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The Joint Effects of Life Stress and Negative Social Exchanges on Emotional Distress

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Objectives. Negative social exchanges detract considerably from older adults' emotional health, but little is known about the specific factors that make some older adults more vulnerable than others to such exchanges. This study examined whether stressful life experiences compound the impact of negative social exchanges on emotional distress. We examined both linear and nonlinear models of the joint effects of negative social exchanges and stressful life experiences.

Methods. In-person interviews took place with a representative sample of 916 noninstitutionalized older adults. We examined linear and nonlinear models for three classes of stressful life experiences (relationship losses, disruptive events, and functional impairment).

Results. Regression analyses that included first-order and second-order interaction terms revealed a linear pattern for loss events and functional impairment, and a nonlinear pattern for disruptive events.

Discussion. This study suggests that negative social exchanges and stressful life experiences jointly affect emotional distress, but the particular nature of the joint effects varies by type and level of stressor. Negative social exchanges appear to have more severe effects in the context of some stressors but less severe effects in the context of other stressors.

SOCIAL network members often contribute to health and well-being by providing day-to-day companionship and support in times of need (Krause, 2006). Yet support provided by social network members is sometimes intrusive or insensitive. In fact, social network members can be a source of stress in their own right. Daily diary studies have found that negative exchanges with social network members are among the most upsetting stressors that people experience in their everyday lives (e.g., Bolger, DeLongis, Kessler, & Schilling, 1989).

Negative social exchanges are actions by social network members that are perceived as misdeeds or transgressions and, accordingly, arouse emotional distress; such actions include acts of omission (e.g., failure to provide needed aid) as well as acts of commission (e.g., criticism, demands; Lincoln, Taylor, & Chatters, 2003; Rook, 1992). Such exchanges occur infrequently in later life, but they have the potential to detract considerably from health and well-being (Rook, 1998). Indeed, S. Cohen (2004) identified negative social interactions as one of the three primary pathways by which social relationships affect health. Consistent with this view, studies have documented significant associations between negative social exchanges and depression, worse immune functioning, increased risk of chronic illnesses such as cardiovascular disease, poor self-rated health, and declines in functional health (e.g., Krause & Shaw, 2002; Umberson, Williams, Powers, Liu, & Needham, 2006). Moreover, the adverse effects of negative social exchanges often outweigh the beneficial effects of positive social exchanges (Rook, 1998).

Yet older adults vary in the degree of distress aroused by negative social exchanges, and an important challenge for researchers is to investigate the factors that account for this variability. Researchers have begun to examine interpersonal perceptions and motivations in this regard (e.g., Sorkin & Rook, 2004), but they have given limited attention to the broader life context in which negative social exchanges occur. An important aspect of this life context is the extent to which older adults already are contending with other kinds of life stress when they experience a conflict or misunderstanding with a social network member (Rook, 2003). The purpose of the current study, accordingly, was to examine how stressful life experiences influence the adverse effects of negative social exchanges.

Conceptual Models of the Joint Effects of Life Stress and Negative Social Exchanges

A small literature has begun to examine the joint effects of life stress and negative social exchanges. Divergent conceptual models can be identified in the literature regarding the specific ways that stressful life experiences and negative social exchanges might jointly affect emotional distress. We illustrate four such models in Figures 1a–1d. At the simplest level, both kinds of stressors might have additive (main) effects on distress, as portrayed in Figure 1a (e.g., Okun, Melichar, & Hill, 1990). In this model, both negative social exchanges and stressful life experiences independently affect emotional distress.

The stress-exacerbation model (see Figures 1b and 1c), in contrast, posits that stressful life experiences amplify the adverse effects of negative social exchanges on emotional distress. The reasoning underlying this model is that having to deal with two different kinds of stressors at the same time taxes a person's coping resources, causing emotional reactions to the stressors to be more pronounced than would have been the case had the stressors been experienced in isolation of each other (Rook, 1998). This exacerbation of emotional distress, moreover, may take either a linear or nonlinear form. In the linear form, the adverse effects of negative social exchanges

