

## Research Article

# Better Off Alone: Daily Solitude Is Associated With Lower Negative Affect in More Conflictual Social Networks

Kira S. Birditt, PhD,<sup>1,\*</sup> Jasmine A. Manalel, PhD,<sup>1</sup> Heidi Sommers, BA,<sup>1</sup> Gloria Luong, PhD,<sup>2</sup> and Karen L. Fingerman, PhD<sup>3</sup>

<sup>1</sup>Life Course Development Program, Institute for Social Research, University of Michigan, Ann Arbor. <sup>2</sup>Human Development and Family Studies, Colorado State University, Fort Collins. <sup>3</sup>Human Development and Family Sciences, University of Texas at Austin.

\*Address correspondence to: Kira S. Birditt, PhD, Life Course Development Program, Institute for Social Research, University of Michigan, 426 Thompson St., Ann Arbor, MI 48104. E-mail: [kirasb@umich.edu](mailto:kirasb@umich.edu)

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## Abstract

**Background and Objectives:** Older adults are often considered at risk for social isolation. Little is known, however, about how often older adults lack social contact (in person, phone, electronic) throughout the day, the implications of lacking contact (i.e., solitude), and whether the effects of solitude vary by the broader social context.

**Research Design and Methods:** Participants were from the *Daily Experiences and Well-being Study* (DEWS) which included 313 older adults (aged 65+) who completed baseline interviews followed by 5–6 days of ecological momentary assessments approximately every 3 hr.

**Results:** Individuals reported having no social contact (i.e., solitude) on 11% of the occasions. Solitude predicted lower negative and positive affect on those occasions. The solitude-negative affect link varied by social network quality. Solitude predicted lower negative affect among individuals with more conflictual social networks but not among those with less conflictual networks.

**Discussion and Implications:** Overall, solitude may serve as an adaptive strategy for individuals embedded in demanding or irritating social contexts.

**Keywords:** Solitude, Aging, Daily life, Well-being, Social networks

Social connection and integration are vital for human well-being and longevity (Holt-Lunstad, Smith, & Layton, 2010). Likewise, social isolation and loneliness (i.e., perceived discrepancies between actual and desired levels of social connection) are linked to poor health and mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Ong, Uchino, & Werhington, 2016). Solitude (or being alone), however, can have both negative and positive effects on well-being. Time alone can increase loneliness and depression, but can also be rejuvenating, acting as a release from pressure of performing social roles (Larson, 1990; Long & Averill, 2003). It is important to examine solitude among

older adults as solitude may be less detrimental as people grow older (Larson, 1990) and older adults report spending 48% (Larson, Zuzanek, & Mannell, 1985) to 70% of time alone (Chui, Hoppmann, Gerstorf, Walker, & Luszcz, 2014).

There are several gaps in the literature on solitude among older adults. Solitude is often defined as the physical absence of others (Chui et al., 2014) or having been in no social contact (in person or electronically) at the time of the survey rather than as having no communication with others for a period of time (physically, telephone, or electronically; Larson, 1990). Further, the links between solitude and well-being may vary depending on the social context.

Periods of solitude may be beneficial when social network members are burdensome or demanding. The present study examined solitude more generally as the lack of social contact (in person, phone, electronic), its implications for daily well-being, and whether these links vary by the quality of adults' social networks (positive and conflictual).

## Theoretical Framework

Solitude is not synonymous with loneliness. Solitude is defined as being alone without communicating with others (Larson, 1990). In contrast, loneliness or perceived social isolation is the perceived discrepancy between actual and desired levels of social connection (Peplau & Perlman, 1982). Individuals can feel lonely in the presence of others as well as contentment during periods of solitude. The present study defines solitude as having no social encounters including electronically, over the phone, or in person within the last 3 hr.

This study is guided by two competing frameworks in the literature regarding solitude. On the one hand, theorists including Goffman (1971) suggested that being alone is restorative because it involves fewer social pressures and provides individuals with time "off stage." Similarly, the psychiatrist Storr (2005) recommended time alone as solitude can be pleasurable and associated with meditation and creativity. On the other hand, several theorists and researchers have suggested that being alone can have negative implications. For example, Larson (1990) suggested that the presence of others can be rewarding involving connection and support which are associated with a multitude of benefits including positive affect and improved physical health (Rook, 1995; Rook & Ituarte, 1999). Being alone may involve the lack of those positive dimensions.

Cacioppo and Patrick (2008) suggested that feeling socially connected allows individuals to benefit from their social encounters, whereas individuals who feel socially isolated often interpret encounters as threatening. We propose that whether solitude is associated with positive or negative daily well-being depends on the interpersonal context of the individual (i.e., their personal social network). Social networks are defined as the close social partners that surround an individual across the life span (Antonucci, 2001). These social networks vary widely in size (i.e., number of social partners) and in their positive (e.g., supportive, loving) and/or conflictual qualities (e.g., demanding, critical) (Akiyama, Antonucci, Takahashi, & Langfahl, 2003; Fingerman, Hay, & Birditt, 2004). In social networks characterized by conflict and low positive qualities, individuals may find encounters troublesome and thus benefit more from solitude. This may be particularly true among older individuals who prefer to use avoidant strategies to withdraw from conflict (Birditt, Fingerman, & Almeida, 2005), which may result in periods of solitude.

