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DISTINCT FUNCTIONS OF SOCIAL SUPPORT AND COGNITIVE FUNCTION AMONG OLDER ADULTS

Regina C. Sims,
School of Nursing, University of Delaware, Newark, Delaware, USA

Megan Hosey,
Department of Psychology, The University of Maryland, Baltimore County, Baltimore, Maryland, USA

Shellie-Anne Levy,
Department of Psychology, Howard University, Washington, DC, USA

Keith E. Whitfield,
Department of Psychology & Neuroscience, Duke University, Durham, North Carolina, USA

Leslie I. Katzel, and
Department of Medicine, University of Maryland School of Medicine, Baltimore, Maryland, USA

Geriatric Research Education and Clinical Center, Baltimore Veterans Affairs Medical Center Baltimore, Maryland, USA

Shari R. Waldstein
Department of Psychology, The University of Maryland, Baltimore County, Baltimore, Maryland, USA

Abstract

Background/Study Context—Social support has been shown to buffer cognitive decline in older adults; however, few studies have examined the association of distinct functions of perceived social support and cognitive function. The current study examined the relations between distinct functions of social support and numerous cognitive domains in older adults.

Methods—Data were derived from a cross-sectional, correlational study of cardiovascular risk factors, cognitive function, and neuroimaging. The participants were 175 older adults with a mean age of 66.32. A number of neuropsychological tests and the Interpersonal Support Evaluation List were administered. Multiple linear regression analyses were conducted to determine cross-sectional relations of social support to cognitive function after controlling for age, gender, education, depressive symptomatology, systolic blood pressure, body-mass index, total cholesterol, and fasting glucose.

Results—No significant positive relations were found between distinct functions of social support and cognitive function in any domain; however, inverse relations emerged such that

Address correspondence to Regina C. Sims, School of Nursing, University of Delaware, 25 N. College Ave., Newark, DE 19716. rsims@udel.edu.

greater social support across several functions was associated with poorer nonverbal memory and response inhibition.

Conclusion—Results suggest that the receipt of social support may be a burden for some older adults. Within the current study, fluid cognitive abilities reflected this phenomenon. The mechanism through which social support is associated with poorer cognitive function in some domains deserves further exploration.

Among older adults, cognitive function is an important indicator of overall well-being. Although cognitive function shows some gradual decline in old age, there are innumerable factors that create individual differences in the rate and timing of the cognitive aging process. Within this process, there are a multitude of socio-demographic, psychosocial, and biological factors that may help to speed or delay the loss of cognitive function (Craik & Salthouse, 2000; Marin, Lord, Andrews, Juster, Sindi, & Arsenault-Lapierre et al., 2011). Among these, psychosocial factors have been largely understudied, and when given attention, studies have focused mainly on psychosocial factors that speed cognitive losses, such as depression and stress (McDermott & Ebmeier, 2009; Peavy, Salmon, Jacobson, Hervey, Gamst, Wolfson et al., 2009; Rönnlund, Sundström, Sörman, & Nilsson, 2013). Far less attention has been paid to factors that buffer the loss of cognitive function, such as social support, which may play a significant protective role in the cognitive aging process.

Social support is defined as the perception or experience that one is loved, cared for, and valued by others, and that one is part of a reciprocal social network (Taylor, 2007). The receipt of social support appears to play an important role in cognitive function and numerous studies support its positive association with cognitive function in older adults (Holtzman et al., 2004; Seeman, Lusignolo, Albert, & Berkman, 2001; Yeh & Liu, 2003; Zhu, Hu, & Efird, 2012). For example, cross-sectional evidence demonstrates that mental status is greater among older adults who report relatively more perceived support from friends (Yeh & Liu, 2003). Similarly, Zhu et al. (2012) found that mental status is greater among older adults who perceived high familial support. In a sample of middle-aged adults, high perceived social support was significantly correlated with improved executive function (Sims, Levy, Mwendwa, Callender, & Campbell, 2011).

