

CLINICAL TRIAL

Six-month outcomes of layperson-delivered, telephone-based behavioural activation and mindfulness interventions on loneliness among older adults during the COVID-19 pandemic: The HEAL-HOA Dual Randomised Controlled Trial

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Abstract

Background: Loneliness among older adults during the COVID-19 pandemic constituted a global public health crisis. This study aimed to determine whether layperson- and telephone-delivered behavioural activation (Tele-BA) and mindfulness (Tele-MF) interventions, compared to telephone befriending/support calls (Tele-BF; attention control), could reduce loneliness among older adults who were living alone, socioeconomically deprived and digitally excluded.

Methods: As part of the ‘Helping Alleviate Loneliness in Hong Kong Older Adults’ dual randomised controlled trial (RCT), 1151 older adults ($M_{\text{age}} = 76.6$, $SD = 7.8$) were randomly assigned to Tele-BA, Tele-MF or Tele-BF. Assessments were conducted at baseline (T0), 4-week (T1), 3-month (T2) and 6-month post-intervention (T3). All interventions (eight 30-minute telephone sessions over four weeks) were delivered by 185 trained lay counsellors who were 50–70 years old and reported feeling lonely.

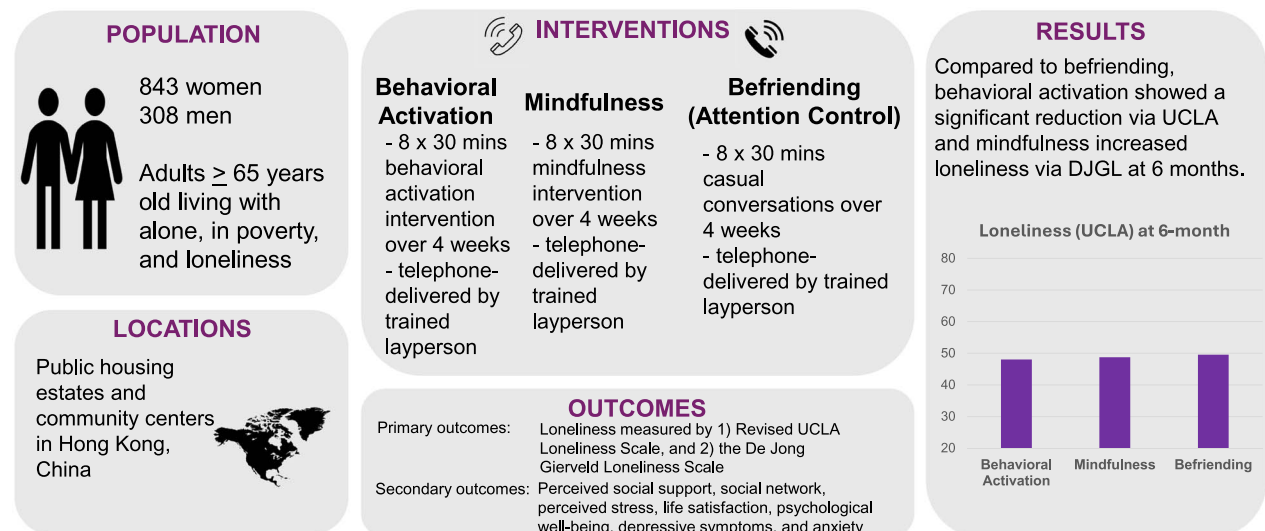
Outcomes: The primary outcome was loneliness (assessed with the UCLA Loneliness Scale [UCLA-LS] and De Jong Gierveld Loneliness Scale [DJGL]). Secondary outcomes were perceived social support, social network size, perceived stress, life satisfaction, psychological well-being, sleep quality and depressive and anxiety symptoms. The UCLA-LS scores were significantly reduced in Tele-BA at T2 and T3 and in Tele-MF at T2, compared to Tele-BF. No significant difference was observed between Tele-BA and Tele-BF from T1 through T3 in DJGL. The Tele-MF group showed significantly higher DJGL scores at T1 and T3 than the Tele-BF group. Significant positive effects of Tele-BA, compared to Tele-BF, were found in perceived social support, perceived stress, psychological well-being, depression and anxiety. Tele-MF did not significantly differ from Tele-BF on these secondary outcomes.

Interpretation: The trial demonstrates the effectiveness of telephone-based psychosocial interventions delivered by laypersons in reducing loneliness. It also underscores the potential for training peer lay counsellors to telephone-deliver scalable psychosocial interventions for older adults experiencing loneliness.

Graphical Abstract

Age and Ageing

RCT: Six-month Outcomes of Layperson-Delivered, Telephone-Based Behavioural Activation and Mindfulness Interventions on Loneliness Among Older Adults During the COVID-19 Pandemic



Keywords: interventions; loneliness; mental health; older people

Key Points

- Telephone-delivered Behavioural Activation sustainably reduced loneliness in vulnerable older adults at both 3-month and 6-month follow-ups compared to befriending, with additional benefits for psychological well-being, sleep quality and perceived social support.
- Telephone-delivered Mindfulness reduced loneliness at 3 months but not at 6 months relative to befriending. It improved sleep quality but did not significantly enhance psychological well-being or social support relative to befriending.
- Layperson-delivered phone interventions are scalable among older adults.

Introduction

Loneliness, defined as ‘the unpleasant experience that occurs when a person’s network of social relationships is significantly deficient in either quality or quantity’ [1], affects >20% of older adults in China, Europe and the USA [2–4]. Loneliness is associated with various adverse mental, physical and cognitive health outcomes [5–10]. The World Health Organization (WHO) has identified loneliness as a major health concern for older adults [11]. The prevalence of loneliness increased during the COVID-19 pandemic due to physical distancing measures, particularly among low-income older adults who are digitally excluded and live alone.

It is widely recognised that psychosocial interventions aimed at reducing loneliness should be more accessible in order to serve vulnerable older adults [12]. Additionally,

most existing studies have focused on short-term effectiveness and narrow conceptualisations of loneliness and interventions [13, 14]. Further research is needed to evaluate loneliness interventions that demonstrate long-term effectiveness and address diverse conceptualisations of loneliness among older adults, particularly those who are socioeconomically disadvantaged [12, 15]. Therefore, the present study aimed to test the effectiveness of lay-person-delivered, telephone-based behavioural activation (Tele-BA) and mindfulness (Tele-MF) interventions in reducing loneliness, relative to a befriending programme (Tele-BF) as an attention control (AC), among low-income, digitally excluded older adults living alone. Both short-term (4-week postintervention) and medium-term (3- and 6-month postintervention) effects were evaluated using two conceptualisations of loneliness: a unidimensional loneliness

and a two-dimensional loneliness comprising emotional loneliness and social loneliness.

Research has identified two effective strategies for alleviating loneliness, grounded in theories of emotional bipolarity and emotion regulation [16–20]. The first strategy seeks to enhance positive emotions by expanding opportunities for social interaction and support, as well as strengthening social skills through approaches such as activity-based group interventions [21–23]. Behavioural activation (BA), which promotes engagement in meaningful and enjoyable activities while avoiding negative stimuli, has been shown to effectively reduce loneliness and depression among older adults [24, 25]. The second strategy focuses on helping individuals better manage negative emotions, such as stress and anxiety, that arise from feelings of loneliness [26, 27] and encouraging awareness of maladaptive thought patterns in social contexts [8]. For instance, mindfulness interventions (MF) have been shown to reduce loneliness by helping participants focus on the present moment, accept negative emotions and cultivate a sense of calm [27]. Despite these findings, further scientific evidence is needed to establish the most effective approaches and their scalability and sustainability [28]. To our knowledge, few randomised controlled trials (RCTs) have compared interventions specifically aimed at reducing loneliness. Consequently, we included both behavioural activation (BA) and mindfulness (MF) in this three-arm RCT and compared them against befriending as an attention control. Befriending (BF) provides participants with positive emotional and social support but does not teach specific skills related to activating meaningful behaviour or mindfulness.

