Psychological well-being and day-to-day social interaction among older adults

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Abstract

A sample of 113 healthy older adults used a variant of the Rochester Interaction Record to describe the social interactions they had each day for two weeks. They also completed various measures of psychological well-being including life satisfaction and loneliness. A series of multilevel random coefficient analyses found that life satisfaction scores were positively related to how enjoyable interactions were, how self-assured people felt when interacting, how much control they felt they had over interactions, how responsive others were to their needs, and how socially active they were. Analyses that took participants' marital status into account suggested, however, that interaction outcomes and life satisfaction were related only for married participants, and that these relationships were primarily due to interaction outcomes with spouses.

There is broad agreement across various theoretical perspectives that psychological well-being is positively related to the quality and quantity of people's relationships, a contention that is supported by a considerable body of research. People who report having more satisfying and active social lives tend to report feeling better about themselves and their lives. Despite this broad agreement, much of the research on this topic (particularly research about older adults) suffers from a potential shortcoming: reliance on a single retrospective report of social relationships and activity. Although such retrospective reports may be valuable for many purposes, frequently people are asked to describe a potential myriad of events occurring over a lengthy period of time, and the aggregation this requires can create numerous problems and confounds.

The present study was designed to complement existing research on well-being and sociality while avoiding the potential problems associated with single, retrospective measures of sociality. Participants in the study, a sample of healthy older adults, described the social interactions they had each day for two weeks using a variant of the Rochester Interaction Record (RIR; Wheeler & Nezlek, 1977). These daily reports provided measures of two distinct characteristics of daily social interaction, quality and quantity, and relationships between measures of these two characteristics and various measures of well-being were examined. The primary hypothesis guiding the study was that well-being would be positively related to the *quality* of participant's social lives.

The importance of daily social interaction for understanding the well-being of older adults was suggested in part by Carstensen's (1995) socioemotional selectivity theory. She argued that older adults are more motivated than young people to regulate emotions during social interactions. Selecting close others for

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interaction and limiting the size of social networks are strategies that older adults may use to regulate their emotional experience during social interaction. Thus, we would expect older adults to try to limit their interactions to those that they expect to be rewarding and for their well-being to be related closely to the quality of their interactions.

In a study of social network predictors of social and emotional loneliness among young and older adults, Green, Richardson, Lago, and Schatten-Jones (2001) found support for hypotheses developed from socioemotional selectivity theory. Although size of the social network was an important predictor of social loneliness for young adults, it did not relate to either form of loneliness among older adults. Moreover, the presence or absence of a romantic partner in the social network was a more important predictor of emotional loneliness for older adults than for younger adults, attesting to the particular importance of relationships with close others to the well-being of older adults.

The present study examined the relationships between well-being and day-to-day social interaction among older adults for two other reasons. First and primarily, few studies of the day-to-day social interactions of older adults have used an intensive repeated measurement technique such as the RIR. This means that conclusions about relationships between well-being and sociality among older adults have been based on the results of research using single, retrospective reports of social life (what we will refer to as *single measure studies*). Second, existing research and theory (concerning both the elderly and the nonelderly) provide an ambiguous description of relationships between social activity and well-being. Some research suggests a positive relationship, some suggests no relationship, and, to make matters more confusing, some theories about the elderly, such as disengagement approaches (e.g., Cummings & Henry, 1961), suggest negative relationships.

Sociality and well-being in the elderly

Research on relationships between well-being and sociality in older adulthood suggests that well-being (measured in various ways) is positively related to both the quantity and quality of social interaction. Greater social activity, such as participation in clubs, community organizations, recreational activity, and the like, has been found to be associated with greater well-being (e.g., Graney, 1975; Harlow & Cantor, 1996). Similarly, frequency of interaction or contact with others, particularly friends, has also been found to be positively related to well-being and negatively related to loneliness (e.g., Larson, 1978; Lee & Ishii-Kuntz, 1988).

Other research suggests that quality of interaction is also related to well-being. For example, individuals who report lower quality relationships also report lower levels of life satisfaction (e.g., O'Connor, 1995). Similarly, greater satisfaction with the quality of relationships is associated with decreased feelings of loneliness and depression (e.g., Mullins & Dugan, 1990) and increased well-being (e.g., Fox & Gooding, 1998; Ishii-Kuntz, 1990). Similar results have been found in other studies of well-being in the elderly (e.g., Beckman, 1981; Ward, Sherman, & LaGlory, 1984).

Although the results of this research are fairly consistent, the vast majority of these studies have used single, retrospective measures of quality and quantity of social interaction. Such retrospective measures may not be accurate because the descriptions they provide of both quantity and quality of interaction may be influenced by various factors other than interaction per se, such as the salience of more recent or more meaningful events or people's schemas (e.g., Ross, 1989; Wheeler & Reis, 1991). Thus, measures requiring such implicit aggregation may provide different descriptions than those provided by measures requesting judgments of more specific situations over relatively short periods of time, descriptions less likely to be influenced by factors other than the characteristics of the social interactions themselves.

