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The Impact of Loneliness on Late-Life Depression and Anxiety During the COVID-19 Pandemic

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ABSTRACT

Objective: *This study investigates the association of loneliness during the COVID-19 pandemic and the course of depressive, anxiety and sleep symptoms after psychological treatment in older adults.* ***Methods:*** *During the first wave of the pandemic in 2020, we assessed additional, original data of 132 participants aged ≥60 years who had completed psychological treatment for late-life depression (LLD) in the context of a multicenter, randomized controlled trial (CBT-late). We measured loneliness using the UCLA Loneliness Scale. Depression, anxiety and sleep symptoms were assessed using the Geriatric Depression Scale (GDS), Geriatric Anxiety Inventory (GAI), and Insomnia Severity Index (ISI).* ***Results:*** *Participants with higher loneliness scores (*n = *44) experienced a significant worsening of depressive and anxiety symptoms during the pandemic (estimated marginal mean difference (emmd) of change in GDS between post-treatment and COVID-19 visit:* GDS_{emmd} *= −4.61, [95% CI: −6.97 to −2.26],*

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*GAI_{emmd}= −2.21, [95% CI: −3.76 to −0.65]), while those with low to moderate loneliness (*n = *72) maintained stable mild symptoms (GDS_{emmd}= −1.39, [95% CI: −3.00 to 0.22], GAI_{emmd}= −0.49, [95% CI: −1.69 to 0.72]). All patients reported increased sleep disturbances during the pandemic regardless of loneliness, while remaining in the range for sub-threshold insomnia.* ***Conclusions:*** *Our results suggest an association of significant loneliness during the COVID-19 pandemic and a clinically relevant worsening of depressive and anxiety symptoms in older adults. Loneliness assessments and interventions may be incorporated into treatments for LLD, particularly during pandemics or other crises.* (Am J Geriatr Psychiatry 2025; 33:717−729)

Highlights

- **What is the primary question addressed by this study?**
  Does loneliness during the COVID-19 pandemic influence the course of depressive, anxiety, and sleep symptoms after psychological treatment for late-life depression in older adults?
- **What is the main finding of this study?**
  Older adults with higher loneliness during the pandemic experienced significant worsening of depressive and anxiety symptoms despite prior psychological treatment for late-life depression, while those with low to moderate loneliness maintained on average mild symptoms. All participants reported increased sleep disturbances during the pandemic regardless of their loneliness levels, remaining within sub-threshold insomnia.
- **What is the meaning of the finding?**
  Loneliness should be assessed and addressed in psychological treatments for late-life depression, particularly during crises such as a pandemic.

INTRODUCTION

In older adults, late-life depression (LLD) is a widespread debilitating mental health condition associated with significant functional impairment, increased risk of dementia, and higher rates of morbidity and mortality.[1] The COVID-19 pandemic exacerbated mental health issues and led to a serious increase in symptoms and prevalence of depression and anxiety across all age groups,[2,3] including in older adults.[4] During the first year of the pandemic, a key risk factor for poor mental health among the elderly was loneliness.[5,6,7] Loneliness is a subjective experience of distress resulting from an insufficient quality and/or size of one's social network,[8] and it is linked to common age-related vulnerability factors like physical limitations, being single, and living alone.[9,10]

During the pandemic, feelings of loneliness were significantly intensified by containment measures such as social distancing.[11] In Germany, for instance, where strict social contact restrictions were implemented during the pandemic's first wave in spring 2020, loneliness drastically increased among the population.[12,13] With higher loneliness, depression and anxiety symptoms also steadily augmented. Interestingly, individuals who felt lonely during the pandemic had higher levels of depressive and anxiety symptoms even before,[12] suggesting a reciprocal relationship between loneliness and mental health issues. Accordingly, systematic reviews have shown that pre-existing mental disorders heightened the risk for both poor mental health and loneliness during the pandemic.[2,14] Loneliness, in turn, is linked to poorer treatment outcomes and higher relapse rates for LLD.[15,16] However, to date, no studies have specifically examined how loneliness during the COVID-19

pandemic affected psychological treatment outcomes in older adults.

This study evaluates the association of loneliness during the pandemic with the trajectory of depressive, anxiety and sleep symptoms after psychotherapy. We assessed original data in the context of an ongoing randomized controlled trial comparing cognitive behavioral therapy (CBT) to a supportive intervention for LLD.[17] We hypothesized that higher levels of loneliness would be associated with a greater exacerbation of depressive, anxiety and sleep symptoms, even after receiving an intensive psychological treatment.

The present study aims to enhance the understanding of the relationship between loneliness and clinical outcomes after psychotherapy in older adults under the unique conditions of a pandemic. It may also offer insights regarding the improvement of support systems and interventions for this vulnerable population, enhancing preparedness for future pandemics.

METHODS

Study Design and Procedures

This study presents additional, original data from a multicenter, randomized, parallel-group, observer-blinded, controlled trial conducted at seven German university sites.[17-19] The main trial is registered at ClinicalTrials.gov (NCT03735576) and DRKS (DRKS00013769) and received approval from all local ethics committees. All participants provided written informed consent. The study protocol has been published previously.[20]

Between October 1, 2018 and November 11, 2020, we recruited 251 participants aged ≥60 years with moderate to severe LLD for the main trial. Stable pharmacological medication at baseline was allowed, but should not be changed during the intervention phase. Participants were randomized to receive either eight weeks of a specific cognitive behavioral therapy for LLD (LLD-CBT) or a nonspecific supportive intervention (SUI). Clinical outcomes were assessed at baseline, week five, post treatment (week 10) and follow-up (month six). Detailed inclusion and exclusion criteria, as well as the randomization procedures and treatment specifics, are described in the study protocol.[20]

Following the outbreak of the COVID-19 pandemic, we conducted an additional diagnostic assessment between May 8, 2020 and July 27, 2020 (COVID-19 visit). During this period, the virus containment strategy in Germany included social contact restrictions (minimum distance of 1.5 meters in public, social gatherings were allowed only with members of a maximum of two different households), mandatory face masks, closure of sport facilities and cultural venues and a ban on large events, with stricter measures in regions experiencing higher COVID-19 incidence.[21]