While prior research has often conceptualised loneliness as a unidimensional construct (i.e. a single overarching experience; [29]), other scholars argue for a multidimensional framework that distinguishes between emotional loneliness (i.e. the perceived absence of close emotional bonds) and social loneliness (i.e. the perceived inadequacy of one's broader social network or community ties; [30, 31]). Although both perspectives have been widely applied in loneliness research, few studies have systematically integrated both approaches to explore whether interventions differentially target specific conceptualisations of loneliness. To comprehensively evaluate the impacts of our intervention on loneliness, we incorporated both conceptualisations of loneliness—unidimensional and multidimensional—as outcome measures, allowing for a nuanced analysis of how the interventions influence various conceptualisations of loneliness.

Given the shortage of professional mental health workers, the scalability of psychosocial interventions would be severely limited if licensed clinicians and in-person delivery were required for loneliness interventions. Interventions delivered remotely by trained laypersons offer a more practical, scalable and sustainable approach. In a previous BA programme, trained lay counsellors were able to deliver the programme via video-conferencing [14]. While

only a small number of studies have adopted layperson-delivered, telephone-based approaches, prior research has demonstrated the effectiveness of BA in reducing loneliness among older adults [32]. Building on the effectiveness demonstrated in previous studies, we implemented the HEAL-HOA (Helping Alleviate Loneliness in Hong Kong Older Adults) dual RCT during the COVID-19 pandemic. This trial evaluated [1] the effectiveness of Tele-BA and Tele-MF interventions in reducing loneliness, compared to Tele-BF, among older adults and [2] the impact of intervention delivery on loneliness among volunteer lay counsellors. The short- and long-term effects of volunteering on lay counsellors ($N = 185$, ages 50–70) are reported elsewhere [33, 34]. In this study, we report the 6-month effectiveness of Tele-BA and Tele-MF compared to Tele-BF among those older adults who received the respective intervention.

Method

Study design

As described, the HEAL-HOA was a parallel dual RCT. The three-arm, assessor-blind RCT of the effectiveness of Tele-BA and Tele-MF against Tele-BF was conducted with socioeconomically disadvantaged older adults who lived alone and were digitally excluded (no access to the internet at home). The trial protocol and statistical analysis plan can be found in [Supplement 1](#). The trial was approved by the Human Research Ethics Board of the affiliation of the first author (Reference no. 2019-2020-0442). All participants provided written informed consent. This study followed the Consolidated Standards of Reporting Trials (CONSORT) reporting guideline and its extension to the nonpharmacological interventions ([Supplement 1](#)).

Trial registration

The study was prospectively registered in the Clinical Trials Registry of the University of Hong Kong Clinical Trials Centre (HKUCTR-2929) and retrospectively registered at the Chinese Clinical Trial Registry in the WHO Registry Network (ChiCTR2300072909), with the same content for both registrations.

Sample size

Previous studies have found that video-conferenced BA showed an effect size (Cohen's d) of 0.5 compared to Tele-BF [15], while in-person-delivered MF showed an effect size of 0.4 compared to a passive control group [26]. To be conservative, we assumed an effect size of 0.25 for both intervention groups using the UCLA Loneliness Scale. Therefore, a minimum of 322 participants was required in each group for a two-sided test with an alpha of 0.05 and a beta of 0.10, accounting for an estimated 10% dropout rate over a 6-month period.

Participants

Participants were recruited using various methods, including household visits and advertisements in public housing estates and community centers for older adults from 1 April 2021 to 30 April 2023. The inclusion criteria were: (i) age 65 years and older; (ii) ≥ 6 on the three-item UCLA Loneliness Scale [35]; (iii) living alone; (iv) no access to the internet at home; (v) monthly individual income < US\$577; and (vi) proficiency in Cantonese via telephone. The exclusion criteria were: (i) major physical (e.g. terminal illness, severe mobility limitations), mental (e.g. severe depression, schizophrenia) or cognitive health problems (e.g. Alzheimer's disease or other dementia) and (ii) engagement in regular (2+ times per week) behavioural activation, mindfulness or other mind-body practices at the baseline. After completing the intervention and all the assessments, participants received a \$31 supermarket voucher as a token of appreciation for their participation.

Randomisation and blinding

An independent research assistant generated the randomisation sequence using an online random number generator. Following the completion of informed consent and baseline assessment, participants were randomly allocated to one of the three groups (Tele-BA, Tele-MF or Tele-BF) in a 1:1:1 allocation ratio (see section [Supervision and Fidelity Monitoring](#) for details). The research assistants who conducted the baseline and follow-up assessments were blinded to the group assignments. Although blinding was not feasible for the participants and their lay counsellors, both groups were unaware of the specific content of the other groups and the study hypotheses.

Intervention delivery

Each lay counsellor delivered eight 30-minute sessions, conducted twice weekly over 4 weeks, to between 1 and 10 participants, over a 6-month period [33, 34]. The detailed intervention content can be found in the study's trial protocol [36].

Lay counsellor training

The intervention sessions were conducted by 185 lay counsellors who were assigned to the volunteering condition. Lay counsellors were recruited through door-to-door visits and advertisements in public residential complexes, senior community centres and educational courses at academic institutions for older adults. The inclusion criteria were: ages between 50 and 70 years, willingness to commit to at least 2 hours of volunteer training and service per week for 6 months, a minimum of 3 years of secondary education, no significant physical, mental or cognitive health issues, no full-time or part-time employment, engagement in formal volunteering fewer than four times in the previous year and scoring at least six on the three-item UCLA Loneliness Scale.

Before delivering the assigned intervention (i.e. BA, MF or BF), lay counsellors received six 2-hour training sessions, held once a week for 6 weeks, to acquire the necessary skills. Practice and mock training sessions were conducted to ensure that the participants could successfully and effectively deliver the intervention.

Tele-BA

The Tele-BA training content was adopted from the Tele-health Behavioural Activation Treatment Manual for Homebound Older Adults with Depression developed by Choi and colleagues [24]. The participants were initially instructed to identify the areas of their lives and values that contribute to their sense of purpose and meaning in life. They then set specific goals in these areas, such as fostering social connections or improving self-care management of chronic conditions. They identified daily activities to achieve these goals and addressed any potential obstacles to implementation. Additionally, participants were motivated to create strategies for continuing their involvement in these activities after the intervention period.

Tele-MF

The Tele-MF training content was adapted from the smartphone-delivered mindfulness intervention developed by Lindsay and colleagues to alleviate loneliness in stressed adults [37]. The intervention targeted two mindfulness skills: monitoring and acceptance. The content covered body scanning, focusing on the body and mind, cultivating equanimity, recognising bodily sensations and guidance on maintaining a positive attitude towards stress by accepting its impermanent nature.

Tele-BF

Tele-BF as an AC was adapted from the BEFRIENDAS 'Befrienders Information Guide' developed by the National Ageing Research Institute programme [38]. The lay counsellors called the participants twice a week via telephone to talk about various topics, such as weather, favourite seasons, TV shows, diet, cooking, favourite food and travel destinations, preferred festivals or holiday activities, recent events in society and noteworthy recent experiences. Tele-BF served as an AC, providing social connectedness to participants without teaching any skills for coping with loneliness.

Supervision and fidelity monitoring

To ensure the interventions' smooth implementation and address potential issues, a team of dedicated research assistants focused on maintaining close communication with lay counsellors. Each lay counsellor completed a detailed record sheet, documenting the date, session number, session duration and any difficulties encountered during delivery. The research assistants followed up with the lay counsellors every 2 weeks to ensure that they were on track and to identify any issues that might have arisen. Additionally,

WhatsApp groups were used by both lay counsellors and research assistants to support one another, share experiences and resolve any issues that arose during the intervention process. The specific content spoken between lay counsellors and participants during the intervention sessions was not recorded.