Day-to-day social interaction and well-being among the nonelderly

Relationships between sociality and well-being have also been studied extensively in

the nonelderly, and some of this research suggests that well-being is positively related to how socially active the nonelderly are (e.g., O'Connor, 1995) and to the quality of their relationships (e.g., Diener & Diener, 1995; McDonough & Munz, 1994). Nevertheless, similar to research on older adults, these results need to be viewed cautiously because of the potential difficulties associated with the use of single measures of social interaction. In fact, the results of studies of the nonelderly that have used social interaction diaries differ in important ways from the results of single measure studies. Much of the research not relying on single measures has used variants of the RIR, and the results of these studies suggest that relationships between social interaction and well-being are somewhat different (and more complex) than the relationships suggested by single measure studies.

In general, and similar to single measure studies, social interaction diary research suggests that relationships between quality of interaction and well-being are positive. For example, Wheeler, Reis, and Nezlek (1983), in a study of collegians, found that loneliness was negatively related to the quality of day-to-day interactions. Similarly, studies of relationships between depression and day-to-day social interaction have tended to find negative relationships between depressive symptoms and quality of interaction for both collegians (Nezlek, Imbrie, & Shean, 1994; Zuroff, Stotland, Sweetman, Craig, & Koestner, 1995) and adults living in the community (Nezlek, Hampton, & Shean, 2000). Finally, in a sample of adults in their mid-twenties and early thirties, Nezlek and Reis (1999) found that quality of social interaction was positively related to a well-being construct that included various measures of adjustment and well-being.

In contrast, the results of studies of relationships between quantity of interaction and well-being that have relied on social interaction diaries have not been consistent. For example, Wheeler et al. (1983) found that loneliness was negatively related only to the quantity of interaction with women (for both men and women). There was no relationship between loneliness and quantity of interaction with men for either men or women. The results of diary studies examining relationships between depression and interaction quantity have also been inconsistent. For example, Zuroff et al. (1995) found a positive relationship between dependency and quantity of interaction (i.e., number of interactions per day) but found no relationship between self-criticism and quantity of interaction. Nezlek et al. (1994, 2000) and Nezlek and Reis (1999) found no relationship between quantity of interaction and depression or well-being. Finally, in a review of research on loneliness, Marangoni and Ickes (1989) concluded that "*qualitative* considerations are more important than *quantitative* considerations in mediating the relationship between social network variables and the experience of loneliness" (p. 97).

Interactions with different relational partners

The previous discussion has focused on social interaction at a general level, and social interaction can be differentiated in terms of various characteristics. One of the most important of these is the presence or absence in interactions of different types of close others such as spouses, friends, relatives, and so forth. Unfortunately in this regard, many of the studies that have used intensive repeated measures techniques such as the Rochester Interaction Record have studied collegiate samples and have therefore studied interactions involving a relatively limited variety of relational partners, typically close same-sex friends and romantic partners. Keeping such a limitation in mind, such studies have suggested that the absence or presence of different relational partners (such as best friends or romantic partners) is related to interaction outcomes such as satisfaction, intimacy, and self-presentational concerns (e.g., Leary et al., 1994; Nezlek, 1995; Wheeler & Nezlek, 1977). These studies have suggested that interaction outcomes associated with the absence or presence of different relational partners may in turn be differentially related to more dispositional measures such as depressive symptoms (Nezlek et al., 1994) and that, at least among collegians, romantic partners are one of the more important relational partners in this regard.

Of particular relevance to our concerns, Nezlek et al. (2000), one of the few studies that used an intensive repeated measures method (the RIR) to examine the day-to-day social interactions of adults (with numerous types of relationships), found that relationships between depression and interaction outcomes varied as a function of the relational partners present during an interaction. For example, the intimacy of interactions that participants had with strangers did not vary as a function of whether participants were clinically depressed or not, whereas the intimacy of interactions with spouses did. The spousal interactions of the depressed were less intimate than those of the nondepressed.

Research on day-to-day social interaction suggested that it was important to consider the absence or presence of different relational partners when examining interaction outcomes. We reckoned that differentiating interactions as a function of the presence or absence of spouses, friends, and relatives would be sensitive to important differences while not being so detailed as to be impractical. Such a scheme is similar to that used by Nezlek et al. (2000) except that Nezlek et al. differentiated interactions at work from those in other contexts, a distinction that was not appropriate for this study because the participants were retired. Given the importance of interactions with romantic partners in studies of the day-to-day interactions of collegians (e.g., Nezlek, 1995), the importance of interactions with spouses in the studies of the day-to-day interactions of adults (Nezlek et al., 2000), and the importance of the quality of marital relationships in studies of well-being (e.g., Gove, Hughes, & Style, 1983), we expected that interactions with spouses would be related more closely to well-being than interactions with other relational partners. It is important to note that this prediction is also consistent with Carstensen's (1995) socioemotional selectivity theory.

To summarize, a sample of elderly participants used a standardized form to describe the social interactions they had each day, and they provided various measures of their psychological well-being. We expected that well-being would be positively related to the socioemotional rewards people derived from their interactions, although we had no clear expectations regarding relationships between quantity of interaction and well-being. Moreover, we expected that well-being would be more closely related to quality of interactions with spouses than to quality of interactions with other relational partners.