Longitudinal evidence has demonstrated that the receipt of social support is related to better cognitive performance at baseline and follow-up in the domains of mental status, language, abstraction, spatial ability, delayed spatial recognition, incidental recall, and delayed recall (Holtzman et al., 2004; Seeman et al., 2001). Findings from the MacArthur Studies of Successful Aging showed that greater emotional support was associated with better cognitive performance at baseline. Furthermore, greater baseline emotional support was a predictor of better cognitive performance at follow-up 7.5 years later (Seeman et al., 2001). A longitudinal study of cognitive decline among Spanish older adults showed that poor social connections, infrequent participation in social activities, and social disengagement predicted the risk of cognitive decline among participants. Findings suggested that the risk of cognitive decline in the domains of orientation, short-term memory, and mental status was lower for those with a high frequency of in-person contact with others and social integration in the community (Zunzunegui, Alvarado, Del Ser, & Otero, 2003).

Social support may provide cognitive benefits through a number of mechanisms. One prominent hypothesis, the stress-buffering hypothesis, posits that social support acts as a buffer against stressful life events by reducing adverse physiological stress reactions and lowering physiological arousal (Seeman et al., 2001; Seeman & McEwin, 1996). In that regard, heightened physiological arousal, such as extensive and chronic hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system (SNS) activation, have been associated with poorer cognitive function and greater cognitive decline (Lupien et al., 1994; Seeman, Singer, Rowe, Horwitz, & McEwen, 1997; Juster, McEwen, & Lupien, 2010). Furthermore, engaging in socially and emotionally supportive environments lowers physiological reactivity and therefore may protect against cognitive decline (Seeman et al., 2001).

The examination of specific dimensions, or functions, of social support may provide a richer explanation for how social support works to benefit the cognitive aging process. These dimensions have traditionally been categorized as emotional, instrumental, and informational supports, and serve qualitatively different and important functions for individuals (Cohen, 1988; Cohen, Mermelstein, & Hoberman, 1985). Emotional support is the presence of encouragement and comfort combined with the presence of interest and concern, boosting one's self-esteem and engendering a feeling of belonging. Instrumental support is the provision of tangible support, such as financial assistance, helping with chores, or providing transportation. Informational support involves the receipt of help to cope with stress or solve problems by provision of information about resources or suggestions about coping strategies.

Stress-buffering models have suggested that stress-buffering occurs only when there is a direct match between the needs created by the stressful event and the functions of the support that the receiver perceives to be available to him/her (Cohen & McKay, 1984; Cohen & Wills, 1985). It is therefore plausible that when social support functions meet the needs of the older adult recipient, stress-buffering occurs, and over time, consistently met needs help to support cognitive function. For example, it may be particularly useful for an older adult to have access to emotional support during a time of bereavement, but not useful to have emotional support, rather than instrumental support, to deal with solving the dilemma of a flat tire.

Few studies have examined the relations of unique social support functions to cognitive performance. Sims et al. (2011) found significant associations between belonging, self-esteem, and appraisal support and inhibition, and tangible support and cognitive set shifting among African Americans with a mean age of 45.6; however, the battery of neuropsychological measures utilized was limited. Evidence suggests that greater emotional support is significantly associated with greater cognitive performance, and that the need to belong and have close friendships is essential for overall well-being (Seeman et al., 2001; Baumeister & Leary, 1995). Gow, Pattie, Whiteman, Whalley, & Deary (2007) found that feeling alone was associated with lower cognitive ability and may be an indicator of lack of support. On the other hand, tangible support is considered a measure of instrumental support. Instrumental support is the availability of having someone to procure financial assistance or aid in the activities of daily living. Tangible support attenuates the response to

stressful situations by directly resolving instrumental problems, and arguably by reducing one's stress response, cognitive function is enhanced (Cohen & Wills, 1985; Seeman et al., 1997).

