HHS Public Access

Author manuscript

J Am Geriatr Soc. Author manuscript; available in PMC 2016 November 01.

Published in final edited form as:

J Am Geriatr Soc. 2015 November ; 63(11): 2430–2432. doi:10.1111/jgs.13805.

Social Network Size and Findings on Cranial Magnetic Resonance Imaging in Older Adults: The Cardiovascular Health Study

Jason D. Flatt, PhD, MPH[a,b], **Andrea L. Rosso, PhD, MPH**[b], **Howard J. Aizenstein, MD, PhD**[c], **Richard Schulz, PhD**[c], **W. T. Longstreth Jr., MD**[d], **Anne B. Newman, MD**[b,e], **Nicole R. Fowler, PhD, MHSA**[f], and **Caterina Rosano, MD, MPH**[b]

[a]Department of Medicine, School of Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania

[b]Department of Epidemiology, University of Pittsburgh, Pittsburgh, Pennsylvania

[c]Department of Psychiatry, University of Pittsburgh, Pittsburgh, Pennsylvania

[d]Departments of Neurology and Epidemiology, University of Washington, Seattle, Washington

[e]Division of Geriatric Medicine, Division of Geriatric Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania

[f]Department of Medicine, Indiana University School of Medicine, Indianapolis, Indiana

To the Editor

Remaining free of dementia and maintaining a high level of cognitive functioning in late life is an important public health priority. Having a larger social network (SN) in late life is associated with a reduced risk of dementia and cognitive decline.[1] A review of studies in younger adults found an association between SN size and brain volumes,[2] but less is known about these associations in older populations. The objective of this study was to examine whether SN size and characteristics (family, friends, and social support) were associated with ventricular enlargement (VE) and white matter hyperintensities (WMHs)—markers of brain atrophy and associated with cognitive and physical impairments—using cranial magnetic resonance imaging (MRI) in a population-based cohort of older adults.

Corresponding Author: Jason D. Flatt, PhD, MPH, Division of Geriatrics, Department of Medicine, University of California at San Francisco, 3333 California Street, Suite 380, San Francisco, California 94115 jason.flatt@ucsf.edu. Alternate Corresponding Author: Caterina Rosano, PhD, 130 N. Bellefield Avenue, Pittsburgh, PA 15213, 412-383-1294, rosanoc@edc.pitt.edu.

Conflicts of Interest: The authors have no financial or any other kind of personal conflicts with this paper.

Author Contributions: Preparation of manuscript Flatt; data analysis and interpretation Flatt, Rosso, Fowler, Longstreth, Aizenstein, Newman and Rosano; study concept and design of study Newman, Longstreth and Rosano; study management Flatt; revising manuscript for intellectual content Flatt, Rosso, Fowler, Longstreth, Schulz, Aizenstein, Newman, and Rosano; and final approval of the version to be published Flatt, Rosso, Fowler, Longstreth, Schulz, Aizenstein, Newman, and Rosano.

Sponsor's Role: None

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

METHODS

The Cardiovascular Health Study (CHS) is a longitudinal cohort study of cardiovascular disease risk factors in older adults living in four US communities. From 1989–1990 a total of 5201 participants were enrolled and from 1992–1993 an additional 687 African American participants were enrolled.[3] Data for this study comes from CHS participants free of dementia, with a MRI between 1997 and 1999 and concurrent complete SN data. MRIs were obtained with 1.5 Tesla scanners and findings of interest for these analyses were VE and WMHs. Neuroradiologists rated severity on a 10-point scale with grades from 0 to 9.[4] VE and WMHs were dichotomized based on high and low severity, with high severity representing those with a ventricular grade 5–9 and a white matter grade 3–9.[4, 5] SN measures were assessed via the Lubben Social Network Scale, a validated 10-item measure scored from 0 to 50, and included measures of family, friends, and social support.[6] Based on previously identified cut-points, four categories of SN size were identified: very small (≤20), small (21–25), medium (26–30), and large (31 and above).[7] The associations between SN size, SN characteristics, VE and WMHs were evaluated using multivariable logistic regression models, adjusted for demographic and health characteristics. A series of sensitivity analyses were conducted to examine whether results changed when MRI findings were treated as continuous and after removing participants with Modified Mini-Mental State Examination (3MSE) <80.

RESULTS

A total of 1580 participants were included, with a mean age of 79.3 (SD = 4.1); 85% were White; 52% had hypertension; and about 70% reported a large SN. Those with smaller SNs were more likely to be older, female, and report more depressive symptoms than those with large SNs. Adjusted associations between SN size and VE and WMHs are presented in Table 1. Those with very small to small SNs were two times more likely to have severe VE compared to those with a large SN ($p<.01$). Those with a very small SN had increased odds of having WMHs compared to those with a larger SN ($p = .04$). Among the SN characteristics, a smaller family network and less social support were independently associated with severe VE; a smaller family network was associated with severe WMHs. Friend network was not associated with MRI findings. Results did not change substantively when VE and WMHs were treated as continuous or after excluding participants with a 3MSE score < 80.

DISCUSSION

This population-based study of community-dwelling older adults quantified the negative association between MRI findings of VE and WMH and SN size and characteristics. Several biological mechanisms have been proposed to explain the potential protective effects of SNs on brain health. SNs may be a source of environmental enrichment.[8] Further, SNs may influence cardiovascular health through the sharing of health behaviors, such as physical activity and obesity, and through the provision of social support—which could alleviate stress[9] and depression.[10] However, studies on SNs and health often cannot determine causal

direction. Manifestations of VE and WMH include cognitive impairment and dementia, which could in turn lead to smaller SNs.