Method

Participants

Participants were 131 older adults from the local community who had read about the study in local newspaper stories or were recruited through lifelong learning classes.[1] Interested older adults contacted us by telephone and were given a general description of the project. If they continued to express interest, they were asked to come to the university for an orientation session. Of those who came to the orientation, 90% completed the study.

Measures of well-being and loneliness

Participants completed two measures of psychological well-being, the Life Satisfaction Index A (LSIA; Neugarten, Havighurst, & Tobin, 1961) and the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The LSIA is a well-established measure of subjective well-being among older adults that consists of 20 agree-disagree items intended to measure global well-being (e.g., "This is the dreariest time of my life"). This scale was designed to obtain the individual's own evaluations of global life satisfaction, independent of level of social activity, and was designed for use with senior citizens. The SWLS consists of five items intended to assess life satisfaction (e.g., "I am satisfied with my life") and has been used widely with nonelderly populations.

Participants also completed two measures of loneliness, the UCLA Loneliness Scale

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1. Unfortunately, the data describing how participants came to know of the study were lost. Nevertheless, it was clear from participants' comments that the vast majority of them had heard of the study from newspaper articles and were self-referred.

(Russell, Peplau, & Cutrona, 1980) and the Emotional and Social Loneliness Scale (ESLS; Wittenberg, 1986). The UCLA scale consists of 20 items (e.g., "How often do you feel in tune with others?") and provides one overall score. The ESLS consists of 10 items, five of which measure social loneliness (e.g., "I belong to a network of friends") and five of which measure emotional loneliness (e.g., "I don't have one specific relationship in which I feel understood"). Recent work has suggested that the concept of emotional loneliness is particularly important for older adults (Green, Richardson, Lago, & Schatten-Jones, 2001; Mullins & Dugan, 1990).

Measure of social interaction

Social interaction was measured using a version of the Rochester Interaction Record (Wheeler & Nezlek, 1977). Similar to most studies using the RIR, participants described those with whom they had interacted (using initials), and described the sex, age, and relationship they had with each person, for up to three different people. For interactions involving more than three others, respondents simply reported how many women and men were present. The length of each interaction was recorded, along with the date, time, place, and activity.[2]

Participants evaluated each interaction on five measures: enjoyableness, intimacy, how self-assured they felt, how responsive the others were to them, and how much influence they felt they had during the interaction. These ratings were made on 9-point scales (1 = *not*, 3 = *slightly,* 5 = *somewhat,* 7 = *quite,* 9 = *very*). These five dimensions were selected because they represented two basic dimensions of interaction, socioemotionality and instrumentality (e.g., Bales, 1950). Intimacy, enjoyment, and responsiveness assessed the socioemotional dimension of interaction, and the confidence (i.e., self-assurance) and influence ratings assessed the instrumental dimension of interaction.

Procedure

Participants attended a half-hour orientation session in groups of 2 to 6. During this session, participants were told that the study concerned older adults' patterns of social interaction and that they would use a structured diary form to describe their social interactions. If they agreed to participate, they completed measures of loneliness and life satisfaction and received instructions for completing the Rochester Interaction Record. Participants were told to use the RIR to describe every social interaction they had that lasted 10 minutes or longer. An interaction was defined as any encounter in which the participants attended to one another and adjusted their behavior in response to one another. They were instructed to fill out the forms as soon as possible after an interaction. To increase compliance, a research assistant called the volunteers approximately twice a week to remind them to fill out their forms and to answer any questions that may have arisen. They also completed some questionnaires at home during this time.

After maintaining the diary, respondents attended a final session in which they returned questionnaires and interaction records and were debriefed. During this session, participants were interviewed about their experience in maintaining the diary. They indicated how difficult it was to maintain the diary, how much time they spent completing the records each day, when they completed the records (e.g., after each interaction, at the end of the day), the percentage of interactions they might not have recorded, the degree to which keeping the records interfered with their daily lives, and the degree to which maintaining the records made them think about their lives in ways they might not have otherwise. In addition, participants' interaction records were examined by a research assistant to ensure that they had been filled out properly. The assistant noted any irregularities and questioned participants about them.

2. Similar to past research using the RIR, interactions longer than 300 minutes (less than 2% of the total) were divided into shorter, sequential interactions. The total time of these interactions equaled the length of the original interaction, and all information from the original interaction was repeated for each shorter interaction.

Maintenance of the records

Post-study interviews and inspection of the diaries suggested that the majority of the participants followed instructions. They reported little difficulty maintaining the diary ($M = 2.10$, $SD = 1.87$, on a 1–9 scale), and they reported missing only 10% of their interactions during the two weeks. They estimated spending an average of 11 minutes per day updating the records and reported that they had updated the records approximately 1.5 times per day. Although participants indicated that keeping the records made them think about their lives differently to some extent ($M = 4.84$, $SD = 2.83$, on a 1–9 scale), they did not think that keeping records interfered with their lives ($M = 1.32$, $SD = .74$, on a 1–9 scale). These reports are very similar to the poststudy descriptions provided by participants in other RIR studies.

