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Social Partners and Momentary Affect in the Oldest-Old: The Presence of Others Benefits Affect Depending on Who We Are and Who We Are With

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Abstract

There are well-documented links between social relationships and emotional well-being in old age, but little is known about daily life fluctuations in momentary affective experiences of the oldest-old while interacting with specific social partners. We examined associations between the presence of different types of social partners and moment-to-moment fluctuations in affect in the oldest-old, taking into account individual differences in gender, neuroticism, depressive symptoms, chronic health conditions, and loneliness. Participants (N = 74, M age = 88.7 years, range = 84 – 102 years, 68% women) provided self-reports concurrently on the presence of social partners and subjective affective states six times a day for each of seven consecutive days (3,071 occasions, in total). Relative to being with other people, time spent alone was associated with lower positive affect in the oldest-old. Being with other family members and friends was associated with more positive affective experiences. Compared to men, women reported more negative affective experiences when they were with their spouses than when their spouses were not present. Individuals with more chronic health problems reported more negative affective experiences when they were with their spouses than not. Participants higher in neuroticism reported more positive affective experiences when they were with their friends, compared to times when their friends were not present. Finally, lonelier individuals reported more positive affective experiences when they were with their spouses than not. These findings suggest that affective experience is a function of individual differences and the type of social partners oldest-old adults interact with in everyday life. We discuss how our findings can be generalized to oldest-olds of different marital statuses taking into account the proportion of widows in our sample as well as measurement specifics.

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Keywords

aging; social relationship; social partners; affect; oldest-old

Aspects of social relationships, such as social support and social integration, have major implications for individuals' physical and psychological health across the lifespan (Berkman, Glass, Brissette, & Seeman, 2000). However, little is known about the affective implications of social interactions in daily life, especially in the oldest-old (Fingerman & Pitzer, 2007). The purpose of our study was to fill this distinct gap in the literature by examining whether the absence or the presence of different types of social partners (e.g. spouse and friends), which may fulfill different relationship functions, are associated with concurrent momentary affective experiences in the oldest-old. Specifically, we used up to 42 repeated daily life assessments from 74 oldest-old adults to examine concurrent associations between the presence of different types of social partners and positive and negative affect.

The link between social relationships and psychological health is well established but the mechanisms underlying this association are not well understood (Cohen, 2004). Fingerman and Lang (2004) proposed a cube model to illustrate the interweaving of three dimensions in social relationships from a lifespan perspective. The *structure* of social relationships concerns the types of social partners individuals interact with, e.g. spouse and friends. The *processes* refer to the underlying mechanisms of social relationships, such as motivation to engage with others. The *outcomes* refer to the benefits and costs of social relationships, including satisfaction and affective state. Research typically focuses on specific dimensions (e.g. friendships in late life) or interactions of dimensions (e.g. affective benefits of friendships in late life). The three dimensions and their associations change and reflect the changing life circumstances of the individual across the lifespan. For instance, because the loss of a spouse becomes more common in late life, the affective benefits of friendships may become more important as individuals age.

The present study focused on the structure-outcome dimensions of the cube model, specifically, the types of social partners and how they are associated with fluctuations in affect quality. Findings have shown that the structure of social relationships, e.g. being married, is associated with physical and mental health outcomes in older adults (Cohen, 2004). To explain the contribution of social relationships to affective experiences, Larson and colleagues (1986) pointed to the important distinction between the *long-term* structure and contributions of social relationships in a global time frame compared to the *immediate* sensations and feelings emergent in social interactions in the present moment. For instance, having more immediate positive affective experiences with friends was not associated with greater life satisfaction in the global time frame. To date, a substantial body of research draws from the between-person perspective (Nesselroade & Molenaar, 2010) and has examined the long-term structure-outcome link, e.g. marital status and mortality (Cohen, 2004). Few studies have integrated the within-person perspective and examined momentary affective experiences emergent from ongoing social interactions (Larson et al., 1986). In order to provide a detailed description of the everyday life processes and contexts influencing affective experiences in old age (Baltes, Wahl, & Schmid-Furstoss, 1990;

Nesselroade & Molenaar, 2010), the present study adopted a within-person perspective and examined the momentary affective experiences associated with the presence of different social partners in oldest-old adults' daily lives.

Long-term Structure and Outcomes in Social Relationship

We first review the literature on the link between the long-term structure and outcomes in social relationships in a global time frame. We then review the literature on the link between the presence of social partners and affect in the present moment. A substantial body of research has examined the long-term structure of social relationships and their associated outcomes (Cohen, 2004). Results from the Australian Longitudinal Study of Ageing (ALSA; Giles, Glonek, Luszcz, & Andrews, 2005) showed that specific social network types differentially predicted mortality in older adults. Having more friends was associated with lower mortality hazards over a 10-year period, whereas no predictive effect was found for networks of children and relatives. Furthermore, parent-adult children relationships can involve tensions and ambivalence with consequences for well-being (Fingerman, Pitzer, Lefkowitz, Birditt, & Mroczek, 2008). Among married older adults, spouses shape each other's developmental trajectories of depressive symptoms (Hoppmann, Gerstorf, & Hibbert, 2011) and well-being (Walker, Luszcz, Gerstorf, & Hoppmann, 2011). In late life, peripheral ties such as healthcare providers, may act as substitutes for lost spouses and are important for well-being (Fingerman, 2009). However, findings seem to suggest that older adults tend to have negative interactions with peripheral ties. This may be due to the tendency of healthcare providers to encourage dependency in older adults which may lead to resentment, lowered self-esteem, and adverse health outcomes (Smith & Goodnow, 1999). It is therefore crucial to move beyond an examination of the mere presence or absence of social relationships in old age and embark on an investigation of how distinct types of social partners may be differentially associated with well-being and health.

Presence of Social Partners and Momentary Affective States

Beyond the global time frame, interactions with different types of social partners are associated with momentary variations in affect and arousal. Larson and colleagues (1986) examined the presence of different types of social partners and the associated affect and arousal in a seven-day experience-sampling study (median age = 68 years, range = 55 – 88 years). The types of social partners examined included spouse, children, friends/neighbors, and other. Affect and arousal were assessed using bipolar items (e.g. happy-sad, energetic-tired) and z-scores of affect and arousal were used for analysis. Older adults reported neutral or below average (relative to individuals' own means) affect and arousal when with their children or spouses. In contrast, they reported above average affect and arousal when with friends. Larsen and colleagues suggested that spouse and family constitute the long-term structural properties of social relationships, which contribute to individuals' overall security and satisfaction. In contrast, friends constitute the short-term process properties of social relationships, which contribute to individuals' momentary affective experiences. These findings were consistent with findings on tension and ambivalence in parent-adult children relationships (Fingerman et al., 2008) and spousal relationships in old age (Hoppmann et al., 2011; Walker et al., 2011).

To examine the momentary affective experiences associated with social interactions, the present study extended the original cube model (Fingerman & Lang, 2004) to take into account within-person variations in the presence of different types of social partners and associated momentary fluctuations in affect in oldest-old adults' daily lives. Compared to Larsen and colleagues' (1986) study that used a younger and mostly married (66%) sample, our sample comprised of older (*M* age = 88.7 years, range = 84 – 102 years) and mostly widowed (68%) oldest-old adults. Thus, our sample is particularly suited to examine the interactions with peripheral ties that may substitute for the loss of spouses in the oldest-old. A second point of difference is that we focused on affect (not arousal) and used unipolar items, instead of bipolar items which assume unidimensionality of the affect structure. The conceptualization of a unidimensional affect structure was timely in the 80's, however, more recent conceptualizations of affect assume a multi-dimensional structure and the use of unipolar items (Watson, Clark, & Tellegen, 1988). Furthermore, we draw from the social convoy model and acknowledge that social relationships are in part shaped by individual characteristics (Antonucci, Fiori, Birditt, & Jackey, 2010). Thus, we examined between-person differences in the within-person variability in affect in the presence of various types of social partners, which allows us to move towards better understanding of affect experienced when oldest-old adults interact with others.

Social Relationships, Solitude, and Age

In general, social networks shrink with age (Lang & Carstensen, 1994) and individuals spend increasing amounts of time alone (Larson, 1990) due to changes in the composition of social networks (Antonucci et al., 2010) and changes in preference for particular types of social partners (Carstensen, Isaacowitz, & Charles, 1999)[1]. However, being alone does not necessarily carry negative connotations for at least two reasons. First, there is an important distinction between solitude and loneliness. Solitude is the objective state of being alone and loneliness is the subjective feeling of a discrepancy in the quantity or quality of social relationships one has and those one desires (Jylhä & Saarenheimo, 2010). From adolescence to old age, being alone becomes more common and less emotionally negative (Larson, 1990). Although loneliness is often associated with poorer health outcomes (Hawkley & Cacioppo, 2010), daily experiences of solitude have been associated with a greater sense of control in older adults (Larson, Zuzanek, & Mannell, 1985). Second, the affective experiences associated with being alone may depend on individual characteristics. For instance, being alone may be particularly negative for lonely individuals because of their unfulfilled social needs (Cacioppo et al., 2000). Because being alone becomes increasingly common with age, it is important to examine the affective experience of the oldest-old when they are alone as well as with other people.

