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Differential Associations of Social Support and Social Connectedness With Structural Features of Social Networks and the Health Status of Older Adults

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Objective: This study explores the extent to which the constructs of social support and social connectedness differ in terms of their associations with the structural characteristics of social networks and the health status of older adults. **Method:** Trained interviewers conducted 126 face-to-face interviews with community-dwelling older adults aged 65 to 85 years. **Results:** Having frequent contact with network members was positively associated with social support. Network density and having network members living in close proximity were positively associated with perceived social connectedness. Furthermore, perceived social connectedness had a significant positive association with health status, whereas social support did not. **Discussion:** Perceived social connectedness may be relatively more important to the health and well-being of older adults than the perceived availability of social support. Efforts to enhance older adults' social relationships can be focused on developing friends and companions, allowing them to feel socially engaged in society.

Keywords: *social support; social connectedness; social engagement; companionship; network characteristics*

Social relationships influence many aspects of people's lives, including the achievement and maintenance of good health. Characteristics of social relationships have been linked with mortality (Berkman & Syme, 1979; House, Robbins, & Metzner, 1982), mental illness (Kawachi & Berkman, 2001; Kessler & McLeod, 1985), and physical health morbidity (Mendes de

Leon, Glass, & Berkman, 2003). Social relationships are thought to be especially important for older adults' health and well-being (Antonucci, 1990; Pillemer & Glasgow, 2000). Older adults with strong social relationships are able to maintain independence and remain in community settings longer than older adults who are socially isolated (Michael, Berkman, Colditz, & Kawachi, 2001). Thus, it is important to investigate the factors that may help individuals maintain strong social relationships as they progress through the life course (Pillemer & Glasgow, 2000).

Social Networks

Individuals live within webs of social ties, often referred to as social networks. Structural characteristics of social networks include the number of network members, density of the network (i.e., the extent to which network members know each other), homogeneity of the network members, frequency of contact with network members, and geographic proximity to the network members (Heaney & Israel, 2002). Some of these characteristics (e.g., network size, density, and homogeneity) are expressed in terms of the network system as a whole, whereas others are seen as "dyadic characteristics" of the relationships between the focal person and each network tie (House, Umberson, & Landis, 1988).

The functional characteristics of social network systems include social connectedness (or social engagement), social support, social influence, and social comparison (Berkman & Glass, 2000). Social networks provide a context in which individuals can simply interact with each other, leading to perceptions of being socially connected. Social support occurs when network members provide aid to each other with the intention of being helpful, distinguishing it from other functions of social networks that can occur without conscious effort (Heaney & Israel, 2002). Norms and values that exist in social networks may create social influence that affects the attitudes and behaviors of the focal individual. When individuals look for similarity or dissimilarity between themselves and the others in their social networks, social comparison occurs (Wood, 1996). Investigating the functions of social

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relationships within a social network framework facilitates the examination of (a) how structural characteristics are related to the various functions of the social ties, (b) how the functions may be associated with each other, and (c) how each function may mediate the associations between the structural network characteristics and health status.

Social Support

The provision of social support among network members is one of the most important functions of social networks. One typology of social support developed by House (1981) includes (a) emotional support (“expressions of empathy, love, trust, and caring”), instrumental support (“tangible aid and services”), informational support (“advice, suggestions, and information”), and appraisal support (“information that is useful for self-evaluation”; cited in Heaney & Israel, 2002, p. 186). Many studies have shown that higher levels of social support are associated with better health and well-being among older adults (for a review, see Bowling, 1991). It has also been shown that well-intended social support may negatively affect older adults’ well-being if excessive instrumental support is provided and undermines older adults’ confidence to remain independent (Seeman, Bruce, & McAvay, 1996).

There are two main pathways through which social support is hypothesized to influence well-being. One is the direct or main effect of social support. The perceived availability of social support can be a source of general positive affect, enhanced self-esteem, and feelings of belonging and security. In turn, these positive psychological states may result in improved neuroendocrine and immune function as well as greater motivation to engage in healthy behaviors (Cohen, Gottlieb, & Underwood, 2000). The second way that social support influences the well-being of individuals is by buffering the adverse effects of stressful life events. According to this stress-buffering model (Cohen et al., 2000), the adverse effect of the stressor on well-being can be reduced if an individual feels that others in the social network will provide the resources or assistance necessary to cope with the stressor.