Data from 18 participants were dropped from the analyses because their debriefing and an inspection of their diaries indicated that they did not maintain the diary accurately. Participants who were dropped did not differ significantly from those who were retained in terms of level of education, marital status, gender, age, ethnicity, religion, self-reported physical health, or financial or residency status (full-time Florida resident versus part-time Florida resident). The remaining 113 participants maintained the diary for an average of 14.75 days ($SD = 2.72$) and described a total of 5,063 interactions over 1,667 days. A description of the final sample is presented in Table 1.

Results

Overview of analyses

In most previous research using diaries such as the RIR, summary measures of interaction quantity and reactions to interaction (usually within-person means) have been analyzed using OLS-based (ordinary least squares) techniques such as ANOVA or correlation. For example, average number of interactions per day and average enjoyment in interaction have been correlated with other individual difference measures, and group differences in

Table 1. *Sample demographics*

Age	71.2 (6.4)
Sex	
Men	32
Women	81
Education	
Less than high school	1
High school	23
Vocational/technical school	3
Some college	30
College degree	18
Grad. degree or school	37
Unknown	1
Marital status	
Unmarried	45
Married	68
Residence	
Part time	19
Full time	94
Religion	
Jewish	86
Protestant	18
Catholic	4
Other	4

such averages have been examined. These procedures and a rationale for them were introduced by Wheeler and Nezlek (1977) and were discussed in detail by Nezlek and Wheeler (1984). Although such procedures have been used successfully in various studies, multilevel random-coefficient modeling procedures are now available that provide important advantages over such OLS procedures (Bryk & Raudenbush, 1992; Kreft & de Leeuw, 1998). Moreover, these advantages are pronounced for data structures in which units of analysis have different numbers of observations, such as different numbers of interactions for individuals.

The data collected in the present study were analyzed with a random coefficient modeling technique known as hierarchical linear modeling (HLM, version 4.03; Bryk, Raudenbush, & Congdon, 1998). These analyses had the same target of inference as the OLS analyses used in the past, but they provided more accurate parameter estimates. One set of

analyses examined reactions to interactions (which we refer to collectively as *measures of the quality of interactions*), and a second examined quantity of interaction. Reactions to interactions were conceptualized as interaction level phenomena, and interactions were analyzed as nested within participants. Quantity of interaction was conceptualized as a day level phenomenon, and days were analyzed as nested within participants. Other applications of using HLM to analyze RIR data can be found in Nezlek (1999) and Nezlek et al. (2000), and a discussion of using multilevel random coefficient modeling to analyze social interaction diary data can be found in Nezlek (2001a). Models and equations are described using the nomenclature used by Bryk and Raudenbush (1992).

In these analyses, interaction and day level phenomena were modeled at what is called level 1 in multilevel terminology, and interactions and days were units of analysis at level 1. In turn, individual differences in interaction and day level phenomena were analyzed at what is called level 2, and the individual participant was the unit of analysis at level 2. Coefficients were estimated for each participant that represented within-person means of interaction variables. In multilevel terminology, a level 1 model was estimated for each level 2 unit. The basic level 1 model was

$$y_{ij} = \beta_{0j} + r_{ij}.$$

In these models, β_{0j} was a random coefficient representing the mean of y_{ij} across all observations (interactions or days, subscripted i) for each participant (subscripted j), and r_{ij} represented error. For analyses of reactions to interaction, β_{0j} represented an individual's mean enjoyment, intimacy, influence, self-assuredness, or responsiveness, and for analyses of interaction quantity, β_{0j} represented an individual's mean for a measure of quantity such as number of interactions per day.

Relationships between social interaction and the loneliness and life satisfaction measures were examined by analyzing the variability of the coefficients from the level 1

models (β_{0j}s) at level 2. These analyses had the same target of inference as OLS regression analyses using within-person means as dependent measures. The basic level 2 model was

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Well–being}) + u_{0j}.$$

The γ_{01} coefficient (well-being) represented the effect for a particular measure of well-being, and u_{0j} represented error.

Well-being and measures of all interactions

Understanding the results of HLM analyses requires knowing the distribution of the variables being analyzed, and descriptive statistics for measures of well-being and of all interactions are presented in Table 2. For measures of well-being, reliabilities are Cronbach's alphas, and for measures of social interaction, reliabilities represent the ratio of true to total variance of an effect (Bryk & Raudenbush, 1992, pp. 39–40).

The first set of analyses examined relationships between well-being and all the interactions a person described, and the results of

Table 2. *Descriptive statistics for measures of well-being and all interactions*

	Mean	SD	Reliability
Well-being			
SWLS	24.3	6.3	.87
LSIA	13.5	3.9	.59
UCLA loneliness	41.4	6.9	.88
Social loneliness	12.4	2.0	.83
Emotional loneliness	10.4	3.9	.69
Interaction quality			
Enjoyment	7.19	.83	.91
Responsiveness	7.24	.87	.93
Intimacy	5.87	1.50	.96
Self-assuredness	7.58	.88	.95
Influence	6.46	.99	.93
Interaction quantity			
Interactions per day	3.04	1.41	.93
Time per day	268	119	.90