## Solitude and Emotional Well-Being

Many studies have examined the links between loneliness and well-being (Hawkey & Cacioppo, 2010; Ong et al.,

2016) but fewer have examined links between solitude and well-being and the findings have been mixed. Larson and colleagues (1985) examined being alone (either physically or on the phone at the time of the survey) among retired older adults aged 55–88 years every 2 hr of the day. Being alone predicted lower positive affect (e.g., happiness, cheer), greater feelings of control, and greater boredom. Similarly, Chui et al. (2014) surveyed older individuals (aged 84–102 years) six times a day. Being alone (i.e., physically alone when completing the survey) was associated with lower positive affect but was not associated with negative affect. Pauly, Lay, Nater, Scott, & Hoppmann (2017) examined solitude (being physically alone and not communicating electronically at the time of the survey) five times a day among individuals ages 20–81. Being alone was associated with increased low arousal positive affect (e.g., calm), reduced high arousal positive affect (e.g., happy), greater low arousal negative affect (e.g., sad), and not linked with high arousal negative affect (e.g., nervous). The mixed findings across studies may be due to variations in definitions of solitude, ages of participants, and social networks in which individuals are embedded.

## Links Between Solitude and Emotional Well-Being by Social Network Quality

The effects of solitude on well-being may vary by the social context. Previous studies have shown that married individuals reported greater feelings of emotional arousal, concentration, and challenge when alone, whereas unmarried individuals did not show these benefits (Larson et al., 1985). There has been little work, however, on whether links between solitude and emotional well-being vary by social network quality. Solitude may represent an effective way of coping with conflictual social networks, especially among older adults who prefer to use avoidance when coping with interpersonal tensions (Birditt et al., 2005). Older adults may choose solitude rather than engaging in social encounters when they have more conflictual networks and/or less positive social networks. Of course, the use of solitude may not involve a deliberate choice but may also involve an unconscious process of disengagement from conflict.

## Present Study

The present study examined daily solitude among retired adults aged 65 years and older. We extend previous research (Chui et al., 2014; Larson et al., 1985) by broadening the definition of solitude and examining whether the solitude-well-being link varies by social network quality. The study addressed two research questions:

- 1) Is daily solitude associated with daily emotional well-being (positive and negative affect)?

Because the sample included older adults, and the research suggests that older adults benefit from solitude (Chui et al., 2014; Larson et al., 1985), we predicted that

periods of solitude would be associated with greater positive affect and lower negative affect than periods of social interaction.

- 2) Do the links between solitude and emotional well-being vary by social network quality (positive and conflictual)?

We predicted that solitude would be associated with even greater beneficial effects (i.e., lower negative and greater positive affect) among individuals with more conflictual and/or less positive social networks.

## Method

### Participants

Participants were from the Daily Experiences and Well-being study (DEWS) which included 333 adults aged 65 years and older from the greater Austin, Texas area. The sample was selected from a landline list with matched addresses representing approximately 80% of this population (approximately 20% of this population relies solely on cell-phones). Individuals who were 65 years and older and not working more than 20 hr a week were eligible to participate. The response rate was 66% for agreement to participate in terms of eligible households. Of the total sample ( $N = 333$ ), 321 participants agreed to complete daily ecological momentary assessment (EMA) surveys and 313 of those respondents completed at least one survey (range 1–32). They were 56% female and ranged in age from 65 to 90 years old ( $M = 73.94$ ,  $SD = 6.38$ ). Table 1 includes a description of the sample.

**Table 1.** Daily Experience and Well-Being Study Sample Descriptives ( $n = 313$ )

	%/M (SD)
% Female	55.6
% White	82.1
% Black	15.0
% Hispanic ethnicity	15.3
% Married/partnered	58.8
% Living alone	34.2
% Working part-time for pay	11.8
Age	73.9 (6.4)
Education <sup>a</sup>	5.9 (1.6)
Proportion time spent alone	0.11 (0.16)
Social network size <sup>b</sup>	15.1 (6.9)
Positive social network quality	3.6 (0.6)
Conflictual social network quality	1.7 (0.6)

Note: <sup>a</sup>Education included eight categories: 1 (no formal education), 2 (1–8 elementary school), 3 (some high school), 4 (12 high school), 5 (13–15 some college/vocational or technical school), 6 (16 college graduate), 7 (17+ post college; no additional degree), 8 (17+ advanced degree). <sup>b</sup>Social network size included the total number of network members reported. Positive and conflictual network quality ranged from 1 (not at all) to 5 (a great deal).

In terms of race and ethnicity, a total of 83% were White which is similar to the Austin (83%), Texas (84%), and U.S. populations (84%). A total of 15% were Black which is higher than Austin (8%), Texas (8%), and U.S. populations (9%). In addition, 15% identified as Hispanic which is slightly lower than the Austin (17%) and Texas (22%) populations but slightly higher than the United States (8%). Despite the higher number of Black individuals than population estimates, response rates were lower among minority participants. A total of 52% Hispanic and 53% of the Black eligible individuals agreed to participate, whereas 76% of the eligible White respondents agreed to participate.

