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### What's Love Got To Do With It?: Social Connections, Perceived Health Stressors, and Daily Mood in Married Octogenarians

Robert J. Waldinger

Marc S. Schulz  
mschulz@brynmawr.edu

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What's Love Got To Do With It?:  
Social Connections, Perceived Health Stressors, and Daily Mood in Married  
Octogenarians

Robert J. Waldinger

Brigham and Women's Hospital, Harvard Medical School

Marc S. Schulz

Bryn Mawr College

Running head: Social Connections, Perceived Health Stressors, and Mood in Married  
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## What's Love Got To Do With It?:

### Social Connections, Perceived Health Stressors, and Daily Mood in Married Octogenarians

#### Abstract

This study examined day-to-day links among time spent with others, health stressors, and mood in 47 elderly couples over an 8-day period. Hierarchical linear modeling revealed daily links between time spent with others and mood for men. For both men and women, being in a satisfying relationship was associated with stronger positive daily links between spending time with one's partner and mood. Women reported lower mood on days when they experienced greater pain and physical limitation, and all participants reported lower mood on days when they experienced other health stressors. Marital satisfaction but not time spent with others buffered day-to-day links between perceived health stressors and mood. Findings are consistent with previous research on younger adults suggesting that the extent to which individuals participate in social relationships is directly linked with emotional well-being regardless of stress levels, and that supportive relationships serve as buffers against the effects of stress.

Key words: social integration, social support, aging, marital satisfaction, health

Threats to physical health are a fact of life for elderly adults. Such threats are stressful across the lifespan, but for older adults they may be especially so as they raise the specter of both inescapable physical decline and long-term dependence on others. Research has consistently linked both social connectedness and support from others with physical and psychological health throughout the adult life cycle (Cohen, 2004). As the population ages, the need to understand the social conditions that improve the quality of life among the elderly grows more pressing. Toward this end, investigators have worked to identify both the ingredients of social relationships that are most closely linked with greater well-being and the mechanisms by which these ingredients contribute to health. Key issues of practical importance include the respective contributions of the quantity and quality of social relationships to health, and whether these relationship factors are salutary for older adults in general or play a more particular role as buffers when individuals are under stress.

This paper reports on a study that investigated these issues using daily reports of the experiences of 47 elderly married couples across an eight-day period. We examined day-to-day links between the amount of time spent with others and mood, as well as the possible roles of time spent with others and marital satisfaction in buffering the elderly from the daily effects of perceived health-related stressors on mood. Prior research in this area has focused almost exclusively on longer-term processes by which social connections influence health, comparing individuals on relatively stable measures of health, social integration, and perceived support. This study focused on short-term processes that may underlie daily connections among social connections, perceived

health-related stressors and mood. We examined within-person associations across a span of 8 days to draw a more fine-grained picture of *how* relationships matter in late life.

### *Social integration and health*

Social integration refers to the extent to which an individual participates in a broad range of social relationships (Brissette, Cohen, & Seeman, 2000). People who are more socially integrated have been found to live longer (Berkman & Glass, 2000), and to have better survival rates from heart attacks, less risk for cancer recurrence, and less depression and anxiety (Cohen, Gottlieb, & Underwood, 2000). Typically, studies find that connectedness is beneficial to individuals in general, not just at times when they are under stress (Berkman, 1995). Some studies suggest that men benefit more than women, perhaps because women's social connections are more likely to involve caretaking responsibilities that typically do not fall to their male counterparts (Smith & Baltes, 1998).

In recent years, the focus of research has shifted from demonstrating the existence of links between social integration and well-being to exploring possible mechanisms by which these effects may come about. For example, Cacioppo and colleagues (2002) have investigated the deleterious effects of being socially isolated on blood pressure as one potential mechanism by which social integration could influence health. Research has also pointed to positive short-term influences of social interaction, including the promotion of more positive psychological states and a reduction in the intensity and duration of negative emotions (Cohen, 1988; Cohen, 2004; Thoits, 1983). These psychological states are thought, in turn, to influence physiological processes. Social

connectedness may also provide motivation and social pressure for self-care (Cohen et al., 2000).

