home residents in Hong Kong. Int Psychogeriatr. 2010;22(7):1185–1190. doi:10.1017/S1041610210000220 [PubMed: 20214845]
21. Greenfield EA, Marks NF. Formal volunteering as a protective factor for older adults' psychological well-being. J Gerontol B Psychol Sci Soc Sci. 2004;59(5):S258–264. doi:10.1093/geronb/59.5.s258 [PubMed: 15358800]
22. Diehl M, Wettstein M, Spuling SM, Wurm S. Age-related change in self-perceptions of aging: Longitudinal trajectories and predictors of change. Psychol Aging. 20210204;36(3):344. doi:10.1037/pag0000585 [PubMed: 33539148]
23. Margrett JA, Daugherty K, Martin P, et al. Affect and Loneliness among Centenarians and the Oldest Old: The Role of Individual and Social Resources. Aging Ment Health. 2011;15(3):385–396. doi:10.1080/13607863.2010.519327 [PubMed: 21491224]
24. Steptoe A, Leigh ES, Kumari M. Positive affect and distressed affect over the day in older people. Psychol Aging. 2011;26(4):956–965. doi:10.1037/a0023303 [PubMed: 21517182]

25. Ho HCY, Yeung DY, Kwok SYCL. Development and evaluation of the positive psychology intervention for older adults. J Posit Psychol. 2014;9(3):187–197. doi:10.1080/17439760.2014.888577
26. Proyer RT, Gander F, Wellenzohn S, Ruch W. Positive psychology interventions in people aged 50–79 years: Long-term effects of placebo-controlled online interventions on well-being and depression. Aging Ment Health. 2014;18(8):997–1005. doi:10.1080/13607863.2014.899978 [PubMed: 24712501]
27. Killen A, Macaskill A. Using a gratitude intervention to enhance well-being in older adults. J Happiness Stud Interdiscip Forum Subj Well-Being. 2015;16(4):947–964. doi:10.1007/s10902-014-9542-3
28. Greenawalt KE, Orsega-Smith E, Turner JL, Goodwin S, Rathie EJ. The impact of "the art of happiness" class on community dwelling older adults: A positive psychology intervention. Act Adapt Aging. 2019;43(2):118–132. doi:10.1080/01924788.2018.1493898
29. Treichler EBH, Glorioso D, Lee EE, et al. A pragmatic trial of a group intervention in senior housing communities to increase resilience. Int Psychogeriatr. 2020;32(2):173–182. doi:10.1017/S1041610219002096 [PubMed: 32017867]
30. Smith JL, Hanni AA. Effects of a Savoring Intervention on Resilience and Well-Being of Older Adults. J Appl Gerontol. 2019;38(1):137–152. doi:10.1177/0733464817693375 [PubMed: 28380722]
31. 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. doi:10.1037/0882-7974.21.1.140 [PubMed: 16594799]
32. Taylor CT, Pearlstein SL, Stein MB. The affective tie that binds: Examining the contribution of positive emotions and anxiety to relationship formation in social anxiety disorder. J Anxiety Disord. 2017;49:21–30. doi:10.1016/j.janxdis.2017.03.007 [PubMed: 28384621]
33. Jeste DV, Savla GN, Thompson WK, et al. Association Between Older Age and More Successful Aging: Critical Role of Resilience and Depression. Am J Psychiatry. 2013;170(2):188–196. doi:10.1176/appi.ajp.2012.12030386 [PubMed: 23223917]
34. Thomas ML, Kaufmann CN, Palmer BW, et al. Paradoxical Trend for Improvement in Mental Health with Aging: A Community-Based Study of 1,546 Adults Aged 21–100 Years. J Clin Psychiatry. 2016;77(8):0–0. doi:10.4088/JCP.16m10671
35. Fowler JH, Christakis NA. Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study. BMJ. 2008;337:a2338. doi:10.1136/bmj.a2338 [PubMed: 19056788]
36. Shafer AB. Meta-analysis of the factor structures of four depression questionnaires: Beck, CES-D, Hamilton, and Zung. J Clin Psychol. 2006;62(1):123–146. doi:10.1002/jclp.20213 [PubMed: 16287149]
37. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for Depression in Well Older Adults: Evaluation of a Short Form of the CES-D. Am J Prev Med. 1994;10(2):77–84. doi:10.1016/S0749-3797(18)30622-6 [PubMed: 8037935]
38. Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. Appl Psychol Meas. 1977;1(3):385–401. doi:10.1177/014662167700100306
39. Derogatis LR, Melisaratos N. The Brief Symptom Inventory: an introductory report. Psychol Med. 1983;13(3):595–605. [PubMed: 6622612]
40. Chokkanathan S, Mohanty J. Factor structure of the CES-D scale among older adults in Chennai, India. Aging Ment Health. 2013;17(4):517–525. doi:10.1080/13607863.2012.751580 [PubMed: 23323570]
41. Miller TQ, Markides KS, Black SA. The factor structure of the CES-D in two surveys of elderly Mexican Americans. J Gerontol B Psychol Sci Soc Sci. 1997;52(5):S259–269. doi:10.1093/geronb/52b.5.s259 [PubMed: 9310098]
42. Petkus AJ, Gum AM, Small B, Malcarne VL, Stein MB, Wetherell JL. Evaluation of the factor structure and psychometric properties of the Brief Symptom Inventory-18 with homebound older adults. Int J Geriatr Psychiatry. 2010;25(6):578–587. doi:10.1002/gps.2377 [PubMed: 20013879]

