Published in final edited form as:
Psychol Aging. 2014 June ; 29(2): 297–305. doi:10.1037/a0036889.

Loneliness in a day: Activity engagement, time alone, and experienced emotions

Tara L. Queen[1], **Robert S. Stawski**[2], **Lindsay H. Ryan**[3], and **Jacqui Smith**[3]

[1]University of Utah, Department of Psychology, 380 S. 1530 E. Salt Lake City, UT 84112, tara.queen@psych.utah.edu, (801) 585-5904

[2]Oregon State University, School of Social and Behavioral Health Sciences, Corvallis, OR

[3]University of Michigan, Institute for Social Research, Ann Arbor, MI

Abstract

The experience of chronic loneliness has been associated with poorer physical health and well-being, including declines in cardiovascular health and higher levels of distressed affect. Given the long-term effects of loneliness on health and well-being, much research has focused on loneliness in older age. The purpose of the current study was to obtain a more detailed picture of the experience of loneliness in midlife and older adulthood by incorporating the context of a day's activities. We use a modified day reconstruction task to examine the activities in which middle age and older adults engaged, the amount of time they spent alone, and the emotions experienced while engaging in a day's activities. Lonely individuals did not participate in different daily activities or spend more time alone during the day; however, loneliness was associated with engaging in more activities alone than with others. In regards to emotional experiences, daily activities yield a different profile of positive emotional experiences for lonelier individuals. The social context of daily activities was an important factor in understanding the effects of loneliness on experienced negative emotions. The results of this study provide insight into the influence of loneliness on the structure of a day and context for understanding the emotional experiences of lonely older adults.

Keywords

loneliness; day reconstruction; aging; emotion

Recent research suggests that the experience of loneliness can have detrimental effects on health and well-being across the adult lifespan. For example, loneliness has been shown to predict increases in depressive symptoms (Cacioppo, Hawkley, & Thisted, 2010) and has been associated with higher levels of distressed affect (Steptoe, Leigh, & Kumari, 2011), poor health behaviors (Lauder, Mummery, Jones & Caperchione, 2006; Shankar, McMunn, Banks, & Steptoe, 2011), sleep disturbance, and declines in cardiovascular health (Cacioppo et al, 2002; Hawkley, Thisted, Masi, & Cacioppo, 2010). Given the accumulation of negative effects of loneliness on health and well-being over time, much research has focused

on loneliness in older adults. It is important to note that loneliness is not an experience specific only to older adulthood, but occurs across the adult lifespan. One population study, for example, reports the highest prevalence of loneliness in those under age 25 and over age 65 (Victor & Yang, 2012). Studies focusing on loneliness in mid-life and later adulthood have found the experience of loneliness to be highest over age 80 (Dykstra, 2009; Pinquart & Sorensen, 2001). As individuals age, life factors contributing to loneliness, such as widowhood, the loss of same-generation network members, and increases in functional limitations (Dykstra & de Jong-Gierveld, 2004; Tijhuis, de Jong-Gierveld, Feskens, & Kromhout, 1999), become more common and contribute to the detrimental health effects of loneliness (Hawkley & Cacioppo, 2007). Chronic loneliness, then, may play an important role in daily well-being during midlife and later adulthood.

A recent study using ecological momentary assessment examined the experience of positive and distressed affect across the day in a large sample of older adults (Steptoe, Leigh, & Kumari, 2011). Loneliness was identified as a strong predictor of higher levels of distressed affect and lower levels of positive affect across the day, even after accounting for factors such as depression, employment status, and health. Although these findings provide an important perspective of the affective experiences of lonely individuals within a day, the methodology did not allow for an examination of the context of these experiences. That is, what are individuals doing when these emotions are being experienced? Work on loneliness and daily social exchanges has emphasized the importance of considering context by suggesting that emotional experiences for those who are lonely may differ depending on the context of social interactions (Russell, Bergeman, & Scott, 2012).

The purpose of the current study was to consider the experience of loneliness within the context of a day's activities. Current research on loneliness has focused on important long term consequences of chronic loneliness on health and well-being. Understanding the daily implications of loneliness may highlight areas in which lonely individuals may modify behavior. A recently developed research method that has been used to incorporate detailed information about a day is the day reconstruction method (DRM). The DRM measures experienced well-being by asking individuals to report on their affective experiences in the context of time use through the activities they engaged in the previous day (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004). The added contextualization from the DRM allows for the opportunity to further analyze how time use relates to experienced emotions and well-being. The DRM could provide a deeper understanding of the experience of loneliness in older adulthood through a closer examination of a day's activities and the affective experiences tied to them. We use a modified day reconstruction task to examine the activities in which middle age and older adults engage, the amount of time they spend alone, and the emotions experienced while engaging in a day's activities.

We begin by comparing the activities in which lonely versus less lonely individuals participate. Previous work on undergraduate students has found that loneliness did not predict differences in engagement in daily activities (Hawkley, Burleson, Berntson, & Cacioppo, 2003); however, the impact of loneliness on time use may be quite different in mid to later adulthood given age differences in the structure of a day (Moss & Lawton, 1982; Robinson & Godbey, 1997). Research on the influence of loneliness on health in older

adulthood has suggested that loneliness is associated with less engagement in physical activity (Shankar, McMunn, Banks, & Steptoe, 2011). Other research has explored the relationship between loneliness and leisure activities and has found that lonelier individuals spend more time watching television and browsing the internet (Perlman, Gerson, & Spinner, 1978; Sum, Mathews, Hughes, & Campbell, 2008). In the current study, we use a list of ten preselected physical, cognitive, and leisure activities to capture time use the previous day. We hypothesize that higher levels of loneliness would be associated with fewer (i.e., count) of activities completed the previous day.