Social integration has been found to be particularly beneficial in late life; for example, greater participation in social relations has been associated with slower rates of cognitive decline (Beland, Zunzunegui, Alvarado, Otero, & del Ser, 2005). Moreover, social integration has been linked with both physical health and perceived well-being in the elderly (Heidrich & Ryff, 1993), and the absence of social integration is associated with higher suicide rates (Heisel & Duberstein, 2005). Social integration typically refers to both the breadth of an individual's social network and the extent of participation in that network. However, Carstensen's socioemotional selectivity theory posits that as aging adults become increasingly aware of the finiteness of life, emotion regulation becomes a more salient goal of social interaction, prompting some elderly adults to be more selective in their social contacts (Carstensen, 1993). For this reason, we were more interested in the proportion of waking hours spent with other people than in the absolute number of individuals with whom our elderly participants had daily contact.

### *Social support and health*

Whereas social integration refers to the amount and frequency of social contact, social support refers to the nature of the material and psychological resources available within that network (Cohen, 2004; Cutrona & Russell, 1990). Quality of social support has been linked consistently with physical health and psychological well-being (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Perceived support, or the view that others will provide the help that is needed, appears to be a critical element, bolstering one's sense of being able to cope with stressors (Thoits, 1986). Work by Cohen and colleagues (Cohen,

Mermelstein, Kamarck, & Hoberman, 1985) suggests that perceived emotional support is helpful in the face of a variety of stressful events. Such support can be derived from many relationships, but for married individuals, satisfaction with this primary intimate connection is likely to be a strong component of their overall perceptions of emotional support (Pasch & Bradbury, 1998; Schulz, Cowan, Cowan, & Brennan, 2004; Shrout, Herman, & Bolger, 2006).

Although multiple studies have demonstrated links between social support and mental and physical health, much remains to be understood about the mechanisms responsible for these links and the specific role of relationship quality (House, 2001). A primary model supported by both theory and research is one of stress-buffering – that is, the idea that social support influences well-being primarily by serving as a buffer against the effects of stress rather than conveying benefits to all individuals regardless of stress levels (Cohen, 2004). For example, in a prospective study of 752 fifty-year-old Swedish men, those who reported a high number of stressful events in the year prior to intake were at greater risk for mortality over the next 7 years, but this risk was ameliorated among men who reported the availability of high levels of emotional support (Rosengren, Orth-Gomer, Wedel, & Wilhelmsen, 1993). Importantly, these buffering effects were unique to perceived emotional support; social integration did not ameliorate this risk.

Studies of social support in older adults provide evidence for the salutary effects of perceived support on emotional and physical well-being. For example, in the Normative Aging Study of 1,209 men age 43-91 (DuPertuis, Aldwin, & Bosse, 2001), those with high perceived support from family and friends reported better physical health and fewer depressive symptoms than those with low support. Consistent with the stress-

buffering model of emotional support, in a study of 274 women age 55 and over (Ulbrich & Bradsher, 1993), the perception that a confidant was available buffered the negative impact of stressors on the women's psychological well-being. Studies have routinely demonstrated the psychological and physical health benefits of marriage among older adults (e.g., Hughes & Waite, 2002), and much of this benefit is believed to reflect the social support entailed in marital relationships.

*Studying the daily fabric of life*

Investigations of the effects of social relationships on health have depended largely on traditional correlational approaches linking relatively stable individual differences in these two domains. People who report more social connectedness in general tend to be better off physically and emotionally than those who are more socially disconnected. However, these approaches do not address the question of whether and how social relationships are linked to health on a day-to-day basis. For example, does an individual experience more positive moods on days when he or she spends more time with others, and less positive moods on days when he or she is more socially isolated? Do the stress-buffering mechanisms associated with perceived support operate within the ebb and flow of stress from day to day? Within-person analyses of repeated daily measures are particularly suited to investigating these short-term processes and linkages (Bolger, Davis, & Rafaeli, 2003). Repeated daily measures also facilitate more accurate assessments of social experiences and emotional and physical well-being than can be obtained retrospectively using questionnaires that ask about longer time spans or experience in general. Many people have difficulty accurately recalling experiences



(Smith, Leffingwell, & Ptacek, 1999), and this is particularly the case among the very old.

Studies of daily life among the very old are rare, and existing studies have not typically used repeated measurements to study within-individual fluctuations in social connections and well-being. Mroczek and Almeida (Mroczek & Almeida, 2004) found that links between daily stressors and day-to-day levels of negative affect were stronger for older individuals, but their sample did not include adults over age 74. Klumb and Baltes (2004), working with a subgroup of the Berlin Aging Study, obtained repeated measurements of life events and well-being in fifty adults age 73-91, but their analytical focus was on between-subject differences rather than intra-individual associations across time. To our knowledge, the study reported here is the first to explore day-to-day links between social connectedness and mood in a population of very elderly couples, and to explore short-term mechanisms by which marital satisfaction and the amount of time spent with others may affect links between perceived health stressors and mood in this vulnerable and growing population.