Social Connectedness

Social relationships may not involve the exchange of social support but may simply exist for pleasurable interaction (Rook, 1990). Ties between individuals without support exchange can still influence human health positively if the need to be socially and emotionally connected with others is satisfied. Although social connectedness has sometimes been operationalized

as the objective absence or presence of social ties (e.g., social isolation), the construct also has a more subjective psychological component (De Jong Gierveld, 1998). Individuals appraise their social relationships and assess the extent to which they feel socially connected. A lack of social connectedness may be experienced as feelings of loneliness and a desire for companionship (Rook, 1990)

Previous studies have not always considered social support and social connectedness separately. For example, having a companion was considered a form of support in one study (Connidis & Davies, 1990) regardless of whether support was provided, and loneliness has been studied in the context of social support (Mullins, Elston, & Gutkowski, 1996; Prince, Harwood, Blizard, Thomas, & Mann, 1997). However, some research has shown that perceived availability of companionship and loneliness are only moderately correlated with social support (Rook, 1990; Sorkin, Rook, & Lu, 2002). Individuals can feel socially disconnected while being surrounded by support providers. For example, in a study of mothers providing care to chronically ill children, a nonsignificant association between the perceived availability of social support and feelings of loneliness was reported (Florian & Krulik, 1991).

Moreover, indicators of social connectedness have been shown to be associated with health and well-being, independent of the effects of social support. For example, Rook (1987) showed that companionship can have unique and relatively more important effects on psychological well-being of older adults compared to social support. Similarly, loneliness was associated with chronic illnesses such as lung disease and arthritis among older adults, whereas emotional support was not associated with these chronic conditions (Penninx et al., 1999). This suggests the advantage of considering social support and social connectedness as independent constructs.

Associations Among Structural Network Characteristics, Social Support, and Social Connectedness

Research has shown that certain structural social network characteristics are associated with the provision of social support (Berkman & Glass, 2000; Bowling, 1991; Heaney & Israel, 2002). For example, although some conflicting results have been reported, social support is typically more often provided to older adults within network systems that are larger in size, denser, and more homogeneous in terms of the network members' demographic characteristics. Similarly, individuals who often interact with their network members are more likely to obtain social support compared to

those who interact less frequently (Seeman & Berkman, 1988). It has been shown that older adults are more likely to identify network members as companions when they live close by (Connidis & Davies, 1992), suggesting an association between the existence of social ties in close geographical proximity and level of social connectedness.

Hypothesized Model

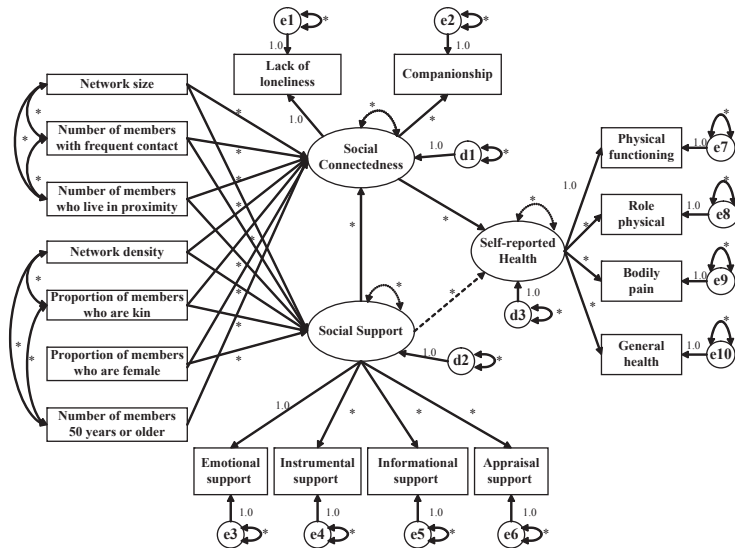
This study examines the constructs of social support and perceived social connectedness among older adults. More specifically, this study (a) explores the association of structural characteristics of the social networks of community-dwelling older adults with their perceptions of the availability of social support and the level of social connectedness and (b) examines the associations of each of these two constructs with older adults' self-reported health status.