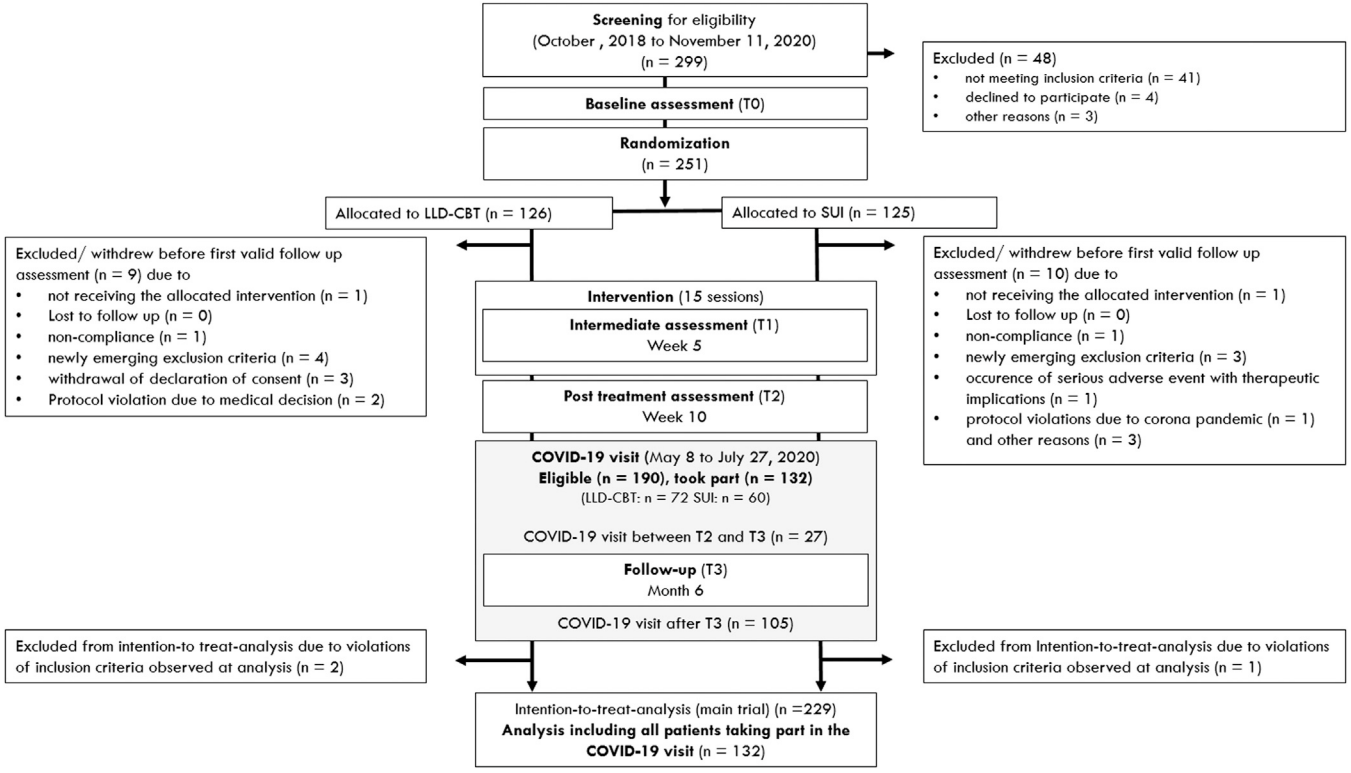
For the COVID-19 visit, we considered only participants visit who had completed the intervention phase and their post treatment assessments. However, depending on each participants individual study schedule and the date of their initial randomization, most but not all participants had also finished the 6-month follow-up when the COVID-19 visit took place (Fig. 1). The additional assessment received ethics approval from all participating sites. Written informed consent was obtained from all participants prior to the COVID-19 visit. Participants had the option to choose between in-person or telephone evaluation. If they opted for a telephone assessment, questionnaires were mailed to them beforehand.

Measures

We used the German 30-item version of the Geriatric Depression Scale (GDS),[22] to assess depressive symptoms, the most widely used measure specific to depression among older populations.[23] Scores range from 0 to 30, with higher scores indicating more severe depressive symptoms and a score of 11 or higher being a possible indicator of depression.[24] Anxiety was measured using the 20-item Geriatric Anxiety Inventory (GAI), a self-report tool designed for older populations.[25] Scores range from 0 to 20, with higher values reflecting greater anxiety. Scores of 9 or above indicate potential clinical relevance.[25] To evaluate sleep disturbances and satisfaction, we employed the Insomnia Severity Index (ISI).[26] Scores range from 0 to 28, with a score of ≥8 indicating sub-threshold insomnia, ≥15 moderate and ≥22 severe insomnia. Depressive symptoms, anxiety, and sleep disturbances were assessed at all visits, including the COVID-19 visit.

At the single-time point COVID-19 visit, we utilized semi-structured interviews and self-report questionnaires to examine participants' financial, social, health, mental health, and living conditions during the pandemic. We assessed loneliness at the COVID-19 visit

FIGURE 1. Trial flowchart of the main trial[17] and the COVID-19 visit. LLD-CBT: cognitive behavioral therapy for late life depression; SUI: supportive nonspecific intervention.



using the German version of the revised UCLA Loneliness Scale.[27] Scores range from 20 to 80, with higher scores indicating a higher degree of loneliness.

Statistical Analysis

Analyses were carried out with the full analysis set derived from the intention-to-treat (ITT) sample, including all randomized subjects with a valid baseline assessment and at least one valid subsequent assessment. We further limited the analysis set to patients that participated in the COVID-19 visit. For evaluating the change of GDS, GAI and ISI, we conducted mixed models for repeated measures (MMRM) with the fixed effects of the respective baseline score, study center, treatment group, visit, and the interaction of treatment group*visit (ARH1-structured covariance matrix over time) with corresponding marginal means and contrast tests.

Since we assessed loneliness only at the COVID-19 visit, which took place after baseline and might have been influenced by treatment, it cannot be incorporated in the MMRM without a high risk of introducing bias. In order to at least informally address a potential effect modification by loneliness, subgroup analyses were performed: We divided the sample into patients with low to moderate loneliness and moderately high to high loneliness, using a UCLA cut-off score of 49 in accordance to the most commonly used severity categorization[28] (low: UCLA score ≤34, moderate: UCLA score 35−49, moderately high: UCLA score 50-64, high: UCLA score ≥65). For each outcome (GDS, GAI and ISI), we performed two MMRMs, one for each group in order to compare the course of symptom severity of patients with low versus high loneliness during the COVID-19 pandemic. We calculated Cohen's *d* as between-group effect size by dividing the difference of the mean change in GDS (or GAI) of the groups (low-moderate versus moderately high-high loneliness) by the pooled standard deviation of the changes (SD). We compared baseline and clinical characteristics between patients with low to moderate and moderately high to high loneliness using chi-square tests (χ^2) and analysis of variance (ANOVA), with phi (φ) and partial eta squared (η_p^2) as effect sizes.