Strengths of this study included the large sample size with complete data on SNs and MRI findings as well as having a multi-site, population-based sample. Limitations of this study include the cross-sectional design, inability to determine the direction of causality, and the self-reported data on SNs and other health characteristics may be subject to bias.

CONCLUSION

Similar to studies showing that SN size was related to neuroimaging markers in younger adults, this study found that older adults with smaller SNs were more likely to have severe VE and WMHs. Although longitudinal follow-up is necessary to understand the causal direction of these effects, strengthening older adults' SNs, especially family networks, may be beneficial to physical and cognitive health.

Acknowledgments

The authors thank the study participants and staff of the Cardiovascular Health Study.

Funding: This research was supported by contracts HHSN268201200036C, HHSN268200800007C, N01HC55222, N01HC85079, N01HC85080, N01HC85081, N01HC85082, N01HC85083, N01HC85086, N01HC15103 and grant U01HL080295 from the National Heart, Lung, and Blood Institute (NHLBI), with additional contribution from the National Institute of Neurological Disorders and Stroke (NINDS). Additional support was provided by R01AG023629 from the National Institute on Aging (NIA). A full list of principal CHS investigators and institutions can be found at CHS-NHLBI.org. Dr. Flatt was supported by the National Center for Advancing Translational Sciences of the National Institutes of Health, Award Number TL1TR000145.

References

1. Dodge HH, Ybarra O, Kaye JA. Tools for advancing research into social networks and cognitive function in older adults. Int Psychogeriatr. 2014; 26:533–539. [PubMed: 24152936]
2. Von Der Heide R, Vyas G, Olson IR. The social network-network: size is predicted by brain structure and function in the amygdala and paralimbic regions. Soc Cogn Affect Neurosci. 2014; 9:1962–1972. [PubMed: 24493846]
3. Tell GS, Fried LP, Hermanson B, et al. Recruitment of adults 65 years and older as participants in the Cardiovascular Health Study. Ann Epidemiol. 1993; 3:358–366. [PubMed: 8275211]
4. Kuller LH, Shemanski L, Manolio T, et al. Relationship between ApoE, MRI findings, and cognitive function in the Cardiovascular Health Study. Stroke. 1998; 29:388–398. [PubMed: 9472879]
5. Rosano C, Newman AB, Katz R, et al. Association between lower digit symbol substitution test score and slower gait and greater risk of mortality and of developing incident disability in well-functioning older adults. J Am Geriatr Soc. 2008; 56:1618–1625. [PubMed: 18691275]
6. Lubben JE. Assessing social networks among elderly populations. Fam Community Health. 1988; 11:42–52.
7. Nagayoshi M, Everson-Rose SA, Iso H, et al. Social network, social support, and risk of incident stroke: Atherosclerosis Risk in Communities Study. Stroke. 2014; 45:2868–73. [PubMed: 25139878]
8. Stern Y. Cognitive reserve. Neuropsychologia. 2009; 47:2015–2028. [PubMed: 19467352]
9. Grant N, Hamer M, Steptoe A. Social isolation and stress-related cardiovascular, lipid, and cortisol responses. Ann Behav Med. 2009; 37:29–37. [PubMed: 19194770]
10. Schwarzbach M, Luppa M, Forstmeier S, et al. Social relations and depression in late life: A systematic review. Int J Geriatr Psychiatry. 2014; 29:1–21. [PubMed: 23720299]

Table 1

Adjusted Associations between Social Networks Size and MRI Findings N=1580

Characteristics	Social Network (score 0–50)			
	Large (31 +)	Medium (26–30)	Small (21–25)	Very Small (≤ 20)
Severe VE (5–9)				
Model 1	1.00	1.13 (0.76–1.68)	1.88 (1.23–2.88)	2.19 (1.32–3.64)
Model 2	1.00	1.13 (0.76–1.69)	1.88 (1.23–2.89)	2.11 (1.26–3.54)
Model 3	1.00	1.14 (0.76–1.70)	1.86 (1.21–2.87)	2.09 (1.24–3.51)
Model 4	1.00	1.21 (0.81–1.83)	1.91 (1.23–2.96)	2.21 (1.30–3.76)
Severe WMHs (3–9)				
Model 1	1.00	1.03 (0.76–1.39)	1.17 (0.82–1.68)	1.58 (1.01–2.47)
Model 2	1.00	1.06 (0.78–1.44)	1.21 (0.84–1.74)	1.70 (1.08–2.69)
Model 3	1.00	1.06 (0.78–1.44)	1.20 (0.83–1.72)	1.69 (1.07–2.66)
Model 4	1.00	1.04 (0.76–1.42)	1.13 (0.78–1.64)	1.63 (1.03–2.60)

Note: VE = Ventricular enlargement, WMHs = White matter hyperintensities.

Model 1 adjusted for age, gender, race, and education. Model 2 adjusted for model 1 plus diabetes and hypertension. Model 3 adjusted for Model 2 and depressive symptoms (Center for Epidemiologic Studies Depression Scale >7). Model 4 adjusted for model 3 and Modified Mini-Mental State Examination <80.