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Original Article

The Reciprocal Relationship Between Social Connectedness and Mental Health Among Older European Adults: A SHARE-Based Analysis

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Abstract

Objectives: The current study aimed to understand the reciprocal relationship between social networks and mental health in old age. It explored the dynamic aspects of that relationship and assessed the influence of social networks on mental health, as well as a concurrent influence of mental health on change in social connectedness.

Method: The data came from two measurement points in the Survey of Health, Aging and Retirement in Europe (SHARE). The analytic sample was composed of adults aged 65 years and above (N = 14,706). Analyses were conducted via latent change score models.

Results: Analyses showed a reciprocal association between social networks and mental health; baseline social connectedness led to mental health improvements and a better initial mental state led to richer social networks. The results further indicated that the relative effect of mental health on change in social network connectedness was greater than the corresponding effect of social network connectedness on change in mental health. No gender differences were found regarding the reciprocal associations.

Discussion: The results of this study demonstrate the dynamic inter-relationship of social networks and mental health. It highlights the need to take into account both directions of influence when studying the impact of social relationships on mental health.

Keywords: Gender, Mental health, Social networks

Social relationships and mental health are two key aspects of successful aging (Cosco, Prina, Perales, Stephan, & Brayne, 2013). Moreover, studies have established the connection between older adults' social milieu and their psychological health, and it is believed that people embedded in supportive social environments enjoy improved well-being and mental health (Pinquart & Sörensen, 2000; Santini, Koyanagi, Tyrovolas, Mason, & Haro, 2015). However, despite ample evidence regarding the existence of such a relationship, its directionality is less clear. Several studies focus on this association at one point in time and thus fail to capture its dynamics (Schwarzbach, Luppa, Forstmeier, König, & Riedel-Heller, 2014). Furthermore, studies tend to assess the effects of social networks on mental health, while largely overlooking the possibility that mental health can also influence older adults' social contacts over time (van Wijngaarden, Schene, & Koeter, 2004). The current inquiry applies a longitudinal analysis to disentangle the reciprocal relationship between older adults' social networks and their mental health.

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The convoy model of social relations maintains that social ties are instrumental for coping with the transitions and challenges of old age. It conceptualizes these ties as the presence of supportive others who accompany individuals across the life span as life circumstances change (Kahn & Antonucci, 1980). The theory particularly underscores the significant implications of social relationships for the psychological well-being of older adults (Lansford, Antonucci, Akiyama, & Takahashi, 2005). This influence is applied through a variety of psychosocial mechanisms, such as fulfilling the need to belong (Baumeister & Leary, 1995) and providing social support and a sense of control (Thoits, 2011). Social ties also facilitate access to resources, such as informal health care, and influence the engagement in mental health promoting activities like physical exercise (Berkman, Glass, Brissette, & Seeman, 2000). In addition they act as stress-buffers, protecting against the negative effects of stressful life events (Cohen & Wills, 1985).

However, the convoy model's assertions go beyond assessing the influence of social networks on the aging individual. The theory recognizes that social relations themselves evolve in reaction to the changing personal and situational characteristics of older people, such as gender, age and culture (Antonucci, Ajrouch, & Birditt, 2014). It is possible that psychological health can also impact one's social relationships, as it changes throughout the aging process (Broese van Groenou, Hoogendijk, & van Tilburg, 2013). People in poor mental health can find it difficult to maintain social relationships in everyday life (Kennedy, Foy, Sherazi, McDonough, & McKeon, 2007) and may become a burden and a source of stress for their social network (van Wijngaarden et al., 2004). On the other hand, happier people are better at creating new relationships and maintaining current ones (Lyubomirsky, King, & Diener, 2005).

These two lines of explanation, as well as the theoretical assertions of the convoy model, indicate interdependence between social networks and mental health. This suggests that social relationships influence older adults' mental health transitions, which in turn enhance their social involvement or, alternatively, withdrawal from social life, leading to further improvements or declines in mental health. Such an understanding of the relationship can shed light on the complex dynamics of the aging process. However, these strands of explanation do not often meet in empirical research. Studies on social networks present a partial picture by focusing mainly on the impact of the social environment on older adults' mental state. The issue of reverse causality is rarely examined directly, although it has been acknowledged in a number of studies (For example: Cornwell & Laumann, 2015; Fiori, Antonucci, & Cortina, 2006; Litwin, Stoeckel, & Schwartz, 2015; Santini et al., 2015; Thoits, 2011). In order to fully understand the reciprocity of the association between social networks and mental health, it is necessary to use a longitudinal design that considers both causal pathways within a single model (Gerstorf, Röcke, & Lachman, 2011).

