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Loneliness, Living Alone, and All-Cause Mortality: The Role of Emotional and Social Loneliness in the Elderly During 19 Years of Follow-Up

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ABSTRACT

Objective: The aims of the study were to examine the predictive value of social and emotional loneliness for all-cause mortality in the oldest-old who do and do not live alone and to test whether these varied by functional status and personality.

Methods: Participants were 413 older adults from the Berlin Aging Study (M [SD] = 84.53 [8.61] years of age) who either lived alone ($n = 253$) or did not live alone ($n = 160$). Significance values for hazard ratios are reported having adjusted for age, sex, education, income, marital status, depressive illness, and both social and emotional loneliness.

Results: Although social loneliness was not associated with mortality in those living alone, emotional loneliness was; with each 1 SD increase in emotional loneliness, there was an 18.6% increased risk of all-cause mortality in the fully adjusted model (HR = 1.186, $p = .029$). No associations emerged for social or emotional loneliness among those not living alone. Examinations of potential moderators revealed that with each 1 SD increase in functional status, the risk associated with emotional loneliness for all-cause mortality increased by 17.9% (hazard ratio$_{interaction}$ = 1.179, $p = .005$) in those living alone. No interaction between personality traits with loneliness emerged.

Conclusions: Emotional loneliness is associated with an increased risk of all-cause mortality in older adults who live alone. Functional status was identified as one potential pathway accounting for the adverse consequences of loneliness. Emotional loneliness that can arise out of the loss or absence of a close emotional attachment figure seems to be the toxic component of loneliness.

Key words: emotional loneliness, functional status, living alone, loneliness, mortality, social loneliness.

INTRODUCTION

Loneliness is associated with an individual's risk of morbidity and mortality (1–4). Other research has found that those who are lonely have higher rates of depression, lower quality of life (5,6), an increased vulnerability for coronary heart disease (7), and display atypical cardiovascular reactions to stress (8). Although these studies have treated loneliness as a unidimensional construct, Weiss (9) in his seminal work suggested that loneliness has social and emotional dimensions. Recent studies have found emotional loneliness to be more common than social loneliness (10) and to be more damaging for health (11). Importantly, the research on loneliness has not disentangled the effects of emotional and social loneliness for mortality.

According to Weiss (9), emotional loneliness arises out of the loss or absence of a close emotional attachment figure, whereas social loneliness arises out of the absence of an engaging social network that is a wider circle of friends and acquaintances that can provide a sense of belonging, of companionship, and of being a member of a community (9). Moreover, emotional loneliness he

argued results in feelings of aloneness, anxiety, hypervigilance, high sensitivity to minimal cues, and feelings of abandonment. In contrast, he suggested that social loneliness would be associated with boredom, depression, and aimlessness. Furthermore, recent studies have found that both social and emotional dimensions are predicted by different psychosocial and demographic factors (10,11). Factor analytic studies also indicate that measurement models, which distinguish between these dimensions of loneliness, are superior to unidimensional models, and that social and emotional loneliness are only moderately correlated (12). Thus, given these insights and the fact that loneliness is considered a public health concern (13) further research is clearly warranted.

The overall aim of the present study was to examine the associations between social and emotional loneliness and all-cause mortality. Given living alone in older age has been repeatedly implicated as a risk factor for premature mortality (14,15), we examined effects

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BASE = Berlin Aging Study, **CI** = confidence intervals, **HR** = hazard ratio

across individuals who do and do not live alone. In addition, we sought to examine functional status as a possible moderator of effects, given its relevance as a crucial marker of health in old age, in addition to being implicated in loneliness (16,17). Furthermore, personality traits have been repeatedly associated with loneliness (18) and health processes and mortality (16,19,20), and as such, it was of importance to determine whether they may act as a further potential moderator in the association between loneliness and mortality.

METHODS

Participants

Berlin Aging Study (BASE) begun between 1990 and 1993 and is a multi-disciplinary investigation of older adults (21,22). Participants recruited in the BASE were sourced using an obligatory population registry for the entire city of Berlin. The present sample comprised 413 participants (M (SD) = 84.53 (8.61) years of age) differentiated by living status; those who either lived alone (n = 253, M (SD) = 85.19 (8.51) years of age, range = 70–103 years) or did not live alone at baseline (n = 160, M (SD) = 83.49 (8.68) years of age, range = 70–101 years).