Perceived physical health difficulties were conceptualized in this study as potential daily stressors. These health difficulties included reported daily levels of pain, physical limitations on daily activities due to ill health, and the occurrence of health stressors (other than personal pain or physical limitation) affecting oneself or someone close. Perceived social support in this group of married individuals was indexed by marital satisfaction, and social integration was operationalized as the proportion of awake time spent with others on a given day. In addition, we included the proportion of awake time spent with one's spouse as a second index of social integration to allow for a more

direct comparison between the *quantity* of time spent in the marital relationship and the *quality* of that relationship. Building on the literature reviewed above, we investigated the following hypotheses about the role of marital satisfaction and social connectedness in the lives of married elderly adults:

1. On a daily basis, the proportion of waking hours spent with others will be positively linked with better mood but will not function as a buffer of links between daily perceived health stressors and lower mood.
2. In contrast, marital satisfaction will function as a buffer of links between daily perceived health stressors and lower mood.

## Method

### *Participants*

The sample consisted of 47 heterosexual couples. The male participants are part of a 68-year longitudinal study of adult development that began when they were age 18-19. Between 1939 and 1942, the Harvard University Health Service chose 268 college sophomores for intensive multidisciplinary study (Heath, 1945; Vaillant, 1977). These sophomores were selected because examination at college entrance revealed no mental or physical health problems and their deans perceived them as having the potential to become promising adults. Sixty-four per cent went on to obtain graduate degrees. Throughout their adult lives, most worked as physicians, lawyers, university professors, or business executives. Participants were assessed using interview and questionnaire techniques at regular intervals. Beginning in 2003, the men and their intimate partners were invited to participate in a study of late life marriage. One hundred five of the surviving members of the original sample had partners. To be eligible, couples had to

have been living together for a minimum of one year.<sup>1</sup> In addition, both members of the couple had to score above 25 (indicating minimal or no cognitive impairment) on the Telephone Interview for Cognitive Status (TICS, Brandt, Spencer, & Folstein, 1988) and be in sufficient physical health to be able to complete the in-home and follow-up telephone interview procedures described below. Twenty-three couples failed to meet these health and relationship criteria. Seven couples completed part but not all of the assessments. An additional 28 couples declined to participate; 13 couples gave no reason for declining, 12 couples expressed a wish to preserve the privacy of their relationship, one couple did not want to spend the time required to complete 8 daily interviews, and two couples failed to respond to several letters and telephone messages.

All participants were Caucasian. Mean age was 82.9 years for men ( $sd=1.7$ , range 80-88) and 78.8 years for women ( $sd=6.16$ , range 62-87). Forty-three couples (92%) were married, and 4 couples (8%) were not married but living together. Mean length of these relationships was 41.5 years ( $sd=19$ , range=1-62). T-tests revealed that the 28 eligible men who declined to participate in the study did not differ significantly from the 47 men who participated with respect to age, number of years of education, income at ages 55 and 80, health at age 70 (based on internist's rating of medical records (for details, see Vaillant, 1979, , 1998), number of previous divorces, or marital satisfaction at ages 75 and 80.

The Human Research Committee affiliated with Brigham and Women's Hospital has approved the study annually for the past 13 years, and written informed consent was obtained from all participants.

### *Procedure*

During a home visit, each member of the couple was asked to complete a questionnaire assessing marital satisfaction, in addition to participating in a videotaped couple interaction and an individual interview about the relationship. Following the home visits, men and women were interviewed separately by telephone on 8 consecutive evenings. We chose 8 evenings so that, even with some missing interviews, we would collect at least a week's worth of data on most participants. The mean number of interviews completed by participants was 7.6 ( $sd=0.73$ ). Interviews lasted 15-20 minutes and focused on the participants' activities during the previous 24 hours. Most interviews were conducted around the dinner hour each day.

### *Measures*

*Marital satisfaction.* Marital satisfaction was measured at the start of the study using the Short Marital Adjustment Test (Locke & Wallace, 1959), a widely used 16-item questionnaire assessing marital satisfaction that has been demonstrated to have high levels of discriminant, concurrent, and predictive validity (Gottman, 1994). Higher scores reflect greater satisfaction with the overall marriage. Scores below 100 are considered to be indicative of clinically significant marital distress (Christensen & Heavey, 1999; Gottman, 1994).