The few studies that utilized a single model framework have yielded inconsistent findings. Li and Zhang (2015) measured social network types and found a bidirectional association with psychological health, such that diverse and friend network types were more beneficial to older adults' mental health, while suffering from poor psychological health resulted in a greater risk to deteriorate to a family focused or restricted network. Matt and Dean (1993) showed a bidirectional relationship of social support from friends with psychological distress, but only among adults aged 71 years and above. In contrast, Krause, Liang, and Yatomi (1989) found a unidirectional association between satisfaction with one's social support and subsequent decline in depressive symptoms.

The different results obtained by these studies may stem, in part, from their presentation of a partial account of social networks. That is, they either focus on one aspect of one's social milieu (satisfaction or support from friends), or use indirect measures to assess social networks (such as marital status and number of children, utilized by Li and Zhang [2015]). The current study employs a composite measure of social connectedness, based on a subjective mapping process of older adults' personal social networks (Litwin & Stoeckel, 2015). This process allows a representation of respondents' most meaningful interpersonal environment and gathers varied information about these social ties, such as frequency of contact with them and emotional closeness to them. It thus taps into both the structural aspects of the social network and its emotional aspects (Antonucci et al., 2014), and can provide a more comprehensive overview of the personal network.

When studying the links between social networks and mental health, there is also a need to consider their association with gender. Research using the framework of the convoy model stresses the gender differences in social relationships and shows that women typically report larger and more diverse close social networks, in comparison to men (Antonucci, Akiyama, & Takahashi, 2004). Mental health also tends to differ by gender, such that women generally experience worse mental health (Luppa et al., 2012; Wiggins, Higgs, Hyde, & Blane, 2004). Moreover, gender can moderate the strength of the associations between social networks and mental health. For example, it was found in one study that women experience a stronger association of social engagement with psychological health (Phongsavan et al., 2013), although other studies did not find such a gender moderation (Chan, Malhotra, Malhotra, & Østbye, 2011; Zunzunegui, Préville, & Dubé, 2010). However, these findings are based on cross-sectional studies and do not enable a distinction of the directionality, calling for further exploration.

Considering the literature reviewed above, the present study examines two main hypotheses:

1. The effect of social networks on mental health is greater than the effect of mental health on social networks.

2. The respective effects of social networks on mental health and mental health on social networks are moderated by gender.

Methods

Participants

We used data from the Survey of Health, Aging and Retirement in Europe. SHARE is a cross-national European survey of adults aged 50 years and above and their spouses of any age. In its fourth wave, collected in 2011, it gathered for the first time information on older Europeans' personal social networks. Four years later, in its sixth wave (2015), the survey returned to the same participants and inquired about their social networks and the changes they underwent. Fourteen European countries contributed to both waves of data collection: Austria, Germany, Sweden, Spain, Italy, France, Denmark, Switzerland, Belgium, Czech Republic, Poland, Portugal, Slovenia, and Estonia. The current analysis focused on respondents who participated in both waves, were 65 years or older at the baseline measurement and had information on all study variables. The analytical sample thus numbered 14,706 participants.

Study Variables

Social connectedness

SHARE collected data about respondents' personal social networks in 2011 and 2015 using a name generating inventory. This inventory asks respondents to name up to six persons with whom they speak about important matters by using the probe "Over the last 12 months, who are the people with whom you most often discussed important things?" accompanied by the clarification that "These people may include your family members, friends, neighbors, or other acquaintances." Respondents are then given the option to list one additional person who is important to them "for any other reason," resulting in a network of up to seven members. The inventory then gathers further information about these social network members, or "confidants," and inquires about their gender, the nature of their relationship to the respondents (e.g., spouse, friend), geographical proximity to them, frequency of contact with them and their emotional closeness (Litwin, Stoeckel, Roll, Shiovitz-Ezra, & Kotte, 2013).