Next, we ask if individuals experiencing higher levels of loneliness spend more time alone versus with others. Previous research on the relationship between loneliness and the frequency of social interactions has provided mixed results. For example, one study identified increases in time spent alone as a vulnerability factor for loneliness (Victor, Scambler, Bowling, & Bond, 2005). Similarly, in validating the UCLA loneliness scale, Russell, Peplau, and Cutrona (1980) reported a positive relationship between loneliness and time spent alone. In contrast to these findings, Hawkley and colleagues (2003) report no differences in the amount of time spent alone across levels of loneliness and Larson reports on the benefits of time spent in solitude, especially in older adulthood (Larson, 1990; Larson, Zuzanek, & Mannell, 1985). The data from the current study allows us to examine time alone in two ways. We first consider the amount of time spent alone during a day and then examine whether a day's activities were completed alone or in the company of others. We expect that lonelier individuals spend more time alone and engage in more solo activities.

Last, we examine loneliness differences in emotional experiences linked to activity engagement. Previous research has suggested that lonely young adults appraise their daily activities, including social interactions, as more stressful, more threatening, and more demanding (Hawkley et al., 2003; Hawkley & Cacioppo, 2007). By using a modified day reconstruction task, we were able to assess specific emotions experienced during participation in a variety of activities. We specifically examine whether the social context of activities (i.e., being alone or with others) moderated lonely individuals' reports of positive and negative emotional experiences. Previous research has emphasized the importance of social exchanges for daily well-being. For example, researchers report that lonelier middle aged and older adults display a greater decrease in negative affect on days marked by more positive social exchanges (Russell, Bergeman, & Scott, 2012). Although we are unable to test individuals' appraisals of the social context as positive or negative, our analyses will allow us to examine whether social context within activities promotes positive emotional experiences.

We examined whether these effects are unique above potential correlates of loneliness, including demographic and health factors. Several studies have focused on identifying life circumstances associated with the experience of loneliness. Socioeconomic status has been predicted to be associated with richer social networks and more resources to engage in activities and has been shown to be negatively related with loneliness (Pinquart & Sorensen, 2010). Earlier work established that those who are married report experiencing less loneliness than those who are unmarried (Perlman & Peplau, 1981). The relationships

between gender and race on loneliness have also been investigated, with somewhat mixed findings. There are some data suggesting that women and racial minorities tend to be more likely to report loneliness and poorer social connectedness (Cornwell, Laumann, & Schrumm, 2008; Perlman & Peplau, 1981; Warner & Kelley-Moore, 2012). Health status, especially functional limitations, may put constraints on the ability to engage with social contacts. Indeed, several studies have found increases in functional limitations to be positively associated with loneliness and social connectedness (Bowling, Edelmann, Leaver, & Hoekel, 1989; Cornwell, Laumann, & Schrumm, 2008; Warner & Kelley-Moore, 2012). Additionally, several studies have focused on the relationships between loneliness and depression, reporting that they are related but distinct constructs (e.g., Cacioppo, Hawkley, & Thisted, 2010). We controlled for depression in all of our analyses in order to assess the unique associations between our outcomes and loneliness.

Method

Participants & Procedure

A total of 968 adults ages 50 – 97 (M = 69.33, SD = 11.64) were recruited for participation in a study on experienced well-being in older adulthood. The sampling strategy, recruitment, and data collection was managed by the Survey Research Operations unit at the Institute for Social Research, University of MichiganOne third of the study sample were local volunteers who completed in-person interviews at the University of Michigan (n = 326). Local recruitment was through newspaper and online announcements and flyers distributed throughout the county. The remaining 642 participants were recruited for telephone interviews via nationwide list-assisted random digit dialing[1] (except Hawaii and Alaska). Of the 6476 lines called, 5100 households (78%) contained household members who were potentially eligible. The original study design was stratified across gender and age decade (50s, 60s, 70s, and 80s). Using strategic sampling frames, this stratification was achieved for age (at least n = 240 participants per decade, *M* = 69.3 years) and partially for gender (56% women participated, with the weakest ratio of men to women in the 50s and 80+ decade groups). The completion rate for the three study components following recruitment was 98% (in-person sample) and 94% (telephone sample).

Respondents in both the in-person and telephone samples completed two computer-assisted individual interviews about their activities and well-being as well as a mailed psychosocial and lifestyle questionnaire. They were paid $60 for completing the protocol. Seventeen trained interviewers were employed on the study. In this paper, we report data from the first interview only. This one-hour interview began with a section on activities and well-being followed by a selection of questions about socio-demographic background, income, health, and measures of cognitive performance drawn from HRS. The interview content was the same for the telephone and local samples, except that the in-person interviews included additional cognitive measures and the collection of several biomarkers.

[1]We observed survey mode (in-person respondents vs. telephone) differences in a few covariates. As may be expected, the in-person sample reported fewer functional limitations and higher self-rated health. They were less likely to be married and more likely to fall in the middle income brackets. In regards to outcomes, the in-person sample reported participating in more activities and experiencing less negative emotion. The magnitude of these differences was very small, with R^2 values ranging from .005 – .009. When mode was included as a covariate in each model, there were no significant changes to the results.

The distribution of sociodemographic, health and cognitive performance characteristics obtained in the final study sample compares favorably with the 2008 and 2010 HRS representative panel. As to be expected in volunteer samples, participants in the study sample tended to be better educated (49% had a college degree) than the target population over age 50. HRS oversamples for minority groups but this was not part of our study design. Nevertheless, the study sample is 88% Caucasian, 7% African American, 1% American Indian, and the remaining participants were Asian, Mexican American or mixed-race. The majority were married (59%), 32% lived alone, 32% were currently employed, 58% retired, 19% reported a diagnosis of diabetes, 19% cancer, 54% arthritis, 54% hypertension, 24% a form of heart disease, and 23% reported that their health interfered with their activities. The average household income was $57902.