*Time with others.* On each of the 8 evenings of daily phone interviews, participants were asked how many waking hours they spent alone and how many hours were spent with partners, relatives, friends, caregivers, and others. The proportion of awake time spent with others each day was computed by dividing the number of hours spent with others by the sum of the number of hours spent with others and the number of hours spent

alone. The proportion of awake time spent specifically with partner each day was also computed using a similar formula. To examine the possible role of the amount of time typically spent with others over 8 days as a moderator of daily links between perceived health stressors and mood, a moderator variable was created by aggregating the proportion of each person's waking hours spent with others across the 8 days into a mean score. The same procedure was used to create time typically spent with partner as a moderator variable.

*Mood.* Participants were asked to rate their mood each day (how they felt during the previous 24 hours) on a 7-point Likert-type scale with the following anchors: 1=very unhappy, 2= moderately unhappy, 3=a little unhappy, 4=neither happy nor unhappy, 5=a little happy, 6=moderately happy, and 7=very happy.

*Pain:* Level of pain was measured each day by asking the participant to rate on an 11-point scale their level of bodily pain during the previous 24 hours (0=no pain, 10=pain as bad as it can be). This measure is adapted from the widely used Brief Pain Inventory (Cleeland, 1989).

*Physical limitation:* Level of physical limitation was measured each day by asking the participant to rate on a 5-point Likert-type scale how much their physical health hindered their usual daily activities during the previous 24 hours (1=not at all, 5=extremely).

*Other Health Stressor.* Participants were asked whether anything stressful happened to them or someone close to them regarding their personal health (other than their own experience of pain or physical limitation) during the previous 24 hours (1=yes, 0=no).

## Results

### *Time spent with others, perceived health stressors, and mood in elderly couples*

Means and variability in the variables of interest across the 8 days of data collection are presented in Table 1. On average, these elderly men and women spent a large majority (more than 70%) of their waking hours with others and over 50% of their waking hours with their spouses. As a group they reported relatively low levels of pain and physical limitation. They did report the occurrence of other health stressors once every three or four days on average. Participants indicated in their daily reports that they were generally moderately happy. Men and women did not differ significantly in the proportion of time they reported spending with their partner or others in general. Moreover, they did not differ significantly in reports of mood, marital satisfaction, pain, physical limitation, or the frequency of occurrence of other health stressors.

In addition to variation between individuals, there was meaningful within-person variation across the 8 days in levels of time spent with others, perceived health stressors, and mood. For example, the average man in our sample varied in the number of daily hours spent with others across the 8 days by 6.6 hours; and the average woman's time with others varied by more than 5 hours per day across the 8 days. Similarly, the average man and woman reported that their daily mood varied by almost 2 points (or slightly more than two standard deviations) on the 7-point mood scale across the 8 days.

These elderly men and women generally reported being satisfied in their marriages, and the high level of marital satisfaction in this sample is consistent with prior research on older adult couples. For example, in a community sample of 182 couples (participant age range 51-92 years old), 80% of men and 71% of women reported that their marriages

were “very happy” or “extremely happy” (Kaufman & Taniguchi, 2006). There was, however, meaningful variability in satisfaction across participants in our sample. About 1/3 of participants reported levels of marital satisfaction characteristic of couples in distress (scores below 100, c.f. Gottman, 1994). The correlation between marital satisfaction and time spent with one’s partner was not significant for men ( $r=.16, p=.28$ ) or women ( $r=.19, p=.19$ ).

#### *Preliminary between-subjects analyses*

Before investigating daily linkages, we aggregated the mood, time with others, and the three health stressor variables across 8 days and examined between-subjects linkages among these aggregated variables. At this level of analysis, time spent with others was not significantly linked with mood either for men or for women. Moreover, there were no significant links (see Table 2) for men between any of the perceived health stressors and mood, and for women there were no significant links between pain and mood. However, women who reported more physical limitations and other health stressors across the 8 days also reported more negative moods.<sup>2</sup>

#### *Data analytic overview of within-subjects analyses*

The central questions of this study were whether time spent with others was linked with mood on a day-to-day basis, and whether marital satisfaction and time spent with others buffered individuals from the daily impact of health stressors on mood. The 8 days of data contributed by participants can be conceptualized at two levels of analysis: a within-person level (Level 1) that captures daily covariation of time spent with others, perceived health stressors, and mood for each person across 8 days, and a between-person level (Level 2) that captures variability between individuals in these patterns of

covariation. Analyses were conducted using a hierarchical modeling approach that simultaneously models effects at the within- and between-person levels (Raudenbusch & Bryk, 2002).