[1]We recognize that the Socioemotional Selectivity Theory (SST) is valuable in the interpretation and prediction of affective experiences in relation to social partners from the lifespan perspective. However, we decided not to rely on SST because testing propositions from the SST requires making use of future time perspective, which was not available in our study.

Individual Characteristics and Social Relationships in Old Age

Beyond within-person variations in social interactions and affect, we acknowledge the important role of between-person differences (Antonucci et al., 2010). Gender, personality, and health conditions have an influence on who individuals interact with and how they benefit from their social relationships (Rook, Mavandadi, Sorkin, & Zettel, 2007). Women often have larger social networks and tend to receive support from multiple sources, while men tend to rely on their spouses exclusively (Antonucci et al., 2010). Older adults higher in neuroticism report receiving less social support and are less satisfied with their social interactions (Bolger & Zuckerman, 1995). Depressive symptoms and chronic health conditions increase with age (Alexopoulos, 2005; Birditt & Antonucci, 2008) and both are associated with less satisfying social interactions (Nezlek, Imbrie, & Shean, 1994), including tension and vulnerability in older couples (Hoppmann et al., 2011). In particular, depressive symptoms are associated with mean affect and affect variability (Ebner-Priemer & Trull, 2009). Furthermore, lonely individuals may be particularly distressed when they are alone (Hawkley & Cacioppo, 2010).

The Current Study

We examined the associations between the presence of different types of social partners and the momentary affective experiences of oldest-old adults, taking into account individual characteristics including gender, neuroticism, depressive symptoms, chronic health conditions, and loneliness. Although social interactions with spouses and family may be emotionally meaningful, there is also evidence suggesting that the presence of spouses and family can be associated with negative affective experiences in young-old adults (Larson et al., 1986). We examined the following hypotheses. H1: We expect that the presence of spouses and family will be associated with lower PA and higher NA in the oldest-old. H2: We expect that the presence of friends will be associated with higher PA and lower NA in the oldest-old. H3: We expect that being alone will be associated with lower PA and higher NA for lonely individuals, compared to the less lonely. H4: Compared to women, the presence of spouses will be associated with higher PA and lower NA in men. H5: Compared to individuals with lower neuroticism, higher neuroticism will be associated with lower PA and higher NA when individuals are with others. H6: Compared to individuals with fewer depressive symptoms and chronic health conditions, the presence of a spouse will be associated with lower PA and higher NA in individuals with more depressive symptoms and chronic health conditions.

Method

Participants

The ALSA Daily-Life Time-Sampling (ADuLTS) Study (Luszcz et al., 2011, November) is an extension of the Australia Longitudinal Study of Ageing (ALSA; Luszcz et al., 2007). Out of the 168 active ALSA participants, a subset ($N = 95$) was invited to take part in ADuLTS based on three criteria: (a) vision and hearing sufficient to independently complete diaries; (b) Mini-Mental State Examination ≥ 24 (MMSE; Folstein, Folstein, & McHugh, 1975); (c) overall functioning based on a clinical assessment in the last wave of ALSA. Out

of the 95 ALSA participants, 51 were successfully recruited. Attrition analyses showed that ADuLTS participants were positively selected, compared to the whole ALSA sample and the eligible participants who refused to participate ($n = 44$)[2]. To increase the sample size, an additional group of community-dwelling adults ($N = 24$) was recruited from multiple sources including the school of psychology older participant pool, retirement villages, and through "snowballing."[3] A total sample of 50 women and 25 men were recruited (M age = 88.65 years, $SD = 3.04$, range = 83.55 – 102.40). The participants were mostly community-dwelling (98.7%). Most participants were widowed (68%), followed by married (25%), de facto (3%), never married (3%), and divorced (1%). Men (44% married) and women (16% married) differed significantly in marital status, χ^2 (1) = 5.51, $p < .05$. Most participants (77%) were born in Australia or the United Kingdom (17%), with the remainder from other European countries. Participants received an AUD$30 gift card as compensation. Analyses were based on 74 individuals' data because one participant did not complete any within-day assessments after the baseline.

Procedure

Participants completed a baseline assessment at home with a research assistant, during which they received instructions on completing the within-day paper diaries and on the use of an electronic beeper that signaled when to complete them. Research assistants met the participants again at home on Day 2 to make sure they followed the instructions without difficulties. Participants carried the beeper for one week and completed six self-reports each day. They were encouraged to contact the research assistant by phone if they had difficulties following the protocol. Research assistants met the participants at home the day after the final assessment day to collect diaries and receive feedback from participants and to debrief, thank and remunerate them.[4]

On each assessment day, the first self-reports were completed shortly after waking up, which was self-initiated. The remaining five were completed in response to a beep that occurred at three-hourly intervals. The beeps were scheduled to minimize conflicts with participants'

[2]Attrition analyses showed that participants who took part in ADuLTS were positively selected, among all ALSA participants. Using data from ALSA (waves 1, 3, 6, 9, and 11), ADuLTS participants were younger, better educated, having better cognitive functioning, self-rated health, and functional health, and lower depressive symptoms, compared to those who either did not survive or refused to take part in ADuLTS. Effects of sample selectivity was primarily due to mortality rather than drop-out for other reasons such as refusal to participate (Luszcz et al., 2011, November). Using data from ALSA Wave 11 (2010), among the 95 ALSA participants eligible to take part in ADuLTS, those who declined to participate ($n = 44$) were significantly different from those who participated ($n = 51$) in age and free recall. ADuLTS participants were significantly younger, $t(92) = -2.12$, $p < .05$, ($M = 88.55$ years, $SD = 2.57$ vs. $M = 89.81$ years, $SD = 3.19$) and scored higher in free recall, $t(93) = 2.55$, $p < .01$, ($M = 7.18$, $SD = 1.51$, vs. $M = 6.27$, $SD = 1.81$) than those who refused to participate. They did not differ from each other in scores of attention and calculation, recall, cued recall, and Mini Mental State Examination.

[3]The ALSA participants and the additional group from the community did not differ significantly from each other in the variables of interest, including age (ALSA group: $M = 89.04$, $SD = 2.50$, community group: $M = 88.02$, $SD = 3.83$, $t(32.70) = 1.19$, $p > .05$), gender (ALSA group: 64% women; community group: 71% women, χ^2 (1) = .10, $p > .05$), neuroticism (ALSA group: $M = 14.60$, $SD = 4.79$, community group: $M = 14.33$, $SD = 5.43$, $t(40.74) = .21$, $p > .05$), depressive symptoms (ALSA group: $M = 4.99$, $SD = 11.63$, community group: $M = 4.06$, $SD = 12.60$, $t(43.86) = 1.06$, $p > .05$), chronic health conditions (ALSA group: $M = 2.22$, $SD = 2.13$, community group: $M = 2.75$, $SD = 2.02$, $t(46.60) = -1.49$, $p > .05$), and loneliness (ALSA group: 27% agree, community group: 38% agree, χ^2 (1) = .37, $p > .05$).

[4]Participants provided feedback by answering four questions (1 = *not at all*; 5 = *very much*): (a) "Do you think that the alarm was loud enough?", $M = 3.86$, $SD = 1.34$; (b) "Did the people around you react negatively when you completed the questionnaires?", $M = 1.27$, $SD = .75$; (c) "To what extent did the questionnaire completion interfere with your daily routines?", $M = 2.49$, $SD = 1.22$; and (d) "Did your response to the questions result in you changing your behaviour?", $M = 1.48$, $SD = .94$. Participants' feedback was positive overall.

daily routines. Participants were instructed to respond to the beep as soon as possible and within two hours. Analyses were based on the baseline data and six within-day self-reports for the seven-day assessment period. The sample provided a total of 3,071 self-reports of the presence of social partners and affective experiences. Overall compliance was 96%. Participants provided an average of 40.38 (*SD* = 4.69) self-reports out of 42 assessment occasions (6 within-day × 7 days). To ensure compliance with the protocol, i.e. no backfilling, participants used an electronic time stamp to record the time that they began and finished each self-report. Participants put each self-report into an envelope and stamped the time again across the seal.