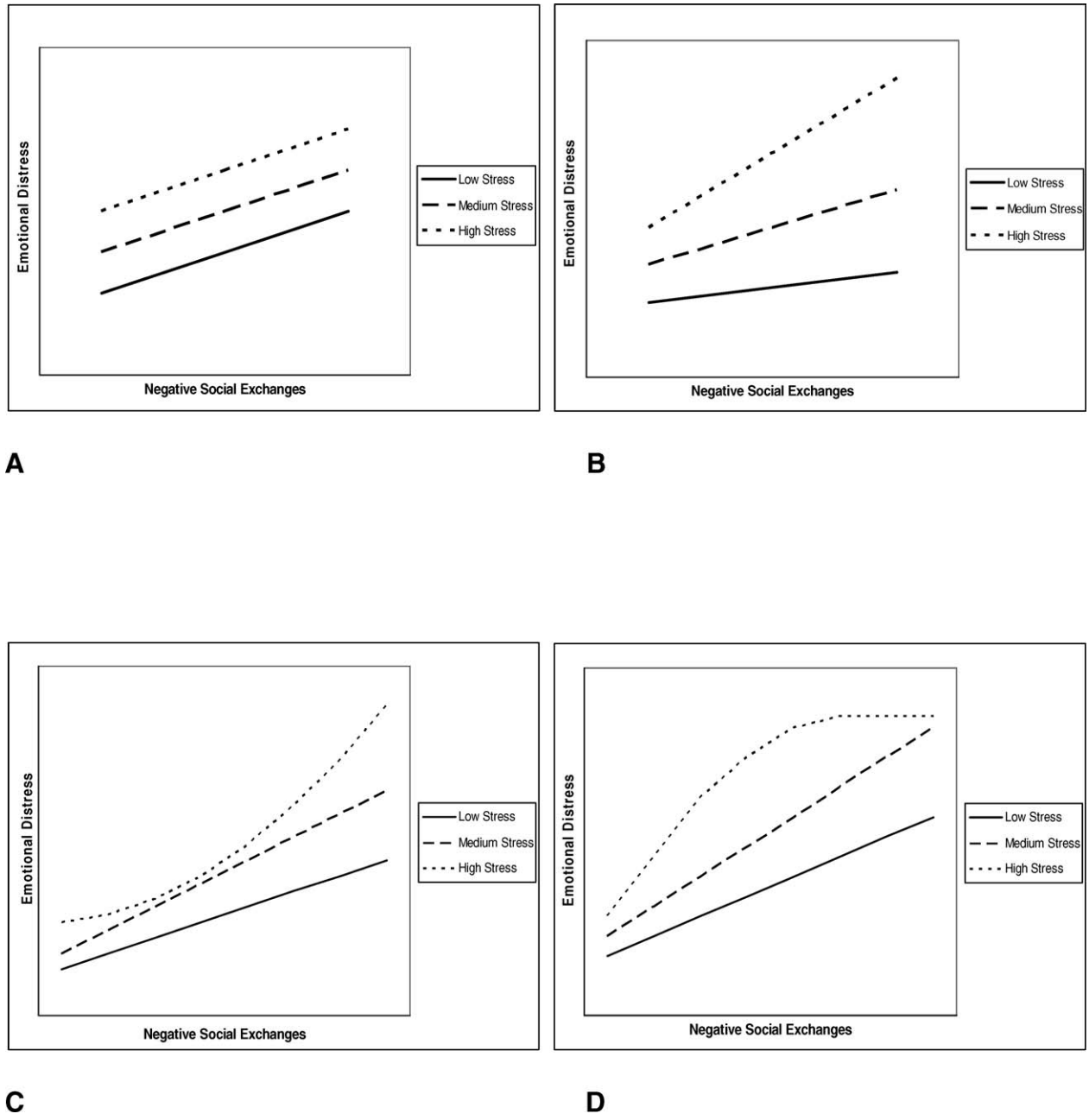

Figure 1. Main and interactive models of the effects of negative social exchanges and life stress: (A) main effect model; (B) linear stress-exacerbation model; (C) nonlinear stress-exacerbation, accelerating model; (D) nonlinear stress-exacerbation, threshold (plateau) model.

would be amplified at a steadily increasing rate with corresponding increases in life stress, with no curvilinear associations evident. Figure 1b illustrates this pattern. In the nonlinear form, in contrast, the adverse effects of negative social exchanges would be magnified, or accelerated, at a distinctively marked rate beyond a particular level of life stress, resulting in a U-shaped association at high levels of life stress (see Figure 1c). For example, disagreements with social network members may become especially upsetting in the context of high life stress, making the effects of such disagreements substantially worse at high levels of life stress than at moderate or low levels of life stress.

It is also possible that the emotional distress aroused by negative social exchanges tapers off or decreases, rather than increases, when such exchanges occur in the context of multiple stressors. The idea that experiencing multiple stressors in close succession might magnify emotional distress only up to a particular level or threshold has been referred to as the emotional-plateau model (Bolger et al., 1989). Figure 1d illustrates a hypothetical emotional-plateau (or stress-exacerbation, threshold) model; at high levels of stress, the association between negative social exchanges and distress takes a curvilinear (or asymptotic) form. The reasoning underlying this model is that a person may be so emotionally distressed by an initial stressor

that a subsequent stressor has little power to arouse further distress. In this sense, an initial stressor causes the person to reach a plateau of distress, beyond which additional stressors do relatively little to increase distress. This model, thus, is a variation of the model illustrated in Figure 1b, in that stressful life experiences exacerbate the adverse effects of negative social exchanges at low to medium levels of life stress but fail to do so at high levels of life stress, when a person reaches an emotional plateau or threshold (cf. Krause, 1995).

Distinguishing among these models is important in efforts to understand how stressful life experiences may influence the impact of negative social exchanges on older adults' emotional health. Doing so would help to identify the particular life circumstances in which older adults may be more versus less vulnerable to the adverse effects of disagreements and misunderstandings with their social network members. The adverse effect of negative exchanges would be underestimated at high levels of life stress, for example, if an accelerating form of stress exacerbation (nonlinear pattern) is present but only linear effects are examined. Conversely, the adverse effects of negative exchanges would be overestimated at high levels of life stress if a form of stress exacerbation involving an emotional plateau (nonlinear pattern) is present but only linear effects are examined. Although a small body of research has begun to examine the joint effects of negative social exchanges and life stress, it has not systematically distinguished among these different models. The current study sought to address this gap in the literature.

Previous Research on the Joint Effects of Life Stress and Negative Social Exchanges

Several studies have yielded evidence suggesting that stressful life experiences amplify the noxious effects of negative social exchanges in a manner consistent with the stress-exacerbation model (e.g., Rhodes, Ebert, & Meyers, 1994; Sandler & Barrera, 1984). Some of these studies have included older adults, along with other age groups (e.g., Cranford, 2004; Ingersoll-Dayton, Morgan, & Antonucci, 1997; Kiecolt-Glaser, Dyer, & Shuttleworth, 1988; Rauktis, Koeske, & Tereshko, 1995; Serido, Almeida, & Wethington, 2004). For example, in a study of young, middle-aged, and older married couples, Cranford examined the effects of perceived life stress and social undermining (spouses' negative affect, criticism, or goal interference) on depressive symptoms. Perceived life stress and social undermining exhibited significant main effects, as well as a significant interaction. The form of the interaction suggested that perceived stress amplified the adverse effects of social undermining on depressive symptoms, consistent with a first-order stress-exacerbation effect (e.g., Figure 1b).

Other studies have suggested that negative social exchanges and life stress interact in a manner that is consistent with the emotional-plateau model (e.g., Figure 1d). Evidence of such effects is relatively sparse, however, and few studies have focused on older adults (e.g., Fukukawa et al., 2002; Rook, 2003). In a daily diary study of older adults, Rook (2003) found that negative exchanges were associated with less, rather than more, emotional distress when they occurred in the context of other life stress, mirroring results reported in a daily diary study of middle-aged couples (Bolger et al., 1989). Furthermore, a study of middle-aged and older Japanese individuals revealed that the adverse effects of negative social exchanges leveled off at the highest level of life stress, consistent with the emotional-plateau model (Fukukawa et al., 2002). These studies demonstrate the importance of being attentive to possible nonlinear patterns in examining the interactive effects of negative social exchanges and life stress on emotional health (Krause, 1995).

Finally, it is important to note that some studies have tested, but failed to find evidence of, significant interactions between stressful life experiences and negative social exchanges (Ingram, Betz, Mindes, Schmitt, & Smith, 2001; Vinokur & van Ryn, 1993); this includes several studies that focused specifically on older adults (Finch, Okun, Barrera, Zautra, & Reich, 1989; Fukukawa et al., 2004; Okun et al., 1990). These studies generally have documented independent main effects of negative social exchanges and life stress. For example, a study of community-dwelling older adults by Okun and colleagues did not find evidence that stressful events exacerbated the adverse effect of negative social ties; rather, negative social ties and stressful events exhibited main effects on psychological distress. However, these previous studies that found evidence of independent main effects did not test nonlinear models.

Impact of Different Types of Life Stress

The inconsistent findings that have emerged in the studies conducted to date may be due, in part, to the fact that researchers have not systematically differentiated among particular types of stressful life experiences. The current study, therefore, distinguished three major categories of life stress: relationship losses, events that disrupt daily routines, and functional impairment. The first category, relationship losses, involves the death of a social network member, a tumultuous event that occurs with increasing frequency as people age (Lynch & George, 2002). The second category, disruptive events, refers to nonloss events that disrupt an individual's daily routines (e.g., car troubles or financial problems). The third category, functional impairment, reflects chronic difficulty experienced in efforts to carry out activities of daily living. Research has shown that these three categories of stressors are both common and distressing in later life (see Aldwin, 1990).

