

Performance of an Abbreviated Version of the Lubben Social Network Scale Among Three European Community-Dwelling Older Adult Populations

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Purpose: There is a need for valid and reliable short scales that can be used to assess social networks and social supports and to screen for social isolation in older persons. **Design and Methods:** The present study is a cross-national and cross-cultural evaluation of the performance of an abbreviated version of the Lubben Social Network Scale (LSNS-6), which was used to screen for social isolation among community-dwelling older adult populations in three European countries. Based on the concept of lack of redundancy of social ties we defined clinical cut-points of the LSNS-6 for identifying persons deemed at risk for social isolation. **Results:** Among all three samples, the LSNS-6 and two subscales (Family and Friends) demonstrated high levels of internal consistency, stable factor structures, and high correlations with criterion variables. The proposed clinical cut-points showed good convergent validity, and classified 20% of the respondents in Hamburg, 11% of those in Solothurn (Switzerland), and 15% of those in London as at risk for social isolation. **Implications:** We conclude that abbreviated scales such as the LSNS-6 should be considered for inclusion in practice proto-

cols of gerontological practitioners. Screening older persons based on the LSNS-6 provides quantitative information on their family and friendship ties, and identifies persons at increased risk for social isolation who might benefit from in-depth assessment and targeted interventions.

Key Words: Health promotion, Intervention study, Scale development, Social isolation, Social networks

For more than 25 years, the World Health Organization has recognized that the prevention of social isolation is necessary for good health (WHO, 1979, 2002). The magnitude of health risk associated with social isolation is now deemed to be comparable with that of cigarette smoking and other major biomedical and psychosocial risk factors (House, 2001). Supportive social ties have been shown to enhance physical and mental health among older adults, whereas social isolation, loneliness, and stressful social ties have been shown to contribute to higher risk of disability, poor recovery from illness, and early death (Berkman & Glass, 2000; Berkman, Glass, Brissette, & Seeman, 2000; Findlay, 2003; House, Landis, & Umberson, 1988; National Research Council, 2001; Seeman, Singer, Ryff, Dienberg Love, & Levy-Storms, 2002; Stuck, Egger, Hammer, Minder, & Beck, 2002; Stuck et al., 1999; Wenger, Davies, Shahtahmasebi, & Scott, 1996).

Accordingly, the development of valid and reliable instruments to screen for social isolation has become even more crucial to the study of gerontology and the appropriate practice of health care with older adults (Glass, Mendes de Leon, Seeman, & Berkman, 1997; Steiner et al., 1996). One instrument that has been widely used to assess social integration and to

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screen for social isolation among community-dwelling populations is the Lubben Social Network Scale (LSNS). The original version of the LSNS is a 10-item scale. It has been translated into many languages (e.g., Chinese, German, Japanese, Korean, and Spanish) and applied to older adult populations of diverse ethnic backgrounds. Although these studies have generally reported good psychometric traits for the LSNS, there has not been a cross-group comparison of the performance of this scale. Lubben and Girona (2000, 2003a, 2003b) recently reported revisions to the original LSNS, including the development of an abbreviated version. In the present study we appraise the performance of this abbreviated version as a social health screener among three European community-dwelling populations.

The LSNS was developed specifically for use among older adult populations (Lubben, 1988) and subsequently has been widely used in both research and clinical settings (e.g., Luggen & Rini, 1995; Martire, Schulz, Mittelmark, & Newsom, 1999; Pourat, Lubben, Wallace, & Moon, 1999; Rubenstein, Lubben, & Mintzer, 1994; Steiner et al., 1996; Stuck et al., 1999). It has been associated with a wide array of health indicators. Low scores on the LSNS have been correlated with mortality (Ceria et al., 2001), all-cause hospitalization (Lubben, Weiler, & Chi, 1989; Mistry, Rosansky, McQuire, McDermott, & Jarvik, 2001), physical health problems (Hurwicz & Berkanovic, 1993; Mor-Borak, Miller, & Syme 1991), depression and other mental health problems (Chou & Chi, 1999; Dorfman et al., 1995; Okwumabua, Baker, Wong, & Pilgram, 1997), and lack of adherence to good health practices (Potts, Hurwicz, Goldstein, & Berkanovic, 1992).

Lubben and Girona (2003a) cited improved psychometrics and ease of administration as the primary reasons for revising the original LSNS. They also recounted that various researchers had developed abbreviated but inconsistent versions of the original LSNS. To address this problem, Lubben and Girona put forward a six-item version that they named the LSNS-6. They suggested that the LSNS-6 would be more appropriate than longer instruments as a screener for social isolation in practice settings. In the present study we evaluate the LSNS-6 among a sample of older adults in Hamburg (Germany), Solothurn (Switzerland), and London (UK).

Methods

LSNS-6

The LSNS-6 is constructed from a set of three questions that evaluate kinship ties and a comparable set of three questions that evaluate nonkin ties. The items that deal with kinship include the following: How many relatives do you see or hear from at least once a month? How many relatives do you feel close to such that you could call on them for help? How

many relatives do you feel at ease with that you can talk about private matters? These three items are repeated with respect to nonkin ties by replacing the word *relatives* with the word *friends*. A copy of the LSNS-6 including response options is found in the appendix. The total scale score is an equally weighted sum of the six items, with scores ranging from 0 to 30. A LSNS-6 Family subscale is constructed from the three LSNS-6 items that ask about relatives. Similarly, a LSNS-6 Friends subscale is constructed from the three items that ask about friends.