Table 3. *Relationships between well-being and measures of all interactions*

		SWLS	LSIA	UCLA	SCL	EML
Enjoyment	Coefficient	.24	.26	−.14	−.05	.00
	t-ratio	3.01**	3.21**	1.71[a]	<1	<1
Responsive	Coefficient	.21	.17	−.14	−.10	−.08
	t-ratio	2.48*	1.97*	1.62[a]	<1	<1
Intimacy	Coefficient	−.02	−.03	.08	.11	.20
	t-ratio	<1	<1	<1	<1	<1
Self-assured	Coefficient	.20	.11	−.19	.00	−.04
	t-ratio	2.35*	1.34	2.31*	<1	<1
Influence	Coefficient	.22	.24	−.20	−.17	−.07
	t-ratio	2.28*	2.49*	2.06*	1.72[a]	<1
Interactions per day	Coefficient	.39	.31	−.28	−.35	−.30
	t-ratio	2.97**	2.30*	2.06*	2.59**	2.22*
Time per day in interaction	Coefficient	43	37	−22	−32	−21
	t-ratio	3.86**	3.27**	1.91[a]	2.73**	1.76[a]

Note. SWLS = Satisfaction with Life Scale; LSIA = Life Satisfaction Index A; EML = Emotional loneliness; SCL = Social loneliness; UCLA = UCLA loneliness.
* $p < .05$. ** $p < .01$. [a] $p < .10$.

these analyses are summarized in Table 3.[3] Of the five measures of well-being, the SWLS was the measure that was the most reliably related to interaction quality and quantity. SWLS scores were positively related to how enjoyable participants found their interactions, how responsive they felt others were, how self-assured they felt, how much influence they felt they had, and how socially active they were.

These relationships can be understood using predicted values. The coefficients from HLM analyses are interpreted like coefficients from a regression analysis. For example, for every 1 *SD* change in SWLS, mean enjoyment changed .24. The predicted mean enjoyment for a person 1 *SD* above the mean on SWLS was 7.43 (7.19 + .24), and the predicted mean enjoyment for a person 1 *SD* below the mean was 6.95 (7.19 − .24). Relationships between interaction and LSIA scores were similar to

the relationships between interaction and SWLS scores, not surprising given that the correlation between SWLS and LSIA scores was .74. Predicted values for all relationships can be calculated using the coefficients presented in Table 3 and the means presented in Table 2. In general, participants who reported being more satisfied with their lives had more rewarding interactions and spent more time with other people than participants who were less satisfied.

Although relationships between loneliness and social interaction were in the expected direction, they were not as reliable as relationships between life satisfaction and interaction. Social and emotional loneliness were not significantly related to any measure of interaction quality, and loneliness as measured by the UCLA scale was significantly (negatively) related to only self-assuredness and influence. Although the negative relationships between loneliness and social interaction quantity were statistically reliable (or approached conventional levels of significance), these relationships were not as reliable as the relationships between quantity and life satisfaction.

To compare the predictive power of measures of life satisfaction and loneliness,

3. To eliminate the influence on parameter estimates of differences in variances of different measures of well-being, all measures of well-being were standardized for these analyses. Unstandardized scores are presented in Table 2.

follow-up analyses were conducted in which measures of interaction were modeled as a joint function of a measure of satisfaction and a measure of loneliness. For example, enjoyment in interaction was modeled as a joint function of SWLS and UCLA loneliness. These analyses suggested that relationships between loneliness and interaction were subsumed by relationships between life satisfaction and interaction. In almost all of these analyses, coefficients for life satisfaction either changed less than coefficients for the loneliness measures or coefficients for life satisfaction remained significant whereas coefficients for loneliness did not. Across these additional analyses, coefficients for SWLS scores changed less than coefficients for LSIA scores. Accordingly, the remaining analyses operationally defined well-being in terms of SWLS scores.[4]

Marital status and interactions with different relational partners

Additional analyses were done to determine if well-being effects were confounded with or moderated by sex or marital status. The logic of these analyses was the same as the logic of stepwise regression. Marital status and sex were represented with effect-coded $(1, -1)$ variables, and interactions between these characteristics and measures of well-being were represented by multiplying measures of well-being and these effect-coded variables. Well-being was entered into the model first, and variables representing marital status and sex and their interaction with well-being were entered next.[5]

For example, to determine if well-being effects were confounded with or moderated by participant marital status the following level 2 model was tested:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Well-being}) + \gamma_{01}(\text{Status})$$
$$+ \gamma_{01}(\text{WB-Status}) + u_{0j}.$$

The γ_{01} coefficient (well-being) represented the well-being effect, the γ_{01} coefficient (status) represented the marital status effect, the γ_{01} coefficient (WB-status) represented the interaction between well-being and marital status, and u_{0j} represented error.