Some types of life stress may be likely to yield evidence of a linear or accelerating stress-exacerbation effect. For example, both stressful life experiences that disrupt daily routines (e.g., problems with transportation or household repairs) and stressful life experiences that one must deal with on a chronic basis, such as functional impairment, tax an individual's psychological resources (e.g., Serido et al., 2004) and thus may be upsetting but perhaps not so much so that negative exchanges with social network members fail to engage attention or to arouse further emotional distress. In such instances, stressful life experiences would aggravate the distress aroused by negative social exchanges, although the literature does not provide a basis for determining whether a linear or nonlinear (accelerating) form of such exacerbation would be more plausible. If the linear stress-exacerbation model holds, we would expect to find a significant first-order interaction between life stress and negative social exchanges; if the nonlinear stress-exacerbation, accelerating model holds, we would expect to find a significant second-order interaction between life stress and negative social exchanges, respectively.

In contrast, major stressful events such as the death of loved ones are emotionally draining experiences that involve a considerable amount of adjustment (e.g., Wheaton, 1997), and, as such, they may limit the potential of negative social exchanges to add to further emotional distress. In such instances, stressful life experiences would interact with negative social exchanges in a nonlinear fashion suggestive of an emotional plateau. An emotional-plateau effect might emerge not only because multiple relationship losses are likely to be emotionally draining but also because they may cause disagreements and misunderstandings with social network members to seem somewhat inconsequential by comparison. If the nonlinear stress-exacerbation, threshold (plateau) model holds, we would expect to find a significant second-order interaction between relationship losses and negative social exchanges, respectively.

The Current Study

Few studies to date have examined both first-order and second-order interactions between stressful life experiences and negative social exchanges, even though stress researchers have long urged greater attention to linear as well as nonlinear patterns in investigations of the joint effects of different kinds of stressors. Moreover, with few exceptions (e.g., Ingersoll-Dayton et al., 1997), studies have not distinguished among different classes of life stress in examining these interaction effects. Differentiating among stressful life experiences is an important next step in efforts to understand the circumstances under which such experiences do or do not compound the adverse effects of negative social exchanges. The present study accordingly examined interactions between negative social exchanges and three distinct classes of life stress. We hypothesized that relationship losses would be so emotionally draining that negative social exchanges with others would have little capacity to arouse further distress, resulting in an interaction effect consistent with an emotional plateau (cf. Figure 1d). We hypothesized that, in contrast, stressors that disrupt daily routines or that interfere with functioning on an ongoing basis (i.e., functional impairment) would interact with negative social exchanges in a manner consistent with stress exacerbation (cf. Figures 1b and 1c).

METHODS

Participants

The data for the present study were from the Later Life Study of Social Exchanges, a 2-year, five-wave longitudinal study of older adults. At baseline, the participants composed a nationally representative sample of 916 noninstitutionalized, cognitively functional, English-speaking adults aged 65 to 91 ($M = 74.16$ years). The sample consisted of 349 men and 567 women. With regard to ethnicity, 83% of the sample was White, with approximately 17% of the participants belonging to an ethnic minority group (11% African American, 5% Hispanic, and 1% other minority group). Approximately 54% of the participants were married or in a marital-like relationship, 34% were widowed, 8% were divorced, and 4% were never married. Finally, 63% had a high school degree or less, 20% had attended some college or vocational training, and the remaining 17% were college graduates. (See Sorkin & Rook, 2004, for further information about the sample.)

Procedure

In-person interviews lasting 70 min, on average, assessed participants' demographic characteristics, social exchanges, stressful life experiences, physical health, and emotional health. To determine whether participants were cognitively functional, interviewers asked questions at the beginning of the interview to identify signs of possible cognitive impairment. If interviewers detected these signs, they administered questions adapted from the Short Portable Mental Status Questionnaire (Pfeiffer, 1975). Data for the current study came from the baseline assessment.

Measures

Negative social exchanges.—Twelve items assessed the frequency with which participants had experienced negative social exchanges with members of their social network in the past month. The items tapped four domains of negative interaction (unwanted advice, others' failure to provide needed help, rejection/neglect, unsympathetic/insensitive behavior) that mirrored four domains of social support identified as important in the literature (informational support, instrumental support, companionship, emotional support). Specific items were developed through a systematic review of published measures and qualitative and quantitative pilot studies that included focus groups and card-sorting tasks conducted with older and younger adults, as well as confirmatory factor analyses to refine item wording and confirm the factor structure of the items (see Newsom, Nishishiba, Morgan, & Rook, 2003, for details). Sample items asked "In the past month, how often did the people you know . . . interfere or meddle in your personal matters?" ". . . fail to give you assistance that you were counting on?" ". . . forget or ignore you?" and ". . . do things that were thoughtless or inconsiderate?" For each of the four domains, three questions asked participants to rate how often each type of exchange had occurred on a 5-point scale (0 = never, 4 = very often). (More information about the measure and a complete list of items appears in Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005).

Life stress.—Interviewers asked participants which of several different types of life stress had occurred in the past 6 months (0 = did not occur, 1 = did occur), a time period found to yield relatively accurate recall of life events (Turner & Wheaton, 1995). Items were drawn from commonly used measures of life stress (B. S. Dohrenwend, Krasnoff, Askenasy, & Dohrenwend, 1978; Turner & Wheaton, 1995) and from measures specifically designed for older adults (Aldwin, 1990).

We assessed three categories of life stress. Relationship losses were assessed with two items that determined whether the participant's spouse or anyone else close to the participant had died in the past 6 months. The deaths of close others were recorded for up to four other individuals. Thus, the composite measure of relationship losses could range from 0 to 5. Items that assessed whether the participant had experienced a major home repair, residential relocation, or financial problems, or been a victim of a crime, in the past 6 months, comprised

Table 1. Means, Standard Deviations, and Intercorrelations for Study Variables ($N = 916$)

Variable	*M*	*SD*	1	2	3	4	5
1. Frequency of negative social exchanges	0.42	.57	—	.04	.17***	.17***	.35***
2. Relationship losses	0.29	.60		—	.08*	.01	.01
3. Disruptive events	0.34	.58			—	.20***	.22***
4. Functional impairment	0.61	.62				—	.22***
5. Negative affect	1.36	.80					—

Notes: *SD* = standard deviation.
*$p < .05$; ***$p < .001$.

a measure of disruptive events. An open-ended item also assessed whether any other disruptive events had occurred in this period. Common responses included in the composite measure of disruptive life events were car troubles (e.g., car breaking down, being in a car accident), problems with pet, and transportation issues. Any responses referring to interpersonal conflicts or disagreements were excluded to avoid a possible confound with the measure of negative social exchanges. Items were summed to create a composite measure of disruptive events that could range from 0 to 10. We assessed functional impairment by asking participants to rate on a 4-point scale (0 = not at all difficult, 3 = very difficult) how difficult it was for them to complete each of 15 activities. The items tapped basic activities of daily living (e.g., feeding oneself), instrumental activities of daily living (e.g., doing housework), upper extremity strength (e.g., carrying groceries), and mobility (e.g., walking a quarter of a mile; e.g., Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Lawton & Brody, 1969). The 15 items were averaged to create an overall measure of functional impairment (cf. Silverstein, Cong, & Li, 2006).