Measures

Mortality

Status of mortality was defined as the number of days between the initial contact at baseline (between 1990 and 1993) and date of death. The final available update pertaining to the mortality status of participants was in July 2009. This study sample across follow-up consists of 385 deaths, and 28 reported as alive in their final update. The study comprised 235 deaths and 18 reported as alive in those living alone (M (SD) = 2595.53 (1991.04) days, range = 176–7012 days) and 150 deaths and 10 reported as alive in those not living alone (M (SD) = 2486.49 (1937.96) days, range = 118–7012 days).

Covariates

The following variables were included as covariates: age; sex (male, female); education (elementary school, no apprenticeship; elementary school, apprenticeship; secondary school certificate, apprenticeship); income (defined as the net household income weighted by the number of people sharing the household); marital status (married, widowed, divorced, single); and depressive illness (based on diagnosis in DSM-III-R into three categories [no depressive disorder, questionable depressive disorder, or depressive disorder]). Recent losses (defined as the total number of losses of very close individuals that the participant deemed as having occurred recently) was also examined. These variables were selected for the present study given they are repeatedly implicated in both health and mortality (23–26).

Loneliness

To assess loneliness, eight items were selected from the revised University of California, Los Angeles (UCLA) Loneliness Scale (27). The scale captures both social (comprising 4 items; e.g., "I feel part of a group of friends") and emotional (comprising 4 items; "I feel isolated") loneliness. Items are scored on a five-point Likert scale ranging from 1 "does not apply to me at all" to 5 "applies very well to me." Higher scores on each scale represents greater feelings of loneliness. A complete list of original scale items, translations which were made for BASE, and correlations are available in Table 1. For cross-instrument comparability and ease of interpretation, scores for loneliness as a unidimensional measure, and both social and emotional loneliness dimensions were converted to standard deviation units (M (SD) = 0 (1)). Medium to small correlation coefficients were observed between social and emotional loneliness; in the complete sample r = .32, in those living alone r = .35, and those not living alone r = .24. These coefficients are consistent with the range seen in existing research with older individuals (28). A linear structural relations analysis of BASE data supports the use of both social and emotional loneliness factors (29). Cronbach's α were .74 (loneliness), .68 (social loneliness), and .73 (emotional loneliness).

Functional Status

A modified version of the Katz Index of Activities of Daily Living was used to measure functional status (30). Participants indicated whether they need personal assistance with dressing, bathing, toileting, transferring, and eating (e.g., toileting example: "going to the toilet"). Total scores for the Katz Index represented a range from 0 (completely dependent on help) to 5 (completely independent). A high Cronbach's α (0.87) was observed.

Personality

Neuroticism, extraversion, and openness to experience were measured using items from the NEO Personality Inventory (31). To measure each trait, six items were used, which were scored on a five-point Likert scale which ranged from "does not apply to me at all" to "applies very well to me." The following measures of internal reliability consistency were observed (Cronbach's α; neuroticism = 0.75, extraversion = 0.65, openness to experience = 0.55).

TABLE 1. Correlation Matrix of Loneliness Items, Including Translations

Original Items	German Translation	Dimension	1	2	3	4	5	6	7
[1] I do not feel alone	Ich fühle mich allein[a]	Emotional							
[2] I lack companionship	Ich habe wenig Gesellschaft	Emotional	.410**						
[3] There are people I feel close to	Es gibt Menschen, die mir nahe stehen	Social	.129**	.140**					
[4] I feel isolated	Ich fühle mich isoliert	Emotional	.483**	.406**	.186**				
[5] There are people I can turn to	Es gibt Personen, an die ich mich vertrauensvoll wenden kann	Social	.163**	.127**	.364**	.174**			
[6] I feel left out	Ich fühle mich ausgeschlossen	Emotional	.321**	.342**	.262**	.531**	.209**		
[7] I feel part of a group of friends	Ich fühle mich einem Bekanntenkreis zugehörig	Social	.123*	.264**	.349**	.176**	.336**	.149**	
[8] There are people I can talk to	Es gibt Menschen, mit denen ich offen sprechen kann	Social	.172**	.129**	.326**	.239**	.555**	.241**	.271**

[a] Double negatives were avoided in the translation.