The analyses were performed with SPSS Statistics 28.0.1.0 (IBM Corp., Armonk, NY, USA).

RESULTS

Overall, 190 participants met inclusion criteria for the COVID-19 visit, and 132 individuals completed the assessment and were analyzed. Baseline and clinical characteristics of the participants at the COVID-19 visit were largely comparable to those of the full sample from the main trial. On average, the COVID-19 visit took place 256.95 days (SD = 138.37 days) after the post treatment assessment. A sensitivity analysis comparing MMRM outcomes of the full set (n = 132) with the subset of patients who had already completed their six-month follow-up by the time of the COVID-19 visit (n = 105) suggested no difference in symptom trajectories.

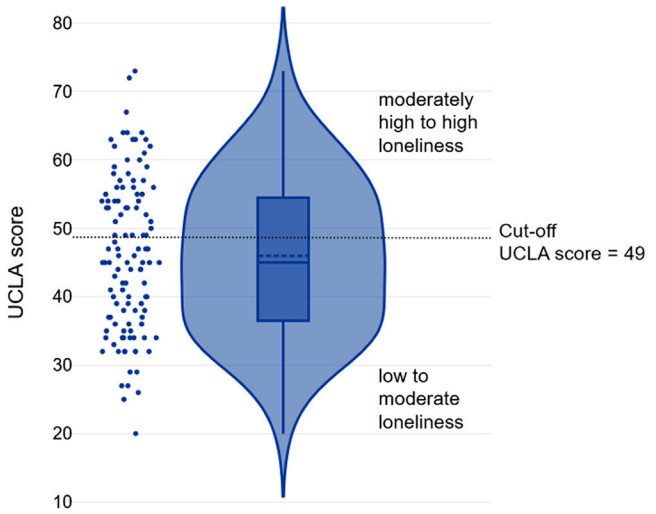
A total of 116 patients filled out the UCLA loneliness scale, of whom 72 (62%) reported low to moderate levels of loneliness and 44 (38%) moderately high to high levels of loneliness. The distribution of UCLA scores in the sample is shown in Fig. 2. There were no differences in loneliness scores between the treatment groups (F (1,114) = 0.003, p = 0.954).

Most clinical and demographic baseline characteristics were fairly balanced between patients with low to moderate loneliness and those with moderately high to high loneliness (Table 1). However, patients experiencing higher loneliness were more often retired or unemployed (χ^2 (1) = 6.20, p = 0.013, φ = 0.23) and had a younger mean age at their first depressive episode (F(1, 4057.76) = 10.58, p = 0.002, η_p^2= 0.09), thus more patients with higher loneliness had their first depressive episode before age 60 (χ^2(1) = 7.99, p = 0.005, φ = −0.26).

Table 2 displays the means and standard deviations of the GDS, GAI and ISI scores throughout the study for patients with higher and lower levels of loneliness. The mean Geriatric Depression Scale (GDS) score at COVID-19 visit (lower loneliness: 12.39 (SD = 6.20), higher loneliness: 19.43 (SD = 5.34), indicates clinically relevant depressive symptoms.[24] The mean Geriatric Anxiety Inventory (GAI) score at COVID-19 visit suggests clinical relevance of anxiety symptoms for higher loneliness (11.50 (SD = 4.59)), but not for lower loneliness (7.65 (SD = 5.31)).[25]

Patients with higher loneliness scores at the COVID-19 visit had significantly fewer social contacts compared to their less lonely counterparts (4.75 versus 7.01, F(1,139.97) = 7.95, p = 0.006, η_p^2 = 0.07) and

FIGURE 2. Violin plot of UCLA score distribution in the sample. Higher values indicate higher loneliness. Solid vertical line: median (m = 45), dashed line: mean (M = 45.99), Box: interquartile range (36.5; 54.5), whiskers: range (minimum = 20, maximum = 73), Dots: sample data points.



more frequently agreed to the statement 'I feel that there is no one in my life with whom I can share my fears and worries.' (61.4% versus 19.4%, $\chi^2(1) = 22.05$, $p < 0.001$, $\varphi = 0.44$). However, frequency of social contacts ($\chi^2(2) = 3.26$, $p = 0.196$, $\varphi = 0.17$) and perceived impairment of contact with family and friends (65.9% versus 77.8%, $\chi^2(1) = 1.97$, $p = 0.161$, $\varphi = -0.13$) did not differ between the groups. Other patient characteristics assessed during the COVID-19 visit were fairly balanced between groups (Table 3).

Higher Loneliness During the COVID-19-Pandemic is Linked to Depressive and Anxiety Symptom Aggravation

For patients with *low to moderate UCLA Loneliness* Scale scores, mixed models for repeated measures (MMRM) for GAI and GDS scores yielded no significant main effect of treatment (GDS: $F(1,68.09) = 0.42$; $p = 0.522$; GAI: $F(1,68.06) = 0.77$; $p = 0.384$), study center (GDS: $F(5,77.77) = 0.76$; $p = 0.579$; GAI: $F(5,75.98) = 1.72$; $p = 0.141$), and no interaction effect of treatment and time (GDS: $F(3,150.86) = 1.19$; $p = 0.315$; GAI: $F(3,115.52) = 1.17$; $p = 0.325$). However, there was a significant main effect of time (GDS: $F(3,150.86) = 14.86$; $p < 0.001$; GAI: $F(3,115.52) = 13.49$; $p < 0.001$). Pairwise comparison of visits revealed a significant change in estimated marginal mean differences (emmd) for GDS and GAI scores from baseline to intermediate (week 5) and post treatment (week 10), indicating a decrease in both depression and anxiety severity during the intervention phase across both treatment groups (Table 4). Furthermore, no significant emmd changes were observed in GDS and GAI scores between post treatment, follow-up (month 6), and COVID-19 visit, suggesting no shift or trend of depression and anxiety severity after the end of treatment for patients with lower levels of loneliness (Table 4).