These analyses produced only one significant effect for marital status ($p = .05$). On average, married participants felt less self-assured (7.38 versus 7.72) than unmarried participants. The main effect for marital status did not approach conventional levels of significance in the analyses of the other variables ($ps > .10$). This main effect was qualified, however, by a significant interaction of SWLS scores and marital status, an effect that was also found in the analyses of enjoyment and responsiveness (all $ps < .05$). The interaction took the same form in all three analyses. The effect for SWLS was much larger for those who were married than it was for those who were not married. For married participants, predicted values for

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4. The centrality of life satisfaction scores (particularly the SWLS) was also suggested by a factor analysis of the two satisfaction and three loneliness measures. This analysis produced one factor on which SWLS had the highest loading (.87), the LSIA had the second highest loading (.81), and the loneliness measures were lower (UCLA, −.67; Emotional, −.49; Social, −.47). Moreover, this factor was significantly related to interaction measures in the same way and with the same strength as SWLS scores. Some might argue that such a factor should be the focus of the analyses instead of a single scale. We chose not to present the analyses with that emphasis because the factor reflected the satisfaction measures much more than it reflected the loneliness measures. We felt that results relying on a factor that combined loneliness and satisfaction (no matter what the relative weight assigned to each) would tend to overstate the importance of relationships between loneliness and interaction, relationships that in and of themselves were either not reliable or not distinct from relationships between interaction and life satisfaction.

5. A series of two (marital status) by two (gender) ANOVAs of the measures of well-being produced significant effects only for the analysis of emotional loneliness. The main effects for status and gender ($ps < .05$) were qualified by a significant status by gender interaction ($p = .06$). Single women ($M = 2.7$) were more emotionally lonely than married women ($M = 1.8$) and single and married men ($Ms = 1.9, 1.7$ respectively). No main effects or interactions approached conventional levels of significance in the analyses of the other measures of well-being (all $ps > .10$).

Table 4. *Reactions to all interactions as joint effect of marital status and SWLS scores*

	Married		Not married	
	Low SWLS	High SWLS	Low SWLS	High SWLS
Enjoyment	6.62	7.50	7.20	7.28
Self-assured	7.04	7.83	7.63	7.67
Responsiveness	6.68	7.56	7.28	7.30

those high and low in SWLS (±1 *SD*) differed by close to a full scale point (e.g., enjoyment differed by .88), whereas for unmarried participants predicted values differed by less than .2 scale points (e.g., enjoyment differed by .08). Predicted values illustrating this interaction are presented in Table 4.[6]

The interactions of marital status and SWLS left open the possibility that interactions with spouses were responsible for the SWLS effect for married participants. The defining differences between married and unmarried participants were the existence of a spouse and interactions with spouses. By design, the previous analyses described relationships between well-being and all interactions. The analyses were not sensitive to how such relationships might vary when interactions with specific relational partners were examined separately. Participants described up to three different individuals present during an interaction, including the relationship (spouse, friend, or family member) they had with each person. This meant that a specific interaction could simultaneously involve different relational partners and could be considered to be an interaction with any of the partners who were present during an interaction. To avoid difficulties in interpreting the coefficients estimated by analyses relying on such simultaneous multiple classification, a series of analyses were done using interactions involving one other person (dyads), and dyads accounted for 61% of all interactions.

Each of the five ratings was modeled as a function of a series of dummy-coded (0, 1) variables representing the presence or absence of a specific type of co-interactant (spouse, friend, family member, or other). For example, if a spouse was present, the Spouse variable was set to 1. If a spouse was not present, the Spouse variable was set to 0. Separate analyses were conducted for married and unmarried participants because if married and unmarried participants were analyzed together, unmarried participants would have contributed to the estimates of spousal effects.[7] There were 1,746 dyadic interactions for the 66 married participants, and 1,338 dyadic interactions for the 47 unmarried participants. The following zero-intercept level 1 models were used:

$$
\text{Married:} \quad y_{ij} = \beta_{1j}(\text{Spouse})
$$
$$
+ \beta_{2j}(\text{Friend})
$$
$$
+ \beta_{3j}(\text{Family})
$$
$$
+ \beta_{4j}(\text{Other}) + r_{ij}.
$$

$$
\text{Not Married:} \quad y_{ij} = \beta_{1j}(\text{Friend})
$$
$$
+ \beta_{2j}(\text{Family})
$$
$$
+ \beta_{3j}(\text{Other}) + r_{ij}.
$$

Deleting the intercept meant that each coefficient represented the mean rating for interactions involving a specific relational

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6. The same interaction occurred when factor scores were used.

7. For a rationale for such tests, see Bryk and Raudenbush (1992, pp. 48–52), and for a discussion of their use in analyzing social interaction diary research see Nezlek (2001a).

Table 5. *Relationships between SWLS scores and reactions to interactions with different relational partners for married participants*

		Spouse	Friend	Family	Other
Enjoyment	Intercept	6.84	6.96	7.29	5.88
	SWLS coefficient	.74	.26	.35	.19
	t-ratio	4.10**	1.62	1.93[a]	<1
Intimacy	Intercept	6.36	5.75	6.71	4.24
	SWLS coefficient	.53	−.09	.16	−.07
	t-ratio	2.10*	<1	<1	<1
Responsiveness	Intercept	7.01	7.41	7.45	6.97
	SWLS coefficient	.82	.38	.35	.28
	t-ratio	5.08**	2.88**	2.27[a]	2.98*
Self-assured	Intercept	7.24	7.62	7.64	7.09
	SWLS coefficient	.68	.34	.27	.23
	t-ratio	4.37**	2.55**	1.74[a]	1.38
Influence	Intercept	6.45	6.54	6.23	5.84
	SWLS coefficient	.59	.35	.27	.31
	t-ratio	3.41**	2.20*	1.47	1.52

* $p < .05$. ** $p < .01$. [a] $p < .10$.

partner. The Spouse coefficient represented the mean for interactions with spouses and so forth. Relationships between these coefficients and SWLS were then analyzed at level 2 with models similar to those used in the previous analyses.