To the extent that specific domains of emotional and instrumental support are associated differentially with various cognitive abilities, we can begin to better understand the mechanisms underlying the stress, social support, and cognitive function link. Accordingly, the aim of the current study was to examine the cross-sectional relations of distinct functions of social support to cognitive function in healthy, older adults. We hypothesized that higher levels of social support across each distinct function (i.e. appraisal, belonging, self-esteem, and tangible support) would be associated with better cognitive function in older adults.

Methods

Participants

Participants were healthy, community-dwelling adults who had participated in a larger investigation of cardiovascular risk factors, cognitive function, and neuroimaging. Recruitment for the parent study took place at the Baltimore Veterans Affairs Medical Center (B-VAMC), the Geriatric Research Education and Clinical Center at the B-VAMC, and through local advertisement. Local advertisement was the main source of participants. We estimate that less than 25% of participants were veterans; however, this question was not specifically asked. Exclusion criteria were a history or clinical evidence of cardiovascular disease (other than mild to moderate hypertension), diabetes mellitus, other major medical disease (e.g., renal, hepatic, pulmonary), neurologic disease, stroke, known or suspected dementia (Mini-Mental State Examination score < 24), psychiatric disorder, heavy alcohol use (>14 drinks per week), severe head injury, or medications affecting central nervous system function. All participants provided written informed consent according to the guidelines of the University of Maryland, Baltimore and University of Maryland, Baltimore County's Institutional Review Boards.

Measures

Interpersonal Support Evaluation List—The Interpersonal Support Evaluation List (ISEL) is a paper-and-pencil, self-report measure of the perceived availability of social support (Cohen, Mermelstein, & Hoberman, 1985). The scale was originally designed to address the limitations of previous social support scales that merged the structure and function of supports together, lacked independent assessment of social support functions, and lacked comparisons of the relative impact of different kinds of support functions on well-being. The ISEL measures the perceived availability of four functions of social support: appraisal, belonging, self-esteem, and tangible support (10 items per function). The belonging subscale measures the perceived availability of individuals with whom one can do things. The appraisal subscale measures the perceived availability of someone to talk to about ones problems. The tangible support subscale assesses the perceived availability of material assistance. The self-esteem subscale measures the perceived availability of having a positive comparison when comparing ones self to another. Respondents indicate whether each of the 40 counterbalanced (positive and negative) items is true or false using a four-

item Likert scale ranging from ‘definitely false’ to ‘definitely true.’ Higher scores indicate the perception of more social support. Five scores are derived from the ISEL, one for each of the four functions of social support, and a total score that accounts for social support across the four dimensions. Examples of ISEL items can be found in Appendix 1.

The ISEL was validated with data from 12 studies (Cohen et al., 1985). Seven studies assessed functions of social support using a student version of the scale, while five studies assessed social support using the general population version of the scale. The current study utilized the general population scale. The general population ISEL scale has high internal reliability (Cronbach’s alpha range = .88–.90) and test-retest reliability (.87 after 2 weeks; . 70 after 6 weeks) (Cohen et al., 1985). The ISEL has good concurrent and discriminant validity; it was modestly correlated with the Moos Family Environment Scale and the Partner Adjustment Scale (r=.30, .31), but not correlated with social desirability or social anxiety measures (Cohen et al., 1985). The ISEL has been widely used in studies of middle age, older, and non-American adult populations.

Neuropsychological tests—The following neuropsychological tests were administered (see Lezak et al., 2004 for detailed descriptions of all tests).

Response inhibition—The Stroop Color-Word Test measured response inhibition, a dimension of executive function. The Stroop interference score was calculated per Golden’s criteria (Golden, 1978).

Visuospatial ability—Judgment of Line Orientation was administered to measure visuospatial abilities (Benton et al., 1975).

Visuoconstructional ability—The Block Design subscale of the Wechsler Adult Intelligence Scale-Revised (WAIS-R) was administered to measure visuoconstructional abilities (Wechsler, 1981).