The hypothesized model is presented in Figure 1. Based on the studies reviewed above, it was hypothesized that network size, density, number of network members with frequent contact, number of members in close geographical proximity, and homogeneity of network systems (i.e., proportions of kin and female members) would be positively associated with both perceived availability of social support and perceived social connectedness. Furthermore, based on Rook's (1990) report regarding differential associations between companionship and social support with psychological well-being of individuals, it was hypothesized that perceived social connectedness would have a stronger and unique association with self-reported physical health than would social support.

An additional construct was included in the hypothesized model. Because older adults highly value their interactions with friends of their own age (Butler, Lewis, & Sunderland, 1998), it is possible that having more older network members will be associated with higher perceived levels of connectedness. Therefore, the number of network members who are 50 years of age or older was hypothesized to be positively associated with perceived social connectedness.

Although not all social interactions involve the exchange of support, receiving social support may facilitate individuals' sense of social connectedness. Therefore, a directional path from perceived availability of social support to perceived level of social connectedness was included in the hypothesized model. Finally, the direct effects of network characteristics on health status were assumed to be zero.

Figure 1
Hypothesized Model for Associations Among Social Network Characteristics, Functions of Social Relationships, and Self-Reported Health Status of Older Adults



Note: Asterisks indicate free parameters. All directional associations (from structural characteristics of social networks to each of the functions of networks, from each of the functions to health, and between two functions) are hypothesized to be positive. The dashed line between social support and health indicates its hypothesized differential association with the outcome from that of the connectedness.

Method

Participants

A total of 126 community-dwelling older adults (between the ages of 65 and 85) residing in an urban Ohio community participated in this study. Older adults who were confined to their homes because of their physical condition were not eligible to participate in this study. The average age of the participants was 73.1 years ($SD = 5.5$), and about 63% of the respondents

were female. About 90.0% identified themselves as White, whereas 9.5% identified themselves as Black. These proportions are very similar to the proportions reported in the 2000 census data for this area. More than half of the respondents were married or living with partners at the time of the interview, and about one third were widowed. In terms of educational attainment, 15.9% reported having less than a high school education, whereas 41.3% reported having at least some post-high school education. Almost 58.0% reported an annual income (before taxes) of between \$10,000 and \$29,999, 34.0% reported \$30,000 or more, and the remaining 8.0% reported \$9,999 or less during the past year.

Measures

Social network characteristics. The social network characteristics indices were adapted from the Social Networks in Adult Life questionnaires (Antonucci & Akiyama, 1987). Participants were asked to create a personal social network diagram using three concentric circles, each circle representing a level of closeness. A number of investigators have reported successful use of this technique across varying cultures, ages, and life situations (Antonucci & Akiyama, 1987).

Up to 20 names were recorded for each respondent's network diagram, providing information on social network size. Detailed questions about each identified network member were then asked. The number of network members who lived within a 1-hour drive of the respondent constituted the proximity measure. Other network indicators used in this study included number of network members with whom respondents frequently came in contact (three to four times a week or more), members who were 50 years of age or older, and the proportions of kin and female members.

A network density matrix was created for each respondent based on the question that asked whether each network member knew other members. Identification numbers for each member of the social network were placed in column and row headers; the number 1 was placed in any cell if the relevant members knew and interacted with each other. Network density was calculated using the formula, $\text{density} = \Sigma X / [N(N-1)/2]$, where X is the number of 1 values in the matrix and N is the network size (Hirsch, 1979). This formula yields numbers between 0 (none of the members knew each other) and 1 (all members knew each other), providing a measure of pooled resource for potential communication and cooperation among members.