Measures

We used a computer-assisted day reconstruction interview, adapted from the Kahneman, Krueger, Schkade, Schwarz, and Stone (2004) pencil-and-paper DRM, to obtain information on individuals' activity engagement, social context, time spent alone, and emotions experienced during activities the previous day. Interviews were scheduled from Tuesday to Saturday to ensure that the reconstruction was for a weekday. The procedure began with a short instruction: *Think about what yesterday was like from the morning until the end of the day as if you were writing a diary or looking at a video. Think about where you were, what you were doing, who you were with, and how you felt.* Participants were then asked the time they awoke and the time they went to sleep the previous day, before questions about the activities in their day.

Activity engagement—We focused on two indicators of activity engagement: activity participation and a count of the activities engaged in the previous day. For activity participation, respondents reported whether they engaged in a predetermined set of 10 activities the previous day (watch TV/DVDs, work/volunteer, socialize, vigorous or moderate exercise, chores, use computer, puzzles/games, hobbies/crafts, read). The order of activities was randomized across participants. We selected these activities to be consistent with findings from the American Time-use Survey (e.g., Kranz-Kent & Stewart, 2007) and the gerontology literature (Everard, Lach, Fisher, & Baum, 2000; Hertzog, Kramer, Wilson, & Lindenberger, 2009) as being important for cognitive and health related outcomes. Participation in each activity was coded as 1 (yes) and 0 (no). Table 1 provides descriptive information about participation in each activity.

The second measure of activity engagement reflected a count of the number of activities participants endorsed (max = 10).

Activity social context—We obtained additional information regarding the social context of activities. Within each activity, we asked respondents, "Were you with anyone else while [watching TV, etc]." This information was used in our analyses in two ways. First, we examined activity social context as an outcome, using a count of activities completed alone (possible scale of 0 – 10; $M = 1.93$, $SD = 1.58$). We additionally used this information as a predictor to examine whether lonely individuals report differential emotional experiences

when activities are done alone versus with others. This was coded as 1 (with others) and 0 (alone).

Time alone—After endorsing whether they participated in each activity, participants were asked to estimate the amount of time they spent home alone the previous day (in hours). This excluded time spent talking with someone on the phone or the internet.

Experienced emotions—In order to assess emotional experiences, participants rated the extent to which they experienced 9 different emotions while participating in each activity ("While [watching TV yesterday] how [calm / interested / happy / bored / frustrated / stressed / impatient / sad / angry] did you feel?"; 0 [Not at all] – 4 [Very]). These feelings were presented in a random order. We examined intensity of positive and negative emotional experiences by creating two composite scores (for positive and negative emotions) by summing the intensity ratings for emotions experienced within each activity. Since we surveyed a different number of positive and negative emotions, the possible range of scores differed. Scores for positive emotions could range from 0 to 12 and those for negative from 0−24.

Chronic loneliness—Participants completed the Health and Retirement Study (HRS) self-administered questionnaire which contains various psychosocial scales, including an 11-item loneliness scale (Smith et al., 2013). This scale is based on the Revised UCLA loneliness scale (Russell, Peplau, & Cutrona, 1980) but was shortened from 20 to 11-items for use in large scale population telephone surveys (see also Huges, Waite, Hawkley, & Cacioppo, 2004 regarding the shortened response scale). Respondents indicated the amount of time they experienced each item (1 = Hardly ever or never; 2 = Some of the time; 3 = Often). We focused our analyses on the first three items of the scale, given that this is the most widely used and well-validated shortened form of the scale and allows for a more transparent comparison to previous research (Hughes, Waite, Hawkley, & Cacioppo, 2004; Perissinotto, Cenzer, & Covinsky, 2012; Shankar, McMunn, Banks, & Steptoe, 2011; Steptoe, Leigh, & Kumari, 2011; Steptoe, Shankar, Demakakos, & Wardle, 2013; Warner & Kelley-Moore, 2012; $\alpha = .79$). Items included "How much of the time do you feel you lack companionship/ do you feel left out/ do you feel isolated from others?" A loneliness index was created by averaging across items, producing scores ranging from 1–3, with higher scores indicating higher levels of loneliness. Loneliness was mean centered in all analyses.

Covariates—Several demographic and health variables known to be associated with loneliness and daily activities were included as covariates in our analyses. Demographic variables included age, gender (0 = men, 1 = women), employment and status (0 = not working, 1 =currently working), marital status (0 = not married [i.e., widowed, divorced, single]; 1 = married), race (1 = white, 0 = other), and income quintiles (higher quintiles reflect greater income). We controlled for several health-related variables, including self-rated health ("Would you say your health is excellent [5], very good [4], good [3], fair [2], or poor [1]?"). Functional limitations put constraints on mobility and can limit the types of activities individuals can do. In order to assess functional limitations, participants were asked if they had difficulty with a list of activities because of a health problem. The items

ranged from running or jogging a mile, walking one block, and climbing one flight of stairs, to picking up a dime, shopping for groceries, dressing, and bathing. We included a sum of functional limitations (max = 23; Fonda & Herzog, 2004) in each model. In order to assess the unique predictive power of loneliness, we controlled for depression using an 8-item version of the Center for Epidemiologic Studies Depression scale (CES-D; max = 8; Steffick, 2000; $\alpha = .79$). We present the relationships between these covariates and loneliness in Table 2.

Analysis Strategy

Multilevel modeling was used to address our questions about activity-level information (i.e., activity participation and activity-linked emotional experiences). It was possible for respondents to participate in up to 10 different activities; thus, our data were structured such that activities were nested within persons. We used multivariate linear regression for analyses on number of activities, time spent alone, and number of activities completed alone.