Analyses were conducted in two stages. First, we examined whether perceived health stressors and time spent with others were linked on a daily basis with mood. Separate models were estimated for each combination of the three perceived health stressor variables and mood, and the two social integration variables (time spent with all others, time spent specifically with partner) and mood. Second, we investigated whether variations across individuals in within-person linkages of health stressors and mood were related to levels of marital satisfaction and levels of social integration. In this stage of analysis, separate models were estimated for each combination of the three perceived health stressors and mood, and each of these models was tested for moderation by marital satisfaction and time spent with others. In all analyses, separate models were estimated for men and for women.

*Is time spent with others linked with mood on a daily basis?*

Following the recommendations of Larson and Almeida (Bolger, Zuckerman, & Kessler, 2000; Larson & Almeida, 1999) we accounted for previous day's mood when examining the daily association between time spent with others and mood. In effect, this strategy allowed us to examine the potential impact of time spent with others on changes in mood from day to day. The Level 1 model for time spent with others and daily mood can be written as:

$$\text{Daily Mood}_{it} = \pi_{0i} + \pi_{1i} (\text{Daily Mood})_{it-1} + \pi_{2i} (\text{Time with Others})_{it} + e_{it} \quad (1)$$

where  $\text{Daily Mood}_{it}$  is participant  $i$ 's daily mood on day  $t$  ( $t = \text{days } 2 \text{ through } 8$ ) and



Daily Mood<sub>*i*-1</sub> is participant *i*'s daily mood from the previous day. Of particular interest is  $\pi_{2i}$ , which captures the predicted change in a participant's daily mood associated with a one unit increase in time spent with others. The Level 1 parameter estimates were allowed to vary randomly in the Level 2 model. In this first stage of analysis, no predictors were added to the between-subjects level of the model.

The Level 2 equation for this model investigating the daily influence of time spent with others can be written as:

$$\pi_{2i} = \gamma_{20} \quad (2)$$

where  $\gamma_{20}$  captures the pooled estimate of the daily association of mood and time spent with others. All model estimates were made using the HLM 6 computer program (version 6.04, Raudenbush et al., 2000).

Results presented in Table 3 indicate that on days when men spent more time with others they reported a more positive mood than on days when they were more socially isolated. Converting the *t* ratio for this association into an effect size correlation ( $r_{\text{effect}} = .30$ )<sup>3</sup> indicates that this daily connection between time spent with others and mood represents a medium effect (Cohen, 1988). There was no daily connection between time spent with others and mood for women.

We also examined whether time spent specifically with *partner* – as opposed to time spent with *all* categories of other people – was directly linked with mood on a daily basis. For the full sample, daily variation in time spent with partner was not, on average, linked with daily fluctuation in mood for men ( $\gamma = .007, p = .98$ ) or women ( $\gamma = .288, p = .31$ ). There was, however, significant variation across individuals in the degree to which time spent with partner covaried with mood over the 8 days of data collection (men:  $\chi^2(38) = 51.4, p = .07$ ; women:  $\chi^2(40) = 56.56, p = .04$ ). Because it seemed likely

that the association of time spent with a partner on mood might depend on one's marital satisfaction, we re-ran the models with marital satisfaction introduced into the Level 2 equation as a moderator of daily links between time spent with partner and mood. Significant and strong moderation was found for both men ( $\gamma = .028$ ,  $p < .001$ ,  $r_{\text{effect}} = .51$ ) and women ( $\gamma = .017$ ,  $p = .009$ ,  $r_{\text{effect}} = .38$ ). Individuals who were less satisfied with their marriages were more likely than satisfied individuals to show a more negative association across days between time spent with partner and their reported mood. In other words, in marriages that were less satisfying, spending more time with a partner was linked with more negative mood.