Social network functions. Items were adapted from the social support measures used by Seeman and Berkman (1988) and Fischer (1982); they were developed exclusively for use with older adults and have been shown to have acceptable validity and reliability. The questions were modified to measure the perceived availability of each type of support (emotional, instrumental, informational, and appraisal) with one item. For example, the perceived availability of emotional support was measured while looking at respondent's network diagram and asking, "Sometimes people need to talk to others when they are upset, nervous, or depressed. If you were to feel upset, nervous, or depressed, to what extent do you feel like people in your social network would be there for you to talk to?" In a similar manner, respondents were asked about the extent to which they could count on the people in their social networks when they needed "help with daily tasks like shopping or giving [them] a ride" (instrumental support), "information that is important [to them]" (informational support), and reassurance when "feeling uncertain about something" (appraisal support). The 5-point response scale for all four items was *not at all, to a small extent, to some extent, to a great extent, and to a very great extent*. Perceived social connectedness was measured using two items based on the measures for general feelings about the network (Seeman & Berkman, 1988). The first item asked about the frequency of respondents' feelings of loneliness (loneliness), and the second item asked about the frequency with which respondents wished for more people to spend time with (companionship). The 5-point response scale for these items was *never, rarely, sometimes, often, and almost all of the time*. All responses were coded so that higher numbers indicated higher perceived availability of support and levels of connectedness.

General health status. The Short Form-36 (SF-36) Health Survey (Ware, Kosinski, & Gandek, 2004) was used. This measurement scale consists of eight subscales: Physical Functioning (PF), Role Limitations Due to Physical Problems (RP), Bodily Pain (BP), General Health Perception (GH), Vitality (VT), Social Functioning Problems (SF), Role Limitations Due to Emotional Problems (RE), and General Mental Health (MH). The reliability and validity of this questionnaire has been extensively tested. Although some limitations of this measure have been identified when administered to older individuals (McHorney, 1996), the SF-36 appears to be a useful tool for measurement of the overall health status of the general population of older adults (Hayes, Morris, Wolfe, & Morgan, 1995). Four subscales (PF, RP, BP, and GH) were used in the analyses constituting a measurement of participants' self-reported health status. Subscales for social and psychological health

were not used because of similarities between the questions in these scales and social network measures used in this study.

Procedure

To identify a sample of community-dwelling older adults, addresses were randomly selected from a list of all available addresses for the target area. They were then screened for the presence of older adults between 65 and 85 years of age, using a public record database available on the Internet (<http://www.intelius.com/>). Personalized recruitment letters were sent to the identified households, along with postage-paid response postcards. Follow-up phone calls were made about 1 week later. Individuals who indicated interest in participating by sending back the postcards, calling the project office, or indicating interest during the recruitment call were scheduled for a face-to-face interview. Interviews were conducted at either the respondents' residences or public locations specified by them. Each participant received a \$5 gift certificate for a local grocery store or restaurant.

About 25% of the letters were returned for such reasons as vacant homes, invalid addresses, and addressees no longer at the specified address. Out of 1,216 recruitment letters that were not returned to the project office, 299 response postcards were sent back—133 from households indicating interest, 111 indicating refusal, and 55 indicating ineligibility (54.5% positive response rate among those who responded and were eligible). Out of 133 positive responses, 126 interviews were successfully scheduled and conducted. Largely because the database from which the sample was drawn contained a substantial amount of outdated personal information, the overall response rate of this study (11.5%) was similar to the response rates of other studies that employed direct mail survey designs (Dillman, Eltinge, Groves, & Little, 2002).

This was a cross-sectional study. Face-to-face structured interviews were conducted by trained interviewers. The average duration of the interviews was 56.8 min ($SD = 18.7$). All interviews were audiotaped for quality control purposes as well as to obtain additional qualitative information from comments made by the respondents during the interviews. Interviewers were asked to make notes of possible signs of cognitive difficulties after each interview. However, no cases of major cognitive difficulties were reported.

Analysis

Structural equation modeling was used to analyze the data to evaluate the associations between constructs in a theoretical model simultaneously using

a sample covariance matrix (see the appendix). Analyses were conducted using EQS (Bentler, 2005). One participant was excluded from the analyses because of extensive missing data. The remaining 125 respondents had no missing data. Preliminary confirmatory factor analyses were conducted to investigate whether survey items used to measure the constructs of social support, social engagement, and health status were valid for this sample. Structural equation modeling was then used in a confirmatory manner to evaluate the extent to which the hypothesized model fit the sample data.