Results

Activity Engagement

We first examined whether loneliness predicted participation in the 10 preselected activities the previous day. We use multilevel modeling for binomial distributions with a logit function (PROC GLIMMIX; SAS 9.2) as our dependent variable was activity participation (i.e., yes vs. no) in each of the 10 activities.

Using a fully unconditional model, we first established that there was adequate between-person variability in activity participation ($\tau_{00} = 0.17$, $t = 8.21$, $p < .001$). Predictors in the conditional model included a dummy coded variable for activity (1 [TV]-10 [reading]; Level 1), loneliness (Level 2), and a cross level interaction. The demographic and health variables were included as covariates at Level 2.

$$\text{Activity participation}_{ij} = \beta_{0ij} + \beta_{1ij}\,(\text{Activity}) + r_{ij}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}\,(\text{Age}) + \gamma_{02}\,(\text{Gender}) + \gamma_{03}\,(\text{Marital status}) + \gamma_{04}\,(\text{Employment status}) + \gamma_{05}\,(\text{Income Quintile}) + \gamma_{06}\,(\text{Race}) + \gamma_{07}\,(\text{Self-rated health}) + \gamma_{08}\,(\text{Functional limitations}) + \gamma_{09}\,(\text{Depression}) + \gamma_{010}\,(\text{Loneliness}) + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}\,(\text{Loneliness})$$

The primary focus of this analysis was the cross level interaction, as our aim was to determine if loneliness predicted differences in activity engagement. The interaction was not significant, $F\,(9, 7087) = 0.91$, $p = .52$, suggesting that across levels of loneliness, individuals participate in similar activities. This finding supports the lack of loneliness differences in activity engagement obtained by Hawkley and colleagues (2003).

Using a generalized linear model for a Poisson distribution, we also examined the influence of loneliness on the number of activities engaged in during the previous day. Higher levels of loneliness predicted doing fewer activities, $b = -0.10$, $\chi^2 = 11.69$, $p < .001$; however, after

controlling for demographic and health covariates, loneliness was no longer significantly related to number of activities ($b = -0.02$, $\chi^2 = -1.81$, $p = .49$).

Time alone

We next examined if lonelier people spend more time alone. In our first analysis, the outcome was participants' estimated hours spent at home alone the previous day. When loneliness was the only predictor in the model, it positively and significantly predicted more time spent alone, $B = 2.02$, $SE = 0.30$, $p < .001$. However, as depicted in Table 3, after controlling for factors such as marital status and depression, loneliness did not reliably predict the number of hours spent at home alone. Marital status was the strongest predictor of time spent alone ($\beta = -0.49$; compare to depression $\beta = 0.05$), with married individuals spending 4.93 hours less alone than those who were not married.

As an alternate way of examining time alone, we next tested if lonelier people engage in more activities alone or in the company of others. We use generalized linear modeling for Poisson distribution, with the outcome reflecting the number of activities completed with others and the predictor being mean-centered loneliness. Demographic and health covariates, including marital status, were also added to the model. As shown in Table 4 higher levels of loneliness predicted engagement in fewer activities with others.

Experienced Emotions

Last, we ask if activity-linked emotional profiles differ by loneliness level and if this effect is moderated by the social context of the activity (i.e., whether activities were completed alone or with others). Given that the outcome of these analyses reflects emotions nested within activities, we estimated two multilevel models to test whether lonelier individuals experience more or less intense positive and negative emotions when they engage in activities with others. Thus, the Level 1 predictors in both models were dummy coded activity[2] and a dichotomous variable identifying whether the activity was completed alone or with others (referred to as social context). The Level 2 predictor was loneliness. In line with our aim for this analysis, we additionally tested a three-way Activity X Social Context X Loneliness interaction. All three two-way interactions were included in the model along with the demographic and health covariates and number of activities endorsed.

$$\text{Experienced emotions}_{ij} = \beta_{0ij} + \beta_{1ij}\,(\text{Activity}) + \beta_{2ij}\,(\text{Social context}) + \beta_{3ij}\,(\text{Activity} * \text{Social context}) + r_{ij}$$

$$\beta_{0i} = \gamma_{00} + \gamma_{01}\,(\text{Age}) + \gamma_{02}\,(\text{Gender}) + \gamma_{03}\,(\text{Marital status}) + \gamma_{04}(\text{Employment status}) + \gamma_{05}\,(\text{Income Quintile}) + \gamma_{06}\,(\text{Race}) + \gamma_{07}\,(\text{Self-rated health}) + \gamma_{08}\,(\text{Functional limitations}) + \gamma_{09}\,(\text{Depression}) + \gamma_{010}\,(\text{Loneliness}) + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}\,(\text{Loneliness})$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}\,(\text{Loneliness})$$

$$\beta_{3i} = \gamma_{30} + \gamma_{31}\,(\text{Loneliness})$$

[2]These models account for 9 activities instead of 10. Socializing was dropped for these analyses as we did not ask if this activity was completed alone or with others.

Positive emotions—A fully unconditional model revealed that 48% of the variability in experienced positive emotions was between-people and 58% of the variability was within-people across activities. The three-way interaction between activity, social context, and loneliness was not significant (p= .85); however, there was a significant two-way interaction between activity and loneliness. In order to examine whether engaging in specific activities resulted in differing profiles of positive affect by loneliness, we conducted a follow-up model, removing the effect of social context. The two-way interaction remained significant, F (8, 3125) = 3.12, p = .002, suggesting that experience of positive emotions in the context of daily activities differs by loneliness. As depicted in Figure 1, follow-up analyses revealed that compared to those experiencing higher levels of loneliness, less lonely individuals experienced more positive emotions while watching television, working or volunteering, engaging in moderate exercise, doing household chores, using the computer, playing games, and reading (p < .01). There were no differences in experienced positive emotions by loneliness during vigorous exercise or hobbies.