Emotional distress.—We assessed emotional distress with a 5-item measure of negative affect (Diener & Emmons, 1984). Participants rated on a 5-point scale (0 = never, 4 = very often) how often in the past month they had experienced each of five negative moods: frustrated, blue, worried, angry, and unhappy. The five items were averaged to form a composite measure of negative affect (Cronbach's $\alpha = .82$).

Covariates.—We examined demographic characteristics commonly included as covariates in previous research on older adults' negative social exchanges and psychological health (e.g., Ingersoll-Dayton et al., 1997; Okun et al., 1990) for inclusion as possible covariates in the current study. We treated characteristics that exhibited a significant correlation with a predictor and/or outcome variable as covariates. We included as covariates in all analyses gender (0 = male, 1 = female), marital status (0 = not currently married, 1 = married or living in a marriage-like relationship), and education (1 = less than eighth grade, 9 = completed graduate school or professional training). We included self-rated health (0 = poor, 4 = excellent) as a covariate in analyses that did not include functional impairment as a key predictor. Additionally, in each analysis that examined a particular category of life stress, we included controls for the effects of the other two categories of stress.

Data Analysis Strategy

We conducted three ordinary least squares multiple regression analyses to examine the hypothesized models of the joint effects of negative social exchanges and the three types of life stress. Each analysis included a first-order interaction term to test for linear stress exacerbation and a second-order interaction term to test for nonlinear stress exacerbation (cf. Krause, 1995). We centered the measures of negative social exchanges and life stress prior to constructing the interaction terms. The first-order interaction term was the product of negative social exchanges and a particular type of life stress. The second-order interaction term consisted of negative social exchanges squared multiplied by a particular type of life stress. For each regression analysis, we entered variables in the following stepwise order: covariates, negative social exchanges, and a particular type of life stress (Step 1), negative social exchanges squared (Step 2), first-order interaction term (Step 3), and second-order interaction term (Step 4). For any significant interactions identified, we examined the nature of the interaction by calculating separate regression equations for three levels of the relevant life stress variable (mean, +1 *SD*, and −1 *SD*), following procedures and using cutpoints recommended by Aiken and West (1991). The interaction was illustrated by inserting low, intermediate, and high values of negative social exchanges into the regression equation for each level of life stress to determine predicted values of negative affect. We then plotted these values to examine the nature of the significant interaction effects.

Although centering reduces nonessential collinearity (Aiken & West, 1991), we took additional steps to ensure that multicollinearity was not present in our data. Specifically, we inspected variance inflation factor values, and we considered all that fell below the value of 10 (or, more conservatively, 7) to indicate problematic levels of multicollinearity (e.g., J. Cohen, Cohen, West, & Aiken, 2003). In addition, we examined condition indices to assess the degree of redundancy among the variables through a function of the ratio of the largest to smallest eigenvalues. Condition indices between 15 and 30 are considered problematic in terms of multicollinearity (e.g., Draper & Smith, 1998), and none of our indices reached this range. (Information about the specific variance inflation factor and condition index values can be found in the tables.)

Results

Descriptive Analyses

Table 1 presents the means, standard deviations, and intercorrelations for the key study variables. Negative social exchanges, disruptive events, and functional impairment were significantly associated with negative affect. Relationship

Table 2. Joint Effects of Relationship Losses and Negative Social Exchanges Predicting Negative Affect ($N = 916$)

Variable	Model 1: Covariates and Main Effects	Model 2: Negative Exchanges Squared	Model 3: First-Order Interaction	Model 4: Second-Order Interaction
Gender	.150 (.054)**	.145 (.054)**	.145 (.054)**	.144 (.054)**
Marital status	.057 (.052)	.054 (.052)	.049 (.052)	.053 (.052)
Education level	.021 (.013)	.019 (.013)	.018 (.013)	.017 (.013)
Self-rated health	−.118 (.026)***	−.117 (.026)***	−.118 (.026)***	−.117 (.013)***
Disruptive events	.165 (.044)***	.165 (.043)***	.172 (.044)***	.170 (.044)***
Functional impairment	.063 (.049)	.061 (.049)	.058 (.049)	.060 (.049)
Relationship losses	−.013 (.040)	−.016 (.040)	−.017 (.040)	−.054 (.045)
Negative social exchanges	.426 (.044)***	.506 (.065)***	.507 (.065)***	.496 (.065)***
Negative social exchanges squared		−.069 (.042)	−.071 (.042)	−.061 (.042)
Negative social exchanges × Relationship losses			−.142 (.082)	−.288 (.115)*
Negative social exchanges squared × Relationship losses				.157 (.087)
Constant	1.373	1.409	1.420	1.418
Adjusted R^2	.183	.185	.186	.189

Notes: Data are unstandardized regression coefficients (standard error). Variance inflation factors ranged from 1.282 to 2.35; condition indices ranged from 1.50 to 9.15.

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

losses were not systematically associated with negative affect; this was unexpected but could have been due to the small number of participants reporting conjugal bereavement. This does not, in any event, preclude the possibility that relationship losses moderate the association between negative social exchanges and negative affect.

Relationship Losses

The first analyses examined the interaction between negative social exchanges and relationship losses as a predictor of negative affect (controlling for the effects of the other stressors). A statistically significant main effect of negative social exchanges emerged ($\beta = .360$, $p < .001$). Although we had expected to find a significant second-order interaction between relationship losses and negative social exchanges (cf. Figure 1d), it did not reach statistical significance (see Table 2). We did find a statistically significant first-order interaction, however, in the step of the analysis that included both first- and second-order interaction terms (Model 4; $\beta = –.109$, $p < .05$; see Table 2). The fact that the first-order interaction effect became apparent only after overlapping variance with the quadratic effect was removed suggested the presence of a suppressor effect in Model 3. A plot of the significant first-order interaction effect indicated that, contrary to expectation, the association between negative social exchanges and negative affect was the strongest for individuals experiencing no losses, the next strongest for those experiencing a medium number of losses, and the weakest for those experiencing the most losses (see Figure 2a).