A total of 93% of the participants reported having a high school degree or higher and 57% reported a Bachelor's degree or higher making the sample slightly more highly educated than the general population of the Austin metropolitan area (85% high school graduate, 42% bachelors or higher). The Austin area population aged 65 years and older is more highly educated than Texas (77% high school graduate, 25% bachelors or higher), and the United States (82% high school graduate, 25% bachelors or higher).

We next assessed whether the likelihood of participating in the EMAs varied as a function of key demographics (e.g., age, education, gender, race, Hispanic ethnicity, marital status, whether respondents live alone, work status and social contextual characteristics), (social network size, and positive and conflictual social network quality) with a logistic regression analysis. The model revealed that older respondents ( $b = -0.13$ ,  $p < .01$ ) and those who identified as Hispanic ( $b = -0.90$ ,  $p < .01$ ) were less likely to participate in the EMA portion of the study. We also estimated a linear regression model predicting the number of EMAs completed and found that respondents with larger social networks complete more EMAs ( $b = 0.15$ ,  $p < .01$ ), whereas older respondents completed fewer EMAs ( $b = -0.12$ ,  $p < .05$ ). These findings indicate that older individuals and Hispanic individuals may have found the EMA portion of the study burdensome.

### Procedure

Participants completed a baseline face-to-face interview in their homes followed by 5–6 days (three weekdays and two weekend days) of ecological momentary assessment (EMA) questionnaires on a mobile device every 3 hr from waking until bedtime (approximately six times). Respondents received \$50 for completing the baseline survey and \$100 for completing the daily component of the study. Participants completed an average of 20 EMA ( $SD = 6.03$ ) surveys. The data used in this study were from the baseline interview and five out of six of the within day EMA surveys. The first morning survey (awakening) data were omitted because these measures did not include information about social encounters.

## Measures

### Daily Solitude

Every 3 hr until bedtime, participants reported whether they had any social encounters (in person, electronically, or over the phone) in the last 3 hr. Solitude was coded according to whether they had no social encounters (1) or had one or more social encounters (-1).

### Emotional Well-being

Every 3 hr until bedtime, participants reported the extent to which they felt negative emotions (*nervous/worried, irritated, lonely, and sad*), and positive emotions (*content, loved, and calm*). The answer choices included 1 (*not at all*), 2 (*a little*), 3 (*somewhat*), 4 (*quite a bit*), and 5 (*a great deal*). The items were adapted from Shaver, Schwartz, Kirson, & O'Connor, 1987 and from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). In particular, irritated, Lonely, Sad, Content, Loved, Calm were from Shaver et al. (1987). Nervous/worried was adapted from the PANAS (1988; nervous) and Shaver et al. (1987; Worry). Items were averaged to create negative and positive affect scores at each time assessment ( $\alpha = .71, .73$ , respectively).

### Social Network Quality

In the baseline interview, participants completed the social convoy measure in which they reported on their close social partners in three concentric circles ranging in closeness (Kahn & Antonucci, 1980). Then, they were asked to report the positive and conflictual qualities of each of the first 10 closest network members. Positive qualities (three items) included the extent to which individuals can: share their private feelings and concerns with the (network member), rely on the (network member) for help when they have a serious problem, and the (network member) loves and cares for them. Conflictual quality items (two items) included the extent to which: (network member) gets on their nerves, and (network member) is critical of them and what they do. Items were rated using the following scale: 1 (*not at all*), 2 (*a little*), 3 (*somewhat*), 4 (*quite a bit*), or 5 (*a great deal*). Means were calculated across all network members of the positive quality items to create the positive network quality scale ( $\alpha = .91$ ) and across all network members of the conflictual items to create the conflictual network quality scale ( $\alpha = .89$ ). The positive and conflictual quality scores were weakly correlated at  $-.17$ ; thus the constructs were included in analyses separately.

### Covariates

Several covariates associated with solitude and emotional well-being were included in the models including participant age, gender, education, marital status, living alone, race, Hispanic ethnicity, employment status, and social network size. Participants reported their birthdate and age was treated as a continuous variable in years. Gender was coded as 1 = *female* or -1 = *male*. To assess education, participants

were asked "What is the highest grade of school or year of college you completed?" and provided with 8 categories: 1 (*no formal education*), 2 (*1–8 years, elementary school*), 3 (*some high school*), 4 (*12 high school*), 5 (*13–15 years some college/vocational or technical school*), 6 (*16 college graduate*), 7 (*17+ post college; no additional degree*), or 8 (*17+ advanced degree*). Marriage was coded as 1 (*married/cohabiting*) or -1 (*widowed, divorced, never married*). Race included four categories (*American Indian or Alaska Native, Asian, Black or African American, or White*) and it was coded as 1 (*White*) or -1 (*non White*). Participants were also asked whether they identified as Hispanic which was coded as -1 (*not Hispanic*) or 1 (*Hispanic*). Participants also reported whether they lived alone which was coded 1 (*live alone*) and -1 (*don't live alone/live with others*). Work status was coded as 1 (*working part time for pay*) or -1 (*not employed part time for pay*). Finally, we controlled for the total number of social network members listed in the social network. We also considered personality in post hoc models. Neuroticism was assessed with four items ([*moody, a person who worries, nervous, calm (reversed)*]) and extraversion was assessed with five items (*outgoing, friendly, lively, active, talkative*) which respondents rated to what extent the terms described them from 1 (*not at all*) to 5 (*a great deal*). The personality items were from the Midlife in the United States Study (MIDUS; Lachman & Weaver, 1997).