The current analysis used a construct of social connectedness based on the information gathered in the name generating inventory (Litwin & Stoeckel, 2015). The construct was composed of four measures summarizing the main characteristics of the social network. These include a count of the persons cited; a count of the persons cited with weekly or more contact; a count of the persons cited with very or extremely close emotional ties and a count of different types of relationships within the network. The first three characteristics were scored as follows: 0 = 0, 1 = 1, 2 = 2/3, 3 = 4/5, and 4 = 6/7 persons cited. The fourth measure counted the number of different relationship categories [(a) spouse, (b) other family, including children, (c) friend, and (d) other] that were present in the network (0–3). The original social connectedness scale also included the number of confidants living within 25 km, but we did not include it in the current analysis since proximity data were not available, in 2015, for some of the confidants.

Mental health

The state of mental health was addressed by two complementary measures—depression and well-being. Considering both of these two aspects presents a more holistic view of the construct, as one's emotional state is composed of two different, moderately related aspects of mental illness and mental health (Keyes, 2005). Hence, mental health should be considered in parallel to mental illness since even if individuals are not depressed, it does not mean that they enjoy psychological well-being (Ploubidis & Grundy, 2009). Depression was assessed with the Euro-D scale, a depression measure which was developed for cross-national comparisons in European countries (Prince et al., 1999). The scale uses binary yes or no questions about depressive symptoms experienced in the previous month, such as loss of appetite or lack of energy, and has a range of 0–12 depressive symptoms. For the manifest variable of depressive symptoms (which was used in the univariate analyses and as a factor in the latent mental health variable), a minimum of 10 completed items was required to get a score, and scores of 10–11 were interpolated (Palgi, Shrira, & Zaslavsky, 2015).

Well-being, a positive indicator of mental health, was assessed by two indicators—the CASP-12 scale for quality of life and a global measure of life satisfaction. The CASP-12 scale was designed to cover the positive and beneficial aspects of aging and is composed of four sub-scales: control, autonomy, self-realization, and pleasure (Wiggins, Netuveli, Hyde, Higgs, & Blane, 2008). Each subscale contains three items such as "I feel that the future looks good for me." Each item ranges from "Often" (1) to "Never" (4), leading to a range of 12–48 for the whole scale. Reverse items were re-coded such that a higher score on the scale indicates higher quality of life. As in the Euro-D scale, for the manifest variable a minimum of 10 complete responses was required and cases with 10–11 complete answers were interpolated. The second well-being indicator, life satisfaction, was made up of a single probe—"How satisfied are you with your life?" Responses ranged from 0 to 10. Single item measurements of life satisfaction are commonly used in social surveys, as they translate well across cultures and have good validity and reliability (George, 2010).

Control variables

It has been shown that late life mental health and social relationships are associated with age, gender, educational attainment, and health (Ajrouch, Blandon, & Antonucci, 2005; Luppa et al., 2012; Wiggins et al., 2004). We therefore

controlled for their effect in our analyses. Gender was used as a control variable in the main analytical model and, in a later stage, it was also examined as a moderator. The measurement of education was based on the International Standard Classification of Education (ISCED). It divided the respondents into two categories: primary schooling or less (ISCED-97 score = 0–2) and secondary education or above (ISCED-97 score = 3–6). Health was measured in terms of mobility limitations and cognition. Mobility limitations were reflected in the difficulties respondents reported having had with various functions, such as climbing one flight of stairs without resting. This continuous measure ranges from 0 to 10 limitations. Cognitive ability was indicated using a combined recall score, based on assessments of immediate and delayed recall. In these measurements, respondents were read a list of ten words, and asked to repeat them immediately and following ten minutes. Their scores were summed to a scale with a range of 0–20, with higher scores reflecting more words recalled.