Between January and April 2022, Hong Kong's most stringent social distancing regulations led to a high dropout rate ($n = 130$) among older adults assigned to the Tele-MF intervention group. The timing of these regulations overlapped with in-person training sessions for Tele-MF volunteers, causing significant delays in the delivery of the intervention, which likely contributed to participant attrition. To maintain the target sample size of 322 individuals per group, researchers revised the allocation ratio for the Tele-BA, Tele-MF and Tele-BF groups to 1:2:1 starting in April 2022. This adjustment resulted in a disproportionate final sample distribution across the three groups (335:460:356).

Fidelity of intervention receipt (participants of this RCT) and intervention enactment

A separate group of research assistants was responsible for addressing the questions of intervention participants and providing support throughout the study period. Participants were assigned homework (e.g. recording daily activities for Tele-BA and practicing mindfulness for Tele-MF), which was then reviewed by their lay counsellors during the next training session. Although compliance with homework was not systematically assessed, the lay counsellors reported a very high level of adherence to the assigned tasks in the supervision sessions. At the 4-week assessment (T1), participants used a 7-point scale to evaluate the intervention they received using the Treatment Evaluation Inventory ($M = 54.18$, $SD = 11.49$), as well as their level of perceived engagement in the intervention ($M = 5.27$, $SD = 1.30$) and satisfaction with their lay counsellors ($M = 5.21$, $SD = 1.26$).

Measures

The assessments were administered at baseline (T0), 4 weeks (T1), 3 months (T2) and 6 months (T3) after the intervention. Assessment at T0 and T3 was collected in person, and those at T1 and T2 were collected over the telephone.

Outcomes

The primary outcome was loneliness, measured with two scales: The Chinese versions of the revised UCLA Loneliness Scale focusing on the unidimensional aspect [29] and the 6-item De Jong Gierveld Loneliness Scale for its multidimensional perspective on social and emotion aspect (DJGL) [30, 31]. The secondary outcomes, all assessed with the Chinese versions of the instruments, included: (i) perceived social support (12-item Multidimensional Scale of Perceived Social Support, MSPSS) [39, 40]; (ii) social network size (Lubben

Social Network Scale) [41, 42]; (iii) perceived stress (14-item Perceived Stress Scale) [43, 44]; (iv) life satisfaction (Satisfaction with Life Scale, SWLS) [45, 46]; (v) psychological well-being (Psychological Wellbeing Scale, PWS) [47, 48]; (vi) sleep quality (8-item Sleep Condition Indicator) [49, 50]; (vii) depressive symptoms (Patient Health Questionnaire-9; PHQ-9) [51, 52]; and (viii) anxiety (Hospital Anxiety and Depression Scale, HADS) [53, 54].

Participants were also asked whether they continued to engage in mindfulness or behavioural activation practices after completing the intervention.

Statistical analysis

Means (SDs) for continuous variables and counts and frequencies for categorical variables are provided in Table 1. The intention-to-treat (ITT) analysis was conducted for all participants who had at least one outcome measure assessed. Linear mixed models were fitted with time, group (Tele-BA vs. Tele-BF; Tele-MF vs. Tele-BF) and their interactions as independent variables. The normality of the residuals and random effects was evaluated by examining normal probability plots. The maximum likelihood method was applied in all linear mixed models to address missing data during follow-up assessments [55]. A per-protocol sensitivity analysis was then performed for participants who completed at least 75% (i.e. six out of eight) of the sessions and completed the follow-up assessments (Supplement 2). To account for multiplicity, a 0.8% ($P \leq .008$) level of significance was applied to primary outcomes, and all significance tests were two-sided. The analyses were conducted using SPSS 29.0.

Adverse events

During the study period, two Tele-MF participants were reported to have died. Since participation in the interventions did not restrict participants' access to their usual health-care and daily activities, these deaths were deemed unrelated to the trial. It is worth noting that a considerable number of older adults (i.e. 9002 individuals) aged 60 years and older died in 2022 in Hong Kong. Moreover, the COVID death rate in 2022 in Hong Kong exceeded 25 per 100 000 residents. No other adverse events were reported during the trial.

Results

Participant

The participant flow is shown in Figure 1. Of the 4152 older adults screened, 1191 were eligible and 1151 consented to participate in the study ($M_{\text{age}} = 76.6$ years, $SD_{\text{age}} = 7.8$ years, 73.2% female) and were randomised into one of the three groups (Tele-BA: 335; Tele-MF: 460; Tele-BF: 356). Table 1 shows baseline sample characteristics. Although there were statistically significant differences, the effect sizes were very small, ranging from 0.004 to 0.144 [56]. In the Tele-BA group, 212 participants (63.3%) completed at least six out of

Table 1. Characteristics at baseline, T0 ($N = 1151$)

	Tele-BA ($n = 335$; 29.10%)	Tele-MF ($n = 460$; 39.97%)	Tele-BF ($n = 356$; 30.93%)	Between-group comparison at baseline P -value
Age (years)	M (SD) 75.34 (7.01) n (%)	M (SD) 77.38 (7.97) n (%)	M (SD) 76.66 (8.12) n (%)	.001
Gender				.02
Male	88 (26.3%)	106 (23.0%)	114 (32.0%)	
Female	247 (73.7%)	354 (77.0%)	242 (68.0%)	
Marital status				.01
Married	17 (5.1%)	43 (9.3%)	51 (14.3%)	
Single (never married)	50 (14.9%)	33 (7.2%)	25 (7.0%)	
Widow	153 (45.7%)	121 (26.3%)	187 (52.5%)	
Divorced	115 (34.3%)	263 (57.2%)	93 (26.1%)	
Education level				<.001
No education	75 (22.4%)	169 (36.7%)	90 (25.3%)	
Primary or below	118 (35.2%)	184 (40.0%)	146 (41.0%)	
Secondary	118 (35.2%)	98 (21.3%)	110 (30.9%)	
Tertiary	24 (7.2%)	9 (2.0%)	10 (2.8%)	
Children				.05
Without children	100 (29.9%)	107 (23.3%)	81 (22.8%)	
With children	235 (70.1%)	353 (76.7%)	275 (77.2%)	
Chronic illnesses ^a				.04
Did not have chronic illnesses	53 (15.8%)	88 (19.1%)	45 (12.6%)	
Had chronic illnesses	282 (84.2%)	372 (80.9%)	311 (87.4%)	
UCLA Loneliness Scale (UCLA-LS)	M (SD) 50.43 (7.27)	M (SD) 51.63 (6.63)	M (SD) 51.54 (7.91)	.05
De Jong Gierveld Loneliness Scale (DJGL)	4.50 (1.45)	4.83 (1.39)	4.28 (1.40)	<.001
Sleep Condition Indicator (SCI)	23.00 (7.67)	22.84 (7.74)	21.21 (8.48)	.004
Psychological Wellbeing Scale (PWB)	56.90 (8.27)	55.13 (6.43)	55.92 (8.24)	.01
Multidimensional Scale of Perceived Social Support (MSPSS)	40.96 (15.10)	37.88 (13.17)	38.06 (16.40)	.01
Depressive symptoms (Patient Health Questionnaire, PHQ-9)	2.01 (3.52)	2.54 (3.95)	2.60 (3.97)	.08
Anxiety symptoms (Hospital Anxiety and Depression, HADS)	1.75 (3.40)	2.53 (3.76)	2.26 (3.55)	.01
Perceived Stress Scale (PSS)	16.52 (11.69)	20.26 (10.82)	11.76 (11.12)	<.001
Satisfaction with Life Scale (SWLS)	18.94 (4.09)	18.14 (4.04)	19.23 (3.54)	<.001
Social network engagement (Lubben Social Network, LSNS-6)	8.15 (5.81)	7.20 (5.56)	8.46 (6.28)	.01

Notes. ANOVA and χ^2 were used to test differences in continuous and categorical variables. SD , standard deviation; Tele-BA, telephone-delivered behavioural activation; Tele-MF, telephone-delivered mindfulness; Tele-BF, telephone-delivered befriending. ^aChronic nonspecific lung diseases, cardiac disease, peripheral disease, stroke, diabetes mellitus, arthritis and cancer.

eight sessions, and 110 (32.8%) completed all eight sessions. In the Tele-MF group, 222 participants (48.3%) completed at least six out of eight sessions, and 140 (30.4%) completed all eight sessions. In the Tele-BF group, 273 participants (76.7%) completed at least six out of eight sessions, and 151 (42.4%) completed all eight sessions. Follow-up data on the primary outcome were available for 631 (54.8%) participants at T1, 574 (49.9%) participants at T2, and 505 (43.9%) participants at T3, when compared to baseline. Dropout rates at the 6-month follow-up (T3) were 54.6%, 64.6% and 44.9% for Tele-BA, Tele-MF and Tele-BF, respectively, compared to baseline. Assessment completers were younger, reported lower perceived stress levels and had a higher social engagement with small effect sizes, but they did not differ from noncompleters in other baseline characteristics (see eTable 3).