* $p < .05$.

** $p < .01$.

Statistical Analyses

Statistical analyses were conducted using PASW Statistics 24.0 (SPSS Inc, Chicago, IL) and R (32). To consider time-to-event while including those reported as alive (censored), the Cox Proportional Hazards Model was used to estimate the risk of death. Models examining the association between the unidimensional measure of loneliness are reported both unadjusted and adjusted for covariates. Following this, models examining the association between both emotional and social loneliness were similarly reported. Variables in the model are entered simultaneously with effects and significance levels estimated after full adjustment. For categorical variables, the method of contrast was set to simple, which allows each category of the predictor variable to be compared with the reference category, which was set to the first category in each instance. Furthermore, significant effects were illustrated by dividing participants into tertiles of loneliness. Schoenfeld Residual Analysis revealed the assumption of proportional hazards was not violated. Hazard ratios (HRs) and 95% confidence intervals (CIs) were reported for Cox Proportional Hazards analyses.

RESULTS

First, we examined descriptive statistics of the present sample, which revealed several significant differences within the present sample (Table 2). Particularly noteworthy are the observed significant differences in sex and marital status observed between those who do and do not live alone. We then examined the unidimensional measurement of loneliness (M (SD) = 2.13 (0.61)) as a significant predictor of all-cause mortality. Loneliness emerged as a significant predictor of all-cause mortality within the unadjusted model (HR = 1.176, $p < .001$, 95% CI = 1.074–1.289). After adjustment for all covariates the observed effect was no longer significant (HR = 1.07, $p = .22$). Given the previously outlined importance of considering living status, we also introduced an interaction between loneliness and living status, which did not emerge as significant (HR$_{interaction}$ = 0.85, $p = .16$).

We then repeated this procedure with both social and emotional dimensions of loneliness. Within the unadjusted models, social loneliness did not emerge as a significant predictor of all-cause mortality (HR = 1.10, $p = .057$). Emotional loneliness did emerge as a significant predictor (HR = 1.214, $p < .001$, 95% CI = 1.105–1.333). Following this, we examined both social and emotional loneliness effects within the fully adjusted model. Both social (HR = 1.01, $p = .81$) and emotional (HR = 1.06, $p = .29$) loneliness were not observed as significant after adjustment for all covariates. We then introduced an interaction term with living status for both dimensions. The interaction between emotional loneliness and living status emerged as significant (HR$_{interaction}$ = 0.804,

TABLE 2. Descriptive Statistics of the Present Sample

	Living Alone (*n* = 253)		Not Living Alone (*n* = 160)		
	M/*n*	SD/%	M/*n*	SD/%	*t* test/χ^2
Age, y	85.19	8.51	83.49	8.68	0.051
Sex					<0.001
Male	98	38.7%	125	78.1%	
Female	155	61.3%	35	21.9%	
Education					0.111
Elementary school, no apprenticeship	77	30.4%	36	22.5%	
Elementary school, apprenticeship	123	48.6%	79	49.4%	
Secondary school certificate, apprenticeship	53	20.9%	45	28.1%	
Income (Deutsche mark)*	2067.77	960.66	1824.12	873.69	0.010
Depressive illness					0.007
No depressive disorder	132	52.2%	108	67.5%	
Questionable depressive disorder	103	40.7%	42	26.3%	
Depressive disorder	18	7.1%	10	6.3%	
Marital status					<0.001
Married	8	3.2%	122	76.3%	
Widowed	191	75.5%	35	21.9%	
Divorced	26	10.3%	0	0%	
Single	28	11.1%	3	1.9%	
Recent losses	0.91	1.20	0.75	1.21	0.182
Functional status	4.55	1.15	4.38	1.32	0.147
Neuroticism	2.38	0.79	2.22	0.71	0.035
Extraversion	3.37	0.56	3.35	0.61	0.735
Openness to experience	3.13	0.59	2.97	0.55	0.007
Loneliness (unidimensional)*	2.23	0.64	1.96	0.53	<0.001
Emotional loneliness*	2.42	0.87	1.99	0.70	<0.001
Social loneliness*	2.05	0.70	1.95	0.65	0.133

* Represents raw values before conversion to standard deviation units.