Disruptive Events

Our next analyses examined whether disruptive events moderated the association between negative social exchanges and negative affect (controlling for the effects of the other stressors). As shown in Table 3, statistically significant main effects emerged for disruptive events and negative social exchanges ($\beta = .126$, $p < .001$; $\beta = .315$, $p < .001$, respectively). We had predicted that the interaction between disruptive events and negative social exchanges would reflect a process of stress exacerbation (as illustrated in Figures 1b and 1c). We obtained a significant second-order interaction ($\beta = .158$, $p < .01$; see Table 3). As shown in Figure 2b, the association between negative social exchanges and negative affect was the greatest for individuals experiencing a high number of disruptive events. The association between negative social exchanges and negative affect increased only up to a certain point of negative social exchanges and then leveled off for individuals experiencing a medium number of disruptive events. Finally, the association between negative social exchanges and negative affect took an inverted U-shaped form among individuals experiencing no disruptive events, with negative affect first increasing, then leveling off, and then decreasing somewhat as negative social exchanges increased.

Functional Impairment

Our next analyses examined whether functional impairment moderated the association between negative social exchanges and negative affect (controlling for the effects of the other stressors). The results (shown in Table 4) revealed statistically significant main effects for functional impairment and negative social exchanges ($\beta = .143$, $p < .001$; $\beta = .289$, $p < .001$, respectively). We had hypothesized that functional impairment would interact with negative social exchanges in a manner that reflected stress exacerbation (as illustrated in Figures 1b and 1c). Consistent with our prediction, a significant first-order interaction between functional impairment and negative social exchanges indicated that the association between negative social exchanges and negative affect increased with corresponding increases in functional impairment ($\beta = .067$, $p < .05$; see Table 4). As shown in Figure 2c, the association between negative social exchanges and negative affect was the strongest for individuals with high levels of functional impairment, the next strongest for individuals with medium levels of functional impairment, and the weakest for individuals without any functional impairment. The second-order interaction between functional impairment and negative social exchanges was not statistically significant (see Table 4).

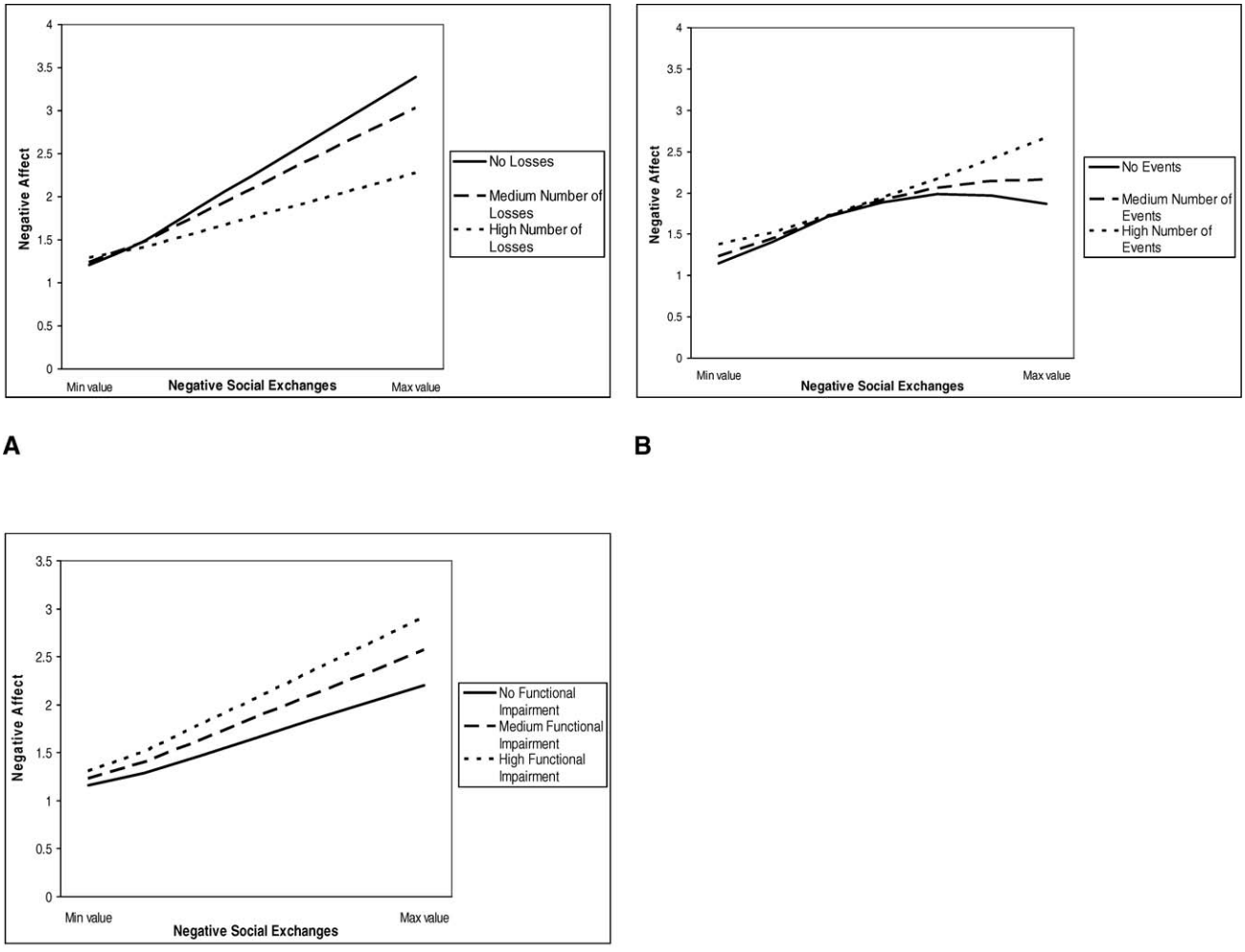

Figure 2. Negative social exchanges predicting negative affect in the context of (A) relationship losses, (B) disruptive events, and (C) functional impairment.

Supplemental Analyses

We undertook supplemental post hoc analyses to determine whether particular domain(s) of negative exchanges were responsible for the interaction effects we obtained. We replicated each analysis that yielded a significant interaction effect (first or second order), substituting measures of each of the four kinds of negative social exchanges for the composite measure. These analyses, thus, sought to "unpack" the key findings to determine whether particular kinds of negative social exchanges were most likely to interact with life stress in predicting participants' negative affect. For the category of relationship losses, the supplemental analyses revealed significant interactions for two of the four domains of negative social exchanges—rejection/neglect by others and others' unsympathetic/insensitive behavior. For both disruptive events and functional impairment, significant interactions emerged only for one of the four domains of negative social exchanges—others' unsympathetic/insensitive behavior. Plots of these interaction effects conformed to the shapes shown in Figure 2. (The results of these post hoc analyses are available upon request from Kristin J. August.) Thus, these analyses provided evidence that specific types of negative social exchanges, in particular emotionally unsupportive behaviors, were most likely to exhibit interactive effects with life stress.