We also examined daily links between perceived health stressors and mood (see Table 4). For women, reports of pain, physical limitation, and occurrence of other health stressors all covaried significantly with mood on a daily basis in the expected direction. The magnitude of these links was between medium and large. For men, there were no significant links between any of the 3 daily health stressor variables and mood. However, there was significant variation across individuals in the daily connection between perceived health stressors and mood in every model except for the one examining physical limitations and mood for men. This variation confirms the importance of looking at moderators such as marital satisfaction and time spent with others that might explain individual differences in these daily connections.<sup>4</sup>

*Do time spent with others and marital satisfaction reduce the negative daily association of perceived health stressors and mood?*

In the second stage of HLM analyses, we investigated whether individual variation in daily links between perceived health stressors and mood was associated with

the amount of time participants typically spent with others (their 8-day average) or with marital satisfaction. As in the analyses reported above, previous day's mood was entered as a covariate at Level 1 in all analyses.

We first examined marital satisfaction as a Level 2 moderator of links between perceived health stressors and mood. As shown in the top half of Table 5 marital satisfaction was a consistent moderator of daily connections between health stressor and mood. Higher marital satisfaction was associated with attenuation in the daily negative covariation between pain and mood, between physical limitation and mood, and between the occurrence of other health stressors and mood (for women only). The moderating effect of marital satisfaction ranged in magnitude from medium to large.

In contrast to the consistent moderating effect of marital satisfaction, analyses examining average levels of time spent with others as a moderator revealed no effects (bottom of Table 5). That is, generally spending more or less time with others was not associated with differences across individuals in the daily links between perceived health stressors and mood. We did a parallel set of analyses examining whether time spent with partner was a Level 2 moderator of links between perceived health stressors and mood. As with time spent with others in general, there was no indication that time spent with partner moderated links between perceived health stressors and mood.

## Discussion

This study was designed to investigate the daily experiences of octogenarians and to examine closely the links between social connections and mood in this group of very elderly adults. By collecting daily reports over 8 days, we were able to characterize in a rigorous way typical levels of social interaction, perceived physical health, and mood.

We found that these married octogenarians were quite social, spending on average more than 70% of their waking hours with others and more than half of their waking hours with their spouses. The daily reports indicated that health concerns and difficulties were indeed a common part of their lives. Despite these health stressors, the participants reported that, on average, they were moderately happy.

Based on previous research, we hypothesized that more time spent with others would be linked with better mood on a daily basis. Multi-level analyses revealed that when men spent more time with others on a given day, they were significantly more likely to report better mood on that day, even after accounting for mood reported on the previous day. This daily connection was not present for women. One possible explanation for the gender pattern is that, for women, social connections are more likely to entail caretaking responsibilities that may offset the positive aspects of connecting with others. We found that spending time specifically with partners was linked with mood on a daily basis, but that this link depended on how satisfied participants were with their marriages. Not surprisingly, for both men and women, being in a satisfied marriage was associated with a stronger positive link between time with partner and mood.

We also expected that perceived health stressors would be linked with more negative mood on a day-to-day basis. On days when women reported greater pain and physical limitation, they reported lower mood, but these daily links were not present for men. Both men and women reported lower mood on days marked by the occurrence of other health stressors.

We next addressed the question of whether relationships convey some benefit in buffering the links between perceived health stressors and mood. As predicted, perceived

support, as indexed by marital satisfaction, was a significant buffer of the day-to-day links between health stressors and more negative mood for these married octogenarians. In contrast, social integration – whether measured in terms of amount of time spent with others in general or with partners in particular – did not buffer day-to-day links between perceived health stressors and mood.

Taken as a whole, these findings are consistent with prior theory and research positing that social relationships are linked with emotional well-being on a day-to-day basis. Specifically, results of this study support the hypothesis that a key source of the health-promoting benefits of perceived social support is its role in protecting individuals against the effects of stress. Study findings are also consistent with previous research suggesting that social integration is associated with more positive emotional well-being regardless of one's level of stress, rather than buffering individuals against the effects of stressors on mood. In our sample of very elderly married adults, the quantity of time spent with others – including one's spouse – did not buffer the negative effects of perceived health stressors on mood, but satisfaction in an intimate relationship did.

Important strengths of this study are its collection of repeated daily measures and its use of multi-level analyses to examine within-person associations across time. When we used more traditional between-subjects analyses and aggregated 8 days of data to capture general mood, general levels of time spent with others, and typical levels of perceived health stressors, we found substantially fewer connections. For example, men and women who generally spent more time with others over the 8 days did not report generally more positive moods than those who tended to spend less time with others.

Moreover, there were no links between the occurrence of perceived health stressors and mood for men at this aggregated, between-subjects level of analysis.