Definition of a Clinical Cut Point for the LSNS-6

Lubben (1988) reported a clinical cut point for the original LSNS, but none had been developed for the LSNS-6. Lubben suggested that this cut point would facilitate identifying an at-risk population that could then be further assessed and for whom interventions might be developed. Such cut points necessarily involve trade-offs addressing the competing goals of sensitivity and specificity of screening instruments. More specifically, if the clinical cut point is set too low, then some individuals truly isolated would be missed. If the cut point is set too high, then too large of a group is deemed at risk and is subsequently targeted for more extensive assessment and consideration of possible interventions. Furthermore, to facilitate ease of administration in practice settings, a cut point should be easy to score and to comprehend.

We decided to focus on the concept of lack of redundancy in social ties as the key criterion for determining a cut point for identifying individuals at risk for social isolation. This approach is supported by studies demonstrating that a lack of redundancy of social ties is associated with lower levels of social support (Fuhrer & Stansfeld, 2002). A lack of redundancy in an older adult's social network could have dire consequences if that key individual was no longer available.

The selected cut point can be illustrated by two extreme representative cases. The first case is an older person with the same number of people available for each of the components of the family and friendship network. If this representative person had two family members available for each of the three family components of social network, and in addition two friends available for each of the three friendship components, then we would consider this person to meet the minimal criterion of having a redundant social network. This person would answer the Category 2 response option for all six LSNS-6 items, resulting in an LSNS-6 score of 12 points. In contrast, if a person had two people available for some but not all of the six categories (corresponding to an LSNS-6 score of <12), then we would consider the person to be at risk for social isolation.

The second extreme representative case is a person with a total lack of either family or friendship ties that is compensated by an abundance of the other type. For example, one might consider the case of an older person lacking family support, but enmeshed in a relatively large friendship network. We assumed that this person might be able to partly compensate for the lack of family support if the person had an extensive friendship network, with at least five individuals available for each of the three components of the LSNS-6 questionnaire, resulting in an LSNS-6 score of 12 points. Similarly, the older person with a large family network might partially compensate for the lack of a friendship network. Thus, using this alternate approach, we found that a cut point of 12 seemed to be a cut point that could be justified by theoretical and practical considerations.

In a next step, we validated this proposed cut point of the LSNS-6 by using the present cross-national samples. We used two criteria for validation. First, we determined the proportion of older adults reported to be at high risk of social isolation by using the a priori defined cut point. On the basis of earlier studies, we expected to find an approximately 10% to 15% point prevalence of individuals at risk for social isolation in a group of a community-dwelling older adults (Rubinstein et al., 1994). Second, we used statistical methods for evaluating the convergent validity of the newly defined cut point. We determined the correlation (based on the Pearson correlation coefficient) between the presence of social isolation according to the new cut point, and two variables measuring social support (i.e., emotional support score on the Medical Outcomes Study, or MOS, and self-reported availability of a caregiver).

Finally, we used statistical methods for determining whether using an alternate cut point would have given better results. We conducted sensitivity analyses, and we repeated the prevalence and convergent validation analyses by using an LSNS-6 cut point of 10 and of 14, instead of 12.

In keeping with the nomenclature used for the original LSNS (Lubben, 1988; Rubinstein et al., 1994), we would identify individuals with a score of less than 12 as socially isolated. Such a score implies that, on average, there are fewer than two individuals for the six aspects of social networks assessed by the LSNS-6. Similarly, we consider those with scores of less than 6 on the three-item LSNS-6 Family subscale to have marginal family ties and those with scores of less than 6 on the three-item LSNS-6 Friends subscale to have marginal friendship ties.

Other Measures

We measured instrumental activities of daily living (IADLs) by using a modification of the original Lawton and Brody IADL tool (1969). We measured

mental health by using the MHI-5 version of the mental health measure used in the MOS (Stewart, Hays, & Ware, 1988; also see Berwick et al., 1991).

The Emotional Support Scale is an abbreviated version of the 20-item Medical Outcomes Study Social Support Survey (MOS-SSS; Sherbourne & Stewart, 1991). The set of three MOS-SSS items selected for the Emotional Support Scale in the present analyses are the ones recommended by Lubben and Gironde (2000). One of the items asks how often the respondent has someone to love. Another item asks how often someone shows love and affection to the respondent, and the third item asks how often the respondent has someone to share worries with. The response options for all three of these items are on a Likert scale ranging from never to always. Lubben and Gironde reported high internal consistency for this three-item Emotional Support Scale ($\alpha = 0.84$).

Source of Data

Data come from the PRO-AGE trial study sites in Hamburg (Germany), Solothurn (Switzerland), and London (UK). The PRO-AGE trial tested interventions designed to reduce disability and loss of function among older adults. In the present analysis we use baseline data from both intervention and control groups in each of the sites of the PRO-AGE study. Study groups were drawn from community-dwelling patients, 65 years or older, enrolled with participating general practitioners. Exclusion criteria included the following: living in nursing home, being dependent in basic activities of daily living, having a terminal disease, being cognitively impaired, and not speaking the regional language. Participants in the PRO-AGE trial completed a 32-page self-administered questionnaire that constituted a multidimensional assessment of risk factors for functional status decline. The questionnaire was an adaptation of the Health Risk Appraisal for the Elderly (Breslow et al., 1997). Additional details about the PRO-AGE trial have been published elsewhere (Stuck, Elkuch, et al., 2002).