Several fit indices were evaluated to assess the models. χ^2 values along with degrees of freedom were evaluated as an absolute fit indicator to compare the models. If the observed variables had non-normal multivariate distributions, Satorra-Bentler scaled statistics (S-B χ^2 ; Satorra & Bentler, 1994) were evaluated. The goodness-of-fit index (GFI) was also evaluated to take into account overfitting of the models that might have occurred. GFI values greater than .90 were considered an indication of adequate fit.

Because maximum likelihood estimation was used, the non-normed fit index (NNFI) and the comparative fit index (CFI) were evaluated. CFI values greater than .95 are considered an indication of good fit (Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) index, which has been suggested as one of the most informative indicators because of its sensitivity to model misspecification (MacCallum & Austin, 2000) was used, with RMSEA values of .05 or less indicating a close fit (Browne & Cudeck, 1993).

The statistical power of the models was evaluated using SAS 9.1 (SAS Institute, 2004) in terms of the degrees of freedom and RMSEA values for each model (MacCallum, Browne, & Sugawara, 1996). The results indicated that all models had adequate statistical power, .99 for the hypothesized model and .95 for the final models.

Results

The descriptive statistics derived from SF-36 health scores and social network characteristics are presented in Table 1. In general, the respondents' average SF-36 health status scores resembled the age-specific national norms for the U.S. general population (Ware et al., 2004). The respondents' network systems contained high proportions of kin. The average social network size was about 12. Of the respondents, 15% reported 20 or more network members. Although the respondents' networks were rather dense, the wide range (between 0.05 and 1.0) indicates that there was much variability across the respondents. The average number of members who lived within a 1-hour

Table 1
Descriptive Statistics of Short Form-36 Health Survey (SF-36)
Scores and Social Network Characteristics

	<i>M</i>	<i>SD</i>	Min	Max	National Norm	
					65 to 74	75 and Older
SF-36 health scores						
Physical functioning	62.70	31.56	0	100	69.38	53.20
Role—Physical	54.40	38.63	0	100	65.54	45.28
Bodily pain	62.36	27.27	10	100	68.49	60.88
General health	61.45	23.73	0	100	62.56	56.66
Social network characteristics						
Size	11.96	5.45	2	20		
Number of members with frequent contact	4.52	3.19	0	15		
Number of members in proximity	9.14	4.84	2	19		
Network density	0.78	0.24	0.05	1		
Proportion of members that are kin	0.72	0.25	0	1		
Proportion of members that are female	0.58	0.17	0.21	1		
Number of members 50 years or older	6.14	4.03	0	18		
Perceived availability of social support						
Emotional	4.05	0.81	1	5		
Instrumental	3.99	0.84	2	5		
Informational	3.98	0.85	1	5		
Appraisal	3.96	0.80	1	5		
Perceived level of social connectedness						
Lack of loneliness	3.94	1.08	1	5		
Companionship	3.47	1.08	1	5		

Note: Age-specific national norms for the SF-36 Health Scores were obtained from Ware, Kosinski, and Gandek (2004).

drive was 9, ranging from 2 to 19, and the average number of members with whom respondents came in contact frequently was 4.5, ranging from 0 to 15. The social network characteristics did not differ significantly across different demographic groups. The only exception was that married respondents had significantly denser networks ($t = 2.31, p = .02$) and higher proportions of kin members ($t = 2.48, p = .02$) than did those who were not married.

Respondents reported generally high levels of perceived availability of social support and social connectedness. The mean value of the four social support items (4.03, $SD = 0.64, \alpha = .79$) indicates that, on average, the participants perceived support to be available "to a great extent." The mean value of the two social connectedness items (3.70, $SD = 0.96, \alpha = .75$) indicates that in general respondents responded *sometimes* to *rarely* to the question about the frequency with which they wished for more people to spend time. However, the wide ranges of responses indicate that some respondents reported very low levels of perceived availability of support and social connectedness. These two mean scores were moderately correlated with each other ($r = .41, p < .001$).