Discussion

The current study sought to examine whether stressful life experiences affect older adults' vulnerability to the adverse effects of negative social exchanges. In order to examine the unique impact of specific types of life stress on the association between negative social exchanges and emotional distress, we distinguished three categories of life stress: relationship losses, disruptive events, and functional impairment. In addition, we tested both first-order and second-order interactions. The literature on negative social exchanges and life stress has rarely examined nonlinear patterns, although Krause (1995) examined first-order and second-order interactions in research on social support and life stress. We found that some types of stressors interacted with negative social exchanges in a linear

Table 3. Joint Effects of Disruptive Events and Negative Social Exchanges Predicting Negative Affect ($N = 916$)

Variable	Model 1: Covariates and Main Effects	Model 2: Negative Exchanges Squared	Model 3: First-Order Interaction	Model 4: Second-Order Interaction
Gender	.150 (.054)**	.145 (.054)**	.144 (.054)**	.147 (.054)**
Marital status	.057 (.052)	.054 (.052)	.053 (.052)	.055 (.052)
Education level	.021 (.013)	.019 (.013)	.019 (.013)	.019 (.013)
Self-rated health	−.118 (.026)***	−.117 (.026)***	−.117 (.026)***	−.115 (.026)***
Relationship losses	−.013 (.040)	−.016 (.040)	−.015 (.041)	−.016 (.040)
Functional impairment	.063 (.049)	.061 (.049)	.061 (.049)	.065 (.049)
Disruptive events	.165 (.044)***	.165 (.043)***	.170 (.044)***	.113 (.049)*
Negative social exchanges	.426 (.044)***	.506 (.065)***	.509 (.065)***	.514 (.065)***
Negative social exchanges squared		−.069 (.042)	−.067 (.042)	−.087 (.043)*
Negative social exchanges × Disruptive events			−.036 (.066)	−.258 (.106)*
Negative social exchanges squared × Disruptive events				.203 (.076)**
Constant	1.373	1.409	1.410	1.408
Adjusted R^2	.183	.185	.184	.190

Notes: Data are unstandardized regression coefficients (standard error). Variance inflation factors ranged from 1.382 to 3.689; condition indices ranged from 1.30 to 9.20.

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

manner, whereas other types of stressors interacted with negative social exchanges in a nonlinear manner in predicting emotional distress.

Relationship Losses

Contrary to our prediction of a second-order interaction conforming to an emotional-plateau effect, we found a significant first-order interaction between negative social exchanges and relationship losses that took a form that departed from the form we had expected. Specifically, although negative affect increased as negative social exchanges increased, this association was the weakest for individuals who had experienced the most relationship losses. This suggests that negative social exchanges may be less, rather than more, distressing when they occur in the context of multiple losses. It is possible that when older adults experience multiple relationship losses, negative social exchanges with social network members become less salient. That is, a social network member's unwanted advice or insensitive behavior may seem less important or meaningful, and therefore less distressing, in the context of the deaths of others. Alternatively, older adults who have experienced multiple relationship losses may appreciate the remaining members of their network more and, as a result, may feel less upset by negative social exchanges that occur with these individuals.

It is also possible, of course, that participants who had sustained multiple relationship losses experienced different types of negative social exchanges than did participants who had not experienced multiple relationship losses. Follow-up analyses conducted to examine this possibility, however, did not support this interpretation. (A summary of all follow-up analyses is available from Kristin J. August upon request.) We also explored the analogous possibility that older adults who had experienced multiple losses, compared to those who had not experienced multiple losses, might have received more social support from their network, thereby limiting the adverse effects of negative social exchanges; this alternative

Table 4. Joint Effects of Functional Impairment and Negative Social Exchanges Predicting Negative Affect ($N = 916$)

Variable	Model 1: Covariates and Main Effects	Model 2: Negative Exchanges Squared	Model 3: First-Order Interaction	Model 4: Second-Order Interaction
Gender	.113 (.054)*	.108 (.054)*	.115 (.054)*	.114 (.054)*
Marital status	.060 (.053)	.058 (.053)	.059 (.053)	.059 (.053)
Education level	.015 (.013)	.013 (.013)	.012 (.013)	.012 (.013)
Relationship losses	−.014 (.041)	−.017 (.041)	−.016 (.041)	−.016 (.041)
Disruptive events	.183 (.044)***	.182 (.044)***	.182 (.044)***	.182 (.044)***
Functional impairment	.184 (.042)***	.182 (.042)***	.178 (.042)***	.165 (.049)**
Negative social exchanges	.423 (.044)***	.503 (.066)***	.487 (.066)***	.487 (.066)***
Negative social exchanges squared		−.070 (.042)	−.078 (.042)	−.080 (.043)
Negative social exchanges × Functional impairment			.149 (.067)*	.107 (.104)
Negative social exchanges squared × Functional impairment				.040 (.077)
Constant	1.175	1.212	1.207	1.209
Adjusted R^2	.166	.168	.172	.171

Notes: Data are unstandardized regression coefficients (standard error). Variance inflation factors ranged from 1.079 to 3.213; condition indices ranged from 1.22 to 7.74.

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

explanation, too, was not substantiated by follow-up analyses, leading us to conclude that the pattern we observed reflects the role of multiple relationship losses in contributing to emotional numbing or to a shift in the meaning attributed to negative social exchanges.

Disruptive Events

Disruptive events interacted with negative social exchanges in a nonlinear pattern in predicting negative affect. Specifically, experiencing negative social exchanges in the context of numerous disruptive events appeared to lead to an exacerbation of negative affect. Thus, the aggravations associated with disruptive events may amplify the emotional distress aroused by negative social exchanges or interfere with the resources needed to deal with such exchanges. In contrast, among older adults who had experienced few disruptive events, the adverse effects of negative social exchanges leveled off, suggesting that older adults may have the resources needed to cope adequately with negative exchanges when they are not inundated with other life events. The apparent diminishing impact of negative exchanges on psychological distress evident at low levels of disruptive events also may indicate that negative exchanges must arouse a certain level of emotional distress before coping mechanisms are mobilized.

Functional Impairment

The significant interaction found for functional impairment is consistent with our prediction of a first-order stress-exacerbation effect and suggests that the adverse effects of negative social exchanges are steadily amplified at increasing levels of impairment. Functional impairment taxes an individual's coping resources on an ongoing basis, leaving fewer resources to deal with negative social exchanges. Furthermore, the physical discomfort that often accompanies functional impairment (Lyons, Sullivan, Ritvo, & Coyne, 1995) may intensify the emotional distress aroused by negative social exchanges. At high levels of functional impairment, negative social exchanges may involve particularly unpleasant or troubling interactions with caregivers (Newsom, 1999). In a related vein, older adults with the greatest functional impairment may be dealing with more severe or categorically different kinds of negative social exchanges, thereby accounting for the stress-exacerbation pattern we observed. Follow-up analyses, however, did not support this alternative explanation, leading us to believe that it is the compounding of emotional distress per se that accounts for the stress-exacerbation pattern we observed.