Nonverbal memory—Nonverbal memory was assessed by the recall of line drawings using the Visual Reproductions I and II subtests of the Wechsler Memory Scale-Revised (WMS-R; Wechsler, 1987).

Perceptuo-motor speed and executive function—The Grooved Pegboard assessed motor speed and manual dexterity (Rourke, Yanni, MacDonald, & Young 1973). Participants completed the task first with the dominant hand and then the non-dominant hand.

The Trail Making Test assessed perceptuo-motor speed and executive function (e.g., mental flexibility) (Reitan, 1978).

Attention and working memory—The Digits Forward and Digits Backward subscales of the WAIS-R were administered to measure attention and working memory (Wechsler, 1981).

The Visual Span Forward and Visual Span Backward subscales of the WAIS-R were also administered to measure attention and working memory (Wechsler, 1981).

Verbal memory—Verbal memory was measured by the recall of story passages using the Logical Memory I and II subtests of the WMS-R (Wechsler, 1987).

Covariates

Age and education were assessed in years. Depressive symptomatology was assessed as the participant's score on the Beck Depression Inventory (BDI-I; Beck, 1987). Systolic blood pressure was assessed as the average of three resting clinic blood pressure measurements. Body-mass index was calculated as the ratio of weight to height (kg/m^2). Weight and height were measured by trained nurses. Fasting levels of total cholesterol and glucose were assessed within the medical evaluation of the study protocol. Total plasma cholesterol and glucose levels were determined using standard enzymatic techniques.

Procedure—Data were collected over the course of several visits. On the first day, participants completed a comprehensive medical evaluation that included a health history, a physical examination, blood chemistries, and an oral glucose tolerance test (OGTT). Resting blood pressure, fasting lipids, and glucose were assessed during routine medication use. The ISEL was administered in the context of various other psychosocial questionnaires. Neuropsychological tests were administered on a separate day. The ISEL and neuropsychological tests were administered by trained clinical psychology graduate students in a standardized manner.

Statistical Analysis—Multiple linear regression analyses were conducted to determine cross-sectional relations of social support to cognitive function. Separate models were run for each type of social support predicting each cognitive outcome; these included the total social support score, appraisal subscale score, belonging subscale score, self-esteem subscale score, and tangible subscale score, respectively. The association of each social support variable with each cognitive variable was adjusted to account for the influence of age, gender, education, depressive symptomatology, systolic blood pressure, body-mass index, total cholesterol, and fasting glucose, variables known to be associated with cognitive function in older adults. Several variables had non-normal distributions and were log transformed to correct for skewness: BDI-I, Visual Reproductions I, Trailmaking B, Grooved Pegboard Dominant I, Grooved Pegboard Non-Dominant I, appraisal support, belonging support, and Tangible support. All statistical analyses were conducted using SPSS version 18.0.

Results

From the overall sample N of 206, 31 participants were excluded from the current analysis because they were missing social support data and/or cognitive data. The final n was 175, and consisted of 96 men and 79 women. The sample was predominately White (87.7%), with 9.9% African American participants. Other races/ethnicities composed 2.4% of the sample. On average, participants were college graduates (education M = 16.26) and reported subclinical levels of depression (BDI M = 4.21). Hypertension and cholesterol were, on

average, well controlled in the sample (systolic blood pressure M = 128; total cholesterol M = 194.41). Participants tended to be overweight (BMI M = 27.49). For additional sample characteristics about participants' biomedical, neurocognitive, and social support data, please refer to Table 1.

Multiple linear regressions

In order to streamline the presentation of the results, findings from the linear multiple regressions are reported in Table 2 only where significant associations were present. Presentation of significant associations is organized by function of social support. Non-significant regression results will be provided by the first author upon request.