Data Analysis

The analysis utilized a Latent Change Score (LCS) approach. LCS models are a powerful and flexible class of structural equation modeling that explicitly model change as a latent variable (McArdle, 2009). Latent change scores are created by setting the regression path between baseline and follow-up equal to 1, implying that some portion of the follow-up score is equal to the baseline score, and the residual variable is interpreted as a change score (McArdle & Nesselroade, 2014). Figure 1 shows an illustration of the bivariate LCS model examined in the current study. Social connectedness and mental health were modeled as latent variables to account for measurement error. The social connectedness construct was estimated using its four indicators. The mental health construct was composed of the Euro-D, CASP and life satisfaction scores. For each latent factor, the first path loading was set to 1. The measurement

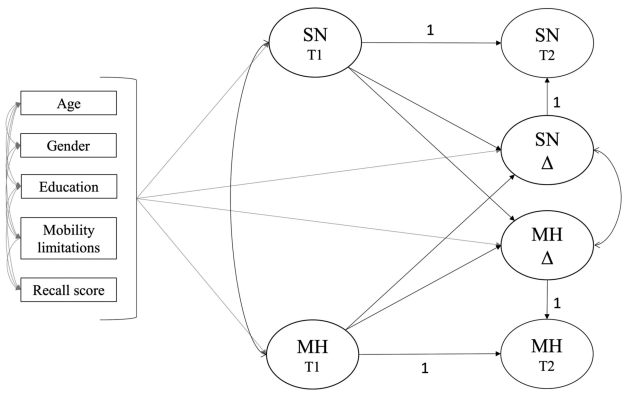

Figure 1. Illustration of the bivariate Change Score Model used in the study. *Note.* SN = Social connectedness; MH = Mental health; Observed variables are drawn as squares and unobserved (latent) variables are drawn as circles.

model of the two constructs at the two time points had good fit to the data (χ^2 = 1,884.43, df = 64, CFI = 0.98, RMSEA = 0.03, SRMR = 0.03), with standardized factor loadings ranging from 0.64 to 0.96 in absolute values (the measurement model detailing these factor loadings is shown in Supplementary Figure 1). Data analysis was performed using R (version 1.0.136; R Core Team, 2016).

The analysis was conducted by comparing a series of nested models. The first model predicted bidirectional paths between social connectedness and mental health. It was compared to subsequent models to assess whether model fit deteriorated as a result of dropping the paths of interest. In the second model, baseline mental health predicted changes in social connectedness. Third, change in mental health was predicted by baseline social connectedness. The final model examined only auto-regressions of social connectedness and mental health. All models controlled for baseline gender, age, education (secondary/above secondary), mobility limitations and recall score. We allowed error terms to covary among matching factor loadings at the two time points.

We accounted for selectivity bias of the sample by using weights (Bollen, Tueller, & Oberski, 2013). These weights were supplied by SHARE at baseline, and were calibrated against the total country population by age group and gender (SHARE, 2017). They adjust for both the survey design and for variation in participating probabilities caused by nonresponse, allowing for unbiased estimators of population parameters. The baseline weights were further adjusted to account for attrition, since respondents who dropped out between the measurements were more likely ($p < .05$) to be older, male, educated and less healthy. We predicted the probability of respondents dropping out based on different sociodemographic and health factors, then multiplied the baseline weights by the inverse of that probability (Cornwell & Laumann, 2015).

The models were run with a maximum likelihood estimator with robust standard errors (MLR) to allow variables to deviate from multivariate normality. The use of MLR entailed adjustment of model comparisons to better approximate chi-square under nonnormality (Satorra & Bentler, 2010). Model fit was evaluated primarily based on the criteria of CFI > 0.95, SRMR < 0.08 and RMSEA < 0.08 (Hooper, Coughlan, & Mullen, 2008). We also tested for factorial invariance of the latent variables across measurement points with a series of increasingly stringent tests (Meredith, 1993). This was done by first testing a baseline model in which the number and pattern of factors were equal over time (configural invariance). This model was compared to a more constrained model of equal factor loadings (weak invariance), followed by equality of manifest variables intercepts (strong invariance) and manifest variable error terms (strict invariance). We used the criteria offered by Meade, Johnson, and Braddy (2008) in which a decrease in CFI of more than 0.002 indicates that additional constraints imposed on the model (compared to a

previous model) are not justified. The test of factorial invariance demonstrated weak factorial invariance. We therefore set the factor loadings to equality at the two measurements for the latent factors and did not set factor means or error variances to be equal over time.

Gender was examined as a moderator in a subsequent analysis. This was done by running the final model separately for men and women, after establishing equality of factor loadings for men and women and constraining these loadings to equality. Gender difference was determined by comparing the models without constraints to models in which the path coefficients of interest were set to equality for both gender groups (Kline, 2011). Specifically, the non-constrained model was compared to a model in which the path between baseline social connectedness and mental health change was set to equality between the gender groups, and to a model in which the path linking baseline mental health to social networks change was set to equality. A significant decline in model fit, were it to occur, would indicate that the path coefficients are different for men and women.