### Analysis Strategy

First, we calculated descriptive statistics including frequencies, means, and standard deviations as well as correlations between key variables. Next, we estimated three-level multi-level models (3 hr time blocks, nested in days, which were nested in participants) in two steps. The first step examined links between solitude and emotional well-being. The models were estimated separately predicting positive and negative affect with solitude included as the predictor. Models controlled for age, education, gender, marital status, living alone, work status, race, Hispanic ethnicity, social network size, and proportion of time in solitude. The proportion of time in solitude variable was created by dividing the number of times participants indicated they were alone by the total number of surveys completed. Next, we included the social network quality variables (positive and negative quality) and interactions between solitude and social network quality. These models were estimated separately for positive relationship quality and conflictual relationship quality. We explored significant interactions with graphs and tests of simple slopes and regions of significance tests in which the estimates from the multilevel models were used to plot affect as a function of solitude and social network quality (Preacher, Curran, & Bauer, 2006). Low was defined as 1 *SD* below the mean and high as 1 *SD* above the mean. We assessed whether there was a significant difference between the fit of the models by subtracting the  $-2$  log likelihood estimations of models and examining differences

on a chi-square distribution with degrees of freedom equaling the change in number of parameters (Singer & Willett, 2003).

## Results

### Descriptives

Participants reported solitude (i.e., no social contact) on 11% of the 3-hr intervals. A total of 5,573 of the 3-hr survey intervals included at least 1 social interaction, whereas a total of 692 included no social encounters. A total of 45% (142) of participants reported at least one social contact at every assessment.

Participants reported relatively high levels of positive affect ( $M = 3.82$ ,  $SD = 0.83$ ) and relatively low levels of negative affect ( $M = 1.23$ ;  $SD = 0.40$ ). Bivariate associations revealed that solitude was generally associated with lower positive affect ( $r = -.10$ ,  $p < .001$ ) but it was not associated with negative affect ( $r = -.01$ ,  $p = .38$ ). Positive and negative affect were negatively correlated ( $r = -.37$ ,  $p < .001$ ).

The proportion of time individuals spent in solitude was significantly correlated with gender, age, marital status, living alone, total network size, and negative relationship quality. Men ( $r = -.12$ ,  $p < .05$ ), older individuals ( $r = .12$ ,  $p < .05$ ), individuals who were not married or cohabiting ( $r = .50$ ,  $p < .001$ ), and individuals who lived alone spent more time in solitude ( $r = .48$ ,  $p < .001$ ). Individuals with

a larger number of network members ( $r = -.13$ ,  $p < .05$ ), and with more conflictual networks spent less time in solitude ( $r = -.19$ ,  $p < .001$ ). Education, race, Hispanic ethnicity, work status, and positive social network quality were not associated with solitude. Further we controlled for both whether individuals lived alone, as well as whether they were married/cohabiting, because although these variables were correlated ( $r = -.64$ ,  $p < .001$ ), they were not so highly correlated that they represented the same construct.

Analysis of the average positive and conflictual social network quality ratings revealed that individuals reported low levels of conflict ( $M = 1.7$ ;  $SD = 0.6$ ) and high levels of positive social network quality ( $M = 3.6$ ;  $SD = 0.6$ ).

### Is Solitude Linked With Daily Emotional Well-Being?

First, we examined whether there were links between daily solitude and daily positive and negative affect. The model examining the links between daily solitude and positive affect showed that on occasions when individuals reported solitude they reported lower positive affect (Table 2). These findings are inconsistent with the hypothesis that solitude would predict greater positive affect. Because the effects of solitude may vary by the specific type of emotion, we also tested whether solitude was associated with each of the positive emotions. Solitude was negatively associated with

**Table 2.** Estimates From Multilevel Models Examining Positive and Negative Affect as a Function of Daily Solitude

	Negative Affect <i>b</i> ( <i>SE</i> )		Positive Affect <i>b</i> ( <i>SE</i> )	
	Model 1	Model 2	Model 1	Model 2
	<i>b</i> ( <i>SE</i> )	<i>b</i> ( <i>SE</i> )	<i>b</i> ( <i>SE</i> )	<i>b</i> ( <i>SE</i> )
Intercept	1.18 (0.04)***	1.17 (0.04)***	3.58 (0.09)***	3.58 (0.09)***
Gender (1=female)	0.01 (0.02)	0.01 (0.02)	0.001 (0.04)	0.001 (0.04)
Race (1=White)	0.02 (0.02)	0.02 (0.02)	0.04 (0.05)	0.04 (0.05)
Hispanic ethnicity	-0.01 (0.03)	-0.01 (0.03)	-0.12 (0.06)*	-0.12 (0.06)*
Working	-0.04 (0.03)	-0.04 (0.03)	-0.04 (0.06)	-0.04 (.06)
Married/partnered	-0.02 (0.03)	-0.02 (0.03)	0.08 (0.06)	0.09 (0.06)
Live alone	-0.002 (0.02)	-0.002 (0.02)	-0.04 (0.05)	-0.04 (0.05)
Age	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.006)	-0.003 (0.006)
Education	0.007 (0.01)	0.007 (0.003)	-0.03 (0.03)	-0.03 (0.03)
Proportion time alone	-0.01 (0.13)	-0.02 (.13)	-0.52 (0.29)	-0.52 (0.29)
Total network size	-0.006 (0.003)*	-0.006 (0.003)*	0.02 (0.006)***	0.02 (0.006)***
Solitude	-0.02 (0.01)*	-0.02 (0.006)**	-0.03 (0.01)**	-0.03 (0.01)**
Positive network	-0.04 (0.03)	-0.04 (0.03)	0.27 (0.06)***	0.27 (0.06)***
Conflictual network	0.10 (0.03)**	0.07 (0.04)*	-0.20 (0.07)**	-0.20 (0.08)**
Solitude × Conflictual network		-0.03 (0.01)*		-0.001 (0.02)
-2loglikelihood (LL)	2465.3	2459.3	7966.5	7966.5
Change in -2LL	6.2*	6.1*	11.4**	.1