Primary outcomes

Table 2 provides a descriptive summary of the primary outcomes, effect estimates and effect sizes of ITT analyses for loneliness. Loneliness measured by the UCLA-LS exhibited significant overall between-group differences at all time points ($P < .001$). Compared to Tele-BF participants, Tele-BA participants showed a significant reduction in UCLA-LS scores at T2 (mean difference [MD] = -1.96 , $P < .001$, Cohen's $d = 0.46$) and T3 (MD = -1.53 , $P = .002$, Cohen's $d = 0.03$). Significant between-group differences were observed for Tele-MF and Tele-BF at T2 (MD = -1.49 , $P = .004$, Cohen's $d = 0.35$) but not at T3 (MD = -0.79 , $P = .161$), indicating that the effects were not sustained (Figure 2).

In terms of loneliness assessed by DJGL, significant overall between-group differences were observed from T0 to T3.

Table 2. Mixed-effects analyses on loneliness using ITT ($N = 1151$)

Estimates across four assessments, mean (95% CI) ^{1,2,3}				Tele-BA vs. Tele-BF		Tele-MF vs. Tele-BF		Overall between-group difference <i>P</i> -value
Measures	Tele-BA (<i>n</i> = 335)	Tele-MF (<i>n</i> = 460)	Tele-BF (<i>n</i> = 356)	Mean difference (Tele-BA – Tele-BF) (95% CI)	Cohen's <i>d</i>	Mean difference <i>P</i> -value	Mean difference <i>P</i> -value	
UCLA-LS								
T0	50.43 (49.66, 51.21)	51.63 (51.02, 52.23)	51.54 (50.72, 52.36)	NA	NA	NA	NA	NA
T1	49.50 (48.79, 50.20)***	49.70 (49.09, 50.30)***	50.66 (49.97, 51.34)***	−1.16 (−2.36, 0.05)	0.162	.064	−0.96 (−2.07, 0.16)	.193
T2	48.92 (48.21, 49.62)***	49.40 (48.80, 50.00)***	50.88 (50.20, 51.56)	−1.96 (−3.16, −0.77)	0.463	<.001	−1.49 (−2.60, −0.37)	.004
T3	48.02 (47.40, 48.65)***	48.76 (48.23, 49.29)***	49.55 (48.95, 50.15)***	−1.53 (−2.59, −0.47)	0.031	.002	−0.79 (−1.77, 0.19)	.161
DJGL								
T0	4.50 (4.35, 4.66)	4.83 (4.71, 4.96)	4.28 (4.13, 4.42)	NA	NA	NA	NA	NA
T1	4.16 (4.04, 4.28)***	4.40 (4.30, 4.51)***	4.00 (3.89, 4.12)***	0.15 (−0.05, 0.36)	0.065	.221	0.40 (0.05, 0.44)	<.001
T2	4.02 (3.91, 4.14)***	4.30 (4.20, 4.40)***	4.09 (3.97, 4.20)	−0.06 (−0.26, 0.13)	0.396	1.000	0.22 (0.03, 0.40)	.013
T3	3.90 (3.80, 4.00)***	4.19 (4.10, 4.27)***	3.93 (3.83, 4.02)***	−0.03 (−0.20, 0.14)	0.066	1.000	0.26 (0.10, 0.42)	<.001
								.006

Notes. Linear mixed models (LMMs) with maximum likelihood missing data treatment; all P -values reported are nonadjusted. In this study, $P \leq .008$ will be considered statistically significant. Tele-BA, telephone-delivered behavioural activation; Tele-MF, telephone-delivered mindfulness; Tele-BF, telephone-delivered befriending; UCLA-LS, UCLA Loneliness Scale; DJGL, De Jong Gierveld Loneliness Scale. ^aPaired t -test between scores at T0 (baseline) and T1 (4-week assessment) for each intervention group separately; ^bPaired t -test between scores at T0 (baseline) and T2 (3-month assessment) for each intervention group separately; ^cPaired t -test between scores at T0 (baseline) and T3 (6-month assessment) for each intervention group separately.

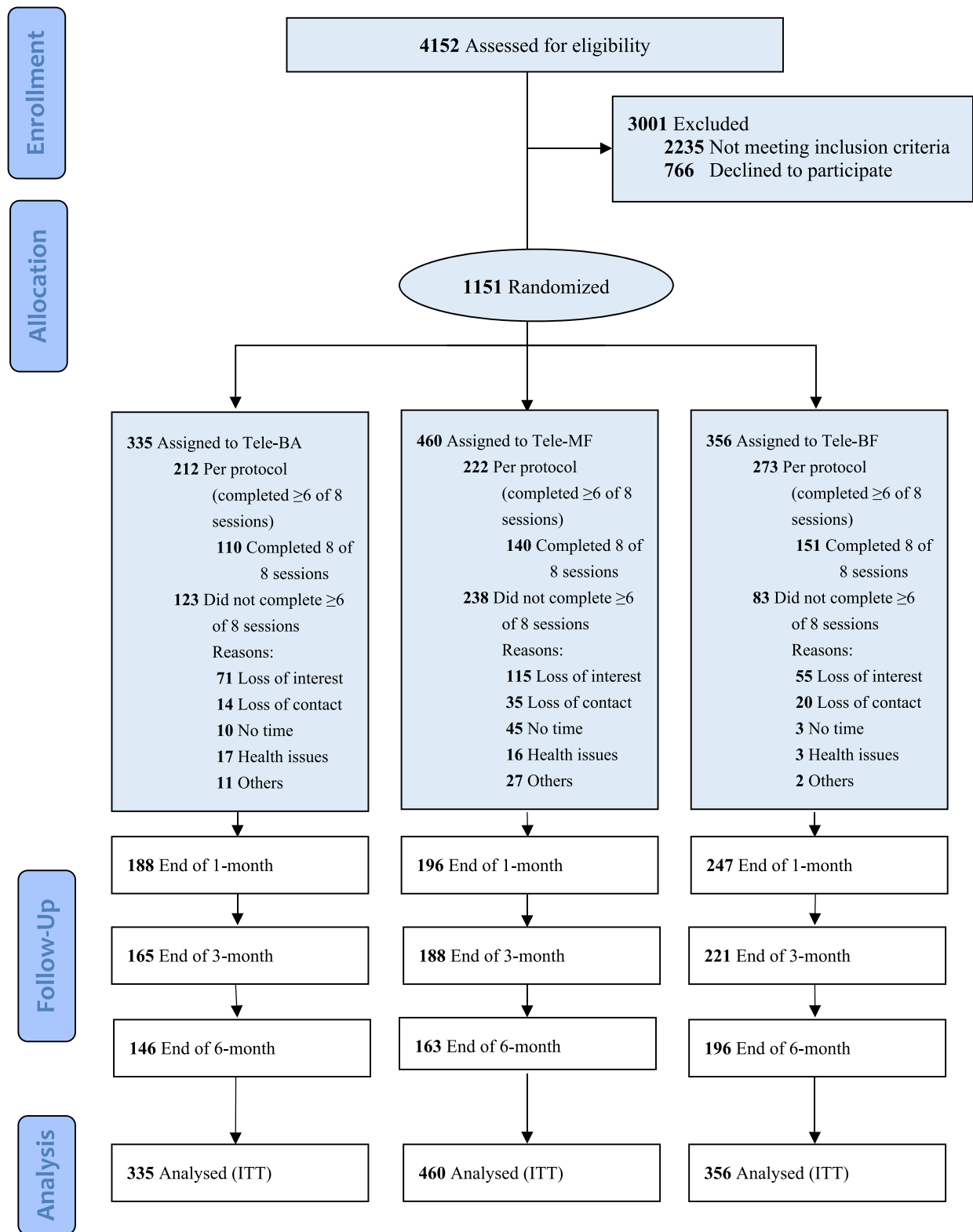


Figure 1. CONSORT Diagram.