Although the three study sites are all located in Europe, and the large majority of study participants were of Caucasian ethnicity, there are important differences between the three sites (Table 1). In Hamburg, participants were recruited from both urban and suburban neighborhoods with a relatively large proportion of individuals with higher educational levels. In Hamburg, the proportion of women was much higher compared with the two other study sites because many men of this generation had died during the Second World War. Among participants in Hamburg, a relevant number of individuals (about 25%) were former residents of Eastern Europe who came as refugees to Hamburg after the Second World War. Solothurn is a mainly rural Canton

Table 1. Sample Characteristics ($N = 7,432^*$)

	Hamburg	Solothurn	London	p Value†	Between-Group Differences‡
N^1	1,964	2,870	2,598		
Age (Mean/ SD)	74.0 \pm 6.4	74.2 \pm 5.9	74.5 \pm 6.2	.012	L > H
Age ≥ 75 years	40.3%	40.6%	42.5%	.233	
Female gender	62.8%	56.1%	54.5%	<.001	H > S, H > L
Basic education only	25.0%	40.4%	63.3%	<.001	S > H, L > H, L > S
Living with partner	59.1%	69.4%	67.2%	<.001	S > H, L > H
Fair or poor self-perceived health	32.6%	19.9%	24.2%	<.001	H > S, H > L, L > S
Functional status: Help or need of assistance in ≥ 1 IADL	50.6%	43.2%	38.9%	<.001	H > S, H > L, S > L
Mental Health (MHI-5)	77.1 \pm 17.7	80.6 \pm 15.5	81.5 \pm 14.9	<.001	S > H, L > H
Sensory deficit					
Vision	20.4%	19.5%	21.7%	.205	
Hearing	22.9%	30.0%	23.4%	<.001	S > H, S > L
≥ 1 Hospital stays previous year	22.3%	19.1%	14.0%	<.001	H > S, H > L, S > L
No caregiver available	19.0%	10.7%	16.6%	<.001	H > S, L > S
No participation in social groups	38.9%	22.1%	32.9%	<.001	H > S, H > L, L > S
Lubben Social Network Scale (LSNS-6)	16.1 \pm 5.5	17.9 \pm 5.3	17.4 \pm 5.5	<.001	S > H, L > H, S > L
LSNS-6 Family Subscale	8.2 \pm 3.3	9.6 \pm 2.9	9.0 \pm 3.3	<.001	S > H, L > H, S > L
LSNS-6 Friend Subscale	7.9 \pm 3.4	8.3 \pm 3.2	8.3 \pm 3.3	<.001	S > H, L > H
Emotional Support Scale	11.8 \pm 4.0	11.7 \pm 3.7	11.8 \pm 4.1	.543	

Notes: SD = standard deviation; IADL = instrumental activities of daily living.

*Due to missing values for individual items on the Health Risk Appraisal questionnaire, N varies between 1,822 and 1,964 for Hamburg, between 2,558 and 2,870 for Solothurn, and between 2,364 and 2,598 for London.

† p values for continuous variables based on analysis of variance (ANOVA), for dichotomous variables based on χ^2 test comparing the three sites.

‡Significant differences between pair of means/proportions (L = London, S = Solothurn, H = Hamburg), adjusted for multiple comparisons (see Methods section).

(county) with approximately 250,000 inhabitants. In this population, there are both residents with lower and higher educational levels. Most live in small villages or towns, and many were born and have lived most of their lives in the Solothurn area. In the London area, the study sample included populations living mainly in the outer urban areas, with a high proportion of individuals of lower educational and income categories. Although all three sites have a majority of residents belonging to a Christian church, the religious orientation differs between the three sites. In Hamburg, most people belong to the Protestant Church; in Solothurn, most belong to the Catholic Church; and in London, the Church of England is predominant.

Statistical Methods

We analyzed data with STATA (2003, version 8.2) in several steps. First, we calculated summary statistics including simple counting, percentages, mean values, standard deviations, and frequency distributions to describe the demographic and clinical characteristics of the sample. Comparisons among the three sites are based on an analysis of variance (for continuous variables) and on a chi-square test (for dichotomous variables). The value determining statistical significance was $p < .05$,

except for comparisons shown in Table 1. We took into account that, for each of the comparisons listed in Table 1, three statistical tests were used. Therefore, we adjusted differences between pairs of means–proportions according to the Bonferroni rule, and we considered them to be statistically significant if the value was $p < .017$. We evaluated internal consistency by using Cronbach's alpha.

A factor analysis identified principal components factors with varimax rotation. We retained those factors with an eigenvalue greater than 1, and we determined the factor structure by factor loadings having an absolute value greater than 0.5 (Table 2). To test factor invariance across sites, we calculated a correlation of rotated factor loadings. This method is sensitive to both the structure elements and the correlation among the observed variables (Nunnally & Bernstein, 1994). We used a further test of item homogeneity, which was the item–total test score correlation (DeVellis, 2003; Streiner & Norman, 1995; see Table 3).