For patients with *moderately high to high loneliness*, the MMRM for GDS also showed no effect of treatment ($F(1,40.27) = 2.63$; $p = 0.113$), study center ($F(6,47.06) = 0.72$; $p = 0.637$), and no treatment*time interaction ($F(3,81.83) = 1.17$; $p = 0.327$), but a significant main effect of time ($F(3,81.83) = 5.23$; $p = 0.002$). Pairwise comparison of visits revealed significant changes in emmd for GDS scores between post treatment (week 10), follow-up (month 6) and the COVID-19 visit (Table 4), reflecting a significant worsening of depression severity during follow-up and the COVID-19 pandemic for this group (Table 2). Similarly, the MMRM for the GAI also demonstrated a significant effect of time ($F(3,79.97) = 8.96$; $p < 0.001$). Pairwise comparison indicated a significant change in

TABLE 1. Baseline Demographic and Clinical Characteristics of All Patients Participating in the COVID-19 Visit

	Low to Moderate Loneliness (n = 72)	Moderately High to High Loneliness (n = 44)	Overall (n = 132)
Age (years), Mean (SD)	69.3 (7.0)	71.4 (6.8)	69.95 (7.02)
Gender (Female), n (%)	49 (68.1)	33 (75.0)	96 (72.7)
Relationship status, n (%)			
Single, separated, or widowed	30 (41.6)	24 (54.5)	64 (48.5)
Married or with partner	42 (58.3)	20 (45.5)	68 (51.5)
Living alone, n (%)	29 (40.3)	24(54.5)	63 (47.7)
Employment, n (%)			
Currently employed	25 (34.7)[a]	6 (13.6)[a]	32 (24.2)
retired or unemployed	47 (65.3)[a]	38 (86.4)[a]	100 (75.8)
Patients born in Germany, n (%)	65 (90.3)	40 (90.9)	120 (90.9)
At least one parent born in another country, n (%)	15 (20.8)	14 (31.8)	34 (25.8)
First depressive episode <60 years of age, n (%)	47 (65.2)[a]	40 (90.9)[a]	101 (76.5)
Age at first depressive episode, Mean (SD)	46.9 (20.6)[a]	34.7 (17.9)[a]	42.0 (20.1)
Number of depressive episodes			
Mean (SD)	3.8 (8.6)	5.2 (8.3)	4.1 (8.0)
Median (IQR; range)	2 (1−3;0−50)	3 (1.5−5;0−50)	2 (1−4;0−50)
chronic depression (current episode since >2 years), n (%)	28 (38.9)	14 (31.8)	48 (36.4)
comorbid psychiatric disorders apart from depression, n (%)			
none	60 (83.3)	40 (90.9)	113(85.6)
one	7 (9.7)	4 (9.1)	14(10.6)
two or three	5 (7.0)	0 (0)	5(3.8)
Inpatient psychiatric treatment (lifetime), n (%)	22 (30.6)	17 (38.6)	45 (34.1)
Outpatient psychiatric treatment (lifetime), n (%)	50 (69.4)	33 (75.0)	93 (70.5)
Outpatient psychotherapy (lifetime), n (%)	46 (63.9)	35 (79.5)	91 (68.9)
Suicide attempts (lifetime), n (%)	5 (6.9)	7 (15.9)	12 (9.1)
Current use of psychopharmacological drugs (regular; patient-reported), n (%)	63 (87.5)	35 (79.5)	4.8)

Notes:
[a] Indicates a significant difference between the groups ($p < 0.05$), tested with a chi-square statistic (df = 1) for categorical variables or a *F*-statistic for "age at first depressive episode" (df = 1,114) and "number of depressive episodes" (df = 1,109).

emmd of GAI scores at the COVID-19 visit compared to post treatment (week 10) and follow-up (month 6) (Table 4), showing a significant increase in anxiety symptoms during the COVID-19-pandemic for patients with higher loneliness (Table 2).

Both loneliness groups showed the same sleep disturbance pattern throughout the study (Table 4), with a significant increase in ISI scores from follow-up to COVID-19 visit (Table 4).

Patients reporting lower levels of loneliness experienced a greater GDS score reduction from baseline to COVID-19 visit than those with higher loneliness (low: mean change in GDS: $GDS_{MChange} = -7.86$, $SD = 6.47$, high: $GDS_{MChange} = -2.36$, $SD = 6.18$), with a significant between-group effect size of $d = -0.86$, [95% CI: −1.25 to −0.47]. The same pattern was observed for GAI scores (low: $GAI_{MChange} = -4.20$, $SD = 5.08$, high: $GAI_{MChange} = -0.39$, $SD = 4.90$; $d = -0.76$, [95% CI, −1.15 to −0.37]), but not for ISI scores (low: $ISI_{MChange} = -2.64$, $SD = 4.81$, high: $ISI_{MChange} = -1.40$, $SD = 4.88$; $d = -0.26$, [95% CI, −0.64 to 0.13]). Fig. 3 illustrates the course of mean GDS and GAI scores throughout the study.

DISCUSSION

In this study, we investigated the trajectories of depression, anxiety and sleep symptoms in elderly patients during the COVID-19 pandemic after having received treatment for late-life depression. Patients with low to moderate levels of loneliness maintained mild depressive and anxiety symptoms during the pandemic, suggesting stable treatment effects. Conversely, patients reporting higher loneliness showed significant worsening and clinically relevant depressive and anxiety symptoms under lock-down conditions with large between-group effect sizes. All patients experienced more sleep disturbances during this period regardless of their reported loneliness, but remained in the range of sub-threshold insomnia. As expected, patients with higher loneliness scores at the

TABLE 2. Mean GDS, GAI and ISI Scores of Patients With Low to Moderate and Moderately High to High Loneliness at the COVID-19 Visit Throughout the Study