Results

Univariate analysis of the latent variables is presented in Table 1. It shows that mental health declined somewhat over time, with a slight increase in depressive symptoms ($p < .001$) and a slight decrease in quality of life ($p < .001$) and life satisfaction ($p < .001$). Social connectedness, on the other hand, slightly expanded with time ($p < .001$). The study sample was aged 73.5 on average, 56% were women and 48% of the participants had a secondary or post-secondary education. They reported an average of two mobility limitations and had a mean recall score of 8. Table 1 also presents the study variables among men and women. It shows that women had significantly worse mental health and better social connectedness at both time points. They were also older, less educated, and had more mobility limitations at baseline.

Several nested models were compared to the model of bidirectional association in order to examine its fit to the data. We first excluded the path from social networks to mental health from the bidirectional model, a change which led to a significant deterioration in model fit ($\Delta\chi^2(1) = 11.17$, $p < .001$). This indicated a significant influence of social networks on mental health. We then examined a model in which we excluded the paths from mental health to the change in social connectedness. This also led to a significant decline in model fit ($\Delta\chi^2(1) = 55.15$, $p < .001$), supporting an association between mental health and change in social connectedness. Finally, we analyzed a model which included only auto-regression paths for mental health and social connectedness. It also showed a decline in model fit, further supporting the claim of bidirectional associations between the two constructs ($\Delta\chi^2(2) = 67.15$, $p < .001$).

The final bidirectional model showed good fit of the data ($\chi^2 = 5{,}570.31$, df = 119, CFI = 0.96, RMSEA = 0.03, SRMR = 0.04). Table 2 details the parameter estimates for the full model. The results underscore that baseline social connectedness was related to an increase in mental health over time. Additionally, mental health at baseline was related to increased social connectedness over time. Baseline social connectedness had a significant association with baseline mental health, indicating that those with better social connectedness at the first measurement also had better mental health. The latent change variables were also associated, such that change in social connectedness was related to a parallel change in mental health. The model also shows negative auto-regressions from baseline social networks and mental health to their corresponding change over time, as is commonly found in studies utilizing a latent change score model (e.g., Eschleman & LaHuis, 2014; Huxhold,

Table 1. Descriptive Statistics of Study Variables (Weighted)

	Mean (*SD*) or %				
	Overall sample	Men	Women	*T* test	Range
Depressive symptoms (T1)	2.73 (2.31)	2.05 (1.96)	3.27 (2.41)	***	0–12
Depressive symptoms (T2)	2.96 (2.39)	2.31 (2.09)	3.47 (2.49)	***	0–12
Quality of life (T1)	36.25 (6.38)	37.31 (6.04)	35.41 (6.52)	***	12–48
Quality of life (T2)	35.84 (6.61)	36.88 (6.34)	35.02 (6.70)	***	12–48
Life satisfaction (T1)	7.66 (1.77)	7.86 (1.61)	7.50 (1.87)	***	0–10
Life satisfaction (T2)	7.54 (1.84)	7.70 (1.71)	7.42 (1.94)	***	0–10
Scale of social connectedness (T1)[a]	1.74 (0.72)	1.69 (0.73)	1.77 (0.72)	***	0–3
Scale of social connectedness (T2)[a]	1.83 (0.69)	1.80 (0.69)	1.85 (0.68)	**	0–3
Age	73.50 (6.13)	72.81 (5.89)	74.05 (6.27)	***	65–98
Gender (women)	56%				
Education (secondary and above)	48%	58%	41%	***	
Mobility limitations	2.21 (2.49)	1.47 (2.00)	2.80 (2.68)	***	0–10
Recall score	7.98 (3.46)	8.00 (3.30)	7.97 (3.59)	n.s.	0–20

Note: [a]Values are based on manifest mean level variable (not the latent variable); $N = 14{,}706$; $^{**}p < .01$, $^{***}p < .001$.