To check whether the mean LSNS-6 total score and the two LSNS-6 subscales discriminate between stratified subgroups, we performed t tests for mean scores of participants living with a partner or living alone, participating or not in group activities, and having marginal emotional support or low, moderate, or high emotional support (Table 4). We analyzed correlations of socioeconomic, clinical,

Table 2. Lubben Social Network Scale (LSNS-6) Factor Matrix

	Hamburg		Solothurn		London	
	Family Factor	Friend Factor	Family Factor	Friend Factor	Family Factor	Friend Factor
LSNS-6 Items						
SNQ1 Family: size	.86	.10	.82	.16	.89	.12
SNQ2 Family: call for help	.90	.21	.87	.22	.91	.19
SNQ3 Family: discuss private matters	.89	.21	.85	.24	.85	.25
SNQ4 Friend/neighbor: size	.15	.80	.22	.76	.17	.82
SNQ5 Friend/neighbor: call for help	.24	.87	.23	.86	.22	.88
SNQ6 Friend/neighbor: discuss private matters	.15	.85	.20	.83	.18	.82
Eigenvalues	3.3	1.4	3.3	1.2	3.3	1.4
Percent of variability explained	54%	24%	55%	19%	55%	23%

and social characteristics with the LSNS-6, and we analyzed the two LSNS-6 subscales by using Pearson product-moment correlation coefficients. We did this by using both continuous scale scores (Table 5) and using suggested clinical cut points for the LSNS-6 and two subscales (Table 6).

Results

Table 1 reports sample characteristics for the three sites. Except for vision and emotional support, significant differences were noted among the samples. The average age of respondents among all of the samples was approximately 74 years, and approximately 40% of the respondents in each sample were 75 years of age or older. Approximately two thirds of the individuals in the Hamburg sample were female, whereas older women constituted slightly more than half of the sample in the other two sites. Hamburg respondents were also less likely to be living with a partner. There were other major differences between the three sites. Because of a strong tradition of group activities in Switzerland, most of the participants from Solothurn reported participating in social groups, whereas this was less frequent in Hamburg and London. In addition, 25% of the participants from Hamburg, 40% of those from Solothurn, and 63% of those from London possessed only a basic education, reflecting the socioeconomic differences of the selected project regions at each site.

The Hamburg individuals consistently reported worse health status than did the individuals at the other two sites. Compared with these individuals, Hamburg respondents reported a greater incidence of poor self-perceived health, IADL difficulties, mental health problems, and health care utilization. The Hamburg respondents were also more apt to report deficiencies in various aspects of their social support networks than their counterparts in Solothurn and London. In sum, the three sites reflect important intergroup differences among a number of domains.

Measures of Internal Consistency

We used an acceptable range of coefficient values of $\alpha = 0.70$ – 0.90 (DeVellis, 2003). A reliability score higher than 0.90 is indicative of excessive redundancy among the scale items. Further, those scales with $\alpha < 0.70$ are deemed likely to be unreliable (Streiner & Norman, 1995). The internal consistency for the LSNS-6 was consistent across sites ($\alpha = 0.83$). The subscales also demonstrated quite consistent Cronbach alpha scores across all three sites. The Family subscale ranged from 0.84 to 0.89 whereas, as the Nonkin subscale ranged from 0.80 to 0.82. These Cronbach alpha values are all well within the acceptable parameters suggested by Streiner and Norman for health measurement scales.

Table 3. Lubben Social Network Scale (LSNS-6) Item-Total Scale and Subscale Correlations

LSNS-6 Items	Hamburg			Solothurn			London		
	LSNS-6	Family	Friend	LSNS-6	Family	Friend	LSNS-6	Family	Friend
SNQ1 Family: size	.69	.87		.69	.82		.73	.90	
SNQ2 Family: call for help	.78	.92		.77	.91		.78	.93	
SNQ3 Family: discuss private matters	.77	.91		.77	.89		.78	.88	
SNQ4 Friend: size	.68		.82	.70		.80	.69		.83
SNQ5 Friend: call for help	.77		.89	.77		.88	.76		.90
SNQ6 Friend: discuss private matters	.71		.86	.74		.86	.71		.85

Table 4. Comparison of Lubben Social Network Scale (LSNS-6) Total Scale and Family and Friend Subscales Across Groups With Different Social Characteristics