Geriatric Depression Scale, 30-Item Version Score (Possible Range 0-30), Mean (SD)			
	overall (n = 132)	**Low to Moderate Loneliness (n = 72)**	**Moderately High to High Loneliness (n = 44)**
Baseline	20.86 (4.13)	20.25 (4.60)	21.80 (3.33)
Intermediate (Week 5)	15.76 (5.83)	14.96 (5.89)	16.52 (6.00)
Post treatment (Week 10)	12.71 (7.28)	10.97 (6.81)	14.82 (7.37)
Follow-up	13.78 (6.77)	11.94 (6.37)	16.63 (6.17)
COVID-19 visit	15.21 (6.74)	12.39 (6.20)	19.43 (5.34)
Geriatric Anxiety Inventory, (possible range 0−20), Mean (SD)			
	overall (n = 130)	**Low to Moderate Loneliness (n = 71)**	**Moderately High to High Loneliness (n = 44)**
Baseline	11.92 (4.03)	11.87 (4.06)	11.89 (4.11)
Intermediate (Week 5)	9.69 (4.55)	9.09 (4.72)	10.61 (4.47)
Post treatment (Week 10)	8.08 (5.21)	7.17 (5.07)	9.30 (5.28)
Follow-up	7.94 (4.94)	7.04 (5.06)	8.98 (4.34)
COVID-19 visit	9.16 (5.41)	7.65 (5.31)	11.50 (4.59)
Insomnia Severity Index, (Possible Range 0−28), Mean (SD)			
	overall (n = 127)	**low to Moderate Loneliness (n = 69)**	**Moderately High to High Loneliness (n = 43)**
Baseline	14.50 (5.41)	14.39 (5.72)	14.60 (5.14)
Intermediate (Week 5)	12.26 (6.02)	11.69 (6.26)	13.05 (5.63)
Post treatment (Week 10)	11.00 (6.21)	10.41 (6.25)	11.41 (6.27)
Follow-up	10.70 (6.41)	9.88 (5.97)	11.45 (6.80)
COVID-19 visit	12.56 (6.10)	11.65 (5.96)	13.39 (6.32)

Notes: SD: standard deviation, low to moderate loneliness: UCLA loneliness scale score ≤49, moderately high to high loneliness: UCLA loneliness scale score >49.

COVID-19 visit had significantly fewer social contact persons compared to their less lonely counterparts. However, the frequency of social contacts and the perceived impact of the pandemic on contact with family and friends did not differ between the groups.

The finding that patients with lower levels of loneliness maintained mild depression and anxiety levels during the pandemic contrasts with previous research suggesting that pre-existing mental disorders per se increase the risk for poor mental health during COVID-19 (Xiong, 2020; Nosè, 2023).[2,14] However, study patients with higher loneliness *did* experience an exacerbation of clinically relevant depressive and anxiety symptoms during the pandemic, despite having received psychological treatment beforehand. This may indicate that loneliness could be a more significant risk factor for mental health decline during a crisis than pre-existing mental disorders. This is in line with research linking loneliness to poorer treatment outcomes and higher relapse rates in older adults with late-life depression.[15,16] Accordingly, loneliness has been identified as a key risk factor for poor mental health[5,6] as well as a significant mediator for the relationship between social isolation and depression in the elderly during the COVID-19 pandemic.[29] The large between-group effect sizes observed in our sample further underscore the significant clinical impact of loneliness. However, in our study, we cannot draw causal conclusions because loneliness was not assessed before the pandemic.

We found no difference in sleep disturbance trajectories between patients with lower and higher levels of loneliness. This aligns with research indicating that the relationship between COVID-19 pandemic related loneliness and sleep problems varies among older adults.[30]

Our results indicate that advanced age is not inherently a risk factor for poor mental health during the pandemic. This is in line with meta-analyses linking young age− rather than old age− to a greater risk for mental health decline during the COVID-19 pandemic.[2,3,31] This may be due to protective factors of the elderly such as lower stress reactivity, better emotional regulation,[32] wisdom,[33] or psychosocial gains from past adversities.[34] In our sample as well, the majority of participants reported that past experiences with crisis helped them to cope better with the pandemic.

Surprisingly, the frequency of social contacts did not differ between patients with higher and lower

TABLE 3. Demographic and Clinical Characteristics at COVID-19 Visit for Patients With Low to Moderate and Moderately High to High Loneliness

	Low to Moderate Loneliness (n = 72)	Moderately High to High Loneliness (n = 44)	Overall (n = 132)
Number of days between post treatment and COVID-19 visit			
Mean (SD)	263.01 (133.60)	251.34 (152.22)	256.95 (138.37)
Median (IQR; range)	273 (223.25; 6-492	271.5 (300.5; 14-512)	266.5 (252.75; 6-512)
Number of social contacts (mean, SD)	7.01 (4.56)	4.75 (3.51)	5.99 (4.15)
Frequency of social contacts, n (%)			
every day	41 (56.9)	18 (40.9)	69 (52.3)
a few times per week	28 (38.9)	22 (50.0)	56(42.4)
less than once a week	3 (4.2)	4 (9.1)	7 (5.3)
Pandemic-related impairment in, n (%)			
Depressive symptoms	40 (55.6)	29 (65.9)	78(59.1)
Anxiety	38 (52.8)	26 (59.1)	76 (57.6)
Sleep	22 (30.6)	11 (25.0)	38 (28.8)
Contact with family and friends	56 (77.8)	29 (65.9)	96 (72.7)
Access to psychiatric/Psychotherapeutic Services	13 (18.1)	15 (34.1)	32 (24.2)
Access to medical services	16 (22.2)	9 (20.5)	30 (22.7)
Access to medication	6 (8.3)	7 (15.9)	16 (12.1)
Regular daily routine, n (%)			
yes	49 (68.1)	27 (61.4)	86 (65.2)
no	14 (19.4)	8 (18.2)	25 (18.9)
sometimes	9 (12.5)	9 (20.5)	21 (15.9)
Access to balcony, terrace, or garden, n (%)	67 (93.1)	44 (100)	123 (93.2)
Experiences with previous Crisis helped to cope with pandemic, n (%)			
yes	28 (38.9)	20 (45.5)	55(41.7)
no	30 (41.7)	13 (29.5)	50 (37.9)
partially	14 (19.4)	10 (22.7)	26 (19.7)
Study therapy helped to cope with the pandemic, n (%)			
yes	39 (54.2)	18 (40.9)	63 (47.7)
no	22 (30.6)	15 (34.1)	44 (33.3)
partially	11 (15.3)	11 (25.0)	25 (18.9)
Changes in household net income during COVID-19 pandemic, n (%)			
No changes or more income	65 (90.3)	39 (88.6)	120 (90.9)
Less income	7 (9.7)	5 (11.4)	12 (9.1)
"I feel that there is no one in my life with whom I can share my fears and worries.", n (%)			
Somewhat agree/ strongly agree	14 (19.4)	27 (61.4)	43 (32.6)
Somewhat disagree/ strongly disagree	58 (80.6)	16 (36.4)	83 (62.9)

loneliness, suggesting that the quality or depth of relationships may be more important than the sheer number of social contacts.[35] Furthermore, both groups reported equally often that the pandemic impaired their contact with family and friends. However, patients with higher loneliness had in fact fewer social contacts compared to their less lonely counterparts and reported more often that they had no one to share their fears and worries with. This may imply that those who felt lonely during the pandemic had already experienced loneliness prior to it, aligning with findings showing that loneliness remains relatively stable across the lifespan[36] and can be chronic in older adults.[10]