These analyses indicated that relationships between SWLS scores and reactions to interactions for married participants were much stronger for interactions with spouses than for interactions with other relational partners. For interactions with spouses, the SWLS coefficient was significant in the analyses of all five reactions, including intimacy, for which there was no significant relationship in any of the previous analyses. In contrast, for interactions with family members, the SWLS coefficient only approached conventional levels of significance for enjoyment, responsiveness, and self-assuredness, and for interactions with friends, the SWLS coefficient was significant for responsiveness, self-assuredness, and influence. These results are summarized in Table 5.

The importance of interactions with spouses was highlighted also by the fact that the SWLS coefficient for spouses was significantly larger than the average of the other three SWLS coefficients for the analyses of enjoyment ($\chi^2(1) = 6.32$, $p = .01$), responsiveness ($\chi^2(1) = 7.83$, $p < .01$), intimacy ($\chi^2(1) = 4.68$, $p < .05$), and self-assuredness ($\chi^2(1) = 6.01$, $p = .01$).[8] Moreover, even though the SWLS coefficients for responsiveness and self-assuredness were significant for interactions with friends, the SWLS coefficients for interactions with spouses were significantly larger ($\chi^2(1) = 6.86$, $p < .01$; $\chi^2(1) = 5.25$, $p < .05$, respectively).

As suggested by the previous analyses of all interactions, for unmarried participants there were no significant relationships between SWLS scores and ratings of interaction with any relational partner (friend, family, or other). The results of these analyses are presented in Table 6.

To determine if the above-described relationships between SWLS and reactions to interactions with different relational partners varied as a function of participant gender, a

8. For a discussion of specific issues relevant to estimating coefficients for interactions with different relational partners, see Nezlek (2001a) and Nezlek et al. (2000).

Table 6. *Relationships between SWLS scores and reactions to interactions with different relational partners for unmarried participants*

		Friend	Family	Other
Enjoyment	Intercept	7.27	7.54	5.71
	SWLS coefficient	.08	−.06	−.03
	t-ratio	<1	<1	<1
Intimacy	Intercept	6.58	6.95	4.03
	SWLS coefficient	.03	−.17	.07
	t-ratio	<1	<1	<1
Responsiveness	Intercept	7.51	7.61	6.78
	SWLS coefficient	−.02	−.20	−.06
	t-ratio	<1	1.58	<1
Self-assured	Intercept	7.74	7.81	7.16
	SWLS coefficient	.00	−.19	−.06
	t-ratio	<1	1.42	<1
Influence	Intercept	6.86	7.00	6.06
	SWLS coefficient	.18	.00	.05
	t-ratio	1.19	<1	<1

series of analyses was conducted which included terms representing participant gender and the interaction between participant gender and SWLS scores. For married participants, there were no significant or near-significant interactions between gender and SWLS in any of the five analyses. Similarly, for unmarried participants, there were only two significant interactions, in the analyses of self-assuredness with friends and family. This interaction suggested that SWLS and self-assuredness were positively related for unmarried men, but unrelated for unmarried women. Given the lack of significant interactions between gender and SWLS in the analyses of other variables, this interaction needs to be viewed cautiously.

Finally, a series of analyses of quantity of interaction that took marital status into account did not find that relationships between quantity of interaction and satisfaction with life varied as a function of marital status.

Discussion

The results confirmed the primary hypotheses of the study. Participants who had more rewarding social interactions reported greater psychological well-being than participants who had less rewarding social interactions. They were more satisfied with their lives. Although there were some relationships between loneliness and different measures of interaction quality, these relationships were subsumed by relationships between quality and satisfaction with life. Most important, relationships between well-being and interaction quality were primarily due to reactions to interactions with spouses. For unmarried participants, quality of interaction and well-being were unrelated. Finally, more socially active participants reported greater well-being (greater life satisfaction) than less socially active participants, and this relationship was found for both married and unmarried participants.

Although we expected relationships between well-being and quality of interaction to be stronger for interactions with spouses, we did not expect that well-being and quality would be unrelated for interactions with people other than spouses and (by extension) for people who were not married. Moreover, it does not seem likely that such differences were due to statistical artifacts such as truncated ranges or differences in variability. For example, there were only nominal differences in the variances and ranges of the well-being measures for the two groups. The *SD* for SWLS

scores (standardized) for married participants was .92 and for unmarried participants was 1.01; the ranges for the two groups were −2.28 to 1.72 and −2.44 to 1.72 respectively. Nor were there meaningful differences between the two groups in the variances of measures of reactions to interactions. For example, the *SD* for enjoyment was 1.84 for unmarried participants and 1.79 for married, and the ranges were similar. Moreover, the *SD*s and ranges for other interaction measures were also similar between the two groups.