	Living With a Partner								
	Hamburg			Solothurn			London		
	Yes	No	Δ	Yes	No	Δ	Yes	No	Δ
	N = 1,135	N = 785	(95% CI)	N = 1,963	N = 865	(95% CI)	N = 1,721	N = 842	(95% CI)
LSNS-6 total score	16.9 \pm 5.6	15.0 \pm 5.2	1.9 (1.5, 2.4)	18.3 \pm 5.2	16.9 \pm 5.2	1.4 (1.0, 1.8)	18.3 \pm 5.4	15.5 \pm 5.3	2.8 (2.3, 3.2)
LSNS-6 Family Subscale	8.9 \pm 3.0	7.4 \pm 3.4	1.5 (1.2, 1.8)	9.8 \pm 2.9	9.0 \pm 2.9	0.8 (0.6, 1.1)	9.7 \pm 3.0	7.7 \pm 3.5	2.1 (1.8, 2.3)
LSNS-6 Friend Subscale	8.1 \pm 3.6	7.6 \pm 3.0	0.5 (0.2, 0.8)	8.5 \pm 3.2	7.9 \pm 3.1	0.6 (0.3, 0.8)	8.6 \pm 3.3	7.9 \pm 3.1	0.7 (0.4, 1.0)
	Participation in Group Activities								
	Hamburg			Solothurn			London		
	Yes	No	Δ	Yes	No	Δ	Yes	No	Δ
	N = 1,190	N = 756	(95% CI)	N = 2,213	N = 629	(95% CI)	N = 1,730	N = 849	(95% CI)
LSNS-6 total score	17.5 \pm 5.2	14.0 \pm 5.3	3.6 (3.1, 4.0)	18.7 \pm 4.9	15.0 \pm 5.5	3.7 (3.3, 4.1)	18.4 \pm 5.3	15.2 \pm 5.4	3.2 (2.8, 3.6)
LSNS-6 Family Subscale	8.6 \pm 3.2	7.7 \pm 3.3	0.9 (0.7, 1.2)	9.9 \pm 2.8	8.5 \pm 3.2	1.4 (1.1, 1.6)	9.3 \pm 3.2	8.5 \pm 3.4	0.8 (0.6, 1.1)
LSNS-6 Friend Subscale	8.9 \pm 3.0	6.3 \pm 3.3	2.6 (2.3, 2.9)	8.8 \pm 2.9	6.5 \pm 3.4	2.3 (2.1, 2.6)	9.1 \pm 3.0	6.7 \pm 3.2	2.4 (2.1, 2.6)
	Marginal Emotional Support								
	Hamburg			Solothurn			London		
	No	Yes	Δ	No	Yes	Δ	No	Yes	Δ
	N = 1,767	N = 197	(95% CI)	N = 2,632	N = 238	(95% CI)	N = 2,347	N = 251	(95% CI)
LSNS-6 total score	16.8 \pm 5.1	9.8 \pm 4.8	7.0 (6.3, 7.8)	18.4 \pm 5.0	12.6 \pm 5.4	5.7 (5.1, 6.4)	18.0 \pm 5.2	11.2 \pm 4.8	6.8 (6.2, 7.5)
LSNS-6 Family Subscale	8.6 \pm 3.1	4.7 \pm 3.1	3.9 (3.5, 4.4)	9.8 \pm 2.8	7.0 \pm 3.3	2.9 (2.5, 3.2)	9.4 \pm 3.1	5.5 \pm 3.3	4.0 (3.6, 4.4)
LSNS-6 Friend Subscale	8.2 \pm 3.2	5.1 \pm 3.0	3.1 (2.6, 3.6)	8.6 \pm 3.1	5.7 \pm 3.1	2.9 (2.5, 3.3)	8.6 \pm 3.2	5.7 \pm 2.9	2.9 (2.5, 3.3)

Note: CI = confidence interval.

Factor Analysis

The factor structure for the LSNS-6 is quite clean among all three sites, as reported in Table 2. The three items dealing with family all load heavily on that factor, and the three nonkin items also load heavily on the nonkin factor. There are no discernible cross-loadings. The eigenvalues suggest a very strong principle component.

Correlations of rotated factor loading among the three sites gave us the opportunity to examine factor invariance. If the correlation of rotated factor loadings between two samples is greater than .95, then their properties can be taken as practically identical (Nunnally & Bernstein, 1994). All rotated factor loading comparisons in the present study were .99, providing strong evidence of the desired trait of factor invariance for the LSNS-6 among the three diverse samples studied.

Item–Total Scale Correlations

Item–total scale correlation analyses (Table 3) reveal coefficients ranging from .68 to .78, indicating that LSNS-6 items are quite homogeneous. The pattern of LSNS-6 item–total scale correlations across the three sites is quite similar. The item–

subscale correlations with total subscale scores range are necessarily higher, reflecting the greater homogeneity of the three items that constitute a given subscale when compared with the six items that constitute the LSNS-6. Correlation coefficients of a specific subscale item to its given subscale total range from .82 to .91 for the Family Subscale items and .80 to .90 for the Friends Subscale items. These correlation coefficients values are well within the acceptable range suggested by Kline (1986).

Discriminant Validity of LSNS-6 and Subscales

Table 4 examines the discriminant validity of the LSNS-6, the LSNS-6 Family subscale, and the LSNS-6 Friend subscale by comparing means of individuals living with a partner or living alone, participating or not in group activities, and having marginal emotional support or low, moderate, or high emotional support. These data are consistent across all three sites and in the direction anticipated. Those individuals living with a partner and those participating in group activities consistently reported higher average LSNS-6 scores, whereas those who reported lower emotional support also reported lower LSNS-6 scores. The LSNS-6 Family subscale and the LSNS-6 Friends subscale similarly demonstrated strong dis-

Table 5. Correlation of Lubben Social Network Scale (LSNS-6) and Subscales with Selected Social and Health Indicators