Results of the preliminary confirmatory factor analyses indicated that the two-factor model of social relationship functions, with four and two indicators for the constructs of social support and social connectedness, respectively, fits the sample data very well: S-B $\chi^2(8, N = 125) = 3.16, p < .92$; CFI = 1.00. Similarly, the use of four subscales of SF-36 (PF, RP, BP, and GH) as indicators of self-reported health fits the sample data well: $\chi^2(2, N = 125) = 1.39, p < .50$; CFI = 1.00; $\alpha = .81$; factor loadings = .66, .73, .75, and .84, respectively.

Evaluation of Hypothesized Models

Information on the overall fit of each of the models evaluated is provided in Table 2. Both univariate and multivariate analyses indicated that the data were fairly normally distributed. Because the normalized estimate of Mardia's coefficient was 3.02, smaller than the value of 5.00 recommended by Bentler (2005), it was determined that maximum likelihood estimates could be used. As shown in Table 2, the hypothesized model did not fit the data very well.

Model Respecification and Final Models

Wald tests were conducted to identify the nonsignificant parameters associated with structural characteristics of social networks. Nonsignificant

Table 2
Summary of Goodness-of-Fit Statistics for Evaluated Models

Models	χ^2	<i>df</i>	GFI	NNFI	CFI	RMSEA	90% CI	$\Delta\chi^2$	Δdf	<i>p</i>
Hypothesized	217.03	104	.86	.83	.87	.09	.08, .11			
Final model	71.17	61	.92	.98	.98	.04	.00, .07	145.86	43	.00
Direct-effect model	70.07	58	.92	.97	.98	.04	.00, .07	1.10	3	.78

Note: GFI = goodness-of-fit index; NFI = non-normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval.

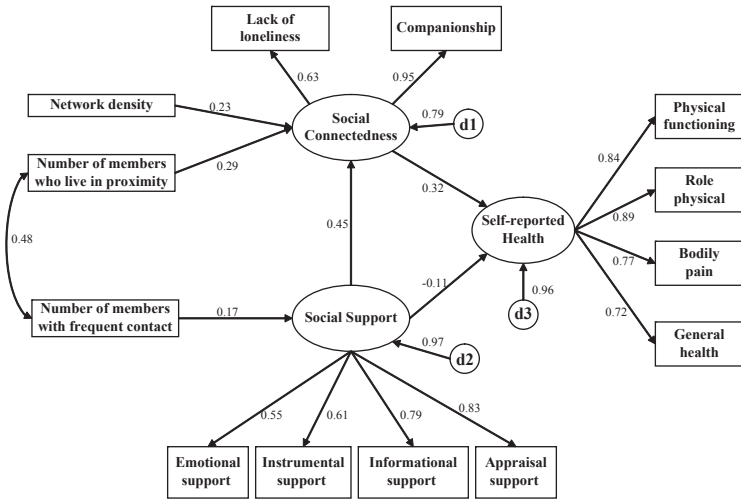
paths were removed from the model one at a time. This resulted in deletion of 10 parameters in the hypothesized model. Five paths directed toward social support (network size, number of members that live in proximity, network density, proportion of kin and female members) and five paths to social connectedness (network size, number of members with frequent contact, proportion of kin and female network members, and number of members 50 years or older) were not significant. As indicated in Table 2, the χ^2 likelihood ratio tests indicated that the deletion of four variables and 10 paths resulted in a significantly improved model.

Because no further parameter between the social network characteristics variables and two network functions was identified as nonsignificant, it was determined to be a final model (Figure 2). The model fit statistics suggest that this model fits the sample data well and thus is plausible. In the final model, a path from social support to health was determined to be nonsignificant. However, deletion of this path did not change the goodness-of-fit statistics very much ($\chi^2 = 71.88$, CFI = .98, RMSEA = .036). Thus, this path was kept in the final model. The figure includes information on standardized regression coefficients, factor loadings for indicators, and error terms in estimation of the constructs of social support, social connectedness, and health status.

In the final model, the number of members living in close proximity and network density were found to have positive directional associations with the construct of social connectedness. The number of members with whom respondents were frequently in contact was the only network variable that was associated with social support. Social connectedness was found to have a positive association with health status; however, social support was not significantly associated with health.