Differences in the pattern of within-person links as compared to between-person links help narrow the field of likely mechanisms that underlie the influence of social connections on emotional well-being. Associations at the between-subjects level – indicating that individuals who generally spend more time with others also report generally more positive moods – could be due to influences that operate over long or short time frames. So, for example, individuals who have generally sunny dispositions might also have more friends with whom they spend time. However, such between-person links were not present in this study. In contrast, we found consistent links only at the within-person level between time spent with others each day and daily mood. These results indicate that each person, regardless of temperament, tended to experience better moods on days when he or she spent more time with others. The presence of associations at this level can only be explained by shorter-term mechanisms that operate on a day-to-day basis, such as the mood-enhancing benefit of interacting with others. Other third variables that might vary on a day-to-day basis, such as weather, cannot be ruled out as alternative explanations for this link. We can, however, rule out mechanisms that exert their effects over a longer period of time, such as the influence of personality variables on both social connections and mood, or the influence of living in a warm vs. cold climate.

Even with the use of daily reports of mood, social connections, and health stressors, teasing out the direction of influence among these variables is difficult. We used recommended procedures to control for previous day's mood (Larson & Almeida, 1999) in our analyses investigating the daily associations among these variables. Such

statistical controls, however, do not allow us to conclude with certainty that mood is shaped by daily encounters with others or the experience of health stressors. It is possible that mood also shapes the likelihood that one will seek contact with others and the likelihood that one will report health concerns.

Additional study limitations should be noted. The modest sample size of 47 couples restricts statistical power and may be responsible for some of the null findings. These 47 couples are the surviving married members of a larger cohort that originally numbered 268. Although analyses included in this report indicate that these individuals are representative in some ways of the survivors of the original cohort, it is possible and maybe even likely that the survivors have other features that distinguish them in important ways from those who have already died or who have had relationships that have not endured. For example, the levels of physical limitations and other perceived health stressors reported in this sample are relatively low and may not be representative of all octogenarians. Future research using larger samples should examine how physical mobility and functioning might influence some of the connections examined in this study. The study sample consisted of socioeconomically advantaged men and women, most of whom came of age in the WW II era. Further research is needed to determine the extent to which these findings are generalizable to other ethnic groups, to different social classes, and to different birth cohorts. It is also important to study how social functioning might be linked with daily mood in single elderly adults.

The results of this study suggest that social relationships play an important role in shaping the emotional well-being of elderly adults. It is imperative that social policy efforts designed to improve the quality of life for our society's oldest citizens take into

account the effect of these initiatives on both the nature and number of elderly adults' social connections.



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Author Note

Robert J. Waldinger, Brigham and Women's Hospital and Harvard Medical School and Marc S. Schulz, Department of Psychology, Bryn Mawr College.

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Correspondence concerning this article should be addressed to Robert J. Waldinger, Department of Psychiatry, Brigham and Women's Hospital, 1249 Boylston Street – 3<sup>rd</sup> floor, Boston, Massachusetts 02215, Telephone: (617) 525-6133, email: [rwaldinger@partners.org](mailto:rwaldinger@partners.org).

Table 1

## Descriptive Statistics Over 8 Days

	Men		Women	
	<i>Mean (sd)</i>	Actual Range of Daily Reports	<i>Mean (sd)</i>	Actual Range of Daily Reports
<u>Aggregated Daily Reports</u>				
Pain (0-10)	1.59 (1.53)	0-7	1.69 (1.54)	0-8
Physical Limitation (1-5)	1.67 (0.70)	1-5	1.66 (0.71)	1-5
Other Health Stressor	0.26 (0.23)	0-2	0.30 (0.26)	0-2
Time spent with others (Proportion of waking hours)	0.71 (0.15)	0.02-1.00	0.76 (0.15)	0.07-1.00
Time spent with spouse (Proportion of waking hours)	0.54 (0.18)	0.01-1.00	0.52 (0.17)	0.00-1.00
Mood (1-7)	5.62 (0.96)	2-7	5.70 (0.96)	1-7
<u>Marital satisfaction</u>	124 (22)		123 (27)	



Table 2

Pearson correlations among average mood, average time spent with others, and average perceived health stressors (N= 47 couples)

	Mood		Time spent with others		Time spent with partner	
	Men	Women	Men	Women	Men	Women
Time spent with others	.10	-.04				
Time spent with partner	.11	-.09	.80**	.55**		
Pain	-.05	-.18	-.06	-.01	-.06	.11
Physical limitation	-.21	-.41**	.12	-.04	.13	.18
Occurrence of other health stressors	-.23	-.59**	-.34*	.08	-.27 <sup>+</sup>	.05