Total social support

The model that predicted Visual Reproductions I score from total social support was significant [$F = 3.24$ (10,154), $p < .01$, adj. $R^2 = .12$]. Within this model greater total social support was associated with poorer Visual Reproductions I performance ($\beta = -.19$, $p < .05$). The model that predicted Stroop Interference score from total social support was also significant [$F = 3.08$ (10,151), $p < .01$, adj. $R^2 = .12$]. Within this model, greater total social support was associated with poorer Stroop interference scores ($\beta = -.17$, $p < .05$).

Appraisal support

Appraisal support was not a significant predictor of performance on any cognitive measure.

Belonging Support

The model that predicted Visual Reproductions I performance from belonging support was significant [$F = 3.21$ (10,154), $p < .01$, adj. $R^2 = .12$]. Belonging support was inversely associated with Visual Reproductions I performance ($\beta = -.18$, $p < .05$). Likewise, the model that predicted Stroop Interference score from total social support was also significant [$F = 3.19$ (10,151), $p < .01$, adj. $R^2 = .12$]. Belonging support was also inversely associated with Stroop interference score ($\beta = -.18$, $p < .05$).

Self-esteem support

The model that predicted Stroop Interference scores from self-esteem support was significant [$F = 3.07$ (10,151), $p < .01$, adj. $R^2 = .11$]. Self-esteem support was inversely associated with the Stroop interference score ($\beta = -.17$, $p < .05$). Self-esteem support was not a significant predictor of any other domain of cognitive performance.

Tangible support

The model that predicted Visual Reproductions I performance from tangible support was significant [$F = 3.14$ (10,154), $p < .01$, adj. $R^2 = .12$]. Tangible support was inversely associated with performance on Visual Reproductions I ($\beta = -.17$, $p < .05$).

There were no significant associations between any function of social support and performance on Visual Reproductions II, Logical Memory I and II, Digit Span Forward and

Backward, Block Design, Judgment of Line Orientation, Trailmaking A and B, and the Grooved Pegboard Test.

Discussion

The goal of the current study was to examine the relations between distinct functions of social support and cognitive function across several domains. Positive relations were hypothesized between each function of social support and performance on cognitive measures. This hypothesis was not supported. No significant positive relations were found between social support and cognitive function in any domain. On the contrary, several functions of social support showed significant inverse relations with cognitive function, such that greater perceived social support was associated with poorer performance. In that regard, nonverbal memory and response inhibition showed a consistent inverse association with belonging, tangible, and/or self-esteem social support. These findings were not consistent with evidence that showed that distinct functions of social support were positively associated with cognitive function among African American middle age adults (Sims et al., 2011). It is possible that these relations vary as a function of the population of interest.

The majority of the literature relating social support to cognitive function supports the beneficial effects of social support (Holtzman et al., 2004; Seeman et al., 2001; Yeh & Liu, 2003). However, the unexpected findings in the current study may be attributed to a curious phenomenon encountered within studies that investigate the receipt of social support. That is, for some individuals, particularly those with a chronic illness or disability, the receipt of social support may be perceived as a burden or stressor (Reinhardt, Boerner, & Horowitz, 2006; Revenson, Schiaffino, Majerovitz, & Gibofsky 1991). Having to associate closely with those who provide social support within social networks may be perceived as a hassle. Social support has also been shown to negatively influence health outcomes, particularly when family social ties are examined (Antonucci, 1985; Burg & Seeman, 1994). While most studies that report negative effects of social support utilized chronically ill or disabled participants, daily reports of social support receipt have been associated with negative states such as anger, anxiety, and depressed mood among healthy, young adult couples as well (Gleason et al., 2008).