Table 2. Parameter Estimates for the Full Latent Change Score Model (Weighted)

	Baseline (T1)				Change score (Δ)			
	Social connectedness		Mental health		Social connectedness		Mental health	
	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Social connectedness (T1)			0.14***	0.06	−0.63***	0.02	0.05**	0.07
Mental health (T1)					0.11***	0.01	−0.42***	0.02
Social connectedness (Δ)							0.12***	0.05
Age	−0.04*	0.01	0.14***	0.01	−0.03*	0.01	−0.07***	0.01
Gender (female)[a]	0.12***	0.02	−0.06***	0.12	0.06***	0.02	−0.02	0.12
Education (secondary and above)[a]	0.07***	0.03	0.13***	0.16	0.04**	0.02	0.08***	0.14
Mobility limitations	0.03	0.01	−0.48***	0.04	0.04**	0.01	−0.09***	0.04
Recall score	0.12***	0.01	0.18***	0.02	0.05***	0.01	0.05**	0.02

Note: N = 14,706; [a]Reference categories: gender (male), education (below secondary education); β represents standardized coefficients; $*p < .05$, $**p < .01$, $***p < .001$.

Miche, & Schüz, 2013; Larsen et al., 2015). More specifically, the negative autoregressive coefficients indicate that higher baseline social connectedness is associated with less social growth while better initial mental health prompts fewer increases in mental health (Eschleman & LaHuis, 2014). This stems, presumably, from the assumption that higher baseline scores leave lesser room for improvement.

Since a bidirectional association was found between social connectedness and mental health, we tested our first hypothesis to examine which direction of association was larger. For that purpose, we imposed equality constraints on the directional regression weights and compared their fit to nonconstrained models. The constraints led to deterioration in model fit ($\Delta\chi^2(1) = 9.26$, $p = .002$), indicating no equality between the two paths. Mental health was thus found to have a somewhat larger influence on change in social connectedness than the corresponding influence of social connectedness on mental health, in the opposite direction to our hypothesis. This is also demonstrated by the larger standardized coefficient of this direction of influence (Kline, 2011), as seen in Table 2.

We next examined our second hypothesis, to see whether the cross-lagged associations varied across gender. Gender groups were found not to differ in the association between baseline mental health and change in social connectedness ($\Delta\chi^2(1) = 1.7$, $p = .19$). The relationship between social connectedness and change in mental health also did not differ across the gender groups ($\Delta\chi^2(1) = 0.7$, $p = .42$). However, we note that gender was related to baseline social connectedness and mental health, as can be seen in Table 2. Women had higher social connectedness and lower mental health. Additionally, women reported an expansion of their social networks over time, while gender was not related to changes in mental health.

Discussion

The current study sought to elucidate the causal links between older adults' social networks and their mental health. It disentangled this complex relationship by employing a longitudinal model which distinguished between the influence of social networks on mental health and the opposite direction of mental health influencing social networks. The study's findings indicate a reciprocal relationship between the two constructs. Moreover, they show that although both directions are meaningful, the influence of mental health over social networks is somewhat larger than that of social networks on mental health. The effect of mental health on social networks did not differ by gender.

Our first hypothesis, that the effect of social networks on mental health will be greater than the opposite direction, was not supported by the study's findings. The analysis showed that the effect of mental health on social networks is actually somewhat larger. This highlights a less explored explanation to the association of social networks and mental health and stresses the need to take the latter's impact into account. The effect of mental health should thus be considered both when studying the influence of social relationships on mental health, and when devising interventions for older adults. This finding may signal that interventions for the older population should stress the need to improve the way one feels as a precursor to bettering his or her social connectedness. Mental health may impact social ties through several avenues, such as the perception, interpretation and performance in social situations (Tse & Bond, 2004), leading to the development of a negative ego-centric point of view that entails a rejection of meaningful others (McCullough, 2003).

However, we note that the second direction of association was also significant, such that older persons embedded in richer networks experienced improved mental health in comparison to those who were less socially connected. This corroborates the perception of social networks as promoting successful aging and the convoy model's premise regarding their influence on mental health changes that occur in later life (Antonucci et al., 2014). Moreover, the finding of a reciprocal association suggest that older people may

face the danger of entering a "vicious cycle," in which those who are embedded in a less supportive social environment may feel isolated and deteriorate in their psychological health. Their worse mental state may in turn cause further social withdrawal, possibly generating more adverse effects on their mental health (Li & Zhang, 2015). In accordance with the convoy model's life-span perspective, such developments may be particularly pronounced in the face of life challenges that occur in old age (Antonucci et al., 2004). Events such as retirement and illness may trigger such a "cycle," leading to losses of both mental and social resources. However, on a more positive note, an intervention concerning only one of these resources may trigger an opposite cycle, in which improvements in the mental and social realms will boost each other.