Measures

Positive and negative affect—In each within-day assessment (not baseline), affect was measured using nine items: happy, sad, calm, sleepy, anxious, alert, quiet, irritated, and excited (1 = *not at all*; 5 = *very much*). These items were selected based on two criteria: (a) each displayed considerable within-person variability in past research, and (b) together the items covered each octant of the affective circumplex (Tsai, Knutson, & Fung, 2006). Drawing from the Circumplex Model of Emotion (Larsen & Diener, 1992), items were selected to represent positive (happy, excited, and calm) and negative affect (sad, anxious, and irritated) based on face validity. Instead of a homogeneous set of items (e.g. high-arousal positive: enthusiastic, excited, strong), the items were selected to capture the wide range of valence and activation. Similar items are commonly used in time-sampling affect research (e.g., Hoppmann & Klumb, 2006). The heterogeneous set of items is expected to have low internal consistency but adequate longitudinal reliability (Shrout & Lane, 2012). For internal consistency, mean Cronbach's α across the 42 within-day assessments was .41 (*SD* = .10; range = .17–.60) for PA and .67 (*SD* = .12; range = .30–.82) for NA. Longitudinal reliability of PA and NA were evaluated using four indices based on the Generalizability Theory (Cranford et al., 2006; Shrout & Lane, 2011). R_{KF} = .99 for PA and .99 for NA. R_{1R} = .75 for PA and .78 for NA. R_{KR} = .98 for PA and .98 for NA. R_C = .37 for PA and .36 for NA. The indices show moderate to excellent longitudinal reliability for PA and NA. The moderate R_C suggests that the selected items were sensitive to detecting moment-to-moment changes in affect. Given the small sample size and limited number of items used to reduce participant burden, the internal consistency of the 3-item PA and NA scales were less than optimal. However, the PA and NA scales show reasonable psychometric properties in the context of a time-sampling design (Shrout & Lane, 2012). Mean scores of PA and NA for each assessment were calculated and used for further analyses.

Types of social interactions in daily life—At each beep, the presence of social partners was determined by responses to the question "Who are you with?" Participants had multiple options to check (a) service provider, (b) formal carer, (c) spouse, (d) other family member, (e) friend, (f) other, and (g) alone. Responses were dummy-coded (*0 = not present; 1 = present*). For example, when participants were with their spouse and friend, *spouse* = 1 and *friend* = 1. The other types of social partners were coded 0. Responses to the option "alone" were also dummy-coded (*0 = not alone; 1 = alone*). Participants reported being alone 71% of the time (2,171 out of a total of 3,071 assessments). Participants were most often (17%) with their spouses, followed by other family members (6%) and friends (3%).

The presence of service providers (0.7%), formal carers (0.03%), and other social partners (1%) were relatively infrequent, so the variable "peripheral ties" was created by collapsing these responses together. When social partners were present, only 5% of the time were there multiple types of social partners. Therefore, we did not examine the interaction effect of multiple social partners, e.g. spouse × friend.

Neuroticism—Neuroticism was assessed during baseline by the 8-item Big Five Inventory subscale (John & Srivastava, 1999), using a 5-point Likert scale (1 = *Disagree Strongly*; 5 = *Agree Strongly*). Cronbach's α was .74 (M = 14.51, SD = 4.97). Higher scores indicate more emotional instability.

Depressive symptoms—Depressive symptoms were assessed during baseline by a 10-item short-version of the Center for Epidemiological Studies Depression Scale (CES-D; Andresen, Malmgren, Carter, & Patrick, 1994). Participants responded using a 4-point Likert scale (0 = *Rarely or none of the time*; 4 = *Most or all of the time*). Cronbach's α was .62. The item "My sleep was restless" was dropped because Cronbach's α was .65 with the remaining nine items (M = 4.69, SD = 3.46). Higher scores indicate more depressive symptoms. The lower than expected internal consistency of the CES-D is addressed as a limitation in the discussion section.

Chronic health conditions—Chronic health conditions were assessed by responses to the question "In the past 12 months, has a Medical Doctor ever told you that you suffer from any of these chronic conditions" on a list of 10 medication conditions, e.g. arthritis and cancer (*1 = Yes*; *0 = No*). The mean number of chronic health conditions was 2.43 (SD = 1.48).

Loneliness—The five-item "lonely dissatisfaction" subscale from a modified Philadelphia Geriatric Center Morale Scale were administered (PGCMS; Lawton, 1975; Ranzijn & Luszcz, 2000). CFA analyses resulted in a poorly fit model with a negative variance. Cronbach α was .27. Only one item, "You feel lonelier than you used to feel," (*1 = Agree; 0= Disagree*) showed face validity in the measure of loneliness and was used for further analyses (M = .30, SD = .46). The lower than expected internal consistency of the "lonely dissatisfaction" subscale is addressed as a limitation in the discussion section.

Covariate

Time—Time was used to control for the temporal effect of being in the study on positive and negative affect. Individuals' self-report of affect may change as a result of reactance and habituation during the study (Barta, Tennen, & Litt, 2012). The duration in the study was measured in the unit of days starting from midnight of Day 1. For example, time = .25 for an individual who completed the first self-report on Day 1 at 6 am and time = 6.94 when an individual completed the last self-report on Day 7 at 10:30 pm.

Statistical Analysis: Multivariate Multilevel Modeling

To examine the presence of different types of social partners and associated PA and NA, a typical multilevel modeling analysis would entail a univariate approach. The current study

took the analyses one step further and used a multivariate multilevel modeling approach (Raudenbush & Bryk, 2002) for its advantages over the univariate approach. First, a multivariate analysis allows better control of the inflation of Type I error rate. Second, a multivariate approach often has more statistical power. Third, a multivariate approach allows testing whether PA and NA are correlated between- and within-person.

Analyses were performed using SAS PROC MIXED (SAS Institute, 2008). The basic multivariate multilevel model can be represented in the following equations.

Level-1 model:

$$d_{it}=\delta_{1i}PA_{it}+\delta_{2i}NA_{it}+e_{it}$$

d_{it} is the affect variable for participant i at time t. PA_{it} and NA_{it} are dummy variables. d_{it} is positive affect when $PA_{it}=1$ and $NA_{it}=0$. d_{it} is negative affect when $PA_{it}=0$ and $NA_{it}=1$. e_{it} represents the residual components. The level-1 intercept is constrained to 0. Thus, for each assessment, t, there are two affect variables, i.e. PA and NA, within participants.

Level-2 model:

$$\delta_{1i}=\gamma_{10}+u_{1i}$$
$$\delta_{2i}=\gamma_{20}+u_{2i}$$

γ_{10} represents the mean PA across participants across occasions and γ_{20} represents the mean NA across participants across occasions. u_{1i} and u_{2i} are the level-2 random effects. In subsequent models, level-1 covariates including time, status of being alone, and the presence of types of social partners were added as level-1 interactions, e.g. $\delta_{3i}\ PA_{it}\times Alone_{it}$. Level-2 covariates were added as cross-level interactions, e.g. $PA_{it}\times\ \gamma_{11}Gender_{1i}$.

Gender was coded −.5 = men and .5 = women. Other level-2 covariates were grand-mean centered. Because the residuals on adjacent assessments are likely to be correlated, we specified a first-order autoregressive error covariance structure to account for the interdependence of affect scores of adjacent assessments within individuals.

Results

The results section is organized in four parts: (a) descriptive statistics of PA and NA, (b) the presence of social partners, (c) the status of being alone, individual differences and the associated PA and NA, and (d) the presence of different types of social partners, individual differences and the associated PA and NA.

Descriptive Statistics of Positive and Negative Affect

Across six (within-day) by seven (days) assessments, mean PA was 3.16 for men (SD = .55; range = 2.21 – 4.50) and 3.09 for women (SD = .53; range = 2.08 – 4.98). Mean NA was 1.39 for men (SD = .46; range = 1.00 – 2.61) and 1.45 for women (SD = .48; range = 1.00 –

2.70). Women and men did not significantly differ from each other in mean PA and mean NA.

Using two basic models with no situation- or person-specific characteristics entered, between- and within-person variability in PA and NA were examined. In Model 1, the random effects showed that between- and within-person variances were significant for both PA (between-person $\sigma^2 = .27$, $SE = .05$; within-person $\sigma^2 = .23$, $SE = .01$) and NA (between-person $\sigma^2 = .21$, $SE = .04$; within-person $\sigma^2 = .21$, $SE = .01$), all ps $< .001$. The auto-correlation of affect scores between adjacent occasions was also significant, AR(1) = .30, $SE = .02$, $p < .001$. In Model 2, the effect of time was added into the model and was significant for PA, $\gamma_{30} = -.02$, $p < .01$, but not NA, $\gamma_{30} = -.01$, $p > .05$.