<sup>+</sup> p<.10

\* p<.05

\*\* p<.01

Table 3

## HLM Estimates of Daily Links between Time Spent with Others and Mood

	Daily Mood			
	Unstandardized Coefficient	SE	<i>t</i>	Effect size <i>r</i>
<b>Men</b>				
Previous Day's Mood, $\gamma_{10}$	.320	.077	4.14***	.52
Time Spent with Others, $\gamma_{20}$	.622	.291	2.14*	.30
<b>Women</b>				
Previous Day's Mood, $\gamma_{10}$	.050	.065	.769	.11
Time Spent with Others, $\gamma_{20}$	.622	.462	.927	.14

\* $p < .05$ ; \*\*\* $p < .001$

Table 4

## HLM Estimates of Daily Links between Perceived Health Stressors and Mood

	Mood			
	Unstandardized Coefficient	<i>SE</i>	<i>t</i>	Effect size <i>r</i>
<b><i>Men</i></b>				
Pain, $\gamma_{20}$	-.075	.067	-1.12	.16
Physical Limitations, $\gamma_{20}$	-.102	.086	-1.19	.17
Other Health Stressor, $\gamma_{20}$	-.231	.138	-1.67	.24
<b><i>Women</i></b>				
Pain, $\gamma_{20}$	-.169	.061	-2.80**	.38
Physical Limitations, $\gamma_{20}$	-.251	.082	-3.06**	.41
Other Health Stressor, $\gamma_{20}$	-.410	.156	-2.63*	.36

\* $p < .05$ ; \*\* $p < .01$

Separate models were estimated for each perceived health stressor. All analyses control for previous day's mood.

Table 5. HLM Estimates of Marital Satisfaction or Time Spent with Others as a Moderator of Daily Links between Perceived Health Stressors and Mood

	Mood			
	Unstandardized Coefficient	SE	t	Effect size r
<b><i>Marital Satisfaction</i></b>				
<b><i>Men</i></b>				
Marital Sat x Pain, $\gamma_{21}$	.006	.002	2.62*	.36
Mar Sat x Physical Limitations, $\gamma_{21}$	.008	.002	4.05***	.52
Mar Sat x Other Health Stressor, $\gamma_{21}$	.008	.005	1.63	.24
<b><i>Women</i></b>				
Marital Sat x Pain, $\gamma_{21}$	.006	.001	4.25***	.54
Mar Sat x Physical Limitations, $\gamma_{21}$	.008	.002	3.80**	.49
Mar Sat x Other Health Stressor, $\gamma_{21}$	.009	.004	2.23*	.32
<b><i>Time Spent with others</i></b>				
<b><i>Men</i></b>				
Time Spent with others x Pain, $\gamma_{21}$	.086	.364	.237	.04
Time Spent x Physical Limitations, $\gamma_{21}$	.404	.333	1.21	.18
Time Spent x Other Health Stressor, $\gamma_{21}$	-.947	.803	-1.18	.17
<b><i>Women</i></b>				
Time Spent with others x Pain, $\gamma_{21}$	-.038	.394	-.10	.01
Time Spent x Physical Limitations, $\gamma_{21}$	-.282	.483	-.58	.09
Time Spent x Other Health Stressor, $\gamma_{21}$	1.183	.950	1.25	.18

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Separate models were estimated for each perceived health stressor. All analyses control for previous day's mood.

## Footnotes

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<sup>1</sup> An exception was made to include one couple who had been dating steadily for 5 years and was about to begin living together.

<sup>2</sup> A very small percentage of participants' time was spent with caregivers. Less than 1.3% of their days involved 3 hours or more with caregivers. These data suggest that the overall lack of correlation between percent time with others and mood is not likely due to the influence of some participants who appear socially integrated but most of their time with others is actually spent with a caregiver.

<sup>3</sup> The formula used for converting the  $t$ 's into  $r_{\text{effect}}$ 's was:  $r_{\text{effect}} = \sqrt{[t^2/(t^2 + df)]}$  (see Karney & Bradbury, 1997; Schulz, Cowan, & Cowan, 2006).

<sup>4</sup> Because the chi square test used to examine the significance of the variance components in HLM is generally regarded as a conservative test, moderation analyses were run for all 6 sets of links between perceived health stressors and mood.)