Negative emotions—Through a fully unconditional model, we established that 35% of the variability in experienced negative emotions was between-people and 65% of the variability was within-people across activities. In contrast to the model for positive emotions, we did obtain an Activity X Social Context X Loneliness interaction for the experience of negative emotions, F (8, 3379) = 3.00, p = .002. As depicted in Table 5, follow up tests revealed that the effect of loneliness on experienced negative emotions was stronger when certain activities were done alone. Compared to the less lonely, lonelier individuals experienced more intense negative emotions only when the following activities were completed alone: watching television, working or volunteering, engaging in vigorous exercise, and doing household chores. Additionally, lonelier individuals experienced more intense negative emotions when engaging in moderate exercise and doing household chores in the company of others. Finally, follow-up contrast tests revealed that engaging in vigorous exercise in the presence of another individual resulted in significantly less intense negative emotional experiences in lonelier individuals than being alone.

Discussion

The present study used a modified DRM to examine activity engagement and experienced well-being among middle aged and older adults. The focus of our analyses was to interpret engagement in daily activities and emotional experiences through the lens of loneliness. It is important to highlight that the effects obtained in the analyses are unique from those of various demographic and health factors, and importantly, depressive symptoms. Although the feelings of loneliness may be a common symptom of or contributor to depression, the experience of chronic loneliness uniquely predicted the social context of middle aged and older individuals' activities and negative emotions experienced during the day. Overall, the results of this study provide insight into the influence of loneliness on the structure of a day and context for understanding the emotional experiences of lonely older adults.

Structure of the day

Consistent with Hawkley and colleagues (2003), we found that loneliness did not influence the activities in which individuals engaged. Across 10 physical, cognitive, social, and leisure activities, we report no loneliness differences in the likelihood of participating in activities the previous day. We also tested the effect of loneliness on the variety of activities completed, and again report no significant differences. The discrepancy in findings from studies reporting associations between loneliness and amount of television watching (Perlman, Gerson, & Spinner, 1978) and physical activity (Shankar, McMunn, Banks, & Steptoe, 2011) may be due to measuring participation in activities on a specific day rather than frequency or duration of engagement. Additionally, all interviews were conducted so that the previous day being reconstructed was a weekday. Prior work examining time use in older adulthood has found differences in time spent on activities during the week versus on the weekend (Horgas, Wilms, & Baltes, 1998; Robinson & Godbey, 1997). It is possible that differences in activity participation by loneliness may be observed when taking weekend leisure time into consideration.

Although lonely individuals did not participate in different daily activities, loneliness was associated with other day characteristics. Lonelier individuals did not spend more time alone during the day, however, they did engage in more activities alone than with others. While a day's activities may look similar for more and less lonely individuals, the social context in which these activities occur is quite different. The lack of association between loneliness and time spent alone mimics the effects obtained by Hawkley and colleagues, and suggests that other life factors, specifically marital status, are stronger predictors of the amount of time older adults spend at home alone. Indeed, the present analyses support this hypothesis, with married individuals spending less time alone than unmarried individuals.

Older age was not associated with more hours spent alone in the day, nor were functional limitations or self-rated health. Interestingly, older age was associated with engaging in fewer activities with others. Given higher rates of widowhood and retirement in older adults, this is not necessarily surprising. An important distinction to make is that chronological older age does not place individuals at greater risk for feelings of loneliness. Rather, older age is associated with risk factors associated with loneliness, such as losing a spouse or experiencing health-related mobility issues that prevent certain types of social engagement. This is consistent with previous work which found that when controlling for these contextual factors, the association of age with feelings of loneliness was no longer significant (Tijhuis, de Jong-Gierveld, Feskens, & Kromhout, 1999).

Experienced well-being

We obtained several interesting patterns of results when examining the influence of loneliness on experienced positive and negative emotions. First, we find that daily activities yield a different profile of positive emotional experiences for lonelier individuals. That is, for all activities but vigorous exercise and hobbies, lonelier individuals experienced less intense positive emotions than less lonely individuals. The obtained pattern of emotional experiences is consistent with Steptoe and colleagues who report that loneliness is strongly associated with reduced positive affect. Our findings add an extra level of context to these

results by considering the activity during which these emotions were experienced. Interestingly, the social context in which the activities occurred did not moderate the relationship between activity and loneliness on experienced positive emotions. Lonelier individuals experienced similar levels of positive emotions regardless of whether activities were completed alone or with others. This finding may suggest that the quality of the social context matters more than the mere presence of another person. Although our data does not allow for such assessments, future work may consider further evaluating the social context of activities by asking for more pointed details about social partners participating in the activities.

In contrast to the effects obtained for experienced positive emotions, social context was an important factor in understanding the effects of loneliness on experienced negative emotions. For most activities, lonelier individuals reported experiencing more intense negative emotions when the activities were completed alone or with others. Vigorous exercise was the only activity in which lonelier older adults, compared to the less lonely, reported less intense negative emotions when the activity was done with another person. This finding is particularly interesting in light of previous work on the effect of loneliness on health behaviors. Several studies on middle aged and older adults report that loneliness is negatively associated with participation in physical activity (e.g., Hawkley, Thisted, & Cacioppo, 2009; Shankar, McMunn, Banks, & Steptoe, 2011). Our results suggest that for lonely older individuals, exercising with a group or partner results in a less negative experience than exercising alone. Participating in group physical activity may improve the emotional experience of exercising for lonelier older adults.

Limitations & future directions

A few limitations of the study should be noted. First, we cannot be entirely certain of the directionality of the effect, as it is possible that the ways in which individuals structure their day contribute to their experience of loneliness. Future longitudinal work could help further investigate these associations by examining if changes in daily activities and the social context of activities are associated with changes in the experience of loneliness. Second, given the wide age range, 50–96, it is likely that participants would display different patterns of activities across the day. This could lead to conclusions that activity patterns associated with loneliness are confounded with age; however, by controlling for work status and health, we have attempted to account for some of those differences. Last, while the Day Reconstruction Method has begun to be utilized more widely in the literature (for example, Kopperud & Vitters, 2008; Oerlemans, Bakker, & Veenhoven, 2011; Srivastava, Angelo, & Vallerux, 2008), future research employing this approach across multiple days will be an important contribution for studying and understanding normative patterns of time use.