The association between loneliness and the deterioration of depressive and anxiety symptoms in our study highlights the importance of addressing loneliness with treatment strategies for late-life depression, particularly during crises like the COVID-19 pandemic. Technology-based interventions may be used even under social restrictions, are increasingly accepted among the elderly, and can reduce loneliness.[37] For example, a pilot study suggests that behavioral activation with mental imagery delivered over the phone is both feasible and potentially effective for treating depressive symptoms in isolated older adults.[38] In addition, digital technologies can improve the quality of life and mitigate the adverse effects of the pandemic for older adults.[39] A systematic review suggests that engaging with chatbots can enhance well-being and alleviate depressive symptoms in the elderly.[40]

TABLE 4. Results From the MMRMs With the Fixed Effects Study Center, Treatment Group, Visit, the Interaction Treatment Group *Visit and the Baseline Score of GDS, GAI or ISI Respectively

Visit A	Visit B	Loneliness	df	Emmd of Change in GDS Compared to Baseline (A−B)	95% CI	p-Value
Intermediate (week 5)	Post treatment (week 10)	Low to moderate	130.44	4.17	2.92; 5.41	p < 0.001
		Moderately high to high	68.55	1.71	−0.16; 3.47	p = 0.072
	Follow-up (month 6)	Low to moderate	173.47	3.24	1.73; 4.74	p < 0.001
		Moderately high to high	91.50	−0.31	−2.41; 1.78	p = 0.768
	COVID-19 visit	Low to moderate	161.73	2.77	1.15; 4.40	p = 0.001
		Moderately high to high	89.29	−2.91	−5.16; −0.66	p = 0.012
Post treatment (week 10)	Follow-up (month 6)	Low to moderate	152.38	−0.93	−2.22; 0.36	p = 0.115
		Moderately high to high	81.71	−2.02	−3.95; −0.08	p = 0.041
	COVID-19 visit	Low to moderate	174.22	−1.39	−3.00; 0.22	p = 0.090
		Moderately high to high	96.40	−4.61	−6.97; −2.26	p < 0.001
Follow-up (month 6)	COVID-19 visit	Low to moderate	131.32	−0.46	−1.66; 0.74	p = 0.447
		Moderately high to high	75.73	−2.60	−4.37; −0.82	p = 0.005
Visit A	**Visit B**	**Loneliness**	**df**	**Emmd of Change in GAI Compared to Baseline (A−B)**	**95% CI**	**p-Value**
Intermediate (week 5)	Post treatment (week 10)	Low to moderate	123.91	2.05	1.20; 2.90	p < 0.001
		Moderately high to high	71.08	1.32	0.23; 2.41	p = 0.018
	Follow-up (month 6)	Low to moderate	154.60	2.21	1.06; 3.37	p < 0.001
		Moderately high to high	94.09	1.75	0.53; 2.97	p = 0.005
	COVID-19 visit	Low to moderate	147.02	1.56	0.32; 2.81	p = 0.014
		Moderately high to high	83.30	−0.89	−2.47; 0.70	p = 0.268
Post treatment (week 10)	Follow-up (month 6)	Low to moderate	154.34	0.16	−0.81; 1.12	p = 0.750
		Moderately high to high	83.47	0.43	−0.68; 1.55	p = 0.441
	COVID-19 visit	Low to moderate	161.27	−0.49	−1.69; 0.72	p = 0.424
		Moderately high to high	99.49	−2.21	−3.76; −0.65	p = 0.006
Follow-up (month 6)	COVID-19 visit	Low to moderate	123.54	−0.65	−1.64; 0.35	p = 0.203
		Moderately high to high	61.59	−2.64	−3.80; −1.47	p < 0.001
Visit A	**Visit B**	**Loneliness**	**df**	**Emmd of Change in ISI Compared to Baseline (A−B)**	**95% CI**	**p-Value**
Intermediate (week 5)	Post treatment (week 10)	Low to moderate	114.89	1.39	0.41; 2.36	p = 0.006
		Moderately high to high	58.26	1.62	0.26; 2.99	p = 0.021
	Follow-up (month 6)	Low to moderate	156.70	1.85	0.57; 3.14	p = 0.005
		Moderately high to high	65.07	1.95	0.20; 3.70	p = 0.030
	COVID-19 visit	Low to moderate	147.71	0.05	−1.32; 1.42	p = 0.940
		Moderately high to high	67.99	−0.35	−2.13; 1.44	p = 0.701
Post treatment (week 10)	Follow-up (month 6)	Low to moderate	135.62	0.47	−0.56; 1.51	p = 0.378
		Moderately high to high	68.66	0.32	−1.35; 2.00	p = 0.701
	COVID-19 visit	Low to moderate	157.65	−1.33	−2.60; −0.07	p = 0.039
		Moderately high to high	77.90	−1.97	−3.86; −0.08	p = 0.041
Follow-up (month 6)	COVID-19 visit	Low to moderate	121.81	−1.80	−2.85; −0.75	p < 0.001
		Moderately high to high	70.18	−2.29	−4.07; −0.52	p = 0.012

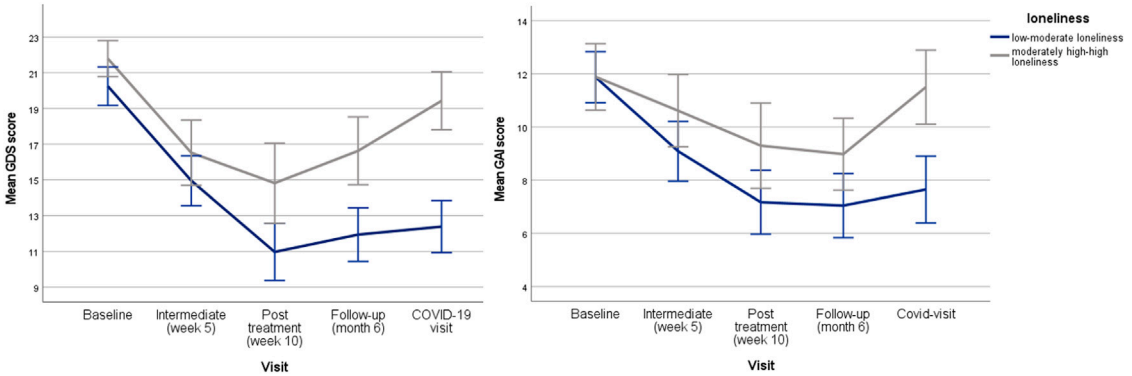
Notes: MMRM: mixed model for repeated measures, df: degrees of freedom, emmd: estimated marginal mean difference, CI: confidence interval, GDS: geriatric depression scale, GAI: geriatric anxiety inventory, ISI: Insomnia Severity Index, low to moderate loneliness: UCLA loneliness scale score ≤49, moderately high to high loneliness: UCLA loneliness scale score >49. Pairwise comparisons in the MMRM were tested using a *t*-statistic.