Being Alone and Presence of Social Partners

Participants reported most often being alone (men = 58.8%; women = 75.7%), followed by being with their spouses (men = 31.7%; women = 8.6%), other family (men = 3.4%; women = 7.0%), friends (men = 3.5%; women = 3.2%), and peripheral ties (men = 2.7%; women = 1.8%). Compared to men, women reported less often being with their spouses, $t(34) = 2.55$, $p < .05$, and more often being with other family members, $t(67) = -2.05$, $p < .05$. Women and men did not differ in the number of occasions with other types of social partners or being alone.

Positive and Negative Affect, Being Alone, and Individual Characteristics

Table 1 presents results of two nested models. Model 3 tested the effect of being alone with no level-2 covariates entered. Specifically, being alone was associated with a lower level of PA, $\gamma_{50} = -.10$, $t(63) = -2.86$, $p < .01$. The association between being alone and NA was not significant, $\gamma_{60} = .02$, $t(63) = .77$, $p > .05$. Results in Model 4 indicate that for both PA and NA, the effect of being alone has to be interpreted in the context of significant effects of person-specific characteristics and interactions between being alone and person-specific characteristics. For effects of person-specific characteristics, individuals higher in neuroticism, $\gamma_{90} = -.04$, $t(5312) = -2.79$, $p < .01$, and depressive symptoms, $\gamma_{110} = -.04$, $t(5312) = -2.12$, $p < .05$, reported lower PA. In addition, individuals higher in loneliness reported higher NA, $\gamma_{160} = .17$, $t(5312) = 2.28$, $p < .05$. For interaction effects, individuals higher in neuroticism reported higher NA when they were alone, $\gamma_{200} = .01$, $t(5312) = 2.06$, $p < .05$. The effects of gender and chronic health conditions were not statistically significant for PA or NA.

Positive and Negative Affect, Social Partners, and Individual Characteristics

Table 2 presents results of two nested models. Model 5 tested the effects of the presence of different social partners with no level-2 covariates entered. Level-2 covariates were entered in Model 6. Models 5 and 6 are not nested within Models 3 and 4 in the previous section. The variable “alone” is not entered in Models 5 and 6 because the status of being alone can be predicted by the presence of social partners. Including “alone” in Models 5 and 6 when variables indicating the presence of social partners are in the model creates multicollinearity.

In Model 5, higher PA was associated with the presence of other family members, $\gamma_{70} = .16$, $t(5428) = 3.96$, $p < .001$, and friends, $\gamma_{90} = .18$, $t(5428) = 3.52$, $p < .001$. In addition, lower NA was associated with the presence of friends, $\gamma_{100} = -.10$, $t(5428) = -1.96$, $p < .05$. The presence of one's spouse or peripheral ties was not associated with PA or NA. Results in Model 6 suggest that the association between the presence of social partners and affect has to be interpreted in the context of significant effects of person-specific characteristics and interaction effects between person-specific characteristics and the presence of social partners. Individuals higher in neuroticism reported lower PA, $\gamma_{150} = -.04$, $t(5388) = -3.78$, $p < .001$, and higher NA, $\gamma_{160} = .03$, $t(5388) = 2.96$, $p < .01$. Individuals higher in depressive symptoms reported lower PA, $\gamma_{170} = -.05$, $t(5388) = -2.89$, $p < .01$. In addition, individuals higher in loneliness reported higher NA, $\gamma_{220} = .20$, $t(5388) = 2.75$, $p < .01$. For interaction effects, women, $\gamma_{230} = -.32$, $t(5388) = -2.42$, $p < .05$, and individuals with more chronic health conditions, $\gamma_{470} = -.11$, $t(5388) = -2.30$, $p < .05$, reported lower PA when they were with their spouses. Individuals higher in neuroticism reported lower NA when they were with friends, $\gamma_{360} = -.03$, $t(5388) = -2.15$, $p < .05$. In addition, individuals higher in loneliness reported higher PA when they were with their spouses, $\gamma_{550} = .18$, $t(5388) = 2.24$, $p < .05$.

Follow-up analyses were performed to control for possible backfilling based on the time indicated by the electronic time stamps. Questionnaires that were not sealed with a legible time stamp on the envelopes were classified as invalid. In addition, the time on the seal had to be consistent with the finish time (within five minutes) on the questionnaire. Based on these criteria, 90% of all observations were classified as valid cases. Results of follow-up analyses using only the valid observations and results based on all observations were substantially identical.

Discussion

Informed by Fingerman and Lang's (2004) cube model, we examined the link between the structural aspect and daily life affective experiences of social relationships. Findings showed that momentary affect is associated with both the type of social partner present and individual characteristics.

Being Alone and Loneliness

Consistent with previous studies, the oldest-old spent much more of their time alone (over 70%), compared to adolescents (17%), adults (29%), young-old adults in the US (48%), and young-old (59%) and old-old adults (62%) in Germany (Baltes et al., 1990; Klumb, 2004; Larson, 1990). Being alone was associated with lower PA and was a particularly negative experience for individuals higher in neuroticism. In addition, loneliness may not be eased simply by being with others. Lonelier individuals reported higher NA in general. Yet higher PA was observed when the spouse of lonely participants was present. Aside from limitations in statistical power, this suggests that being with social partners other than one's spouse may not ease the unpleasant experience associated with loneliness. Our findings are consistent with the distinction between solitude and loneliness (Jylhä & Saarenheimo, 2010), that being

alone does not necessarily imply loneliness and individuals may feel lonely in the presence of others (Larson, 1990).

Presence of Different Types of Social Partners

Results showed that being with friends and other family members was associated with more positive affective experiences in general. There were several significant interaction effects. First, when with their spouses, men, but not women, reported higher PA. Second, individuals with fewer chronic health conditions reported higher PA when with their spouses. Third, individuals higher in neuroticism reported lower NA when with friends. Finally, individuals higher in loneliness reported higher PA when with their spouses. We discuss these findings in the context of the literature on social relationship and affective experience.

This study has highlighted the importance of examining both person- and situation-specific characteristics on momentary affect in the oldest-old. Our results suggest that whether individuals benefit from the presence of others depends on who the individual is (person-specific characteristics) and who they are with (situation-specific). For person-specific characteristics, older adults bring to the social relationships a life-time of experiences which have effects on how social partners interact with them (Fingerman & Pitzer, 2007). For situation-specific characteristics, not all social ties are beneficial to older adults' emotional well-being. Different types of social partners convey distinct emotional meanings and instrumental benefits (Carstensen et al., 1999; Rook et al., 2007). For instance, older adults tend to spend time with their spouses and children for routine daily activities (Baltes et al., 1990; Larson et al., 1986). In contrast, older adults tend to share leisure activities with friends, which lead to substantially higher positive affect and arousal (Larson et al., 1986). To summarize, our findings indicate that momentary affective experience in the oldest-old is a function of both situation- and person-specific characteristics.

Affect in the Context of Social Partners and Individual Differences

Taking into account both situation- and person-specific characteristics, the present study complements earlier work on social relationships in older adults in several ways. First, relative to spouses, family, and friends, we know very little about peripheral ties in old age (Fingerman, 2009). Consistent with the social convoy model (Antonucci et al., 2010), the oldest-old adults did not often interact with peripheral ties and being with these ties was not significantly associated with PA or NA. Peripheral ties may be "weak ties" in terms of emotional closeness compared to "core ties" (Fingerman, 2009). Interactions with peripheral ties are perhaps more driven by instrumental support in terms of tangible resources, and not emotional support in terms of companionship and emotional disclosure (Schwarzer & Leppin, 1991). Although the oldest-old did not gain positive affective experiences from peripheral ties, their presence was not negative, compared to the presence of one's spouse for women and individuals with more chronic health conditions. Findings in young-old adults show that daily interactions with spouses and family was characterized by negative affective experiences and preoccupied with daily routines (Larson et al., 1986). However, the present study found that only the presence of one's spouse for individuals of particular characteristics was associated with negative affective experiences. In contrast, the presence of other family members was associated with positive affective experiences. It is possible

that the oldest-old shared different activities with their spouses and other family members, compared to young-old adults. For example, although the nature of activities engaged in with one's spouse was not examined, it may be that they are centered around caregiving, while interactions with other family members possibly from the younger generations may involve more fulfilling leisure activities (Baltes et al., 1990). Future examination of routine vs. leisure activities may explain why the presence of other family members was associated with negative affective experiences in the young-old but not in the oldest-old.