Note: Covariate only model for positive affect -2LL = 7,976.5, covariate only model for negative affect -2LL = 2,471.4, change in -2LL for model 1 was compared to the covariate only model.

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

feeling content and feeling loved but positively associated with feeling calm (Supplementary Table 1).

The model examining the links between daily solitude and negative affect showed that on occasions when individuals reported solitude they also reported lower negative affect, confirming our hypothesis (Table 2). We assessed the models separately for each negative affect item to test whether the findings were similar across low and high arousal negative emotions. Solitude was associated with lower high arousal negative emotions (irritation, nervous) but was not associated with low arousal negative emotions (sadness, loneliness; Supplementary Table 2).

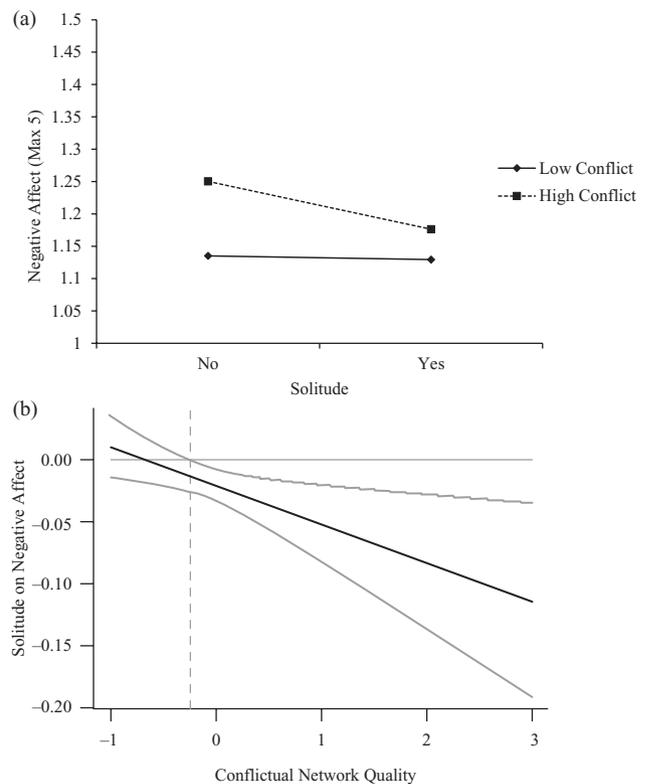
### Are Associations Between Solitude and Well-Being Moderated by the Quality of Individuals' Social Networks?

Multilevel models were estimated including interactions between positive social network quality and solitude predicting positive and negative affect. These models revealed that there were no significant interactions between solitude and positive social network quality predicting positive or negative affect. These models are not presented in tabular form in the interest of space.

Next, models were estimated including the interaction between solitude and conflictual social network quality predicting positive and negative affect. There was a significant interaction between solitude and conflictual social network quality when predicting negative affect but not positive affect (Table 2). Tests of the simple slopes of solitude by high and low conflictual social network quality revealed that solitude was associated with lower negative affect among individuals with more conflictual networks ( $b = -0.04, t = -3.44, p = .001$ ) and not among individuals with less conflictual networks ( $b = -0.003, t = -.37, p = .72$ , Figure 1a). Analysis of the regions of significance revealed that the association between solitude and negative affect was significant when conflictual quality was  $-.25$  or higher, which corresponds to a raw score of 1.43 or higher (Figure 1b).

We assessed the models separately by type of emotion. For positive emotions, the interaction between conflictual social network quality and solitude was significant when predicting feeling calm and feeling loved (Supplementary Table 1). Plots of the interactions showed that solitude predicted greater feelings of calm ( $b = 0.16, p < .01$ ) and lower feelings of love among people with more conflictual networks ( $b = -0.30, p < .001$ ).

For negative emotions, there were significant interactions between solitude and conflictual social networks when predicting high arousal negative emotions (nervous, irritated) and the low arousal negative emotion of sadness but not loneliness (Supplementary Table 2). Plots of the interactions showed that solitude was associated with lower feelings of nervousness ( $b = -0.14, p < .01$ ), irritation ( $b = -0.12, p < .01$ ), and sadness ( $b = -0.06, p < .05$ )



**Figure 1.** (a) Link between momentary solitude and daily negative affect as a function of conflictual network quality. Low conflictual quality is 1 *SD* below the mean and high conflictual quality is 1 *SD* above the mean. (b) Confidence bands for the observed sample values of conflictual network quality and the simple slope of solitude on negative affect. The area outside the dotted lines represents statistical significance at  $p < .05$ .

among people with more conflictual networks. Thus, consistent with the hypothesis, with the exception of feeling loved, individuals appeared to benefit more from solitude when they had more conflictual networks.