$p = .043$, 95% CI = 0.650–0.994), whereas social loneliness did not (HR$_{interaction}$ = 0.95, $p = .64$).

Emotional Loneliness and Living Status

To further examine the potential effects of emotional loneliness and living status, we examined emotional loneliness effects in persons who do and do not live alone. Within the unadjusted model, emotional loneliness emerged as a significant predictor of all-cause mortality in those living alone (HR = 1.316, $p < .001$, 95% CI = 1.160–1.493), but not in participants who did not (HR = 1.09, $p = .25$). In the fully adjusted model for those living alone, emotional loneliness remained significant after adjustment (HR = 1.186, $p = .029$, 95% CI = 1.017–1.383). Each 1 SD increase in emotional loneliness was associated with an 18.6% increased risk in all-cause mortality (Figure 1). The other independent predictors in the model were; sex (HR = 0.662, $p = .007$, 95% CI = 0.490–0.892), age (HR = 1.114, $p < .001$, 95% CI = 1.091–1.138), education (comparison of elementary school, no apprenticeship, and both elementary school, apprenticeship [HR = 1.17, $p = .31$], and secondary school certificate, apprenticeship [HR = 1.651, $p = .018$, 95% CI = 1.190–2.501]), marital status (all p's > .29), income ($p = .088$), depressive illness (all p's > .45), and social loneliness (HR = 0.99, $p = .94$). The observation that many of those living alone were widowed raised the possibility that bereavement may account for observed effects with emotional loneliness (Table 2). As such, we included the total number of recent losses of close persons within the adjusted model. The inclusion of recent losses within the model did not alter the effects of emotional loneliness (HR = 1.194, $p = .024$, 95% CI = 1.024–1.394).

We also conducted a moderation analyses to determine potential pathways of the effect observed for emotional loneliness in those living alone. First, functional status and its interaction with emotional loneliness were entered within the fully adjusted model. Functional status significantly predicted mortality (HR = 0.766,

$p < .001$, 95% CI = 0.685–0.865), with lower mortality among participants with better functional status. A significant effect also emerged for the interaction between emotional loneliness and functional status (HR$_{interaction}$ = 1.179, $p = .005$, 95% CI = 1.051–1.323). Thus, for each increase in independence in functional status, the effect rate of loneliness on all-cause mortality increased by 17.9%. For personality traits, all analyses revealed no significant interaction effect between neuroticism, extraversion, and openness to experience, and emotional loneliness (all p's > .11).

DISCUSSION

Although other studies have suggested emotional loneliness to be more damaging for health than social loneliness, the present study provides new evidence showing that emotional loneliness is associated with mortality in very old adults who live alone. More specifically, in a sample of older adults followed for 19 years, higher emotional loneliness was found to significantly predict an increased risk of all-cause mortality. This effect remained after the adjustment for several confounds, including clinically assessed depression. No significant effects were observed for social loneliness in those living alone. Similarly, no significant loneliness effects were observed for individuals who did not live alone. The previously observed significant effects for loneliness as a unidimensional measure did not remain significant after adjustment for all covariates.