Second, the present study highlighted individual differences and the presence of different types of social partners and their associated PA and NA. Women reported lower PA than men when with their spouses. This is consistent with past findings that effects of social relationships on health outcomes differed between men and women (Shumaker & Hill, 1991). For instance, the effect of social support on mortality was much stronger in women than in men across age groups. Because women are more likely than men to be support providers in old age, and possibly more so in the oldest-old if they are still married, older women may not gain as many positive emotional experiences when they are the primary caregivers (Shumaker & Hill, 1991).

Third, individuals with more chronic health problems reported more negative affective experiences when with their spouses. This is consistent with past findings that being the support recipient because of poor health may create tension with one's spouse because s/he may perceive the relationship as not equitable or reciprocal (Rook, 1987). In addition, the experience of positive affect with a spouse may be undermined because of burdens of chronic illnesses. Paradoxically, individuals with poor health are more likely to be socially isolated and not receiving the support that they need (Hawkley & Cacioppo, 2010). This has clinical and policy implications such that services are needed to resolve spousal conflicts arising from care-giving in old age (Wolff & Kasper, 2006).

Our findings showed that individuals higher in neuroticism reported less negative affective experiences when they were with friends. Higher neuroticism is associated with negative social interactions in general (McCrae & Costa, 2003) and interactions with spouse and family can involve tension and ambiguity (Fingerman et al., 2008; Hoppmann et al., 2011). In addition, individuals higher in neuroticism may be particularly uncomfortable about seeking out less familiar people, e.g., counselors (Bolger & Zuckerman, 1995), thus, friends may be the primary source for emotional support.

Finally, lonelier individuals reported more positive momentary affective experiences when they were with their spouses. This is consistent with past research that older adults living with a spouse reported being less lonely than those living alone or widowed (Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2005). Our findings provide partial support that individuals may feel lonely even in the presence of others (De Jong Gierveld, Tilburg, & Dykstra, 2006). Aside from limitations in statistical power and the relatively infrequent presence of social partners other than one's spouse, lonelier individuals did not experience the presence of other types of social partners differently compared to the less lonely. Our findings suggest that being with one's spouse may be particularly beneficial to lonelier individuals' affective experience. Both societal arrangements and personal choices

determine with whom and how older adults interact (Fingerman & Lang, 2004), including whether older adults decide to (re)marry or cohabit. Most older adults without partners live alone and the percentage of older adults living alone is rising (Wilmoth, 1998). Although the present study did not examine the effect of living arrangement, our findings have policy implications for the provision of social services to encourage socializing and possibly partner-seeking in old age, to relieve the negative consequences associated with loneliness (De Jong Gierveld et al., 2006).

Limitations and Outlook

Our findings should be considered in light of several limitations. First, our sample is healthy and mostly community-dwelling. Attrition analyses using ADuLTS participants who were also in ALSA revealed that ADuLTS participants were positively selected, compared to those who either did not survive or declined to participate. The positive selection of ADuLTS participants probably resulted in a relatively homogeneous sample, leading to underestimation of effects and making effects harder to detect (Anstey & Luszcz, 2002). Results may not be generalizable to oldest-old adults living in residential care where poor health and social isolation are more common (Suzman, Willis, & Manton, 1992). In addition, we did not have details of living arrangements, e.g. living alone or with family. Future research is needed to examine patterns of social interactions and affect among those living in different settings.

Second, brief versions of PA, NA, and depressive symptoms were used to reduce participant burden. Despite the reasonable psychometric properties of the PA and NA in the context of a time-sampling design, the limited number of items and the small sample size restricted the evaluation of the measurement properties based on the between-person psychometric literature (Shrout & Lane, 2011). Specifically, the 3-item PA and NA measures did not allow the examination of affect vs. arousal, or orthogonal vs. correlated factors in the present study. Compared to PA, NA showed lower mean and less between- and within-person variance. The fewer significant effects for NA may in part be due to floor effects[5]. In addition, the 10-item CES-D and the 5-item “lonely dissatisfaction” subscale of the PGCMS did not show acceptable internal consistency. Despite any limitations in the measures, our results were largely consistent with past findings (Cacioppo et al., 2000; Larson et al., 1986).

Third, the present study focused on the *structure* of social relationships and did not examine other aspects, such as relationship *quality* (Antonucci et al., 2010). The emotional benefits from the presence of social partners may be dependent on relationship quality, which is in part determined by whether individuals are the support provider or recipient in a social relationship (Ingersoll-Dayton, Morgan, & Antonucci, 1997). Future research should examine relationship quality and effects of support provider vs. recipient roles on emotional experiences in the oldest-old. In addition, drawing from Fingerman and Lang’s (2004) cube model of social relationships, future research may include *process* variables to further illuminate the underlying emotional, motivational, and cognitive processes that link social relationship structures and psychological outcomes. For instance, coping strategies involved

[5]Major findings from additional analyses using individual items (‘happy’ and ‘sad’ for high face validity) were substantively identical to those reported in the main text.

in the daily interactions with various social partners may explain why lonelier individuals have more positive affective experiences with their spouses, whereas women and individuals with more chronic health conditions experience more negative affective experiences with their spouses. It is possible that lonelier individuals tend to use emotion-focused coping strategies (Lazarus, 1996) and view their spouses as a source of companionship (Rook, 1990). In contrast, women and individuals with more chronic health conditions may tend to use problem-focused coping strategies (Lazarus, 1996) in their interactions with their spouses, engaging in instrumental activities centered around care-giving.

Fourth, given its age range, our sample is comprised mostly of widowed individuals and the inclusion of widowed, married, and single individuals in our sample allows our findings to be generalizable to the population of oldest-olds. However, it is possible that among married oldest-old adults, patterns of social interactions are centered around their spouses' care-giving needs. Compared to the widowed, the presence of other family and friends may be particularly beneficial for the married if this provides relief from care-giving demands. Future research that oversamples married oldest-old adults is needed to examine whether the pattern of social interactions found in our study also generalizes to them[6].

The last limitation affects all time-sampling designs, i.e., effects of instrumentation and procedures which may bias individuals' responses (Iida, Shrout, Laurenceau, & Bolger, 2012) and effect sizes (Snijders, 2005). The significant linear effect of time on PA possibly reflected measurement reactivity (Barta et al., 2012). We adopted several procedures to reduce and control for measurement reactivity. First, participants were instructed to seal the envelopes to ensure that responses of previous self-reports were not accessible to reduce reactivity due to self-monitoring. Second, to adjust for possible response shift, i.e., participants changing the meaning they assign to a rating, the linear effect of time on PA and NA was controlled in the models examined. Past research has used both time-sampling and event-sampling designs to study social partners of older adults (Larson et al., 1985; Nezlek, Richardson, Green, & Schatten-Jones, 2002). Instead of responding to prompts at fixed time-intervals as done herein, participants fill out self-reports as soon as possible after a social interaction in event-sampling studies (Nezlek et al., 2002). Event-sampling designs generate self-reports of affective reactions and evaluations targeting the social interaction of focus. In contrast, time-sampling designs generate self-reports of affective experiences and social interactions that occurred during the same time interval. Because affective experiences may or may not be contingent on social interactions that were reported at the same time, results of our correlational study warrant cautious interpretation. We cannot ascertain whether the affective experiences reported were reactions to the presence of social partners or other intervening events. Future time-sampling studies may test lead-lag effects to examine the causal and cumulative effects of social interactions on affective experiences. In addition, the present study used fixed intervals and compared to results of a time-sampling study using

[6]Additional analyses were performed to further examine results of Model 6, using a subsample of participants who were either married or in a de facto relationship (n = 21, 28% of the whole sample; total number of observations = 808). Results related to the presence of spouse were substantially identical with those reported herein, except that the interaction effect of Spouse × Lonely on PA, γ_{550} = .11, $t(1523)$ = 1.35, p > .05, became non-significant, and the interaction effect of Spouse × Neuroticism on PA, γ_{310} = .03, $t(1523)$ = 2.52, p < .05, became significant. These effects are still in the same direction as in the original analyses. This convergent evidence indicates that the effects related to the presence of spouse are relatively solid although this is not true for the loneliness findings. However, we caution against over-interpreting results of the additional analyses due to the very small sample size.

random intervals (Klumb, 2004), our sample of oldest-olds reported spending more time alone (71%) than did the sample of older adults (*M* age = 80.6 years; 62% of the time alone). Our participants might have picked beep schedules that sampled times when they were likely to be alone. Future studies using random time-sampling intervals will be needed to ascertain whether the age difference in time spent alone is due to differences in the fixed vs. random time-sampling schedule.