### Post Hoc Analyses

We estimated additional models controlling for lagged effects of solitude as well as models controlling for lagged effects of emotional well-being to address potential bidirectional associations between affect and solitude. Models controlling for whether or not the participant reported solitude in the previous 3-hr survey (e.g., solitude reported at the 9 a.m. survey predicting affect in the 12 p.m. survey) showed that previous experiences of solitude did not predict affect in the next 3 hr but that solitude was associated with concurrent lower negative affect ( $b = -0.02, p < .05$ ) and lower positive affect ( $b = -0.03, p < .05$ ) during the same 3-hr period.

Because prior research suggested that solitude may be particularly beneficial when immediately following social encounters (Lowenthal & Robinson, 1976), we also tested additional models to examine whether the effects of solitude varied depending on whether individuals engaged in

social encounters in the previous 3 hr. To do so, we tested interactions between lagged solitude and current solitude predicting positive and negative affect. The interactions were not significant.

Models controlling for emotional well-being in the previous 3 hr survey (e.g., positive affect reported in the 9 a.m. survey as covariate in the model predicting positive affect in the 12 p.m. survey) also yielded the same pattern of findings. Solitude was associated with lower concurrent negative affect ( $b = -0.02, p < .05$ ) and lower concurrent positive affect ( $b = -0.04, p < .05$ ).

We also conducted post hoc tests to assess the stability of the Solitude  $\times$  Conflictual network quality interaction predicting negative affect with a series of different metrics of conflictual network quality. Models tested ratings of conflictual quality with the closest social partner in the network, the total number of conflictual network members (scores of higher than 1 on either conflict item), and highest rated conflictual quality social network member. All models were consistent with the average conflictual network findings. Analysis of the interaction effects revealed that the association between solitude and negative affect was significant at higher levels of conflictual quality. The regions of significance tests showed that the effect was significant when the closest network member was rated as 1.55 or higher, the total number of conflictual network members was 3.82 or higher and the most negative network member was 2.30 or higher.

Previous research suggested that the effects of solitude vary by marital status/living arrangement (Larson et al., 1985). Consequently, we estimated additional models with interactions between living alone and solitude as well as marital status and living alone. There were no significant interactions indicating that the effects of solitude did not vary by marital status or living alone.

Solitude and its implications may be accounted for by variations in personality. Thus, we tested models controlling for personality traits of extraversion and neuroticism and found the same effects.

Because solitude may have involved social media/e-mail use, we re-estimated the models with e-mail and social media usage as covariates to assure these activities did not account for periods of "solitude." The same findings emerged with regard to the associations between solitude and affect (positive, negative) and the interactions with conflictual networks.

## Discussion

Using an expanded definition of solitude as having no social encounters (via in person, phone or texting) in the past 3 hr, this study revealed that older adults rarely report solitude. Further, individuals in more conflictual social networks appear to benefit more from solitude (showing lower negative affect and greater feelings of calm). Solitude may

represent an effective coping strategy for individuals faced with irritating social network members.

## Solitude and Emotional Well-Being

In contrast to previous studies which suggested that older adults are frequently alone (i.e., 48%–70% of the time; Chui et al., 2014; Larson et al. 1985), individuals aged 65 years and older experienced complete solitude, in which they are out of contact with others for 3 hr, only 11% of the time. This is surprising but may be due to our more expanded definition of solitude. Previous studies have often defined solitude as being physically alone at the time of the survey. While people may be physically alone they may have many other types of contact with others including via text messaging and computers (Zickuhr & Madden, 2012). Given these new technological advances, older adults may be alone less often than in the past.

Further, solitude predicted lower positive and negative affect. Similarly, Chui and colleagues found that solitude was associated with lower positive affect among the oldest old (aged 84 years and older; Chui et al., 2014) and suggests this pattern is pervasive in late life. Thus, just as Larson (1990) suggested, there may be drawbacks to solitude as it involves the lack of social connection and companionship. This may be especially true for older adults who are more likely to strive for emotionally meaningful connections than younger adults (Carstensen, Isaacowitz, & Charles, 1999).

However, at the same time, solitude was associated with lower negative affect. This finding is inconsistent with previous research which has either found no link with negative affect or that solitude is associated with greater negative affect (Chui et al., 2014; Larson et al., 1985). It is possible that older adults are less negatively affected by solitude as the previous research has suggested. It is also possible that our definition of solitude as a complete lack of social contact for 3 hr meant that individuals were using this time to decompress. Indeed, solitude predicted lower high arousal negative affect (i.e., irritation and nerves) but was not associated with low arousal negative affect. Individuals may use these times of solitude to regroup and refresh as they are "off stage" and not constrained by the needs or expectations of others (Goffman, 1971).