Our second hypothesis, that the reciprocal effects will be moderated by gender, was also not confirmed. Our analyses showed that women were more likely to have higher social connectedness, a tendency which increased with time, similarly to previous findings (Antonucci et al., 2004). They were also shown to report worse mental health, although this tendency did not persist over time. However, despite these gender differences, women did not differ in the nature of the reciprocal associations of social connectedness and mental health. Thus among both men and women, those who are at a worse mental state face the danger of dwindling social ties, and vice versa. Women, however, may be at a particularly greater risk of entering such a "cycle," due to their tendency to experience worse mental health.

The current study also indicated that social connectivity and mental health changes are influenced by various sociodemographic and health factors. It was found that mental health improved among those with more resources and with better health overall. Specifically, those in the present study who were younger, more educated, and in better physical and cognitive state reported better psychological well-being over time. This underscores that mental health is influenced by a variety of factors.

It was also found that social network connectedness improved over time among younger adults, those who had more education and a better recall score. However, worse physical health at baseline was also related to improvements in social connectedness. This raises the possibility that the improvement in connectedness stems from the social network's mobilization to support the older individual in his or her time of need.

The present study has a few limitations that should be noted. First, our analysis was based on two waves of data collection. While this allowed us to make a valuable distinction between parallel change processes, having additional waves of data collection would have allowed for a broader causal model and discovery of different patterns of influence. Since SHARE currently has only two waves of social network data available, our analysis is limited to a two-wave causal model. Future studies may broaden our findings and detail more elaborate processes. Another limitation is our assessment of changes that occur in a span of approximately 4 years. A longer time period may have allowed us to track more extensive changes that take place following detrimental shifts in ones' life. For example, individuals are more likely to undergo health deterioration within longer time periods, possibly leading to more extensive changes in their social environment (Shaw, Krause, Liang, & Bennett, 2007). Nonetheless, as our analysis shows, a 4-year interval can suffice to track changes in older adults' lives.

A point of strength of our study is that the findings are based on latent factors that take into account several dimension of social networks and mental health. Using a composite measure allows for a more general overview of the phenomenon while taking into account its various dimensions. Moreover, latent factors enable an examination of these constructs without measurement error (Kline, 2011). On the other hand, we must remember that mental health and social networks are both complex, multidimensional constructs (Keyes, 2005). According to the convoy model, individuals' close social relationships vary in their closeness, quality, function, and structure (Kahn & Antonucci, 1980), and these various aspects were found elsewhere to differ in their associations with mental health (Pinquart & Sörensen, 2000). Furthermore, the associations with mental health may also differ according to the composition of the network

Future investigation may add valuable insight to the current findings by examining whether the somewhat larger impact of mental health is found equally for kinship and friendship ties as well as among the different aspects of social networks, namely, their quality and structure. Therefore, while we have asserted a general reciprocal association between these constructs, future studies may tease apart their components and examine their inter-associations from a more fine-grained perspective. Moreover, we should also add that our conclusions need to be considered with some degree of caution. This is because our results are based on a specific set of variables which may be sensitive to how the survey questions were constructed and how the scales were developed. Future research may expand upon our findings using different data sets and different measurements.

Overall, our study represents an effort to better understand the mutual association of social networks and mental health. We showed the reciprocal nature of this association, such that higher social connectedness facilitates mental health improvements, and at the same time, psychological health is linked even more to gains in the close social milieu. These findings elucidate the dynamic and inter-dependent nature of the aging process and provide a more complex picture of the association between social networks and mental health than has been presented thus far. The results of this study also point to the importance of developing interventions that assist older adults as they face the challenges of aging by highlighting the reciprocal consequences of improving either psychological health or social connectedness.

Supplementary Material

Supplementary data is available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Author Contributions

E. Schwartz designed the study, constructed the analytic sample, performed the statistical analyses, and wrote the paper. H. Litwin gave critical comment and edited the paper.

Conflict of Interest

None reported.

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