Strengths and Limitations

This study fills a gap in research by examining the association of loneliness during the COVID-19 pandemic and the course of clinical outcomes after psychological treatment for late-life depression using original data from a large, multicenter trial. However, the cross-sectional and post treatment observational nature of the additional COVID-19 assessment limits our ability to draw causal conclusions.

Another limitation is the variation in time-intervals between the end of treatment and the COVID-19 visit, depending on each individual's randomization date. Although all participants had completed their treatment by the time of the COVID-19 visit, and most had finished their 6-month follow-up, these varying

FIGURE 3. Mean GDS and GAI scores over time for patients with low to moderate loneliness (UCLA score ≤49) and moderately high to high loneliness (UCLA score >49). Error bars show standard deviation.



intervals between the assessments introduce uncertainty in interpreting the long-term effects of treatment.

The study's strengths, including adherence to manual monitoring and rater blinding in a large, multicenter, randomized controlled trial, enhance the credibility of our findings. The applied mixed model for repeated measures (MMRM) is a robust approach even with smaller sample sizes and subgroups. Nevertheless, the results should be interpreted cautiously as MMRMs were not corrected for multiple testing including type I error inflation. We used a well-validated version of the UCLA Loneliness Scale, which is widely applied for assessing loneliness during the pandemic and has strong psychometric properties,[41] also in older adults.[42]

Although only slightly over half of the main trial's participants took part in the COVID-19 visit, their baseline and clinical characteristics were similar to the full sample of the main trial, suggesting comparability. However, since our study was conducted in Germany, the generalizability to other countries with different pandemic measures may be limited. The impact of pandemic-related restrictions on mental health can vary depending on their length and strictness, which differed across regions.[11]

CONCLUSIONS

In summary, our study highlights the significant role of loneliness during the COVID-19 pandemic in mental health outcomes of elderly patients previously treated for late-life depression. Patients with lower levels of loneliness during the pandemic maintained consistently mild depressive and anxiety symptoms after treatment, contrary to those with higher loneliness who experienced significant worsening.

Our results suggest a need to incorporate loneliness assessments and intervention into treatment plans for late-life depression, especially during periods of social isolation such as pandemics or other crises. Future research should focus on the development of targeted interventions. Technology-based solutions emerge as promising strategies to mitigate loneliness and its adverse effects in older adults.

AUTHOR CONTRIBUTIONS

JM, ME, ES and RB drafted and edited the manuscript. JM, WM and MHe performed the statistical analysis. JM, ME and ES interpreted the results. ES, ME, RB, FSD, FJ and MHa developed the study concept and design. ES, ME, JM, NZ, FSD, SR-H, MW, LF, KD, OP, FJ, BB, and MHa acquired the data. All authors critically revised the manuscript for important intellectual content. FJ and MHa were the principle investigator of the main trial and obtained funding for the main trial. FSD coordinated the main trial. ES obtained funding for the present study.

DATA SHARING STATEMENT

The data that support the findings of this study are not publicly available due to ethics restrictions but available from the corresponding author upon reasonable request with individual permission from local institutions ethics board.