To evaluate whether network characteristics are directly associated with health, a direct-effect model was tested by adding three direct paths from each of the network characteristics (network density: $b = -.10$, number of members in close proximity: $b = -.01$, number of members with frequent contacts: $b = .02$) to self-reported health status. The results revealed no significant direct path. As indicated in Table 2, the fit of the data to this direct-effects model and the final model did not significantly differ. Although social network characteristics were associated with perceived social support and connectedness, no direct associations between the network characteristics (network density: $b = -.04$, number of members in close proximity: $b = .10$, number of members with frequent contacts: $b = .03$) and health status were observed in a model that excludes social support and connectedness. This indicates that social support and social connectedness do not mediate the associations between the social network characteristics and health.

Figure 2
Final Model for Associations Among Social Network Characteristics, Functions of Social Relationships, and Self-Reported Health Status of Older Adults



Discussion

The results of this study indicate that individuals with denser social network systems and more network members living in close proximity reported higher perceived levels of social connectedness. This supports the previous report that older adults consider geographic proximity when they identify someone as a companion (Connidis & Davies, 1992). Having more network members with whom the respondent is in frequent contact was associated with higher perceived availability of social support, also consistent with earlier findings (Seeman & Berkman, 1988). Structural network characteristics such as network size, density, and proportions of kin and female members were not significantly associated with social support, even though such associations had been found in these earlier studies.

In the final model, social connectedness had a positive association with the health status of the participants ($b = .32$). Social support ($b = -.11$) was

not significantly associated with health status and had a trend toward negative association. In an alternative final model that excluded a path from social support to connectedness, the association between connectedness and health remained positive and significant, whereas the association between social support and health remained negative and nonsignificant (data not shown). This suggests that social support and social connectedness may have differential associations with the health status of older adults. This lack of association between social support and health status may reflect, in part, the cross-sectional nature of the data and individual differences in the need for social support. Older adults with health problems are likely to need more support from network members compared to those who are healthier, possibly leading to systematic differences in how the questions about social support availability were answered and reducing any positive association between social support and health. Longitudinal analyses and more detailed evaluation of support types and needs are necessary to get further clarity on this relationship.

Implications

A stronger association between health status and social connectedness, as compared to that with social support, indicates the importance of further exploring the construct of social connectedness in future studies. Especially for healthy older adults, enhancing their perceptions of social connectedness may help them maintain health and well-being. It has been reported that older adults are more satisfied with life when instrumental support is provided by formal agencies rather than by members of their own social networks (Bowling, 1991). Because of the changing fast-paced nature of our society, even if network members manage to provide needed support and assistance, it is becoming increasingly difficult for them to provide satisfying companionship, which requires spending quality time together. Efforts to help community-dwelling older adults develop and enhance the availability of social relationships that allow them to feel socially connected are much needed.

The final model suggests that increasing the number of network members living in close proximity and the network density might lead to higher perceived levels of connectedness among older adults. One possible way to enhance perceived connectedness in social networks among community-dwelling older adults would be to facilitate participation at public places such as community or senior centers. Such centers are capable of providing older adults with opportunities to establish mutual friendships with others who live

in the same community. Social network systems established in community settings can potentially become dense because network members have more opportunities to see and get to know each other. Although these community centers have traditionally focused on providing services and support to older adults, it could be beneficial for these centers to place even stronger emphasis on creating an environment that is conducive to establishing and enhancing companionship and friendship among the participants.

As stated earlier, the construct of social support has been of primary interest in the study of older adults' social relationships (Connidis & Davies, 1992). Understanding how social support and social connectedness may influence the health and well-being of older adults differently can benefit health professionals by informing intervention efforts to enhance social relationships, thus improving on current strategies that have heavily focused on increasing support availability (Minkler, Schauffler, & Clements-Nolle, 2000). This study employed a cross-sectional design; it is critical that a longitudinal study be conducted to allow the examination of causal relationships. Collecting follow-up information will also allow evaluation of the changing nature of older adults' social relationships and the possible impact of such change on health and well-being.

This study examined only social support and social connectedness. It is possible that other social network functions not explored in this study may mediate the associations between social network characteristics and the health status of older adults. Social relationship functions such as social influence and social comparison have been suggested as possible mediators between social network characteristics and health (Berkman & Glass, 2000). Understanding which social relationship functions figure most prominently in influencing individuals' health will provide guidance for developing intervention programs to promote the health and longevity of the population through enhancement of social relationships.