However, no significant difference was found between Tele-BA and Tele-BF from T1 through T3. Tele-MF participants showed higher loneliness than Tele-BF participants from T1

through T3 (T1: MD = 0.40, $P < .001$, Cohen's $d = 0.21$; T2: MD = 0.22, $P = .013$, Cohen's $d = 0.13$; T3: MD = 0.26, $P < .001$, Cohen's $d = 0.32$). The majority of results for

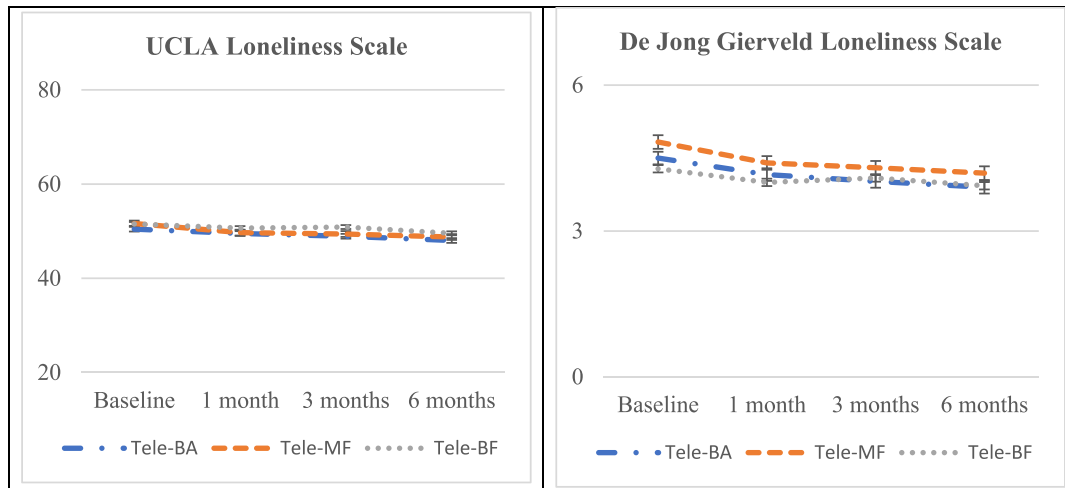


Figure 2. Marginal means of primary outcomes from baseline to 6-month follow-up.

the primary outcomes were consistent across the ITT and per-protocol sensitivity analyses, except that the differences between Tele-MF and Tele-BF at T2, and between Tele-BA and Tele-BF at T3, became nonsignificant in the per-protocol sensitivity analysis (Supplementary eTable 4).

Secondary outcomes

Table 3 shows the results of ITT analyses for the secondary outcomes. Both Tele-BA and Tele-MF participants reported better sleep quality than Tele-BF participants from T1 through T3 (T1: Tele-BA: MD = 2.30, $P < .001$, Cohen's $d = 0.40$; Tele-MF: MD = 2.22, $P < .001$, Cohen's $d = 0.41$; T2: Tele-BA: MD = 2.10, $P < .001$, Cohen's $d = 0.26$; Tele-MF: MD = 2.00, $P < .001$, Cohen's $d = 0.24$; T3: Tele-BA: MD = 1.59, $P < .001$, Cohen's $d = 0.01$; Tele-MF: MD = 1.43, $P < .001$, Cohen's $d = 0.05$). Compared to Tele-BF participants, Tele-BA participants reported better psychological well-being and perceived social support from T1 through T3 (Psychological Well-being T1: MD = 1.28, $P = .045$, Cohen's $d = 0.20$; T2: MD = 2.17, $P < .001$, Cohen's $d = 0.49$; T3: MD = 1.56, $P = .002$, Cohen's $d = 0.04$; Perceived Social Support T1: MD = 2.28, $P = .042$, Cohen's $d = 0.12$; T2: MD = 3.06, $P < .001$, Cohen's $d = 0.36$; T3: MD = 2.65, $P = .002$, Cohen's $d = 0.11$). In addition, the Tele-BA group showed lower levels of depression and anxiety at T1 and T2 but not at T3 (Depression T1: MD = -0.63, $P = .032$, Cohen's $d = 0.21$; T2: MD = -0.60, $P = .014$, Cohen's $d = 0.19$; Anxiety T1: MD = -0.56, $P = .023$, Cohen's $d = 0.22$; T2: MD = -0.54, $P = .011$, Cohen's $d = 0.20$). However, Tele-MF did not significantly differ from Tele-BF on these secondary outcomes (Figure 3).

Tele-BA and Tele-MF did not differ significantly from Tele-BF in terms of life satisfaction and social network size. Surprisingly, Tele-BF participants reported lower perceived stress than Tele-BA and Tele-MF at T1, T2 and T3 (Tele-BA vs. Tele-BF: T1: MD = 3.79, $P < .001$, Cohen's

$d = 0.28$; T2: MD = 3.30, $P < .001$, Cohen's $d = 0.25$; T3: MD = 3.10, $P < .001$, Cohen's $d = 0.32$; Tele-MF vs. Tele-BF: T1: MD = 7.29, $P < .001$, Cohen's $d = 0.64$; T2: MD = 6.51, $P < .001$, Cohen's $d = 0.55$; T3: MD = 6.18, $P < .001$, Cohen's $d = 0.71$).

Discussion

To our knowledge, this study represents the largest-scale RCT to date, utilising psychosocial interventions to address loneliness among highly vulnerable older adults—specifically, those who live alone, face socioeconomic deprivation and lack digital access. Importantly, our study demonstrated the effectiveness of both the telephone-based behavioural activation and the telephone-based mindfulness interventions, compared to the telephone-based befriending attention control, all delivered by lay counsellors during the COVID-19 pandemic.

Few intervention programs have demonstrated effectiveness in reducing loneliness through a rigorous RCT [12]. A study by Kahlon *et al.* [12] showed the effectiveness of a layperson-delivered, empathy-focused telephone programme. However, it only assessed short-term effectiveness in loneliness with a 4-week follow-up and included a passive control group without any intervention. In contrast, our intervention aimed to address these limitations by investigating the long-term effectiveness of the interventions compared to tele-befriending.

Compared to befriending as an attention control, tele-behavioural activation was effective in reducing loneliness, as measured by the UCLA Loneliness Scale, at both T2 (3-month) and T3 (6-month) follow-ups. Additionally, tele-behavioural activation was effective in improving psychological well-being, perceived social support and sleep quality from T1 to T3. Tele-Mindfulness was effective in reducing loneliness, as measured by the UCLA Loneliness Scale, at T2; however, this effect was not sustained at T3.