Given our findings surrounding the social context of daily activities, future work may further explore the importance of this context on daily emotional experiences. For some activities, participating with a social partner may improve associated emotional experiences, which in turn may be a motivating factor for increased participation in the activity. More information about the social partner (e.g. spouse or friend versus casual acquaintances) may lend more information on the potential for social partners to influence activity participation

and associated emotional experiences. This association may be especially important for engagement in health behaviors, especially physical exercise.

Our findings suggest that loneliness is associated with day characteristics and experiences. Our measure of loneliness incorporates both social isolation and emotional disconnectedness. Recent work, however, has attempted to disentangle the role of social isolation (e.g., contact with family and friends) from feelings of loneliness. Researchers have found that higher mortality is associated with social isolation and loneliness, but after controlling for important demographic variables only social isolation predicted mortality (Steptoe, Shankar, Demakakos, & Wardle, 2013). Teasing apart the influence of social isolation and loneliness on activity engagement and emotional experiences may help clarify some of the findings (e.g. time spent alone).

Overall, our findings suggest that there are small differences in the ways in which lonely versus less lonely middle-aged and older adults structure their day; however, these individuals do display different profiles of emotions experienced during the day. Loneliness was associated with dampened positive emotions and stronger experienced negative emotions. Trends in the data suggest that being with others may reduce negative emotional experiences, though the presence of social partners did not seem to impact the experience of positive emotions. Future work may explore how social partners can improve the emotional experiences of lonely individuals.

Acknowledgments

This work was supported by a grant from the National Institute of Aging at the National Institute of Health (RCI-AG035576) awarded to Jacqui Smith. We thank Sandra Becker for her assistance with data management on this project.

References

Bowling AP, Edelmann RJ, Leaver J, Hoekel T. Loneliness, mobility, well-being and social support in a sample of over 85 year olds. Personality and Individual Differences. 1989; 10:1189–1192.

Cacioppo JT, Hawkley LC, Thisted RA. Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. Psychology and Aging. 2010; 25:453–463. [PubMed: 20545429]

Cacioppo JT, Hawkley LC, Crawford LE, Ernst JM, Burleson MH, Kowalewski RB, Berntson GG. Loneliness and health: Potential mechanisms. Psychosomatic Medicine. 2002; 64:407–417. [PubMed: 12021415]

Cornwell B, Laumann EO, Schumm LP. The social connectedness of older adults: A national profile. American Sociological Review. 2008; 73:185–203. [PubMed: 19018292]

Dykstra PA. Older adult loneliness: myths and realities. European Journal of Ageing. 2009; 6:91–100. [PubMed: 19517025]

Dykstra PA, de Jong-Gierveld J. Gender and marital-history differences in emotional and social loneliness among Dutch older adults. Canadian Journal on Aging. 2004; 23:141–156. [PubMed: 15334814]

Everard KM, Lach HW, Fisher EB, Baum MC. Relationship of activity and social support to the functional health of older adults. Journal of Gerontology: Social Sciences. 2000; 55B:S208–S212.

Fonda, S.; Herzog, AR. Documentation of Physical Functioning Measures in the Health and Retirement Study and the Asset and Health Dynamics among the Oldest Old Study. 2004. Retrieved from http://hrsonline.isr.umich.edu/sitedocs/userg/dr-008.pdf

Hawkley LC, Burleson MH, Berntson GG, Cacioppo JT. Loneliness in everyday life: Cardiovascular activity, psychosocial context, and health behaviors. Journal of personality and social psychology. 2003; 85:105–120. [PubMed: 12872887]

Hawkley LC, Cacioppo JT. Aging and Loneliness Downhill Quickly? Current Directions in Psychological Science. 2007; 16(4):187–191.

Hawkley LC, Thisted RA, Cacioppo JT. Loneliness predicts reduced physical activity: cross-sectional & longitudinal analyses. Health Psychology. 2009; 28(3):354. [PubMed: 19450042]

Hawkley LC, Thisted RA, Masi CM, Cacioppo JT. Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. Psychology and Aging. 2010; 25:132. [PubMed: 20230134]

Hertzog C, Kramer AF, Wilson RS, Lindenberger U. Enrichment effects on adult cognitive development. Psychology Science in the Public Interest. 2009; 9:1–65.

Horgas AL, Wilms HU, Baltes MM. Daily life in very old age: everyday activities as expression of successful living. The Gerontologist. 1998; 38:556–568. [PubMed: 9803644]

Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT. A short scale for measuring loneliness in large surveys: results from two population-based studies. Research on Aging. 2004; 26:655–672. [PubMed: 18504506]

Kahneman D, Krueger AB, Schkade DA, Schwarz N, Stone AA. A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method. Science. 2004; 306:1776–1780. [PubMed: 15576620]

Kopperud KH, Vitters J. Distinctions between hedonic and eudaimonic well-being: Results from a day reconstruction study among Norwegian jobholders. The Journal of Positive Psychology. 2008; 3:174–181.

Krantz-Kent R, Stewart J. How do older Americans spend their time? Monthly Labor Review. 2007; 130:10–26.

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.

Larson R, 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. [PubMed: 3989252]

Lauder W, Mummery K, Jones M, Caperchione C. A comparison of health behaviours in lonely and non-lonely populations. Psychology, Health and Medicine. 2006; 11:233–245.