DISCLOSURES

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References

1. Zenebe Y, Akele BW, Selassie M, et al: Prevalence and determinants of depression among old age: a systematic review and meta-analysis. Ann Gen Psychiatr 2021; 20(1):55
2. Xiong J, Lipsitz O, Nasri F, et al: Impact of COVID-19 pandemic on mental health in the general population: a systematic review. J Affect Disord 2020; 277:55–64
3. COVID-19 Mental Disorders Collaborators: Global prevalence and burden of depressive and anxiety disorders in 2020 due to the COVID-19 pandemic. Lancet 2021; 398:1700–1712
4. Mushtaq A, Khan MA: Social isolation, loneliness, and mental health among older adults during COVID-19: a scoping review. J Gerontol Soc Work 2024; 67(2):143–156
5. Ciuffreda G, Cabanillas-Barea S, Carrasco-Uribarren A, et al: Factors associated with depression and anxiety in adults ≥60 years old during the COVID-19 pandemic: a systematic review. Int J Environ Res Public Health 2021; 18(22):11859
6. Lau J, Koh W, Ng J, et al: Understanding the mental health impact of COVID-19 in the elderly general population: a scoping review of global literature from the first year of the pandemic. Psychiatr Res 2023; 329:115516
7. Silva C, Fonseca C, Ferreira R, et al: Depression in older adults during the COVID-19 pandemic: a systematic review. J Am Geriatr Soc 2023; 71(7):2308–2325
8. European commission: Defining Loneliness [EU joint research center: An official website of the European Union]. Available at: https://joint-research-centre.ec.europa.eu/scientific-activities-z/survey-methods-and-analysis-centre-smac/loneliness/defining-loneliness_en. Accessed July 24, 2024
9. Cohen-Mansfield J, Hazan H, Lerman Y, et al: Correlates and predictors of loneliness in older-adults: a review of quantitative results informed by qualitative insights. Int Psychogeriatr 2016; 28(4):557–576
10. Newall NE, Chipperfield JG, Bailis DS: Predicting stability and change in loneliness in later life. J Soc Pers Relat 2014; 31(3):335–351
11. Knox L, Karantzas GC, Romano D, et al: One year on: What we have learned about the psychological effects of COVID-19 social restrictions: a meta-analysis. Curr Opin Psychol 2022; 46:101315
12. Berger K, Riedel-Heller S, Pabst A, et al: Loneliness during the first wave of the SARS-CoV-2 pandemic—results of the German National Cohort (NAKO). Bundesgesundheitsbl 2021; 64:1157–1164
13. Entringer T, Kröger H, Schupp J, et al: Psychische Krise durch COVID-19? Sorgen sinken, Einsamkeit steigt, Lebenszufriedenheit bleibt stabil [Psychological crisis due to COVID-19? Worries decrease, loneliness rises, life satisfaction remains stable]. SOEP — The German Socio-Economic Panel at DIW Berlin 2020, available at: http://www.diw.de/soeppapers. Accessed October 1, 2024.
14. Nosè M, Gastaldon C, Acaturk C, et al: Have the COVID-19 outbreak and related restrictions affected the right to mental health of people with severe mental health conditions? Int Rev Psychiatry 2023; 35(2):180–193
15. Huang AX, Delucchi K, Dunn LB, et al: A systematic review and meta-analysis of psychotherapy for late-life depression. Am J Geriatr Psychiatry 2015; 23:261–273
16. Ji M, Sun Y, Zhou J, Li X, et al: Comparative effectiveness and acceptability of psychotherapies for late-life depression: a systematic review and network meta-analysis. J Affect Disord 2023; 323:409–416
17. Dafsari FS, Bewernick B, Böhringer S, et al: Cognitive behavioral therapy for late-life depression (CBTlate): results of a multicenter, randomized, observer-blinded, controlled trial. Psychother Psychosom 2023; 92:180–192
18. Müller J, Elsaesser M, Müller W, et al: Differential psychological treatment effects in patients with late-life depression and a history of childhood maltreatment. Am J Geriatr Psychiatr 2024; 17:1325–1336
19. Dafsari FS, Bewernick B, Böhringer S, et al: Perceived physical health and cognitive behavioral therapy vs supportive psychotherapy outcomes in adults with late-life depression: a secondary analysis of a randomized clinical trial. JAMA Netw Open 2024; 7(4):e245841
20. Dafsari FS, Bewernick B, Biewer M, et al: Cognitive behavioural therapy for the treatment of late life depression: study protocol of a multicentre, randomized, observer-blinded, controlled trial (CBTlate). BMC Psychiatr 2019; 19:423
21. Bundesregierung: Beschluss: Manahmen zur Eindämmung der COVID-19-Epidemie [German Government: Resolution: Measures to contain the COVID-19 epidemic]. May 6, 2020. Available at: https://www.bundesregierung.de/resource/blob/975226/1750986/8689a57b635d9f2d602e94f94dd48c51/2020-05-06-mpk-beschluss-data.pdf?download=1, Accessed July 24, 2024

22. Gauggel S, Birkner B: [Validity and reliability of a German version of the geriatric depression scale (GDS)]. Zeitschrift für Klinische Psychologie und Psychotherapie 1999; 28:18–27
23. Hu T, Zhao X, Wu M, et al: Prevalence of depression in older adults: a systematic review and meta-analysis. Psychiatry Res 2022; 311:114511
24. Yesavage JA, Brink TL, Rose TL, et al: Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res 1982; 17:37–49
25. Pachana NA, Byrne GJ, Siddle H, et al: Development and validation of the geriatric anxiety inventory. Int Psychogeriatr 2007; 19(1):103–114
26. Bastien CH, Vallières A, Morin CM: Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Med 2001; 2(4):297–307
27. Döring N, Bortz J: Psychometrische einsamkeitsforschung: deutsche neukonstruktion der UCLA loneliness scale [Psychometric loneliness research: German reconstruction of the UCLA loneliness scale]. Diagnostica 1993; 39(3):224–239
28. Deckx L, van den Akker M, Buntinx F: Risk factors for loneliness in patients with cancer: a systematic literature review and meta-analysis. Eur J Oncol Nurs 2014; 18(5):466–477
29. Jin MJ, Bae SM: The effect of social isolation, loneliness, and physical activity on depressive symptoms of older adults during COVID-19: a moderated mediation analysis. Int J Environ Res Public Health 2024; 21(1):26
30. Grossman ES, Hoffman YSG, Palgi Y, et al: COVID-19 related loneliness and sleep problems in older adults: Worries and resilience as potential moderators. Pers Individ Dif 2021; 168:110371
31. Tasnim A, Rahman FN, Rakhshanda S, et al: Ageing and mental health in the context of social isolation in COVID-19 pandemic. Mymensingh Med J 2024; 33(2):626–635
32. Lee EE, Depp C, Palmer BW, et al: High prevalence and adverse health effects of loneliness in community-dwelling adults across the lifespan. Int Psychogeriatr 2019; 31(10):1447–1462
33. Lee EE, Bangen KJ, Avanzino JA, et al: Outcomes of randomized clinical trials of interventions to enhance social, emotional, and spiritual components of wisdom. JAMA Psychiatry 2020; 77 (9):925–935
34. Mancini AD: When acute adversity improves psychological health: a social-contextual framework. Psychol Rev 2019; 126 (4):486–505
35. Vahia IV, Jeste DV, Reynolds CF: Older adults and the mental health effects of COVID-19. JAMA 2020; 324(22):2253–2254
36. Mund M, Freuding MM, Möbius K, et al: The stability and change of loneliness across the life span: a meta-analysis of longitudinal studies. Pers Soc Psychol Rev 2020; 24(1):24–52
37. Sinha S, Verma A, Tiwari P: Technology: saving and enriching life during COVID-19. Front Psychol 2021; 12:647681
38. Pellas J, Renner F, Ji JL, et al: Telephone-based behavioral activation with mental imagery for depression: a pilot randomized clinical trial in isolated older adults during the COVID-19 pandemic. Int J Geriatr Psychiatr 2022; 37(1);doi:10.1002/gps.5646
39. Bafail DA: Mental health issues associated with COVID-19 among the elderly population: a narrative review. Cureus 2022; 14(12):e33081
40. Chou YH, Lin C, Lee SH, et al: Potential mobile health applications for improving the mental health of the elderly: a systematic review. Clin Interv Aging 2023; 18:1523–1534
41. Das A, Padala KP, Crawford CG, et al: A systematic review of loneliness and social isolation scales used in epidemics and pandemics. Psychiatry Res 2021; 306:114217
42. Ausín B, Muñoz M, Martín T, et al: Confirmatory factor analysis of the Revised UCLA loneliness scale (UCLA LS-R) in individuals over 65. Aging Ment Health 2019; 23(3):345–351