A growing literature base is indicating the relevance of loneliness on health into old age. Here, however, we extend on this to show that emotional loneliness, which is often associated with feelings of abandonment and anxiety, to be the toxic component of loneliness. Moreover, it has identified those at greatest risk, older adults who live alone and experience this sense of emotional abandonment, whereas this risk was not evident in those older adults living with someone and had the same experiences. This could well be the result of living alone being primarily the result of bereavement. Although the supplementary examination of recent losses did not alter the effect, further research needs to
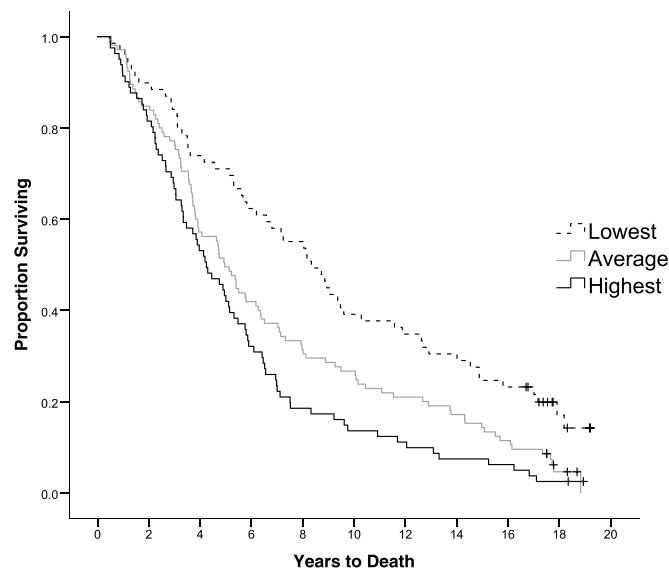
FIGURE 1. Kaplan-Meier plot of those living alone illustrating the proportion of persons surviving by tertiles of emotional loneliness. Note: The analyses examined days to death, years are represented here for clarity. + indicates censored points.

examine this potential pathway in detail. Furthermore, a full examination of possible biobehavioral pathways in the associations between emotional loneliness, living alone, and mortality is required. Though speculative, the mechanisms implicated within existing literature on loneliness more broadly (e.g., increased hypothalamic adrenocortical functioning, altered gene expression, increased inflammation, and poor sleep, for review see (33) and (34)) may be similar.

Increases in emotional loneliness resulted in an increase of the effect rate of functional status on mortality. Functional status is a crucial marker of health in old age, and its decline represents health deterioration. Existing research has linked functional status and loneliness (35). This study provides new evidence that functional status may provide a pathway in the association between emotional loneliness and mortality in persons who live alone. Furthermore, despite personality traits accounting for an individual's tendency to exhibit consistent thoughts, emotions, and behaviors for long periods, and being repeatedly associated with loneliness, they did not emerge as significant moderators of emotional loneliness and mortality.

STRENGTHS AND LIMITATIONS

The present study examined a heterogeneous and locally representative sample followed for a long period. This study also used several data forms known to predict all-cause mortality. The study used theoretically appropriate and methodologically robust covariates. However, limitations must be duly noted. This study is of the oldest old, and as such, it is unclear how these effects generalize to younger cohorts. It must also be noted that the translated items for the UCLA loneliness scale used within BASE may also be open to cultural influences in its interpretation. Future research must also consider the generalizability of these findings in the context of cultural differences across countries. Cultural differences between individualistic and collectivistic societies across Europe in the experience of loneliness have been documented (36). Furthermore, although average levels of loneliness within the present sample are below the midpoint of the scale with the complete range of ratings used, it is difficult to compare loneliness levels across studies given a subset of items from the UCLA loneliness scale were used during data collection. In addition, the variable included to address the possibility of bereavement may not capture the loss of a close individual beyond what an individual may consider recent. As such, it is imperative that future research clearly examines the potential for a bereavement pathway within the loneliness and mortality context. It would have been beneficial to the study if information pertaining to status of living alone was available repeatedly for the follow-up period. This would have provided a clearer separation of both groups across the entire follow-up period. In addition, future research should consider the associations between loneliness and various illness and disease trajectories and their resulting effect on mortality, particularly in the case of samples consisting of the oldest old. Although there was no information available about cause of death in the present sample, future research should examine potential associations with specific types of mortality.

CONCLUSIONS

This study provides new evidence that emotional loneliness is associated with all-cause mortality in older adults who were living alone. Those highest in emotional loneliness were at a greater risk of premature mortality. Functional status was identified as one potential pathway of effect. Present findings suggest future research would benefit from the further examination of associations between emotional loneliness and mortality in older adults who live alone. The results of this present study would suggest that the emotional component of loneliness seems to be of relevance to mortality, above social loneliness effects.

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