Table 3. Mixed-effects analyses on secondary outcomes using ITT ($N = 1151$)

	Estimates across four assessments, mean (95% CI) ^{1,2,3}			Tele-BA vs. Tele-BF			Tele-MF vs. Tele-BF			Overall between- group difference, <i>P</i> -value
Measures	Tele-BA (<i>n</i> = 335)	Tele-MF (<i>n</i> = 460)	Tele-BF (<i>n</i> = 356)	Mean difference (Tele-BA – Tele-BF) (95% CI)	Cohen’s <i>d</i>	Mean difference <i>P</i> -value	Mean difference (Tele-MF – Tele-BF) (95% CI)	Cohen’s <i>d</i>	Mean difference <i>P</i> -value	
SCI										
T0	23.00 (22.18, 23.82)	22.84 (22.13, 23.55)	21.21 (20.32, 22.09)	NA	NA	NA	NA	NA	NA	NA
T1	23.23 (22.49, 23.96)	23.14 (22.51, 23.77)**	20.93 (20.21, 21.64)	2.30 (1.04, 3.56)	0.397	<.001	2.22 (1.05, 3.38)	0.406	<.001	.006
T2	23.28 (22.61, 23.95)	23.18 (22.61, 23.75)	21.18 (20.53, 21.83)	2.10 (0.96, 3.23)	0.259	<.001	2.00 (0.94, 3.05)	0.243	<.001	.967
T3	22.99 (22.42, 23.56)*	22.83 (22.34, 23.32)**	21.40 (20.85, 21.96)	1.59 (0.61, 2.56)	0.010	<.001	1.43 (0.53, 2.34)	0.048	<.001	<.001
PWB										
T0	56.90 (56.01, 57.78)	55.13 (54.54, 55.72)	55.92 (55.01, 56.78)	NA	NA	NA	NA	NA	NA	NA
T1	58.70 (57.96, 59.44)***	57.05 (56.41, 57.68)***	57.41 (56.69, 58.13)***	1.28 (0.02, 2.55)	0.197	.045	−0.36 (−1.54, 0.81)	0.009	1.000	.122
T2	59.36 (58.64, 60.09)***	57.73 (57.11, 58.35)***	57.19 (56.49, 57.90)***	2.17 (0.94, 3.41)	0.492	<.001	0.54 (−0.61, 1.69)	0.310	.782	<.001
T3	60.70 (59.43, 60.71)***	58.21 (57.67, 58.76)***	58.52 (57.90, 59.14)***	1.56 (0.47, 2.65)	0.038	.002	−0.30 (−1.31, 0.71)	0.396	1.000	.071
MSPSS										
T0	40.96 (39.35, 42.58)	37.88 (36.68, 39.09)	38.06 (36.35, 39.76)	NA	NA	NA	NA	NA	NA	NA
T1	41.97 (40.67, 43.28)**	40.09 (38.98, 41.21)***	39.69 (38.42, 40.96)***	2.28 (0.06, 4.51)	0.120	.042	0.40 (−1.66, 2.47)	0.076	1.000	.029
T2	42.76 (41.57, 43.94)***	41.48 (40.47, 42.49)***	39.70 (38.55, 40.85)**	3.06 (1.04, 5.08)	0.361	<.001	1.78 (−0.09, 3.65)	0.381	.069	<.001
T3	43.94 (42.86, 45.01)***	42.34 (41.42, 43.26)***	41.29 (40.24, 42.33)***	2.65 (0.82, 4.48)	0.114	.002	1.06 (−0.64, 2.76)	0.092	.410	.755
PHQ-9										
T0	2.01 (1.64, 2.39)	2.54 (2.18, 2.90)	2.60 (2.19, 3.01)	NA	NA	NA	NA	NA	NA	NA
T1	1.98 (1.63, 2.33)	2.33 (2.03, 2.63)***	2.61 (2.27, 2.95)	−0.63 (−1.23, −0.04)	0.205	.032	−0.28 (−0.83, 0.27)	0.151	.657	.058
T2	2.11 (1.82, 2.41)*	2.45 (2.20, 2.71)	2.71 (2.42, 3.00)	−0.60 (−1.11, −0.09)	0.188	.014	−0.26 (−0.73, 0.21)	0.077	.551	.572
T3	2.26 (2.01, 2.51)**	2.69 (2.47, 2.90)***	2.69 (2.44, 2.93)	−0.43 (−0.86, 0.00)	0.029	.052	−0.00 (−0.40, 0.40)	0.287	1.000	<.001
HADS										
T0	1.75 (1.39, 2.11)	2.53 (2.19, 2.88)	2.26 (1.89, 2.63)	NA	NA	NA	NA	NA	NA	NA
T1	1.72 (1.42, 2.02)	2.29 (2.04, 2.54)***	2.29 (2.00, 2.57)	−0.56 (−1.07, −0.06)	0.223	.023	0.00 (−0.47, 0.48)	0.093	1.000	.027

(continued)

Table 3. Continued.

Measures	Estimates across four assessments, mean (95% CI) ^{1,2,3}			Tele-BA vs. Tele-BF			Tele-MF vs. Tele-BF			Overall between- group difference, <i>P</i> -value
	Tele-BA (<i>n</i> = 335)	Tele-MF (<i>n</i> = 460)	Tele-BF (<i>n</i> = 356)	Mean difference (Tele-BA – Tele-BF) (95% CI)	Cohen's <i>d</i>	Mean difference <i>P</i> -value	Mean difference (Tele-MF – Tele-BF) (95% CI)	Cohen's <i>d</i>	Mean difference <i>P</i> -value	
T2	1.77 (1.51, 2.03)	2.32 (2.09, 2.54)	2.31 (2.05, 2.56)	−0.54 (−0.98, −0.09)	0.197	.011	0.01 (−0.40, 0.42)	0.006	1.000	.289
T3	1.85 (1.63, 2.08)	2.47 (2.81, 2.66)*	2.15 (1.93, 2.36)**	−0.30 (−0.68, 0.09)	0.213	.190	0.32 (−0.03, 0.68)	0.561	.084	<.001
PSS										
T0	16.52 (15.27, 17.77)	20.26 (19.27, 21.25)	11.76 (10.60, 12.91)	NA	NA	NA	NA	NA	NA	NA
T1	14.99 (13.92, 16.07)***	18.50 (17.58, 19.41)***	11.21 (10.16, 12.25)**	3.79 (1.96, 5.62)	0.284	<.001	7.29 (5.59, 8.99)	0.643	<.001	<.001
T2	14.20 (13.20, 15.19)***	17.40 (16.55, 18.25)***	10.89 (9.92, 11.86)***	3.30 (1.60, 5.00)	0.250	<.001	6.51 (4.93, 8.08)	0.549	<.001	<.001
T3	14.67 (13.81, 15.53)	17.75 (17.02, 18.49)**	11.58 (10.74, 12.41)**	3.10 (1.63, 4.56)	0.323	<.001	6.18 (4.82, 7.53)	0.714	<.001	<.001
SWLS										
T0	18.94 (18.50, 19.38)	18.14 (17.77, 18.51)	19.23 (18.86, 19.60)	NA	NA	NA	NA	NA	NA	NA
T1	19.63 (19.29, 19.98)***	19.07 (18.77, 19.37)***	19.65 (19.31, 19.99)***	−0.02 (−0.61, 0.57)	0.076	1.000	−0.58 (−1.13, −0.03)	0.023	.034	<.001
T2	20.10 (19.76, 20.43)***	19.58 (19.29, 19.86)***	19.66 (19.33, 19.98)***	0.44 (−0.13, 1.01)	0.395	.192	−0.08 (−0.61, 0.45)	0.265	1.000	<.001
T3	20.56 (20.27, 20.85)***	19.90 (19.65, 20.15)***	20.31 (20.02, 20.59)***	0.25 (−0.24, 0.75)	0.080	.666	−0.40 (−0.87, 0.06)	0.367	.109	.480
LSNS-6										
T0	8.15 (7.53, 8.77)	7.20 (6.69, 7.71)	8.46 (7.81, 9.12)	NA	NA	NA	NA	NA	NA	NA
T1	8.51 (8.01, 9.01)*	7.84 (7.42, 8.27)***	8.71 (8.23, 9.19)	−0.20 (−1.04, 0.65)	0.018	1.000	−0.87 (−1.65, −0.08)	0.100	.025	.071
T2	8.89 (8.45, 9.33)***	8.50 (8.13, 8.87)***	8.64 (8.22, 9.07)	0.25 (−0.50, 0.99)	0.249	1.000	−0.14 (−0.83, 0.55)	0.295	1.000	<.001
T3	9.34 (8.94, 9.74)***	9.06 (8.72, 9.40)***	8.92 (8.54, 9.31)***	0.42 (−0.26, 1.10)	0.201	.420	0.14 (−0.49, 0.77)	0.220	1.000	<.001