Consistent with similar time-sampling studies on momentary affect in old age (e.g., Charles et al., 2010), effect sizes of our findings are small. Small effect sizes are expected in time-sampling studies compared to laboratory-based studies where variables of interests are manipulated and effects of other variables are controlled. The strength of a time-sampling design is that the phenomenon of interest is examined as it unfolds in the natural environment, thus ecological validity is enhanced. Unlike laboratory-based studies, however, our study cannot control for all other factors that may impact fluctuations in affect. Thus, both time-sampling and laboratory-based studies are needed to provide a comprehensive picture of affective experiences in late life. In addition, intervention studies examining the effect of friendship and caregiver support programs are needed to explore the practical significance of our findings on affective experiences.

Conclusion

This study shows that the presence of various types of social partners is differentially associated with momentary affective experiences of oldest-old adults. Although social relationships play an important role in oldest-old adults' well-being, it is not the case that the presence of all social partners is associated with positive affective experiences. Owing to heterogeneity among individuals, they differ in how much they benefit emotionally in the presence of various social partners. Our findings attest to the value of including both person- and situation-specific characteristics to delineate the association between social relationships and well-being in the oldest-old. Future research may substantiate our findings by examining underlying relationship-specific characteristics, such as daily activities performed alone and with social partners. In summary, our findings extend the literature by showcasing the dynamic and diverse affective experiences linked to social partners of oldest-old adults.

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References

Alexopoulos GS. Depression in the elderly. The Lancet. 2005; 365(9475):1961–1970. DOI: 10.1016/s0140-6736(05)66665-2

Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults - Evaluation of a short-form of the CES-D. American Journal of Preventive Medicine. 1994; 10:77–84. [PubMed: 8037935]

Anstey KJ, Luszcz MA. Selective non-response to clinical assessment in the longitudinal study of aging: Implications for estimating population levels of cognitive function and dementia. International Journal of Geriatric Psychiatry. 2002; 17:704–709. DOI: 10.1002/gps.651 [PubMed: 12211118]

Antonucci, TC., Fiori, KL., Birditt, K., Jackey, LMH. Convoys of social relations: Integrating life-span and life-course perspectives. In: Lamb, ME., Freund, AM., editors. The Handbook of Life-Span Development. Vol. 2: Social and Emotional Development. Hoboken, NJ: John Wiley & Sons, Inc; 2010. p. 434-473.

Baltes MM, Wahl HW, Schmid-Furstoss U. The daily life of elderly Germans: Activity patterns, personal control, and functional health. Journal of Gerontology. 1990; 45(4):P173–P179. DOI: 10.1093/geronj/45.4.P173 [PubMed: 2365973]

Barta, WD., Tennen, H., Litt, MD. Measurement reactivity in diary research. In: Mehl, MR., Conner, TS., editors. Handbook of research methods for studying daily life. New York: Guilford; 2012. p. 108-123.

Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. Social Science and Medicine. 2000; 51:843–857. DOI: 10.1016/S0277-9536(00)00065-4 [PubMed: 10972429]

Birditt K, Antonucci TC. Life sustaining irritations? Relationship quality and mortality in the context of chronic illness. Social Science and Medicine. 2008; 67:1291–1299. DOI: 10.1016/j.socscimed.2008.06.029 [PubMed: 18662845]

Bolger N, Zuckerman A. A framework for studying personality in the stress process. Journal of Personality and Social Psychology. 1995; 69:890–902. [PubMed: 7473036]

Cacioppo JT, Ernst JM, Burleson MH, McClintock MK, Malarkey WB, Hawkley LC, Berntson GG. Lonely traits and concomitant physiological processes: The MacArthur social neuroscience studies. International Journal of Psychophysiology. 2000; 35:143–154. DOI: 10.1016/s0167-8760(99)00049-5 [PubMed: 10677643]

Carstensen LL, Isaacowitz DM, Charles ST. Taking time seriously: A theory of socioemotional selectivity. American Psychologist. 1999; 54:165–181. DOI: 10.1037/0003-066X.54.3.165 [PubMed: 10199217]

Charles ST, Luong G, Almeida DM, Ryff C, Sturm M, Love G. Fewer ups and downs: Daily stressors mediate age differences in negative affect. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences. 2010; 65B:279–286. DOI: 10.1093/geronb/gbq002

Cohen S. Social relationships and health. American Psychologist. 2004; 59:676–684. DOI: 10.1037/0003-066X.59.8.676 [PubMed: 15554821]

Cranford JA, Shrout PE, Iida M, Rafaeli E, Yip T, Bolger N. A procedure for evaluating sensitivity to within-person change: Can mood measures in diary studies detect change reliably? Personality and Social Psychology Bulletin. 2006; 32:917–929. DOI: 10.1177/0146167206287721 [PubMed: 16738025]

De Jong Gierveld, J., Tilburg, TV., Dykstra, PA. Loneliness and social isolation. In: Vangelisti, A., Perlman, D., editors. Cambridge handbook of personal relationships. Cambridge: Cambridge University Press; 2006. p. 485-500.

Ebner-Priemer UW, Trull TJ. Ecological momentary assessment of mood disorders and mood dysregulation. Psychological Assessment. 2009; 21:463–475. DOI: 10.1037/a0017075 [PubMed: 19947781]

Fingerman KL. Consequential strangers and peripheral ties: The importance of unimportant relationships. Journal of Family Theory and Review. 2009; 1:69–86. DOI: 10.1111/j.1756-2589.2009.00010.x

Fingerman, KL., Lang, FR. Coming together: A perspective on relationships across the life span. In: Lang, FR., Fingerman, KL., editors. Growing together: Personal relationships across the life span. Cambridge, UK: Cambridge University Press; 2004. p. 1-13.

Fingerman, KL., Pitzer, L. Socialization in old age. In: Hastings, PD., Grusec, JE., editors. Handbook of socialization. New York: Guilford; 2007. p. 232-255.

Fingerman KL, Pitzer L, Lefkowitz ES, Birditt KS, Mroczek D. Ambivalent relationship qualities between adults and their parents: Implications for the well-being of both parties. Journal of Gerontology: Psychological Sciences and Social Sciences. 2008; 63B:P362–P371.

Folstein MF, Folstein SE, McHugh PR. “Mini-mental state”: A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research. 1975; 12:189–198. DOI: 10.1016/0022-3956(75)90026-6 [PubMed: 1202204]

Giles LC, Glonek GFV, Luszcz MA, Andrews GR. Effect of social networks on 10 year survival in very old Australians: the Australian longitudinal study of aging. Journal of Epidemiology and Community Health. 2005; 59:574–579. DOI: 10.1136/jech.2004.025429 [PubMed: 15965141]

Hawkley LC, Cacioppo JT. Loneliness matters: A theoretical and empirical review of consequences and mechanisms. Annals of Behavioral Medicine. 2010; 40(2):218–227. DOI: 10.1007/s12160-010-9210-8 [PubMed: 20652462]

Hoppmann CA, Gerstorf D, Hibbert A. Spousal associations between functional limitation and depressive symptom trajectories: Longitudinal findings from the Study of Asset and Health Dynamics Among the Oldest Old (AHEAD). Health Psychology. 2011; 30:153–162. DOI: 10.1037/a0022094 [PubMed: 21401249]

Hoppmann CA, Klumb PL. Daily goal pursuits predict cortisol secretion and mood states in employed parents with preschool children. Psychosomatic Medicine. 2006; 68(6):887–894. DOI: 10.1097/01.psy.0000238232.46870.f1 [PubMed: 17132838]

Iida, M., Shrout, PE., Laurenceau, J-P., Bolger, N. Using diary methods in psychological research. In: Cooper, H.Camic, PM.Long, DL.Panter, AT.Rindskopf, D., Sher, KJ., editors. APA handbook of research methods in psychology, Vol 1: Foundations, planning, measures, and psychometrics. Washington, DC, US: American Psychological Association; 2012. p. 277-305.

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

John, OP., Srivastava, S. The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In: Pervin, LA., John, OP., editors. Handbook of personality: Theory and research. 2. New York: Guilford Press; 1999. p. 102-138.

Jylhä, M., Saarenheimo, M. Loneliness and ageing: Comparative perspectives. In: Dannefer, D., Phillipson, C., editors. The SAGE handbook of social gerontology. London, UK: SAGE; 2010. p. 317-328.

Klumb PL. Benefits from productive and consumptive activities: Results from the Berlin Aging Study. Social Indicators Research. 2004; 67:107–127.

Lang FR, Carstensen LL. Close emotional relationships in late life: Further support for proactive aging in the social domain. Psychology and Aging. 1994; 9:315–324. [PubMed: 8054179]

Larsen, RJ., Diener, EF. Promises and problems with the circumplex model of emotion. In: Clark, MS., editor. Emotion: Review of personality and social psychology. Newbury Park, CA: Sage; 1992. p. 25-59.