Disaggregating Negative Social Exchanges

We undertook supplemental analyses to determine whether particular domains of negative social exchanges accounted for the significant interaction effects we observed. The results of these analyses highlight the central role of emotionally unsupportive behavior by others in multiple life stress contexts, a finding that has parallels in the literature on social support, in which emotional support has been suggested to have singular importance in many different life stress contexts (Wills & Shinar, 2000). Surprisingly, the adverse effects of instrumental support let-downs were not compounded by functional impairment. This may reflect the ambiguous, or even negative, meaning of instrumental support among older adults who are dealing with functional limitations, as receiving instrumental support has been found to contribute to feelings of inadequacy or dependence among older adults (Reinhardt, Boerner, & Horowitz, 2006). Failure to receive instrumental support, therefore, may not be as emotional distressing as might be expected. Emotionally unsupportive behavior (such as criticism or insensitive comments) has a less ambiguous meaning and may be particularly distressing in the context of functional impairment. These findings highlight the importance of disaggregating not only life stress but also negative social exchanges in efforts to understand their joint effects on health and well-being.

Limitations

In evaluating the results of the current study, we should note several limitations. First, we found small effect sizes for the significant interactions, although small effect sizes are common when examining interaction effects in nonexperimental studies (McClelland & Judd, 1993). Moreover, the interactions we tested were part of complex models that involved second-order as well as first-order effects. Variable centering reduces nonessential collinearity in such models (Aiken & West, 1991), and we did not detect multicollinearity (as evidenced by variance inflation factor and condition index values), but overlap remained that may have contributed to the modest effect sizes of our interaction effects once all other effects were held constant.

Second, although the current study differentiated three classes of stressors that are relatively common in later life, it did not examine other stressors, such as natural disasters. Such stressors might exhibit patterns different from those we observed. It is also important to note that the findings of the current study may differ from those derived from studies that examined interactions between daily stressors (e.g., Bolger et al., 1989), between chronic and daily stressors (e.g., Serido et al., 2004), or between chronic and acute stressors (e.g., Lepore, Miles, & Levy, 1997). It would be valuable to explore in greater depth the temporal dimensions of stressors, such as the distinction between acute and chronic stressors, in examining their interactive effects with negative social exchanges. Compared to chronic stressors, for example, acute stressors appear to have more proximal effects on emotional well-being and may contribute to fluctuations in emotional well-being (Almeida, Neupert, Banks, & Serido, 2005). Thus, understanding the synergies that may occur between negative social exchanges and various forms of life stress would benefit from systematic attention to the acute versus chronic nature of such stressors. The investigation of such synergies would benefit, as well, from greater attention to the severity or magnitude of stressful life experiences, although researchers must carefully consider the strategies for assessing severity to avoid confounds with psychological outcomes (B. P. Dohrenwend, 2006). We reasoned in the current study that relationship losses represented a category of more severe stressors than the categories of disruptive events and functional impairment, but formal assessment of severity both within and across stressor categories is needed to buttress such claims and, more generally, to illuminate the kinds of stressful experiences that are most likely to compound (or mute) the adverse effects of negative social exchanges.

Finally, the cross-sectional nature of our analyses made it difficult to determine the causal direction of effects. Negative affect might precipitate negative social exchanges or stressful life experiences, rather than vice versa. Our longitudinal assessments were not optimally spaced to address such questions of causal order, however, in view of research suggesting that the effects of commonly studied stressors tend to dissipate within 6 months of their occurrence (e.g., Glass, Kasl, & Berkman, 1997; Norris & Murrell, 1987). Longitudinal studies with more closely spaced assessments or microanalytic methods, such as daily diary studies, would offer advantages in future research investigating the temporal and causal connections among negative social exchanges, stressful life experiences, and psychological distress.

Conclusion

This study contributed to the literature in two main ways. First, we examined both first-order and second-order interactions in order to evaluate the independent and joint effects of negative social exchanges and life stress on negative affect. Moreover, we differentiated several classes of life stress to avoid the possibility of masking important associations with the use of an aggregate measure.

The study revealed that negative social exchanges are associated with considerable psychological distress and that life stress moderates this association. Some types of life stress magnify this association, whereas other types of life stress reduce this association. Thus, it is important to bear in mind that negative social exchanges and life stress often co-occur and have synergistic effects that warrant investigation. Future efforts to probe the joint effects of these co-occurring aversive experiences would add to researchers' understanding of the factors that affect vulnerability to negative social exchanges in later life.

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References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

Aldwin, C. M. (1990). The elders life stress inventory: Egocentric and nonegocentric stress. In M. A. P. Stephens, J. H. Crowther, S. E. Hobfoll, & D. L. Tennenbaum (Eds.), *Stress and coping in later life families* (pp. 46–69). Washington, DC: Hemisphere.

Almeida, D. M., Neupert, S. D., Banks, S. R., & Serido, J. (2005). Do daily stress processes account for socioeconomic health disparities? *Journal of Gerontology: Social Sciences, 60B*, S34–S39.

Bolger, N., DeLongis, A., Kessler, R. C., & Schilling, E. A. (1989). Effects of daily stress on negative mood. *Journal of Personality and Social Psychology, 57*, 808–818.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Cohen, S. (2004). Social relationships and health. *American Psychologist, 59*, 676–684.

Cranford, J. A. (2004). Stress buffering or stress-exacerbation? Social support and social undermining as moderators of the relationship between perceived stress and depressive symptoms among married people. *Personal Relationships, 11*, 23–40.

Diener, E., & Emmons, R. A. (1984). The independence of positive and negative affect. *Journal of Personality and Social Psychology, 47*, 1105–1117.

Dohrenwend, B. P. (2006). Inventorying stressful life events as risk factors for psychopathology: Toward resolution of the problem of intracategory variability. *Psychological Bulletin, 132*, 477–495.

Dohrenwend, B. S., Krasnoff, L., Askenasy, A. R., & Dohrenwend, B. P. (1978). Exemplification of a method for scaling life events: The PERI Life Events Scale. *Journal of Health and Social Behavior, 19*, 205–229.

Draper, N. R., & Smith, H. (1998). *Applied regression analysis* (3rd ed.). New York: Wiley.

Finch, J. F., Okun, M. A., Barrera, M., Jr., Zautra, A. J., & Reich, J. W. (1989). Positive and negative social ties among older adults: Measurement models and the prediction of psychological distress and well being. *American Journal of Community Psychology, 17*, 585–605.

Fukukawa, Y., Nakashima, C., Tsuboi, S., Niino, N., Ando, F., Kosugi, S., et al. (2004). The impact of health problems on depression and activities in middle-aged and older adults: Age and social interactions as moderators. *Journal of Gerontology: Psychological Sciences, 59B*, P19–P26.

Fukukawa, Y., Tsuboi, S., Niino, N., Ando, F., Kosugi, S., & Shimokata, H. (2002). Stress, social exchanges and depressive symptoms in Japanese middle-aged and elderly adults: Positive and negative effects of familial relationships on psychological health. *Japanese Journal of Developmental Psychology, 13*, 42–50.