Limitations

The respondents in this study were from a particular urban community with a very low proportion of minority residents. Therefore, some of the findings may not be generalizable to older adults with different socioeconomic and cultural backgrounds. Because of the limited sample size and the need to conserve degrees of freedom, possible moderating effects of demographic characteristics were not evaluated. Conducting further studies with a larger number of older adults from different communities with diverse cultural backgrounds would help increase the overall understanding of the

associations between the social relationships and health of older adults. Because the hypothesized models were respecified based on the sample data, the final models were derived based on the specific characteristics of the participants in this study. The final models need to be cross-validated with new independent samples. It is possible that the social network characteristics that were found to be associated with social support and connectedness would be different for different samples.

It is important to note that the directional associations between the factors in the models may have reverse causal associations. It was hypothesized in this study that social network characteristics and functions influence the health status of older adults. However, as discussed above, it is likely that health status of older adults also affects social network characteristics and functions. Such bidirectional associations should be considered in future longitudinal studies.

It is highly likely that the high rate of unit nonresponse in this study occurred because of potential participants not actually receiving the request for participation. Although the low response rate might have caused biases in point estimation and inflation of the variances of point estimators (Dillman et al., 2002), this study was able to reach older adults with a wide range of social relationship characteristics as well as health status.

Finally, only two items were used to measure social connectedness, and this might have resulted in limiting the reliability and in reducing the strength of associations. Future studies should consider development of more comprehensive measures.

Conclusion

Results of the current study suggest that the constructs of social support and social connectedness are positively associated with each other but have differential associations with social network characteristics and health status of older adults. Furthermore, perceived social connectedness may be relatively more important to the health and well-being of older adults than the perceived availability of social support. Efforts to enhance older adults' social relationships can be focused on developing friends and companions that allow them to feel socially engaged in the society. Other functions of social relationships may also play roles in explaining associations between social network characteristics and the health status of older adults. Further studies are needed to increase our understanding of these functions and to improve intervention efforts to promote the health and longevity of older adults.

Appendix Covariance Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Physical functioning	996.19																
2. Role—Physical	906.24	1492.58															
3. Bodily pain	533.41	750.22	743.78														
4. General health	484.03	577.25	338.39	562.86													
5. Lack of loneliness	10.29	8.55	7.92	4.81	1.16												
6. Companionship	8.14	7.79	5.81	3.88	0.70	1.17											
7. SS: emotional	0.72	-1.59	-2.18	-1.63	0.07	0.18	0.65										
8. SS: instrumental	-1.34	-1.17	0.04	-0.33	0.20	0.35	0.21	0.70									
9. SS: informational	3.10	3.00	1.04	1.91	0.18	0.37	0.28	0.36	0.78								
10. SS: appraisal	2.24	0.89	-1.19	0.71	0.20	0.34	0.33	0.35	0.49	0.71							
11. Network size	44.01	27.60	24.95	27.80	1.08	1.96	0.28	0.23	0.67	0.73	29.72						
12. Number with frequent contact	8.51	7.77	3.24	5.06	0.35	1.06	0.75	0.46	0.43	0.28	7.78	10.17					
13. Number in proximity	23.99	14.12	10.46	15.24	1.07	1.77	0.39	0.24	0.11	0.24	21.68	7.42	23.41				
14. Network density	-0.48	-0.28	-0.17	-0.70	0.03	0.03	0.02	0.04	0.01	0.01	-0.37	0.10	-0.28	0.06			
15. Proportion of kin	0.40	0.03	0.24	-0.63	0.04	0.04	0.03	0.02	0.00	0.02	-0.09	0.00	-0.21	0.03	0.06		
16. Proportion of female	-1.47	-1.06	-0.90	-0.18	-0.03	-0.03	0.02	0.00	0.00	0.00	-0.17	-0.03	-0.05	0.00	-0.01	0.03	
17. Number of 50 or older	22.23	29.20	12.78	20.88	0.53	1.01	-0.21	0.09	0.21	0.30	13.36	1.51	10.93	-0.42	-0.40	0.08	16.24

Note: SS = social support.

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