Larson RW. The solitary side of life: An examination of the time people spend alone from childhood to old age. Developmental Review. 1990; 10:155–183. DOI: 10.1016/0273-2297(90)90008-r

Larson RW, Mannell R, Zuzanek J. Daily well-being of older adults with friends and family. Psychology and Aging. 1986; 1:117–126. [PubMed: 3267387]

Larson RW, Zuzanek J, Mannell R. Being alone versus being with people: Disengagement in the daily experience of older adults. Journal of Gerontology. 1985; 40:375–381. DOI: 10.1093/geronj/40.3.375 [PubMed: 3989252]

Lawton MP. The Philadelphia Geriatric Center Morale Scale: A revision. Journal of Gerontology. 1975; 30:85–89. DOI: 10.1093/geronj/30.1.85 [PubMed: 1109399]

Lazarus, RS. The role of coping in the emotions and how coping changes over the life course. In: Magai, C., McFadden, SH., editors. Handbook of emotion, adult development, and aging. San Diego, CA: Academic Press; 1996. p. 289-306.

Luszcz, MA., Giles, L., Eckermann, S., Edwards, PA., Browne-Yung, K., Hayles, C. The Australian Longitudinal Study of Ageing: 15 years of ageing in South Australia. 2007. p. 130Retrieved from http://www.flinders.edu.au/sabs/fcas-files/Documents/StudyOfAgeing.pdf

Luszcz, MA., Hoppmann, C., Gerstorf, D., Walker, R., Edwards, P., Hunter, M. A week in the lives of oldest-old Australians: Initial findings from ADuLTS measurement burst study. Poster session presented at The Gerontological Society of America's 64th Annual Scientific Meeting; Boston, US. 2011 Nov.

McCrae, RR., Costa, PTJ. Personality in adulthood: A Five-Factor Theory perspective. 2. New York: Guilford; 2003.

Nesselroade, JR., Molenaar, PCM. Emphasizing intraindividual variability in the study of development over the life span: Concepts and issues. In: Overton, WF., editor. Handbook of life-Span development: Cognition, biology, and methods. Vol. 1. Hoboken, NJ: Wiley; 2010. p. 30-54.

Nezlek JB, Imbrie M, Shean GD. Depression and everyday social interaction. Journal of Personality and Social Psychology. 1994; 67:1101–1111. [PubMed: 7815303]

Nezlek JB, Richardson DS, Green LR, Schatten-Jones EC. Psychological well-being and day-to-day social interaction among older adults. Personal Relationships. 2002; 9:57–71. DOI: 10.1111/1475-6811.00004

Ranzijn R, Luszcz M. Measurement of subjective quality of life of elders. International Journal of Aging and Human Development. 2000; 50:263–278. [PubMed: 11087107]

Raudenbush, SW., Bryk, AS. Hierarchical linear models: Applications and data analysis methods. 2. Thousand Oaks, CA: Sage; 2002.

Rook KS. Reciprocity of social exchange and social satisfaction among older women. Journal of Personality and Social Psychology. 1987; 52:145–154.

Rook, KS. Social relationships as a source of companionship: Implications for older adults' psychological well-being. In: Sarason, BR.Sarason, IG., Pierce, GR., editors. Social support: An interactional view. Oxford, England: Wiley; 1990. p. 219-250.

Rook, KS., Mavandadi, S., Sorkin, DH., Zettel, LA. Optimizing social relationships as a resource for health and well-being in later life. In: Aldwin, CM.Park, CL., Spiro, A., editors. Psychology of health psychology and aging. New York: Guilford; 2007. p. 267-285.

SAS Institute. SAS 9.2. Cary, NC: 2008.

Savikko N, Routasalo P, Tilvis RS, Strandberg TE, Pitkälä KH. Predictors and subjective causes of loneliness in an aged population. Archives of Gerontology and Geriatrics. 2005; 41:223–233. DOI: 10.1016/j.archger.2005.03.002 [PubMed: 15908025]

Schwarzer R, Leppin A. Social support and health: A theoretical and empirical overview. Journal of Social and Personal Relationships. 1991; 8:99–127. DOI: 10.1177/0265407591081005

Shrout, PE., Lane, SP. Psychometrics. In: Mehl, MR., Conner, TS., editors. Handbook of research methods for studying daily life. New York: Guilford; 2011. p. 302-320.

Shrout, PE., Lane, SP. Reliability. In: Copper, H.Camic, PM.Long, DL.Panter, AT.Rindskopf, D., Sher, KJ., editors. APA handbook of research methods in psychology. Vol. 1: Foundations, planning, measures, and psychometrics. Washington, DC, US: American Psychological Association; 2012. p. 643-660.

Shumaker SA, Hill DR. Gender differences in social support and physical health. Health Psychology. 1991; 10:102–111. [PubMed: 2055208]

Smith J, Goodnow JJ. Unasked-for support and unsolicited advice: age and the quality of social experience. Psychology and Aging. 1999; 14:108–121. [PubMed: 10224636]

Snijders, TAB. Power and sample size in multilevel linear models. In: Everitt, BS., Howell, DC., editors. Encyclopedia of statistics in behavioral science. Vol. 3. Chicester: Wiley; 2005. p. 1570-1573.

Suzman, RM.Willis, DP., Manton, KG., editors. The oldest old. Oxford: Oxford University Press; 1992.

Tsai JL, Knutson B, Fung HH. Cultural variation in affect valuation. Journal of Personality and Social Psychology. 2006; 90:288–307. DOI: 10.1037/0022-3514.90.2.288 [PubMed: 16536652]

Walker R, Luszcz M, Gerstorf D, Hoppmann C. Subjective well-being dynamics in couples from the Australian Longitudinal Study of Aging. Gerontology. 2011; 57:153–160. DOI: 10.1159/000318633 [PubMed: 20616527]

Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology. 1988; 54:1063–1070. [PubMed: 3397865]

Wilmoth JM. Living arrangement transitions among America's older adults. The Gerontologist. 1998; 38:434–444. [PubMed: 9726130]

Wolff JL, Kasper JD. Caregivers of frail elders: Updating a national profile. The Gerontologist. 2006; 46:344–356. DOI: 10.1093/geront/46.3.344 [PubMed: 16731873]

Table 1

Multilevel Model Results of Situation-Specific (Being Alone vs. Not) and Person-Specific Characteristics on Positive and Negative Affect

	Model 3			Model 4		
		95% *CI*			95% *CI*	
Fixed effects	**γ (*SE*)**	**Lower**	**Upper**	**γ (*SE*)**	**Lower**	**Upper**
PA, γ_{10}	3.22(.07)***	3.09	3.35	3.24(.06)***	3.12	3.36
NA, γ_{20}	1.44(.06)***	1.33	1.55	1.44(.05)***	1.33	1.55
PA × Time, γ_{30}	−.02(.01)**	−.03	−.01	−.02(.01)**	−03	−.01
NA × Time, γ_{40}	−.01(.01)	−.02	.003	−.01(.01)	−.02	.003
PA × Alone, γ_{50}	−.10(.03)**	−.17	−.03	−.09(.04)*	−.16	−.01
NA × Alone, γ_{60}	.02(.03)	−.04	.09	.002(.03)	−.06	.06
PA × Gender, γ_{70}	--	--	--	−.08(.12)	−.31	.16
NA × Gender, γ_{80}	--	--	--	−.05(.10)	−.25	.16
PA × Neuro, γ_{90}	--	--	--	−.04(.01)**	−.06	−.01
NA × Neuro, γ_{100}	--	--	--	.02(.01)	−.004	.04
PA × CES-D, γ_{110}	--	--	--	−.04(.02)*	−.08	−.003
NA × CES-D, γ_{120}	--	--	--	.01(.02)	−.02	.04
PA × Chronic, γ_{130}	--	--	--	−.03(.04)	−.11	.05
NA × Chronic, γ_{140}	--	--	--	−.02(.04)	−.09	.05
PA × Loneliness, γ_{150}	--	--	--	.05(.09)	−.12	.22
NA × Loneliness, γ_{160}	--	--	--	.17(.08)*	.02	.32
PA × Alone × Gender, γ_{170}	--	--	--	−.04(.07)	−.19	.10
NA × Alone × Gender, γ_{180}	--	--	--	.10(.06)	−.02	.23
PA × Alone × Neuro, γ_{190}	--	--	--	−.004(.01)	−.02	.01
NA × Alone × Neuro, γ_{200}	--	--	--	.01(.01)*	.001	.03
PA × Alone × CES-D, γ_{210}	--	--	--	−.01(.01)	−.03	.01
NA × Alone × CES-D, γ_{220}	--	--	--	.01(.01)	−.01	.03
PA × Alone × Chronic, γ_{230}	--	--	--	.01(.03)	−.04	.06
NA × Alone × Chronic, γ_{240}	--	--	--	−.01(.02)	−.05	.03

	Model 3			Model 4		
		95% *CI*			95% *CI*	
Fixed effects	**γ (*SE*)**	**Lower**	**Upper**	**γ (*SE*)**	**Lower**	**Upper**
PA × Alone × Lonely, γ_{250}	--	--	--	−.05(.05)	−.15	.05
NA × Alone × Lonely, γ_{260}	--	--	--	.03(.04)	−.06	.12
Goodness-of-fit						
Deviance	7095.2			7039.4		
AIC	7135.2			7119.4		
BIC	7181.3			7211.5		

Note.