Notes. Linear mixed models (LMMs) with maximum likelihood missing data treatment; Tele-BA, telephone-delivered behavioural activation; Tele-MF, telephone-delivered mindfulness; Tele-BF, telephone-delivered befriending; SCI, Sleep Condition Indicator; PWB, Psychological Wellbeing Scale; MSPSS, Multidimensional Scale of Perceived Social Support; PHQ-9, Patient Health Questionnaire-9; HADS, Anxiety subscale of Hospital Anxiety and Depression Scale; PSS, Perceived Stress Scale; SWLS, Satisfaction with Life Scale; LSNS-6, Lubben Social Network Scale. *** $P < .001$, ** $P < .01$, * $P < .05$. ^aPaired t -test between scores at T0 (baseline) and T1 (4-week assessment) for each intervention group separately. ^bPaired t -test between scores at T0 (baseline) and T2 (3-month assessment) for each intervention group separately. ^cPaired t -test between scores at T0 (baseline) and T3 (6-month assessment) for each intervention group separately.

Tele-Mindfulness participants also reported improved sleep quality from T1 to T3 but did not experience significant improvements in psychological well-being or perceived social support. There were no significant differences between the

intervention groups and the attention control befriending group in terms of depressive symptoms and anxiety, which may be attributable to the low values of these outcomes already at baseline.

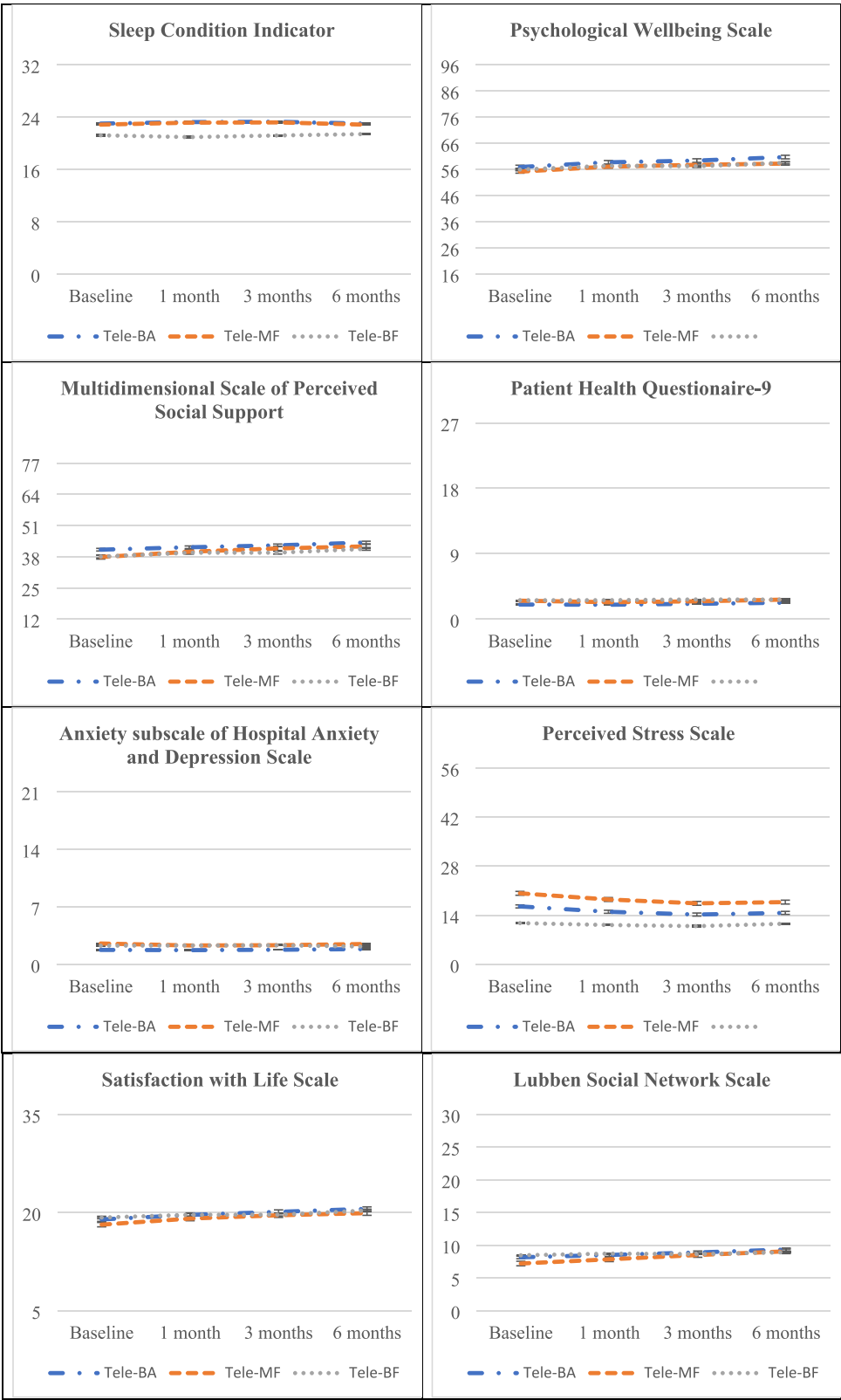


Figure 3. Marginal means of secondary outcomes from baseline to 6-month follow-up.

Similarly, tele-befriending participants showed lower levels of loneliness as assessed by the De Jong Gierveld Loneliness Scale from T1 to T3, compared to tele-mindfulness

participants. No significant differences in loneliness were observed between the tele-behavioural activation and the tele-befriending from T1 to T3 as measured by

the De Jong Gierveld Loneliness Scale. These findings may reflect the different conceptualisations of loneliness assessed by the two different scales. The UCLA Loneliness Scale conceptualises loneliness as a singular dimension encompassing deficiencies in various relationships, whereas the De Jong Gierveld Loneliness Scale distinguishes between social and emotional loneliness, capturing the perceived absence of social interactions and emotional attachments, respectively. Especially during the pandemic, social activities and relationship-building opportunities were particularly constrained by social and physical distancing policies. In this context, regular telephone conversations (as in Tele-Befriending) may have been more effective in alleviating loneliness than solitary mindfulness practices. Notably, all three groups experienced within-group reductions in loneliness across both measures, suggesting intervention effects within each group. While the data from this study alone cannot fully explain the reasons for these divergent intervention effects, they offer valuable insights into the complex mechanisms underlying loneliness reduction and highlight critical directions for future research. Specifically, further investigation is needed to determine whether and how interventions differentially impact social versus emotional loneliness. Such insights would not only inform the design of targeted loneliness interventions but also advance theoretical frameworks for understanding and addressing loneliness.

The tele-befriending group, the attention control, showed lower levels of perceived stress than the two intervention groups across all time points. This may be attributed to the nature of the intervention, which involved unstructured, casual conversations about neutral topics with a person of similar age, offering participants low-pressure social engagement that mimicked natural companionship. The immediate stress-relieving effects of tele-befriending likely stemmed from its informal, low-demand format, consistent with evidence that unstructured social support can buffer stress during crises [12]. In contrast, our structured behavioural activation and mindfulness interventions required participants to learn new skills during a pandemic over the telephone, potentially introducing transient stress. Additionally, the cognitive load associated with skills acquisition, coupled with the performance pressure from tracking progress and completing homework, may have felt more stressful to participants at times [12].