Moss MS, Lawton MP. Time budgets of older people: A window on four lifestyles. Journal of Gerontology. 1982; 37:115–123. [PubMed: 7053392]

Oerlemans WG, Bakker AB, Veenhoven R. Finding the key to happy aging: A day reconstruction study of happiness. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences. 2011; 66:665–674.

Perissinotto CM, Cenzer IS, Covinsky KE. Loneliness in older persons: A predictor of functional decline and death. Archives of Internal Medicine. 2012; 172:1078–1084. [PubMed: 22710744]

Perlman D, Gerson AC, Spinner B. Loneliness among senior citizens: An empirical report. Essence. 1978; 2:239–248.

Pinquart M, Sorensen S. Influences on loneliness in older adults: A meta-analysis. Basic and Applied Social Psychology. 2001; 23:245–266.

Robinson, J.; Godbey, G. Time for Life: The Surprising Ways Americans Use Their Time. University Park, PA: The Pennsylvania State University; 1997.

Russel D, Peplau LA, Cutrona CE. The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. Journal of Personality and Social Psychology. 1980; 39:472–480. [PubMed: 7431205]

Russell A, Bergeman CS, Scott SB. Daily social exchanges and affect in middle and later adulthood: the impact of loneliness and age. International Journal of Aging & Human Development. 2012; 74:299–329. [PubMed: 22950350]

Shankar A, McMunn A, Banks J, Steptoe A. Loneliness, social isolation, and behavioral and biological health indicators in older adults. Health Psychology. 2011; 30:377. [PubMed: 21534675]

Smith, J.; Fisher, G.; Ryan, L.; Clarke, P.; House, J.; Weir, D. Psychosocial and Lifestyle Questionnaire 2006–2010: Documentation Report. 2013. Retrieved from http://hrsonline.isr.umich.edu/sitedocs/userg/HRS2006-2010SAQdoc.pdf

Srivastava S, Angelo KM, Vallereux SR. Extraversion and positive affect: A day reconstruction study of person-environment transactions. Journal of Research in Personality. 2008; 42:1613–1618.

Steffick, DE. Documentation of Affective Functioning Measures in the Health and Retirement Study. 2000. Retrieved from http://hrsonline.isr.umich.edu/sitedocs/userg/dr-005.pdf

Steptoe A, Leigh ES, Kumari M. Positive affect and distressed affect over the day in older people. Psychology and Aging. 2011; 26:956–965. [PubMed: 21517182]

Steptoe A, Shankar A, Demakakos P, Wardle J. Social isolation, loneliness, and all-cause mortality in older men and women. Proceedings of the National Academy of Sciences. 2013; 110:5797–5801.

Sum S, Mathews RM, Hughes I, Campbell A. Internet use and loneliness in older adults. CyberPsychology and Behavior. 2008; 11:208–211. [PubMed: 18422415]

Tijhuis MA, de Jong-Gierveld J, Feskens EJ, Kromhout D. Changes in and factors related to loneliness in older men. Age and Ageing. 1999; 28:491–495. [PubMed: 10529046]

Victor CR, Scambler SJ, Bowling ANN, Bond J. The prevalence of, and risk factors for, loneliness in later life: a survey of older people in Great Britain. Ageing and Society. 2005; 25:357–375.

Victor CR, Yang K. The prevalence of loneliness among adults: a case study of the United Kingdom. The Journal of psychology. 2012; 146:85–104. [PubMed: 22303614]

Warner DF, Kelley-Moore J. The Social context of disablement among older adults: Does marital quality matter for loneliness? Journal of Health and Social Behavior. 2012; 53:50–66. [PubMed: 22382720]