## The Links Between Solitude and Well-Being Vary by Social Network Quality

As, Cacioppo and Patrick (2008) suggested, overall feelings about social networks and connections may provide a lens upon which all encounters or the lack of social encounters are interpreted. This study showed individuals with more conflictual networks (i.e., more irritating and critical) benefited from solitude (show lower negative affect when alone) compared to individuals with less conflictual

networks. Maintaining solitude may be an effective coping strategy for individuals faced with irritating or demanding social networks. Individuals may use solitude either unconsciously or consciously as a coping mechanism for avoiding potentially negative social encounters. This finding may provide insights into discrepant findings in the literature regarding solitude and well-being as previous studies have not considered the quality of social networks.

It is interesting to note that the links between daily solitude and emotional well-being did not vary by positive relationship quality. Thus, it does not appear that individuals benefit from solitude when they have less supportive ties as we had predicted. Negative aspects of relationships also tend to be more predictive of well-being than are positive aspects of relationships (Newsom, Nishishiba, Morgan, & Rook, 2003; Rook & Charles, 2017). Negative events tend to be more salient to individuals perhaps because negativity occurs less frequently and is more surprising (Rook, 2015). Indeed, research suggests that one negative interpersonal event can overwhelm several positive events (Gottman & Levenson, 1992).

Interestingly, solitude appears to be beneficial among individuals with a single irritating network member as well as a high number of conflictual network members. Similarly, previous studies have found that there is a threshold of negativity and that individuals can be just as affected by one negative or problematic relationship as they are by several problematic network members. For example, studies comparing a “threshold” versus a “cumulative” effect of grown children’s problems on midlife parents have found that even one child with a problem had a deleterious effect on depressive symptoms and on daily well-being (Fingerman, Cheng, Birditt, & Zarit, 2012; Suito et al., 2017).

### Directions for Future Research

There are limitations to this study which should be addressed in future research. First, this is a regional sample and it is not clear to what degree these findings reflect the lives of older adults nationally. The Austin area is unique in that the population is more highly educated and includes a larger population of Hispanic individuals than the U.S. population. Both ethnicity and education are important predictors of social relationships (Ajrouch, Blandon, & Antonucci, 2005; Kim & McHenry, 1998). Although the present study showed that the frequency of solitude did not vary by ethnicity, future research should examine whether the links between solitude and well-being vary by ethnicity as there were significant associations between ethnicity and daily positive affect. Future research should also examine the process by which solitude occurs. For example it is not clear to what extent older adults proactively use solitude to remove themselves from conflictual networks. What activities are individuals engaging in during solitude? Although the data include questions about several activities, the majority of time spent alone, individuals engaged in “other” unspecified activities. Researchers

also need to examine the length of time individuals are alone. Because solitude was defined as lacking social contact for 3 hr, shorter periods of time in which individuals were alone were not examined.

More research needs to be conducted examining the bidirectional associations between solitude and affect. The present study found concurrent associations between solitude and affect which may indicate either that solitude predicts changes in affect or that affect predicts changes in solitude. It is important to note, however, that the findings remained when controlling for affect and solitude in the previous 3-hr period. Examining percent of time alone every 3 hr and affect may provide a finer grained assessment of the links between solitude and affect.

Overall, solitude predicts drawbacks (i.e., lower positive affect) and benefits (i.e., lower negative affect). Solitude appears to be beneficial in the context of conflictual social networks. Thus, it is important to consider the broader social context to understand the effects of solitude on well-being.

### Supplementary Data

Supplementary data are available at *The Gerontologist* online.

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### Author Contributions

K. L. Fingerman developed the study concept and oversaw the data collection. K. L. Fingerman, G. Luong, and K. S. Birditt contributed to the study design. J. A. Manalel and H. Sommers performed the data analysis and created tables and figures under the supervision of K. S. Birditt. K. S. Birditt drafted the manuscript, and G. Luong and K. L. Fingerman provided critical revisions. All authors approved the final version of the manuscript for submission.

### Conflict of Interest

None reported.

### References

- Ajrouch, K. J., Blandon, A. Y., & Antonucci, T. C. (2005). Social networks among men and women: The effects of age and socioeconomic status. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 60, S311–S317. doi:10.1093/geronb/60.6.S311