When comparing the two intervention conditions, it appears that behavioural activation, which aims to enhance self-efficacy and find meaning and pleasure in daily life, is more effective in reducing loneliness and improving psychological well-being during the pandemic. These findings are consistent with previous studies of delivering behavioural activation remotely [15, 24] and underscore the significance of interventions that help older adults cultivate self-efficacy and find a sense of meaning in order to reduce loneliness and enhance well-being [57–59]. Tele-Mindfulness, however, did not demonstrate sustained effects at the 6-month follow-up or positive effects on psychological well-being during

the pandemic. These findings suggest that participants may find it easier to engage in behavioural activation than in mindfulness practices in their daily lives and that the benefits of mindfulness training may require ongoing practice to be sustained.

Theoretical and practical implications

Our three-arm RCT advanced both the theoretical and practical understanding of loneliness interventions from several perspectives. First, we directly compared two different psychosocial approaches, tele-behavioural activation and tele-mindfulness, against an attention control befriending programme. BA is designed to enhance positivity and meaningfulness through value-based activities and engagement, while mindfulness emphasises regulating negative emotions by increasing present-moment awareness and fostering a sense of acceptance. This trial sheds light on the effects of different theoretical pathways for reducing loneliness. The findings reveal that tele-behavioural activation led to sustained reductions in loneliness (measured by the UCLA Loneliness Scale) for up to 6 months, whereas the effects of mindfulness diminished over time. These results align with the socioemotional selectivity theory [60] and the positivity effect [61], which suggest that older adults prioritise activities and stimuli that promote positivity and emotional meaningfulness. Thus, interventions that focus on increasing positive activities or emotions may be more effective in reducing loneliness than those that primarily target negative affect among older adults. These findings also underscore the need for future research to explore the underlying mechanisms, addressing critical gaps in loneliness intervention studies.

Furthermore, the study employed ‘multiple validated measures’ (UCLA Loneliness Scale for unidimensional loneliness and De Jong Gierveld Loneliness Scale for social/emotional loneliness) to capture distinct dimensions of loneliness. The differential outcomes across the scales (e.g. behavioural activation intervention improved loneliness measured by the UCLA Loneliness Scale but not De Jong Gierveld Loneliness Scale) emphasise the need for multidimensional assessments and contribute to advancing theory by demonstrating that interventions may selectively impact specific facets of loneliness.

Another innovative aspect of our RCT is the use of trained lay counsellors aged 50–70 who have personal experience of loneliness to deliver the interventions. This ‘older-adult peer support’ model leverages peer relatability and shared life experiences. Based on the social learning theory [62], interventions delivered by in-group members may enhance trust and engagement, potentially yielding better outcomes than those provided by individuals from younger age groups. This approach not only addresses scalability challenges by reducing reliance on specialised clinicians but also fosters a sustainable, community-driven public health strategy. This is particularly important in light of the rapidly ageing population in Hong Kong and many other societies.

In addition, the RCT was administered remotely via telephone during the COVID-19 pandemic, a period marked by heightened isolation among digitally excluded older adults. The successful delivery of all interventions via such a low-tech channel demonstrates the feasibility of scalable, cost-effective models for reaching vulnerable populations, even in crises. The public health implications are notable: this trial offers a scalable blueprint for deploying layperson-delivered, telephone-based programmes in resource-limited settings or during emergencies, thereby expanding access to services and support for underserved populations. By integrating theoretical rigour, methodological innovation and real-world applicability, the study bridges the gap between academic research and actionable public health solutions, ultimately advocating for policies prioritising accessible, peer-supported interventions to combat the global loneliness epidemic.

Strengths and limitations

In addition to the theoretical and practical implications, the study has several notable strengths that enhance its overall validity and applicability. First, the sample size was adequate and consisted of vulnerable, lonely older adults. This demographic focus not only strengthens the robustness of the findings but also ensures their practical relevance and generalisability to similar populations. Second, the diverse interventions implemented in the study had varying foci, allowing for a nuanced comparison of their effects. This aspect is particularly valuable as it helps identify which specific elements of the interventions are most effective in reducing loneliness. Third, the trial included a comparison with a strong attention control condition, specifically befriending. This design feature enables a clear distinction between the impact of receiving mere companionship and the effects of learning specific skills to reduce loneliness. Fourth, the study's assessment of both short-term and medium-term effects provides a comprehensive understanding of the interventions' effectiveness, allowing researchers to gauge not only immediate outcomes but also the sustainability of the benefits over time. Collectively, these strengths offer a deeper understanding of the complexities of loneliness interventions among older adults, informing future research and clinical practices.

We also acknowledge a few limitations: the ongoing pandemic posed challenges to participant enrollment and adherence, resulting in slightly higher dropout rates compared to other studies. A meta-analysis of smartphone-based mental health interventions reported attrition rates of 24.1% at short-term follow-up (≤ 8 weeks) and 35.5% at longer-term follow-up [63]. Mental health interventions during the COVID-19 pandemic sometimes experienced higher dropout rates than in prepandemic periods [64, 65]. The dropouts in our study may be due to the unique challenges faced by our study population, i.e. older adults living in socioeconomic deprivation, with limited digital access and experiencing high levels of loneliness. These findings underscore the importance of developing strategies to enhance

adherence and retention in future interventions, such as incorporating motivational interviewing techniques or simplifying intervention protocols.

The higher dropout rates in tele-behavioural activation and tele-mindfulness conditions compared to the attention control may reflect the additional cognitive and behavioural demands of these interventions. As aforementioned, participants in tele-behavioural activation and tele-mindfulness need to learn new skills and complete assignments. However, the attention control was less structured and focused on providing social connectedness, which may have been more accessible and less demanding for participants. Future studies should consider simplifying intervention protocols to increase adherence and retention in the intervention.

This difference in dropout rates points to the importance of tailoring interventions to the needs and capabilities of the target population. Future studies could explore ways to simplify the delivery of tele-behavioural activation and tele-mindfulness, such as reducing the number of sessions or incorporating more flexible scheduling. Additionally, providing participants in these conditions with extra support (e.g. further optional group calls) or resources (e.g. written training materials) may help improve adherence and reduce dropout rates. To address these issues, both ITT and per-protocol analyses were conducted.

In addition to the dropout rate, we noted differences in the baseline characteristics across participant groups. A scoping review suggested that individual characteristics may moderate intervention outcomes for depression among adolescents [66]. Although we did not identify a comparable review for interventions targeting the mental health of older adults or those addressing loneliness, baseline differences in our study may have influenced participants' responsiveness to mindfulness and behavioural interventions. While the current study employed randomisation and validated the findings using both ITT and per-protocol analyses, future research should adopt strategies to ensure balanced baseline characteristics. Another limitation of this study is the impact of Hong Kong's stringent social policies implemented during the data collection period. These measures led to significant delays in the delivery of interventions and contributed to a higher dropout rate among the participants in the tele-mindfulness group. Although we adjusted the allocation ratio to address this issue, this imbalance may have introduced bias into the findings. Future studies should consider these contextual factors and further validate the findings. Additionally, the study did not assess the long-term intervention effects beyond 6 months. However, it is worth noting that most previous studies focused on shorter time frames, typically ranging from 4–6 weeks.

Conclusion

This RCT found that a layperson-delivered, telephone-based behavioural activation intervention was effective in reducing

loneliness and improving psychological well-being, perceived support and sleep quality at both 3-month and 6-month follow-up assessments, compared to a befriending intervention. In addition, a layperson-delivered, telephone-based mindfulness intervention was effective in reducing loneliness at the 3-month follow-up. These findings underscore the potential of training laypeople, particularly older adult peers, to deliver scalable psychosocial interventions via telephones to other older adults, who are often difficult to engage through in-person services.

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Supplementary Data: Supplementary data are available at *Age and Ageing* online.

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