Several explanations for the negative influence of social support on health outcomes have been put forward in the literature, but the most widely accepted explanation involves the reciprocity of social support within social networks. Reciprocity theory suggests that receiving support that cannot be returned may be particularly distressing to the recipient (Uehara, 1995). The recipient of the support may begin to doubt his or her usefulness in the social relationship. Additionally, undesired feelings of dependence may also accompany the receipt of support that cannot be returned (Uehara, 1995). Reciprocity within the family domain has been linked to psychological well-being while inequity in the receipt of social support has been linked to negative affect among kin (Lu, 1997). While the current study is limited by the homogeneity of the sample in terms of health status (participants were relatively healthy), at least one other study has reported on the burden of social support among healthy adults (Gleason et al., 2008).

The burden of social support, as explained by the reciprocity theory, may have deleterious effects on cognitive function through an increase in negative affect and stress. The burden of social support is associated with negative affective states, such as depression, anger, and anxiety (Gleason et al., 2008). Evidence suggests that dispositional negative affect is associated with impaired executive functions of updating and monitoring in working memory, and the tendency to express negative affect is associated with poor inhibition (Bridgett, Oddi, Laake, Murdock, & Bachmann, 2013). Furthermore, the inability to reciprocate support may become a significant stressor for the recipient. Specifically, as a part of the healthy aging process, adults have to successfully negotiate the changing roles of provider of support to recipient of support (Lachman, 2001). Unsuccessful negotiation of the change in these social roles may be a source of social strain. This stress may be sufficient to negatively impact cognitive function (Tun, Miller-Martinez, Lachman, & Seeman, 2012). Indeed, a negative association between social support and cognitive function would be more likely among vulnerable populations; however, it is important to consider that this phenomenon may exist among healthy older adults who may perceive social support as a hassle or burden.

Although the receipt of social support can have mixed effects on recipients, some evidence suggests that the type of social support received can determine whether this effect is positive or negative. The receipt of emotional support may have more positive consequences than the receipt of instrumental support, which may be more closely associated with feelings of overdependence on the provider of social support (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001; Reinhardt et al., 2006). However, findings from the current study suggest no consistent pattern in how either emotional or instrumental support may impact cognitive function. While emotional support was associated with both nonverbal memory and response inhibition, instrumental support was only associated with nonverbal memory. In the context of the stress-buffering hypothesis, results that emerged in an unexpected direction might suggest that within the current sample, the functions of social support may not be aligned with the needs of recipients. Perhaps the misalignment of functions to needs exacerbates stress and ultimately manifests as poorer performance in some cognitive domains. While the current study did not test this inference, it suggests a rationale for future exploration of the negative effects of misaligned or unneeded social support provision on cognitive function.

Given that findings suggest the negative relations of social support to cognitive function are not dependent upon whether the support received is emotional or instrumental, the exact mechanisms through which cognitive function is lowered in the presence of greater social support are unclear. One common thread among nonverbal memory and response inhibition is that they are not enhanced by formal education or training. Nonverbal memory (assessed as short-term nonverbal memory by Visual Reproductions I) and response inhibition (assessed by the Stroop) are examples of fluid abilities. Fluid intelligence abilities are simple, innate abilities such as problem-solving, short-term memory ability, and pattern recognition (Cattell, 1987; Horn & Cattell, 1967). These abilities can be directed to most tasks. Crystallized intelligence, on the other hand, is more dynamic, and influenced by specific acquired (often verbal) information or knowledge (Cattell, 1987). Given the distinction between fluid and crystallized abilities and the pattern of findings in the study

(including no relations of social support to verbal memory) it is possible that social support may operate to negatively influence cognitive domains that are fluid in nature. This idea is plausible because crystallized abilities are often enhanced in social environments such as school and work (Cattell, 1987). Because enhancement of fluid abilities does not typically rely on social interactions, they may be slowed by the distraction of social interactions. Future studies should test the influence of distinct functions of social support on performance on numerous fluid and crystallized measures to directly assess this distinction.