* $p < .05$.

** $p < .01$

*** $p < .001$.

SE = standard error; Neuro = Neuroticism; Chronic = Chronic health conditions; AR(1) = First-order auto-regression; AIC = Akaike information criterion; BIC = Bayesian information criterion. Gender was coded −.5 = men and .5 = women. CES-D, neuroticism, chronic health conditions, and loneliness were grand-mean centered.

Results of random effects were not shown for simplicity. Results of random effects can be provided upon request.

Table 2

Multilevel Model Results of Situation-Specific (Being with Different Social Partners) and Person-Specific Characteristics on Positive and Negative Affect

	Model 5			Model 6		
		95% *CI*			95% *CI*	
Fixed effects	**γ (*SE*)**	**Lower**	**Upper**	**γ (*SE*)**	**Lower**	**Upper**
PA, γ_{10}	3.14(.07)***	3.01	3.27	3.15(.06)***	3.03	3.26
NA, γ_{20}	1.45(.06)***	1.34	1.57	1.44(.05)***	1.34	1.55
PA × Time, γ_{30}	−.02(.01)***	−.03	−.01	−.02(.01)**	−.03	−.01
NA × Time, γ_{40}	−.01(.01)	−.02	.003	−.01(.01)	−.02	.003
PA × Spouse, γ_{50}	.002(.05)	−.10	.10	−.04(.06)	−.16	.08
NA × Spouse, γ_{60}	−.03(.05)	−.12	.07	.02(.06)	−.10	.14
PA × Other family, γ_{70}	.16(.04)***	.08	.24	.13(.05)**	.04	.23
NA × Other family, γ_{80}	.05(.04)	−.03	.12	.04(.05)	−.05	.13
PA × Friend, γ_{90}	.18(.05)***	.08	.27	.17(.07)*	.04	.30
NA × Friend, γ_{100}	−.10(.05)*	−.19	−.0001	−.13(.07)*	−.26	−.001
PA × Peripheral ties, γ_{110}	.02(.06)	−.10	.14	−.02(.07)	−.16	.12
NA × Peripheral ties, γ_{120}	.05(.06)	−.07	.17	.06(.07)	−.08	.20
PA × Gender, γ_{130}	--	--	--	−.08(.11)	−.30	.14
NA × Gender, γ_{140}	--	--	--	.06(.10)	−.14	.26
PA × Neuro, γ_{150}	--	--	--	−.04(.01)***	−.06	−.02
NA × Neuro, γ_{160}	--	--	--	.03(.01)**	.01	.05
PA × CES-D, γ_{170}	--	--	--	−.05(.02)**	−.09	−.02
NA × CES-D, γ_{180}	--	--	--	.02(.02)	−.01	.05
PA × Chronic, γ_{190}	--	--	--	−.01(.04)	−.08	.06
NA × Chronic, γ_{200}	--	--	--	−.04(.03)	−.10	.03
PA × Lonely, γ_{210}	--	--	--	−.02(.08)	−.17	.14
NA × Lonely, γ_{220}	--	--	--	.20(.07)**	.06	.34
PA × Spouse × Gender, γ_{230}	--	--	--	−.32(.13)*	−.58	−.06

	Model 5			Model 6		
		95% *CI*			95% *CI*	
Fixed effects	**γ (*SE*)**	**Lower**	**Upper**	**γ (*SE*)**	**Lower**	**Upper**
NA × Spouse × Gender, γ_{240}	--	--	--	−.01(.13)	−.26	.25
PA × Other family × Gender, γ_{250}	--	--	--	.09(.10)	−.10	.28
NA × Other family × Gender, γ_{260}	--	--	--	.0004(.09)	−.18	.18
PA × Friend × Gender, γ_{270}	--	--	--	.04(.12)	−.20	.28
NA × Friend × Gender, γ_{280}	--	--	--	−.12(.12)	−.36	.11
PA × Peripheral ties × Gender, γ_{290}	--	--	--	−.19(.14)	−.46	.08
NA × Peripheral ties × Gender, γ_{300}	--	--	--	−.01(.13)	−.27	.25
PA × Spouse × Neuro, γ_{310}	--	--	--	.02(.01)	−3.00E-05	.05
NA × Spouse × Neuro, γ_{320}	--	--	--	−.01(.01)	−.04	.01
PA × Other family × Neuro, γ_{330}	--	--	--	−.004(.01)	−.02	.01
NA × Other family × Neuro, γ_{340}	--	--	--	.001(.01)	−.02	.02
PA × Friend × Neuro, γ_{350}	--	--	--	.02(.01)	−.01	.05
NA × Friend × Neuro, γ_{360}	--	--	--	−.03(.01)*	−.06	−.003
PA × Peripheral ties × Neuro, γ_{370}	--	--	--	.02(.01)	−.01	.04
NA × Peripheral ties × Neuro, γ_{380}	--	--	--	.01(.01)	−.02	.04
PA × Spouse × CES-D, γ_{390}	--	--	--	−.001(.02)	−.03	.03
NA × Spouse × CES-D, γ_{400}	--	--	--	.02(.02)	−.02	.05
PA × Other family × CES-D, γ_{410}	--	--	--	.03(.01)	−.0005	.05
NA × Other family × CES-D, γ_{420}	--	--	--	−.02(.01)	−.05	.002
PA × Friend × CES-D, γ_{430}	--	--	--	−.01(.02)	−.04	.03
NA × Friend × CES-D, γ_{440}	--	--	--	−.03(.02)	−.06	.002
PA × Peripheral ties × CES-D, γ_{450}	--	--	--	.01(.03)	−.04	.06
NA × Peripheral ties × CES-D, γ_{460}	--	--	--	−.001(.03)	−.05	.05
PA × Spouse × Chronic, γ_{470}	--	--	--	−.11(.05)*	−.20	−.02
NA × Spouse × Chronic, γ_{480}	--	--	--	.06(.04)	−.02	.15
PA × Other family × Chronic, γ_{490}	--	--	--	.06(.03)	−.01	.13
NA × Other family × Chronic, γ_{500}	--	--	--	−.05(.03)	−12	.01

	Model 5			Model 6		
		95% *CI*			95% *CI*	
Fixed effects	**γ (*SE*)**	**Lower**	**Upper**	**γ (*SE*)**	**Lower**	**Upper**
PA × Friend × Chronic, γ_{510}	--	--	--	−.01(.04)	−.09	.08
NA × Friend × Chronic, γ_{520}	--	--	--	.002(.04)	−.08	.09
PA × Peripheral ties × Chronic, γ_{530}	--	--	--	.04(.04)	−.03	.12
NA × Peripheral ties × Chronic, γ_{540}	--	--	--	−.002(.04)	−.07	.07
PA × Spouse × Lonely, γ_{550}	--	--	--	.18(.08) *	.02	.34
NA × Spouse × Lonely, γ_{560}	--	--	--	−.05(.08)	−.20	.11
PA × Other family × Lonely, γ_{570}	--	--	--	.04(.06)	−.08	.16
NA × Other family × Lonely, γ_{580}	--	--	--	−.06(.06)	−.18	.05
PA × Friend × Lonely, γ_{590}	--	--	--	−.07(.10)	−.26	.12
NA × Friend × Lonely, γ_{600}	--	--	--	.08(.09)	−.10	.27
PA × Peripheral ties × Lonely, γ_{610}	--	--	--	.01(.12)	−.22	.25
NA × Peripheral ties × Lonely, γ_{620}	--	--	--	−.09(.12)	−.33	.14
Goodness-of-fit						
Deviance	7084.7			6963.3		
AIC	7122.7			7101.3		
BIC	7166.5			7260.2		

Note.

* $p < .05$.

** $p < .01$

*** $p < .001$.

SE = standard error; Neuro = Neuroticism; Chronic = Chronic health conditions; AR(1) = First-order auto-regression; AIC = Akaike information criterion; BIC = Bayesian information criterion. Gender was coded −.5 = men and .5 = women. CES-D, neuroticism, chronic health conditions, and loneliness were grand-mean centered.

Results of random effects were not shown for simplicity. Results of random effects can be provided upon request.