43. Cacioppo JT, Patrick W. Loneliness: Human Nature and the Need for Social Connection. W. W. Norton & Company; 2008.
44. Doryab A, Villalba DK, Chikersal P, et al. Identifying Behavioral Phenotypes of Loneliness and Social Isolation with Passive Sensing: Statistical Analysis, Data Mining and Machine Learning of Smartphone and Fitbit Data. JMIR MHealth UHealth. 2019;7(7):e13209. doi:10.2196/13209 [PubMed: 31342903]
45. Cyranowski JM, Zill N, Bode R, et al. Assessing Social Support, Companionship, and Distress: NIH Toolbox Adult Social Relationship Scales. Health Psychol Off J Div Health Psychol Am Psychol Assoc. 2013;32(3):293–301. doi:10.1037/a0028586
46. Cella D, Riley W, Stone A, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. J Clin Epidemiol. 2010;63(11):1179–1194. doi:10.1016/j.jclinepi.2010.04.011 [PubMed: 20685078]
47. Watson P Rule of thumb on magnitudes of effect sizes: University of Cambridge; 2021 [cited 2021 October 13th]. Available from: https://imaging.mrc-cbu.cam.ac.uk/statswiki/FAQ/effectSize.
48. IBM Corp. IBM SPSS Statistics for Windows, Version 28.0 Armonk, NY; 2021.
49. Taylor CT, Pearlstein SL, Kakaria S, Lyubomirsky S, Stein MB. Enhancing Social Connectedness in Anxiety and Depression Through Amplification of Positivity: Preliminary Treatment Outcomes and Process of Change. Cogn Ther Res. 2020;44(4):788–800. doi:10.1007/s10608-020-10102-7
50. Ramírez E, Ortega AR, Chamorro A, Colmenero JM. A program of positive intervention in the elderly: Memories, gratitude and forgiveness. Aging Ment Health. 2014;18(4):463–470. doi:10.1080/13607863.2013.856858 [PubMed: 24229346]
51. Ishihara M, Saito T, Sakurai T, Arai H. Sustained mood improvement by the positive photo appreciation program in older adults. Int J Geriatr Psychiatry. 2021;36(6):970–971. doi:10.1002/gps.5493 [PubMed: 33462902]
52. Hausmann LRM, Youk A, Kwoh CK, et al. Testing a positive psychological intervention for osteoarthritis. Pain Med. 2017;18(10):1908–1920. doi:10.1093/pm/pnx141. [PubMed: 29044408]
53. Salces-Cubero IM, Ramírez-Fernández E, Ortega-Martínez AR. Strengths in older adults: differential effect of savoring, gratitude and optimism on well-being. Aging Ment Health. 2019;23(8):1017–1024. doi:10.1080/13607863.2018.1471585 [PubMed: 29781723]
54. Keisari S, Palgi Y, Yaniv D, Gesser-Edelsburg A. Participation in life-review playback theater enhances mental health of community-dwelling older adults: A randomized controlled trial. Psychol Aesthet Creat Arts. September 2020. doi:10.1037/aca0000354
55. Stevens NL, Martina CMS, Westerhof GJ. Meeting the Need to Belong: Predicting Effects of a Friendship Enrichment Program for Older Women. Gerontologist. 2006;46(4):495–502. doi:10.1093/geront/46.4.495 [PubMed: 16921003]
56. Stewart M, Craig D, MacPherson K, Alexander S. Promoting positive affect and diminishing loneliness of widowed seniors through a support intervention. Public Health Nurs. 2001;18(1):54–63. doi:10.1046/j.1525-1446.2001.00054.x [PubMed: 11251874]
57. Theeke LA, Mallow JA, Theeke E. A Pilot One Group Feasibility, Acceptability, and Initial Efficacy Trial of LISTEN for Loneliness in Lonely Stroke Survivors. SAGE Open Nurs. 2021;7:23779608211015150. doi:10.1177/23779608211015154
58. Bemelmans R, Gelderblom GJ, Jonker P, de Witte L. Socially Assistive Robots in Elderly Care: A Systematic Review into Effects and Effectiveness. J Am Med Dir Assoc. 2012;13(2):114–120.e1. doi:10.1016/j.jamda.2010.10.002 [PubMed: 21450215]
59. Cacioppo S, Grippo AJ, London S, Goossens L, Cacioppo JT. Loneliness: Clinical Import and Interventions. Perspect Psychol Sci J Assoc Psychol Sci. 2015;10(2):238–249. doi:10.1177/1745691615570616
60. Chen Y-RR, Schulz PJ. The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly: A Systematic Review. J Med Internet Res. 2016;18(1):e18. doi:10.2196/jmir.4596 [PubMed: 26822073]
61. Cohen-Mansfield J, Perach R. Interventions for Alleviating Loneliness among Older Persons: A Critical Review. Am J Health Promot. 2015;29(3):e109–e125. doi:10.4278/ajhp.130418-LIT-182 [PubMed: 24575725]