Limitations

The correlational and cross-sectional nature of the study did not lend itself to causal assumptions or direction of influence. It is indeed plausible that poorer cognitive function demands a need to secure and utilize greater social support; however, well known aging studies suggest that the positive association proposed in our original hypotheses is theoretically sound (Seeman et al., 2001; Hughes, Andel, Small, Borenstein, & Mortimer, 2008; Zunzunegui et al., 2003; Yeh & Liu, 2003). Subsequent longitudinal studies that examine functions of social support and cognitive function are necessary to support or challenge these results. Findings from the current study may have also been partially limited by the sample size, while generalizability of findings is constrained by the nature of the sample which is highly educated, predominantly White, and comprised of individuals willing and able to participate in multiple days of testing.

Conclusions

Feeling loved, cared for, valued by others, and part of a reciprocal social network are priorities for many older adults as they experience less social exposure and reduced independence over time. Maintaining optimal cognitive function is necessary for older adults to carry out their everyday activities, execute plans, and remember important tasks and events. Overall, the results of the study suggest that the fit between these important aspects of quality of life is not clear-cut. Our findings point to the receipt of social support across several functions as a possible burden on older adults that may negatively influence cognitive function. Despite its unexpected findings, this study makes a significant contribution to the social support and cognitive function literature. By assessing the various functions of social support and their relations to cognition, we have further elucidated the mechanisms through which social support may operate as a burden to the recipient. Our findings highlight the importance of considering how the alignment of social support functions with social support needs may play a role in distinct cognitive abilities. Moreover, the findings stimulate questions about how social support, whether emotional or instrumental, may influence various types of cognitive abilities, including fluid and crystallized abilities.

Future research should more closely examine the socio-demographic and psychosocial profiles of older adults that experience a burden of social support. Other research should include longitudinal analysis of the social support and cognitive function link. It is plausible that social support has a non-linear association with cognitive function, and that the burden or benefit of social support on cognitive function may vary during older adulthood, or have a

propensity to shift during certain common life events. Finally, mixed-methods studies are needed to determine the qualitative social support experiences of older adults, particularly those for whom social support needs and social support receipt are misaligned. Qualitative data may also help to further clarify the mechanisms responsible for the cognitive effects of social support.

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Appendix

Sample items from the Interpersonal Support Evaluation List (ISEL) by Functional Component

Appraisal support: When I need suggestions on how to deal with a personal problem I know someone I can turn to.

Belonging support: If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.

Tangible support: If I were sick, I could easily find someone to help me with my daily chores.

Self-esteem support: Most people I know think highly of me.

Table 1

Sample characteristics and descriptives for neuropsychological measures and covariates

Variable	M (SD)	Range
Age (y)	66.32 (6.92)	54 – 83
Sex (% Male)	55%	--
Race/ethnicity		
White	87.7%	
African American	9.9%	
Other	2.4%	
Education (y)	16.26 (2.87)	8 – 24
Beck Depression Inventory	4.21 (4.25)	0 – 23
Systolic blood pressure (mm/Hg)	128 (16.55)	95 – 176.5
Body-mass index (kg/m^2)	27.49 (4.76)	17.83 – 42.50
Total cholesterol (mg/dL)	194.41 (30.06)	99 – 261
Fasting glucose (mg/dL)	94.23 (9.46)	57 – 126
Total ISEL score	95.08 (18.87)	25 – 120
Appraisal support	23.24 (6.31)	2 – 30
Belonging support	24.05 (5.26)	6 – 30
Self-esteem support	22.50 (4.57)	5 –30
Tangible support	25.29 (4.95)	9 – 30
Stroop interference	−4.40 (6.95)	−23.57 – 14.22
Judgment of Line Orientation	24.39 (4.20)	12 – 30
Block Design raw	26.13 (8.87)	1 – 49
Visual Reproductions I	32.85 (5.36)	15 – 41
Visual Reproductions II	25.19 (8.62)	0 – 40
Grooved Pegboard time (dominant hand)	79.56 (14.26)	56 – 155
Grooved Pegboard time (non-dominant hand)	87.02 (16.49)	55 – 161
Trailmaking A	31.53 (10.73)	11 – 86
Trailmaking B	77.37 (33.26)	32 – 204
Digit Span Forward raw	8.19 (2.07)	4 – 13
Digit Span Backward raw	7.25 (2.51)	2 – 14
Visual Span Forward raw	8.03 (1.69)	4–12
Visual Span Backward raw	7.52 (1.91)	4–12
Logical Memory I	24.94 (6.52)	11 – 41
Logical Memory II	19.99 (7.75)	1 – 38