	LSNS-6			LSNS-6 Family Subscale			LSNS-6 Friend Subscale		
	Hamburg	Solothurn	London	Hamburg	Solothurn	London	Hamburg	Solothurn	London
LSNS-6	—	—	—	.83***	.85***	.84***	.84***	.87***	.84***
Family Subscale	.83***	.85***	.84***	—	—	—	.39***	.48***	.41***
Friend Subscale	.84***	.87***	.84***	.39***	.48***	.41***	—	—	—
Age	-.15***	-.15***	-.21***	-.11***	-.11***	-.14***	-.15***	-.15***	-.21***
Female	-.04 [†]	-.06**	-.07**	-.07**	-.03	-.06**	.00	-.07**	-.05*
Basic education	-.06**	-.09***	-.08***	-.03	-.03 [†]	-.00	-.08**	-.11***	-.13***
Living with a partner	.17***	.12***	.24***	.22***	.13***	.29***	.07**	.09***	.10***
Caregiver available	.23***	.20***	.30***	.25***	.22	.30***	.13***	.13***	.20***
No group activity	-.32***	-.29***	-.27***	-.14**	-.19***	-.12***	-.38***	-.31***	-.34***
Emotional support	.42***	.37***	.46***	.41***	.35***	.45***	.29***	.29***	.32***
Fair or poor self-perceived health	-.22***	-.12***	-.20***	-.18***	-.12***	-.11***	-.18***	-.10***	-.22***
≥1 Hospital stays last year	.04	-.02	-.01	.02	-.04 [†]	.01	.04 [†]	.00	-.02
Mental Health (MHI-5)	.19***	.18***	.22***	.18***	.16***	.14***	.14***	.15***	.24***
Help in ≥1 IADL	-.19***	-.09***	-.20***	-.15***	-.07**	-.13***	-.16***	-.09***	-.21***
Limited Physical Activity	-.20***	-.18***	-.17***	-.15***	-.13***	-.09***	-.18***	-.18***	-.19***

Note: IADL = Instrumental activities of daily living.

[†]Denotes .05 ≤ *p* < .10; *denotes .01 ≤ *p* < .05; **denotes .001 ≤ *p* < .01; ***denotes *p* < .001.

criminate validity in terms of the measures of living with a partner, participating in group activities, and receiving emotional support.

Correlation of the LSNS-6 and Subscales with Selected Social and Health Indicators

Table 5 shows consistent correlation patterns across the three sites for all of the LSNS-6 scales and selected social and health indicators. As also shown in Table 5, the LSNS-6, the LSNS-6 Family subscale,

and the LSNS-6 Friends subscale are most highly correlated with other measures of social integration (e.g., emotional support, availability of caregiver, participation in group activities, and living with a partner), indicating good convergent validity. These LSNS-6 measures are also highly correlated with many measures of physical and mental health. However, none of the LSNS-6 scales were correlated with hospital stay as a measure of health care utilization. Female respondents in Solothurn and London reported lower LSNS-6 and two LSNS-6 subscale scores than did their male counterparts.

Table 6. Correlation of Clinical Cut-Points of Lubben Social Network Scale (LSNS-6) and Subscales with Selected Social and Health Indicators

	Social Isolation (LSNS-6 <12)			Marginal Family Ties (LSNS-6 Family Subscale <6)			Marginal Friendship Ties (LSNS-6 Friend Subscale <6)		
	Hamburg	Solothurn	London	Hamburg	Solothurn	London	Hamburg	Solothurn	London
LSNS-6	-.73***	-.65***	-.68***	-.62***	-.51***	-.58***	-.63***	-.62***	-.60***
Family Subscale	-.63***	-.56***	-.59***	-.75***	-.62***	-.73***	-.28***	-.31***	-.27***
Friend Subscale	-.60***	-.56***	-.56***	-.28***	-.27***	-.24***	-.77***	-.74***	-.74***
Age	.10***	.08***	.14***	.05*	.04*	.08***	.10***	.09***	.16***
Female	-.01	-.00	.02	.04	-.02	.03	-.03	.01	.02
Basic education	.04 [†]	.06**	.06**	.01	-.00	.01	.06*	.06**	.10***
Living with a partner	-.09**	-.06**	-.15***	-.15***	-.05*	-.21***	.01	-.05**	-.05*
Caregiver available	-.20***	-.17***	-.24***	-.22***	-.18***	-.25***	-.09**	-.11***	-.14***
No Group Activity	.22***	.23***	.18***	.09***	.17***	.07**	.29***	.27***	.25***
Emotional Support	-.35***	-.26***	-.36***	-.36***	-.24***	-.36***	-.23***	-.21***	-.22***
Fair or poor self-perceived health	.19***	.09***	.14***	.14***	.08***	.08***	.14***	.05**	.17***
≥1 Hospital stays last year	-.04	-.01	.02	.01	.04*	.00	-.04 [†]	.00	.03 [†]
Mental Health (MHI-5)	-.15***	-.12***	-.17***	-.14***	-.10***	-.10***	-.11***	-.09***	-.19***
Help in ≥1 IADL	.11***	.07***	.11***	.07**	.05*	.08**	.10***	.09***	.14***
Limited Physical Activity	.13***	.14***	.10***	.10***	.08**	.06**	.13***	.14***	.14***

Notes: IADL = Instrumental activities of daily living.