62. Masi CM, Chen H-Y, Hawkley LC, Cacioppo JT. A Meta-Analysis of Interventions to Reduce Loneliness. Personal Soc Psychol Rev. 2011;15(3):219–266. doi:10.1177/1088868310377394

Table 1.

Linear regression models predicting the following outcomes: (A) loneliness, (B) Companionship, and (C) Satisfaction with Discretionary Social Activities.

A.	**Loneliness (UCLA scale) Adjusted R^2 =.328**					
	B	**SE**	**F**	**df**	**p**	**ηp2**
Age	−0.04	0.04	0.94	1	0.33	0.003
Sex (female)[a]	−0.13	1.02	0.02	1	0.90	<0.001
Marital Status (married)[b]	−2.14	1.04	4.21	1	0.04	0.01
Education[c]			1.66	1	0.19	0.01
High School and Below	2.73	1.52			0.07	0.01
Some College to Bachelor's	0.62	1.01			0.54	0.001
Race (Caucasian)[d]	1.18	1.11	1.13	1	0.29	0.004
Positive Affect (Z-score)	−4.13	0.53	60.78	1	**<0.001**	0.16
Negative Affect (Z-score)	2.60	0.64	16.55	1	**<0.001**	0.05
Positive Affect × Negative Affect	0.81	0.32	6.55	1	0.01	0.02
B.	**Companionship (PROMIS) Adjusted R^2 =.398**					
	B	**SE**	**F**	**df**	**p**	**ηp2**
Age	0.01	0.04	0.11	1	0.73	<0.001
Sex (female)[a]	0.20	0.83	0.06	1	0.81	<0.001
Marital Status (married)[b]	8.35	0.84	97.80	1	**<0.001**	0.24
Education[c]			1.14	1	0.32	0.01
High School and Below	−0.97	1.23			0.43	0.002
Some College to Bachelor's	0.63	0.82			0.44	0.002
Race (Caucasian)[d]	−0.60	0.90	0.44	1	0.51	0.001
Positive Affect (Z-score)	2.43	0.43	32.10	1	**<0.001**	0.09
Negative Affect (Z-score)	−1.38	0.52	7.06	1	0.008	0.02
Positive Affect × Negative Affect	−0.69	0.26	7.36	1	0.007	0.02
C.	**Satisfaction with Discretionary Social Activities (PROMIS) Adjusted R^2 =.356**					
	B	**SE**	**F**	**df**	**p**	**ηp2**
Age	−0.15	0.07	4.89	1	0.03	0.07
Sex (female)[a]	−0.90	2.04	0.20	1	0.66	0.003
Marital Status (married)[b]	−0.13	2.02	0.004	1	0.95	<0.001
Education[c]			0.89	1	0.42	0.03
High School and Below	−2.17	2.37			0.36	0.01
Some College to Bachelor's	0.59	1.79			0.74	0.002
Race (Caucasian)[d]	0.78	1.97	0.16	1	0.69	0.002

Positive Affect (Z-score)	3.67	0.92	15.53	1	**<0.001**	0.19
Negative Affect (Z-score)	−0.78	0.92	0.72	1	0.40	0.01

[a] compared to male

[b] compared to not married

[c] compared to post-graduate degree

[d] compared to not Caucasian