Table 2

Linear multiple regressions: Social support predicting neurocognitive performance

Visual Reproductions I (VRI)							
	F-value	df	p-value	Adjusted R^2	Standardized B	SE	p-value
Model	3.24	10,154	0.001	0.12			
Total social support					−0.19	.06	0.02
Age					−0.10	.01	0.88
Sex					−0.14	.01	0.89
Education					0.25	.01	0.001
Ethnicity					−0.10	.02	0.20
Systolic blood pressure					0.04	.00	0.58
Beck depression score					−0.17	.02	0.03
Body-mass index					0.24	.01	0.004
Total cholesterol					0.07	.00	0.35
Fasting glucose					−0.008	.01	0.92
Model	3.21	10,154	0.001	0.12			
Belonging support					−0.18	.05	0.02
Age					−0.09	.01	0.25
Sex					−.01	.01	0.93
Education					0.25	.01	0.001
Ethnicity					−0.11	.02	0.14
Systolic blood pressure					0.04	.00	0.60
Beck depression score					−0.17	.02	0.03
Body-mass index					0.23	.01	0.004
Total cholesterol					0.09	.00	0.25
Fasting glucose					−0.003	.01	0.97
Model	3.14	10,154	0.001	0.12			
Tangible support					−0.17	.06	0.03

Age					−0.09	.01	0.23
Sex					−.01	.01	0.93
Education					0.25	.01	0.001
Ethnicity					−0.09	.02	0.22
Systolic blood pressure					0.05	.00	0.54
Beck depression score					−0.17	.02	0.04
Body-mass index					0.23	.01	0.01
Total cholesterol					0.07	.00	0.39
Fasting glucose					−0.01	.01	0.92
Stroop Interference Score (STINT)							
	F-value	df	p-value	Adjusted R^2	Standardized B	SE	p-value
Model	3.08	10,151	0.001	0.12			
Total social support					−0.17	5.02	0.03
Age					−0.19	.08	0.02
Sex					−.040	1.16	0.64
Education					0.20	.18	0.01
Ethnicity					−0.02	1.61	0.75
Systolic blood pressure					0.13	.04	0.12
Beck depression score					−0.08	1.5	0.31
Body-mass index					−0.07	.12	0.40
Total cholesterol					0.06	.02	0.47
Fasting glucose					−0.17	.06	0.03
Model	3.19	10,151	0.001	0.12			
Belonging support					−0.18	4.40	0.02
Age					−0.18	.08	0.02
Sex					−.04	1.15	0.65
Education					0.20	.18	0.01
Ethnicity					−0.04	1.61	0.62
Systolic blood pressure					0.13	.04	0.11
Beck depression score					−0.07	1.50	0.28

Body-mass index					−0.07	.12	0.39
Total cholesterol					0.07	.02	0.37
Fasting glucose					−0.17	.06	0.04
Model	3.07	10,151	0.001	0.11			
Self-esteem support					−0.17	4.83	0.03
Age					−0.19	.08	0.02
Sex					−.03	1.15	0.76
Education					0.19	.18	0.01
Ethnicity					−0.02	1.63	0.84
Systolic blood pressure					0.12	.04	0.14
Beck depression score					−0.09	1.52	0.26
Body-mass index					−0.07	.12	0.43
Total cholesterol					0.06	.02	0.49
Fasting glucose					−0.17	.06	0.03