- Akiyama, H., Antonucci, T., Takahashi, K., & Langfahl, E. S. (2003). Negative interactions in close relationships across the life span. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 58, P70–P79. doi:10.1093/geronb/58.2.P70
- Antonucci, T. C. (2001). Social relations an examination of social networks, social support. *Handbook of the Psychology of Aging*, 3, 427.
- Birditt, K. S., Fingerman, K. L., & Almeida, D. M. (2005). Age differences in exposure and reactions to interpersonal tensions: A daily diary study. *Psychology and Aging*, 20, 330–340. doi:10.1037/0882-7974.20.2.330
- Cacioppo, J. T., & Patrick, W. (2008). *Loneliness: Human nature and the need for social connection*. New York, NY: WW Norton & Company
- Carstensen, L.L., Isaacowitz, D.M., & Charles, S.T. (1999). Taking time seriously. A theory of socioemotional selectivity. *The American Psychologist*, 54, 165–181. doi:10.1037/0003-066X.54.3.165
- Chui, H., Hoppmann, C. A., Gerstorf, D., Walker, R., & Luszcz, M. A. (2014). 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. *Developmental Psychology*, 50, 728–740. doi:10.1037/a0033896
- Fingerman, K. L., Cheng, Y. P., Birditt, K., & Zarit, S. (2012). Only as happy as the least happy child: Multiple grown children's problems and successes and middle-aged parents' well-being. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 67, 184–193. doi:10.1093/geronb/gbr086
- Fingerman, K. L., Hay, E. L., & Birditt, K. S. (2004). The best of ties, the worst of ties: Close, problematic, and ambivalent social relationships. *Journal of Marriage and Family*, 66, 792–808.
- Goffman, E. (1971). *Relations in public: Microstudies of the public order*. New York: Basic Books.
- Gottman, J. M., & Levenson, R. W. (1992). Marital processes predictive of later dissolution: Behavior, physiology, and health. *Journal of Personality and Social Psychology*, 63, 221–233. doi:10.1037/0022-3514.63.2.221
- Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, 40, 218–227. doi:10.1007/s12160-010-9210-8
- Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, 10, 227–237. doi:10.1177/1745691614568352
- Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, 7, e1000316. doi:10.1371/journal.pmed.1000316
- Kahn, R. L., & Antonucci, T. C. (1980). Convoys over the life course: attachment, roles and social support. In Baltes, P. B. & Brim, O. G. (Eds.) *Life Span Development and Behaviour*, vol 3. New York: Academic Press.
- Kim, H. K. & McHenry, P. C. (1998). Social networks and support: Comparison of African Americans, Asian Americans, Caucasians, and Hispanics. *Journal of Comparative Family Studies*, 29, 313–334.
- Lachman, M. E., & Weaver, S. L. (1997). *The Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring (Tech. Rep. No. 1)*. Waltham, MA: Brandeis University, Department of Psychology.
- Larson, R. W. (1990). The solitary side of life: An examination of the time people spend alone from childhood to old age. *Developmental Review*, 10, 155–183. doi:10.1016/0273-2297(90)90008-R
- Larson, R., Zuzanek, J., & Mannell, R. (1985). Being alone versus being with people: Disengagement in the daily experience of older adults. *Journal of Gerontology*, 40, 375–381. doi:10.1093/geronj/40.3.375
- Long, C. R., & Averill, J. R. (2003). Solitude: An exploration of benefits of being alone. *Journal for the Theory of Social Behaviour*, 33, 21–44. doi:10.1111/1468-5914.00204
- Lowenthal, M. F., & Robinson, B. (1976). Social networks and isolation. *Handbook of Aging and the Social Sciences*, 5, 432–456.
- 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. doi:10.1037/0882-7974.18.4.746
- Ong, A. D., Uchino, B. N., & Wethington, E. (2016). Loneliness and health in older adults: A mini-review and synthesis. *Gerontology*, 62, 443–449. doi:10.1159/000441651
- Pauly, T., Lay, J. C., Nater, U. M., Scott, S. B., & Hoppmann, C. A. (2017). How we experience being alone: Age differences in affective and biological correlates of momentary solitude. *Gerontology*, 63, 55–66. doi:10.1159/000450608
- Peplau, L. A., & Perlman, D. (1982). *Loneliness: A Sourcebook of Current Theory, Research and Therapy*. New York, John Wiley and Sons.
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, 31, 437–448.
- Rook, K. S. (1995). Support, companionship, and control in older adults' social networks: Implications for well-being. In J. F. Nussbaum & J. Coupland (Eds.), *LEA's communication series. Handbook of communication and aging research* (pp. 437–463). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Rook, K. S. (2015). Social networks in later life: Weighing positive and negative effects on health and well-being. *Current Directions in Psychological Science*, 24, 45–51. doi:10.1177/0963721414551364
- Rook, K. S., & Charles, S. T. (2017). Close social ties and health in later life: Strengths and vulnerabilities. *The American Psychologist*, 72, 567–577. doi:10.1037/amp000104
- Rook, K. S., & Ituarte, P. H. (1999). Social control, social support, and companionship in older adults' family relationships and friendships. *Personal Relationships*, 6, 199–211. doi:10.1111/j.1475-6811.1999.tb00187.x
- Shaver, P., Schwartz, J., Kirson, D., & O'Connor, C. (1987). Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology*, 52, 1061–1086. doi:10.1037/0022-3514.52.6.1061
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
- Storr, A. (2005). *Solitude: A return to the self*. New York, NY: Simon and Schuster.

- Suitor, J. J., Gilligan, M., Pillemer, K., Fingerman, K. L., Kim, K., Silverstein, M., & Bengtson, V. L. (2017). Applying within-family differences designs to enhance understanding of the complexity of intergenerational relations in well-being. *The Journals of Gerontology, Series B: Social Sciences*. doi:10.1093/geronb/gbx037
- U.S. Census. (2016) Quick facts, Austin, Texas, retrieved, April 22, 2018 from <https://www.census.gov/quickfacts/fact/table/austincitytexas/LND110210>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070. doi:10.1037/0022-3514.54.6.1063
- Zickuhr, K. & Madden, M. (2012). Older adults and Internet use. For the first time, half of adults aged 65 and older are online. Retrieved January 14, 2018 from <http://pewinternet.org/Reports/2012/Older-adults-and-internet-use.aspx>