[†]Denotes .05 ≤ *p* < .10; *denotes .01 ≤ *p* < .05; **denotes .001 ≤ *p* < .01; ***denotes *p* < .001.

However, gender was not correlated with the LSNS-6 Friends subscale in Hamburg. Age was negatively correlated with the LSNS-6 and the two LSNS-6 subscales at all sites.

Suggested Clinical Cut Points for the LSNS-6 and Subscales

The present cross-national samples gave us the opportunity to identify and suggest clinical cut points for the LSNS-6, the LSNS-6 Family subscale, and the LSNS-6 Friend subscale. As previously described, the basic logic behind these suggested cut points was to identify respondents who appeared to be overly reliant on one person or perhaps even lacked this minimal level of support. A clinical cut-point score of less than 12 on the LSNS-6 indicates that, on average, the respondent had fewer than two people to perform the particular social integration functions assessed by the LSNS-6. Similarly, a cut-point score of less than 6 on the three-item Family subscale would indicate that, on average, the respondent would have fewer than two family members to perform those functions. By similar logic, we also adopted a cut-point score of 6 for the three-item Friend subscale.

Such cut points could be used in clinical practice or health promotion screenings to identify those individuals who might be at high risk for social isolation and deemed appropriate for additional diagnostic assessment. It would be impractical and expensive to offer extensive diagnostic social network assessment to large numbers of older adults, but a screening instrument such as the LSNS-6 might be an effective and efficient means to target such assessments.

Using a score of less than 12 as a clinical cut point for the LSNS-6, we classified 20% of the respondents in Hamburg, 11% of those in Solothurn, and 15% of those in London as socially isolated ($p < .001$; $H > S$, $H > L$, $L > S$). Using a score of less than 6 on the Family subscale, we classified 18% of the respondents in Hamburg, 8% of those in Solothurn, and 15% of those in London as having marginal family ties ($p < .001$; $H > S$, $H > L$, $L > S$). Using a score of less than 6 on the Friends subscale, we classified 23% of the respondents in Hamburg, 18% of those in Solothurn, and 19% of those in London as having marginal friendships ($p < .001$; $H > S$, $H > L$).

Shown in Table 6 are correlations of these various clinical cut-point versions of the LSNS-6 scale scores with the scores from the continuous versions of the LSNS-6 scales. These data show that some information is lost as a result of the dichotomization of the scores. The correlations indicate that the clinical cut-point version of the LSNS-6 generally explains between one third and one half of the total LSNS-6, using the continuous scale scores. We observed similar results for the LSNS-6 Family

subscale and the LSNS-6 Friend subscale, correlating the scores from clinical cut-point versions with those from the respective continuous scale versions. Also shown in Table 6 are the correlations of these proposed cut points with the same set of social and health indicators used in the previous table. As we expected, the dichotomous versions have a somewhat lower level of correlations with the selected social and health indicators. However, the clinical cut-point scores are consistently and significantly correlated with the selected social and health indicators in a pattern similar to that observed with scores from the continuous versions of the scales that were reported in Table 6. In particular, there was a significant correlation between the cut-point scores and two social support variables (i.e., emotional support and self-reported availability of a caregiver).

We used sensitivity analyses to compare the performance of using a cut point of 12 for the LSNS-6 as compared with using cut points of 10 or 14. Using a cut point of 10, we found that the prevalence of social isolation for Hamburg, Solothurn, and London individuals was 13%, 7%, and 9%, respectively; using a cut point of 14, we found that the prevalence of social isolation for Hamburg, Solothurn, and London individuals was 31%, 19%, and 25%, respectively. We found the following correlations of social isolation with having a caregiver available (Hamburg, Solothurn, and London) when we used a cut point of 10: -0.16 , -0.16 , and -0.21 ; using a cut point of 14, we found -0.20 , -0.17 , and -0.25 ; using a cut point of 12 (as depicted in Table 6), we found -0.20 , -0.17 , and -0.24 . The correlations of social isolation with emotional support (Hamburg, Solothurn, and London) when we used a cut point of 10 were -0.35 , -0.26 , and -0.29 ; with a cut point of 14, -0.35 , -0.29 , and -0.33 ; and with a cut point of 12 (Table 6), -0.35 , -0.26 , and -0.36 .

Discussion

Our central focus in this study was to assess a recently reported abbreviated social network scale. Scale development and validation are cumulative and ongoing processes. Researchers must test social integration scales on a variety of levels, using both psychometric and practical standards to assess their actual clinical usefulness. Analyses of social integration scales should include an assessment of their sensitivity to various differences within and between groups, such as cultural and sociodemographic differences or levels of health and functional status that might affect response patterns. Improved measures of social support networks are essential to a better understanding of the reported link between social integration and health. Such improved knowledge will enhance future gerontological research and geriatric care.

The present study contributes to these objectives by evaluating the performance of the LSNS-6 among three European community-dwelling populations. It demonstrated highly desirable measurement traits among three European older adult populations. Across these three samples of older adults, the LSNS-6 showed high internal consistency and a consistent factor structure. It is noteworthy that this consistency was found even though there were relevant differences among the three samples in terms of demographic and health characteristics. Additional data presented also were highly supportive of its discriminant validity. Comparable data were presented for LSNS-6 Family and Friends subscales. Both of these two subscales also demonstrated high internal consistency and other desirable measurement traits. The LSNS-6, the LSNS-6 Family subscale, and the LSNS-6 Friend subscale all performed very well.