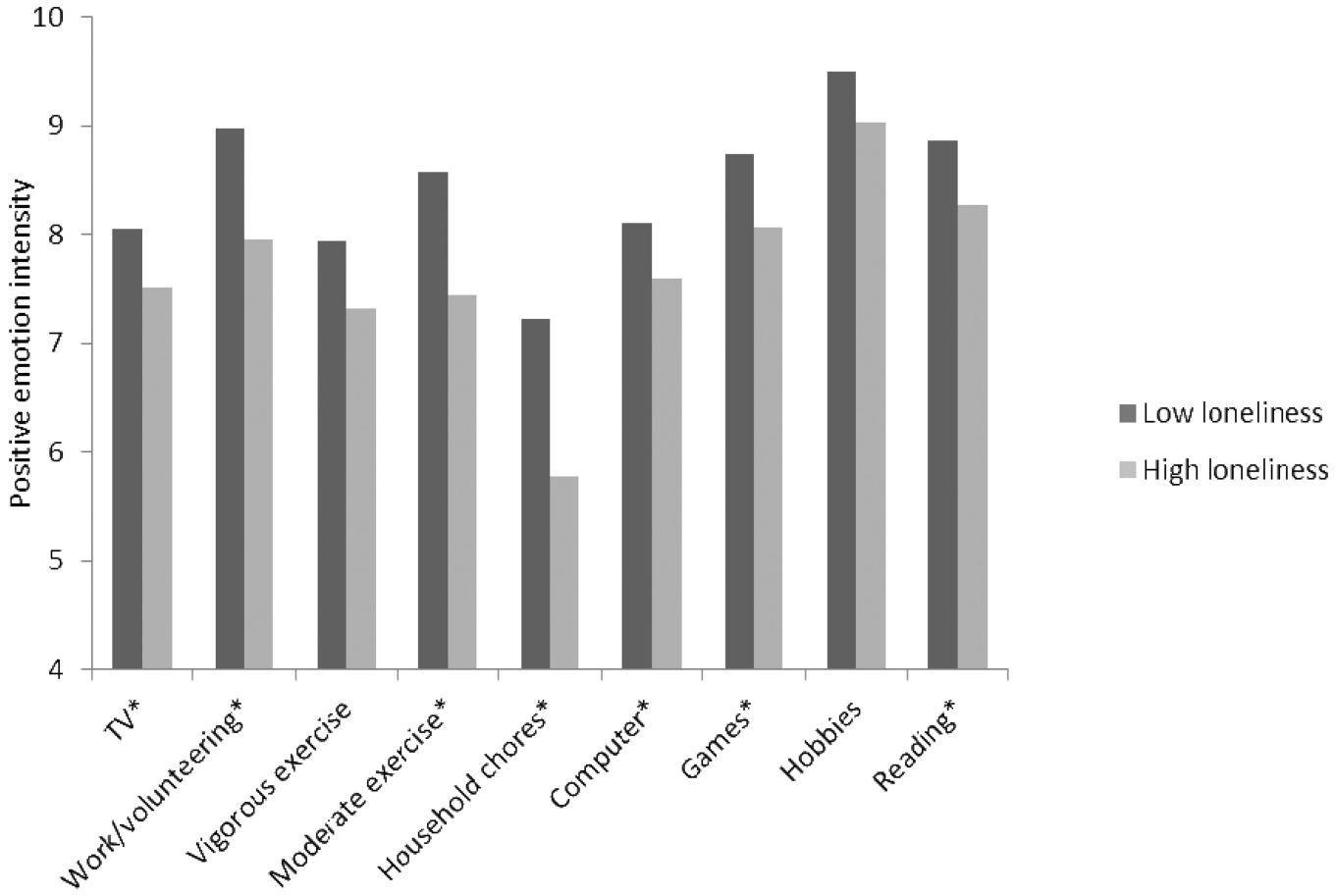

Figure 1.

Loneliness is associated with the intensity of positive emotions experienced during daily activities. High and low loneliness was estimated at 1 SD above and below the mean.

Note: * $p < .01$

Table 1

Sample characteristics

	%	M	SD
Covariates			
Age		69.33	11.64
Women	56.10		
White	87.73		
Employed	31.82		
Top 2 income brackets	39.95		
Married	63.35		
Functional limitations		3.79	3.69
Self-rated health		3.45	1.11
CES-D		1.14	1.70
Predictor			
Loneliness		1.51	0.52
Outcome variables			
Time alone (hrs)		4.28	5.01
Number of activities		5.43	1.62
Percent participating in activities			
TV	81.82		
Work/volunteering	27.40		
Socialize	80.37		
Vigorous exercise	20.56		
Moderate exercise	45.14		
Household chores	78.08		
Computer	63.95		
Games	36.05		
Hobbies	22.73		
Reading	86.98		

Table 2

Covariate correlations with loneliness

	$r_{loneliness}$	*p*
Age	−0.05	0.12
Gender	0.08	0.02
Race	0.01	0.80
Employment status	−0.03	0.37
Marital status	−0.31	<.001
Income quintiles	−0.21	<.001
Functional limitations	0.22	<.001
Self-rated health	−0.23	<.001
CES-D	0.45	<.001

Note: Gender: 1 = women, 0 = men; Race: 1 = white, 0 = other, Employment: 1 = employed, 0 = not employed; Marital status: 1 = married, 0 = not married; Income: higher quintiles reflect greater income

Table 3

Effect of loneliness on hours spent alone the previous day

	B	*SE*	*p*
Intercept	7.04	0.55	<.001
Age	0.01	0.02	0.50
Married	−4.95	0.38	<.001
Women	−0.12	0.31	<.001
Employed	−0.94	0.36	0.01
Income Q2	−0.87	0.48	0.07
Income Q3	−0.16	0.51	0.76
Income Q4	−0.30	0.52	0.57
Income Q5	0.40	0.55	0.47
Race	0.88	0.49	0.07
Functional limitations	−0.05	0.05	0.41
Self-rated health	−0.14	0.17	0.41
CES-D	0.16	0.11	0.16
Loneliness	0.29	0.34	0.40
R2	0.27		

Note: Income Q1 is reference group

Table 4

Effect of loneliness on number of activities completed with others

	B	*SE*	Wald χ^2	*p*
Intercept	−0.002	0.11	0.00	0.98
Age	−0.01	0.002	10.16	0.001
Married	0.76	0.07	106.57	<.0001
Women	0.06	0.05	1.48	0.22
Employed	0.07	0.06	1.32	0.25
Income Q2	0.24	0.09	6.84	0.01
Income Q3	0.05	0.10	0.32	0.57
Income Q4	0.14	0.09	2.31	0.13
Income Q5	0.06	0.10	0.39	0.53
Race	0.02	0.09	0.07	0.80
Functional limitations	−0.001	0.01	0.00	0.94
Self-rated health	0.02	0.03	0.59	0.44
CES-D	−0.03	0.02	1.75	0.19
Loneliness	−0.15	0.06	5.94	0.01

Note: Income Q1 is reference group

Table 5

Influence of loneliness on experienced negative emotion when daily activities are done alone or with others

	B		Difference
	Alone	**With others**	
TV	0.49 (0.15)*	0.09 (0.15)	−0.40 (0.19)
Work/volunteering	1.09 (0.40)*	0.37 (0.19)	−0.73 (0.44)
Vigorous exercise	1.01 (0.28)**	−0.50 (0.29)	−1.50 (0.39)**
Moderate exercise	0.34 (0.17)	0.62 (0.25)*	0.29 (0.28)
Household chores	0.46 (0.13)**	0.54 (0.19)*	0.08 (0.22)
Computer	0.25 (0.13)	0.45 (0.24)	0.20 (0.27)
Games	−0.22 (0.18)	0.20 (0.26)	0.42 (0.31)
Hobbies	0.08 (0.25)	0.20 (0.32)	0.12 (0.40)
Reading	0.13 (0.13)	0.07 (0.18)	−0.05 (0.21)

Note:

** *Note*: $p < .001$;

* $p < .05$