Although determining the power of multilevel random coefficient models is not fully understood at present (Kreft & deLeeuw, 1998), more level 1 observations (interactions) and more level 2 observations (people) provide more power. Considering the number of observations, the failure to find relationships in the unmarried group was probably not due to a lack of power. Although there were more married than unmarried participants (68 versus 45), the number of unmarried participants and number of interactions they recorded (*M* = 44.0) probably provided reasonable power (Kreft & deLeeuw, 1998; pp. 124–125). Within a traditional OLS analysis, the 45 unmarried participants in the study would provide a power of approximately .40 to detect a .50 correlation, which was the magnitude of the relationship between SWLS scores and responsiveness of friends for married participants.

It is possible that the well-being of married participants is closely tied to interactions with spouses because spouses are such a central part of married persons' lives. Spouses were present in 43% of nongroup interactions (i.e., interactions in which individual initials were recorded), and although unmarried participants had plenty of interactions with close friends and family members, rarely did a specific friend or relative figure as prominently in the life of an unmarried person as spouses figured in the lives of the married. Moreover, such logic is consistent with previous research that has found psychological well-being to be closely related to the quality of marital relationships (e.g., Gove et al., 1983). Finally, in terms of the present sample, the importance of spousal relationships as part

of well-being is probably particularly pronounced for retired persons (compared to the nonretired) because they have no jobs and may have fewer role sets that do not include their spouses.

In contrast, for the unmarried, no specific person may play such a central role. Although plausible, such a possibility does not account per se for why social interaction and well-being are unrelated for the unmarried. It appears that unmarried participants derive their sense of well-being from sources other than their social relationships. Perhaps the absence of the companionship of a spouse leads them to focus on nonsocial aspects of their lives as the bases for their sense of well-being.

The fact that well-being was positively related to quantity of interaction (for both the married and unmarried) is inconsistent with some previous research on psychological adjustment and daily social interaction, much of which has found that quantity of social interaction and adjustment are unrelated (e.g., Nezlek et al., 1994, 2000). Various factors may be responsible for this discrepancy. Previous studies of daily social interaction and well-being have examined social interaction in the nonelderly. Perhaps quantity of interaction is related to well-being for the elderly, but not for the nonelderly. The elderly may be more concerned about being socially isolated per se than younger people are, and for the elderly, simple contact with others may be sufficient to elicit well-being because, by definition, social interaction is the antithesis of social isolation.

Also, previous research on daily social interaction and well-being among the nonelderly has not explicitly concerned relationships between quantity of interaction and life satisfaction. Although life satisfaction and the measures of well-being that have been used in previous research are related (e.g., depression; Headey, Kelley, & Wearing, 1993), perhaps quantity of interaction is unrelated to well-being as measured by more clinically focused measures whereas it is related to satisfaction with life. Addressing such issues requires studies explicitly comparing relationships between social interaction and different

measures of adjustment and well-being across different samples.

The foregoing discussion has tacitly assumed that individual differences in well-being are determined by the quality of social interaction, at least for married participants. Although the present study was not designed to examine such causal relationships, such a causal sequence is consistent with recent research by Nezlek and colleagues that relied on structural equation modeling of causal relationships between naturally occurring social interaction and psychological adjustment. In a two-year longitudinal study of collegians, Nezlek (2001b) found that changes in the quality of social interaction led to changes in self-perceived social skill (a measure that had a strong component of social acceptance), whereas there was no causal relationship from skill to interaction. Similarly, in a study of community residents aged 27 to 31, Nezlek and Reis (1999), found stronger causal paths from interaction quality to psychological well-being than from well-being to interaction quality. Nevertheless, a causal sequence from well-being to interaction quality is logically possible and consistent with the present results, and determining the causal relationships between social interaction and well-being will require considerably more research.

The present study was somewhat exploratory in nature, and an important limitation of the study was that the sample was not randomly selected from a specific population and cannot be considered to be a representative sample of older Americans. For example, our sample was better educated then the norm. Almost half of our participants (49%) had a college degree, whereas only 12% of older Americans have a college degree (U.S. Bureau of the Census, 1994). Three-quarters of our sample participants were Jewish, whereas only 2% of Americans are Jewish (U.S. Bureau of the Census, 1998). The generalizability of our results is naturally limited by the nature of the sample. Although there are no compelling reasons to expect that the relationships we found between interaction and well-being should vary as a function of demographic characteristics such as religion and education, we cannot be certain if our findings can be generalized to samples differing in health, education, and other characteristics.

Although the present results are similar to those that have been found in studies of other populations, the differences between the present results and previous findings leave unanswered some important questions about relationships between daily social interaction and psychological well-being. For example, why did quantity of interaction covary with well-being in the present study whereas no such relationships have been found in past RIR-based studies? Why were there virtually no relationships between quality of interaction and well-being for single participants, when previous research has consistently found such relationships? Finally, given the differences between the present results describing the elderly and the results of previous research describing the nonelderly, might the causal relationships between interaction and well-being vary as a function of age? Clearly, resolving such matters will take considerable research but, at the least, the present study provides some guidance for such work.

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