A final contribution of the present study was to suggest clinical cut points for the LSNS-6 and the two subscales. We developed these cut points on the basis of a hypothesis-driven approach and evaluated them with statistical methods. The sensitivity analyses revealed that using a cut point of less than 10 instead of a cut point of less than 12 would result in slightly worse findings for concordant validity. Using a cut point of less than 14 instead of a cut point of less than 12 would result in similar findings for concordant validity but in high prevalence rates of social isolation between 19% and 31%. These prevalence rates are higher than the rates expected in these populations. For example, in a population of older adults in Switzerland, researchers found the prevalence rate of social isolation to be 15% (Martin-du-Pan, Collart & Simeone, 1991), and in a London-based sample, researchers found this rate to be 14% (Iliffe, Haines, Stein, & Gallivan, 1991). Therefore, using the higher cut point would result in a situation in which too large a group of individuals would be deemed at risk and thus be candidates for more extensive assessment and consideration for possible clinical interventions.

The suggested clinical cut point of less than 12 is easy to calculate and to comprehend and could be used in practice to identify those clients in need of additional assessment. Such cut points are also useful for targeting interventions to those deemed at higher risk for social isolation. Whereas the overall LSNS-6 clinical cut point is suggestive of social isolation, the two subscales taken separately could indicate whether limited family or nonkin ties or both were responsible.

The following limitation should be taken into account when the overall LSNS-6 score or the suggested clinical cut point is used. The total score is a simple and concise measure, but it overlooks the possible variability across items. Therefore, for screening purposes, in addition to looking at the cut point, one might also look at the range of responses because this would give information about the

consistency of responses across items. For example, a score of 6 could reflect that there are fewer than two individuals for the six aspects of social networks assessed by the LSNS-6, but it also could reflect nine or more relatives a person feels at ease with talking about private matters and one friend who could be called on for help.

It is noteworthy that the proportion of those identified as high risk of social isolation approximated the data previously reported by Lubben and associates (Lubben & Gironde, 2003a; Rubinstein et al., 1994). The exception was Hamburg, which reported a much higher at-risk population. Given the large number of World War II war refugees that settled in Hamburg, this higher proportion of older adults with limited social ties in the present study is understandable.

A limitation of the present study is that a gold standard for social isolation has yet to be developed. More work in this area is needed. There have been some attempts to compare the results of self-reported social network assessments with the assessment of social isolation by social workers in clinical settings (e.g., Rubinstein et al., 1994). However, there are no known sources of normative data drawn from population surveys regarding social isolation among general community-dwelling older adults. Given the lack of such validation, it is noteworthy that the cutoffs reported in this study have shown good psychometric properties.

Another possible limitation is that the data are drawn only from self-administered questionnaires. However, there was a high level of correlation between the self-administered version of the LSNS-6 questionnaire and the interviewer-administered version of the LSNS-6 questionnaire (Cohen's $\kappa = 0.72$, and 95% confidence interval = 0.36–1.0; see Goetz et al., 2000). Another limitation is that the data for this study are drawn from a single administration and so there are no test-retest data. Again, this concern is tempered by data from another earlier study. In that earlier study, the Cohen kappa for test-retest reliability (time interval 6 \pm 2 days) of the self-administered version of the LSNS-6 was acceptable, with a value of $\kappa = 0.64$ (95% confidence interval = 0.45–0.83; see Goetz et al., 2001).

In summary, social isolation has gained increased credibility as a health risk (House, 2001; WHO, 2002). The National Research Council (2001) recently called for research to clarify the mechanisms by which social isolation and health are linked. Central to this research will be measurement development. In addition to more research, gerontologists and other health care workers should also respond to the growing body of knowledge regarding the centrality of social ties to health and well-being of older adults. Geriatric practice protocols to regularly monitor the social integration of older adult clientele have to be adopted. Much as community health nurses are now being urged to screen clients for social isolation (Tremethick, 2001), it

appears that other gerontological professionals should consider adopting similar practice protocols. Valid and reliable abbreviated instruments such as the LSNS-6 and its two subscales can facilitate the achievement of these objectives.

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Appendix

LUBBEN SOCIAL NETWORK SCALE—6-Item Version

LSNS-6

FAMILY: *Considering the people to whom you are related either by birth or marriage . . .*

1. How many relatives do you see or hear from at least once a month?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more
2. How many relatives do you feel close to such that you could call on them for help?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more
3. How many relatives do you feel at ease with that you can talk about private matters?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more

FRIENDSHIPS: *Considering all of your friends including those who live in your neighborhood . . .*

4. How many of your friends do you see or hear from at least once a month?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more
5. How many friends do you feel close to such that you could call on them for help?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more
6. How many friends do you feel at ease with that you can talk about private matters?
0 = none 1 = one 2 = two 3 = three or four 4 = five thru eight 5 = nine or more

LSNS-6 total score is an equally weighted sum of these six items. Scores range from 0 to 30.

Family and Friend Subscales are an equally weighted sum of their three items respectively.

Subscales scores range from 0 to 15.