Glass, T. A., Kasl, S. V., & Berkman, L. F. (1997). Stressful life events and depressive symptoms among the elderly. *Journal of Aging and Health, 9*, 70–89.

Ingersoll-Dayton, B., Morgan, D., & Antonucci, T. (1997). The effects of positive and negative social exchanges on aging adults. *Journal of Gerontology: Social Sciences, 52B*, S190–S199.

Ingram, K. M., Betz, N. E., Mindes, E. J., Schmitt, M. M., & Smith, N. G. (2001). Unsupportive responses from others concerning a stressful life event: Development of the Unsupportive Social Interactions Inventory. *Journal of Social and Clinical Psychology, 20*, 173–207.

Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged. The index of ADL: A standardized measure of biological and psychosocial function. *Journal of the American Medical Association, 185*, 914–919.

Kiecolt-Glaser, J. K., Dyer, C. S., & Shuttleworth, E. C. (1988). Upsetting social interactions and distress among Alzheimer's disease family caregivers: A replication and extension. *American Journal of Community Psychology, 16*, 825–837.

Krause, N. (1995). Assessing stress-buffering effects: A cautionary note. *Psychology and Aging, 10*, 518–526.

Krause, N. (2006). Social relationships in late life. In R. H. Binstock & L. K. George (Eds.), *Handbook of aging and the social sciences* (6th ed., pp. 181–200). Amsterdam: Elsevier.

Krause, N., & Shaw, B. A. (2002). Negative interaction and changes in functional disability during late life. *Journal of Social and Personal Relationships, 19*, 339–359.

Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist, 9*, 179–186.

Lepore, S. J., Miles, H. J., & Levy, J. S. (1997). Relation of chronic and episodic stressors to psychological distress, reactivity, and health problems. *International Journal of Behavioral Medicine, 4*, 39–59.

Lincoln, K. D., Taylor, R. J., & Chatters, L. M. (2003). Correlates of emotional support and negative interaction among older Black Americans *Journal of Gerontology: Social Sciences, 57B*, S117–S125.

Lynch, S. M., & George, L. K. (2002). Interlocking trajectories of loss-related events and symptoms among elders. *Journal of Gerontology: Social Sciences, 58B*, S225–S233.

Lyons, R. F., Sullivan, M. J. T., Ritvo, P. G., & Coyne, J. C. (1995). *Relationships in chronic illness and disability.* Thousand Oaks, CA: Sage.

McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin, 114*, 376–390.

Newsom, J. T. (1999). Another side to caregiving: Negative reactions to being helped. *Current Directions in Psychological Science, 8*, 183–187.

Newsom, J. T., Nishishiba, M., Morgan, D. L., & Rook, K. S. (2003). The relative importance of three domains of positive and negative social exchanges: A longitudinal model with comparable measures. *Psychology and Aging, 18*, 746–754.

Newsom, J. T., Rook, K. S., Nishishiba, M., Sorkin, D. H., & Mahan, T. L. (2005). Understanding the relative importance of positive and negative social exchanges: Examining specific domains and appraisals. *Journal of Gerontology: Psychological Sciences, 60B*, P304–P311.

Norris, F. H., & Murrell, S. A. (1987). Transitory impact of life-event stress on psychological symptoms in older adults. *Journal of Health and Social Behavior, 28*, 197–211.

Okun, M. A., Melichar, J. F., & Hill, M. D. (1990). Negative daily events, positive and negative social ties, and psychological distress among older adults. *The Gerontologist, 30*, 193–199.

Pfeiffer, E. A. (1975). Short Portable Mental Status Questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of the American Geriatrics Society, 23*, 433–441.

Rauktis, M. E., Koeske, G. F., & Tereshko, O. (1995). Negative social interactions, distress, and depression among those caring for a seriously and persistently mentally ill relative. *American Journal of Community Psychology, 23*, 279–299.

Reinhardt, J. P., Boerner, K., & Horowitz, A. (2006). Good to have but not to use: Differential impact of perceived and received support on well-being. *Journal of Social and Personal Relationships, 23*, 117–129.

Rhodes, J. E., Ebert, L., & Meyers, A. B. (1994). Social support, relationship problems and the psychological functioning of young African-American mothers. *Journal of Social and Personal Relationships, 11*, 587–599.

Rook, K. S. (1992). Detrimental aspects of social relationships: Taking stock of an emerging literature. In H. O. F. Veiel & U. Baumann (Eds.), *The meaning and measurement of social support* (pp. 157–169). New York: Hemisphere.

Rook, K. S. (1998). Investigating the positive and negative sides of personal relationships: Through a lens darkly? In B. H. Spitzberg & W. R. Cupach (Eds.), *The dark side of close relationships* (pp. 369–393). Mahwah, NJ: Erlbaum.

Rook, K. S. (2003). Exposure and reactivity to negative social exchanges: A preliminary investigation using daily diary data. *Journal of Gerontology: Psychological Sciences, 58B*, P100–P111.

Sandler, I. N., & Barrera, M., Jr. (1984). Toward a multimethod approach to assessing the effects of social support. *American Journal of Community Psychology, 12*, 37–52.

Serido, J., Almeida, D. M., & Wethington, E. (2004). Chronic stressors and daily hassles: Unique and interactive relationships with psychological distress. *Journal of Health and Social Behavior, 45*, 17–33.

Silverstein, M., Cong, Z., & Li., S. (2006). Intergenerational transfers and living arrangements of older people in rural China: Consequences for psychological well-being. *Journal of Gerontology: Social Sciences, 61B*, S256–S266.

Sorkin, D. H., & Rook, K. S. (2004). Interpersonal control strivings and vulnerability to negative social exchanges in later life. *Psychology and Aging, 19*, 555–564.

Turner, R. J., & Wheaton, B. (1995). Checklist measurement of stressful life events. In S. Cohen, R. Kessler, & L. Gordon (Eds.), *Measuring stress: A guide for health and social scientists* (pp. 29–58). London: Oxford University Press.

Umberson, D., Williams, K., Powers, D. A., Liu, H., & Needham, B. (2006). You make me sick: Marital quality and health over the life course. *Journal of Health and Social Behavior, 47*, 1–16.

Vinokur, A. D., & van Ryn, M. (1993). Social support and undermining in close relationships: Their independent effects on the mental health of unemployed persons. *Journal of Personality and Social Psychology, 65*, 350–359.

Wheaton, B. (1997). The nature of chronic stress. In B. H. Gottlieb (Ed.), *Coping with chronic stress* (pp. 43–73). New York: Plenum Press.

Wills, T. A., & Shinar, O. (2000). Measuring perceived and received social support. In S. Cohen, L. G. Underwood, & B. H. Gottlieb (Eds.), *Social support measurement and intervention: A guide for health and social scientists* (pp. 86–135). New York: Oxford University Press.

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