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Effect of Group Cognitive Behavioural Therapy on Loneliness in a Community Sample of Older Adults: A Secondary Analysis of a Randomised Controlled Trial

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Objectives: Research suggests a link between loneliness, depression and anxiety. Multiple studies have examined treatment programs for loneliness, however none have examined the efficacy of Cognitive Behavioural Therapy (CBT) for depression and anxiety in reducing loneliness.

Methods: Change in loneliness in sixty-two older adults (≥ 60yrs; 65% female) who took part in a previously reported randomised controlled trial for the treatment of comorbid depression and anxiety was examined. Older adults were randomised to a 12-week group CBT or waitlist control condition. Participants who took part in CBT were followed-up three months later.

Results: Linear Mixed Model analyses indicated that after controlling for baseline cognition, depression and anxiety, participants who completed CBT experienced a significant decrease in loneliness while the control group did not. This reduction was maintained at follow-up.

Conclusions: CBT programs for depression and anxiety are likely to be effective at reducing loneliness. This may be due to shared underlying cognitive and behavioural mechanisms between loneliness, depression, and anxiety such as sensitivity to perceived threat and social withdrawal. Further research is needed to understand if specific loneliness interventions are more effective.

Clinical Implications: CBT may be effective at reducing loneliness among older adults with depression and anxiety.

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Keywords: loneliness, anxiety, depression, Cognitive Behavioural Therapy, older adults

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Introduction

Loneliness refers to a discrepancy between an individual's preferred and actual social relationships (Peplau & Perlman, 1982) that leads to distress related to feeling socially isolated (although being alone is not a requirement) (J. T. Cacioppo et al., 2015). Loneliness is strongly linked to depression and anxiety (Douglas, Georgiou, & Westbrook, 2017; Golden et al., 2009; Hawkley & Cacioppo, 2010). For example, Golden et al. (2009) found that loneliness and having poor social networks together accounted for 70% of the population-attributable risk for depression in a large sample of older adults (N=1,299). The direction of causality between social interactions and depression is unclear, but is likely bidirectional (Hodgetts, Gallagher, Stow, Ferrier, & O'Brien, 2017). That is, emotional distress most likely impedes social participation through its characteristics such as irritability, social withdrawal, anhedonia, and negative cognitive biases. At the same time, a lack of quality social interactions is likely to directly increase feelings of worthlessness and rejection and thereby produce or maintain symptoms of anxiety, depression, and suicidal ideation. There is also emerging evidence of a link between loneliness and social anxiety, with research suggesting shared maintaining factors. For example, loneliness and social anxiety are both likely maintained by sensitivity to threat perception, real or perceived rejection, as well as behaviours such as social withdrawal (Alden & Taylor, 2004; J. T. Cacioppo & Hawkley, 2009; Fung, Paterson, & Alden, 2017; Lim, Eres, & Vasan, 2020). However, although there are strong overlaps between these constructs, there is also evidence from factor analyses that loneliness and social anxiety are independent (Fung et al., 2017). Cacioppo and colleagues (2006) found strong but unique associations between loneliness and depression both cross-sectionally and longitudinally. Results of a three-year study showed that loneliness at year 1 was a predictor of the trajectory of depressive symptoms when controlling for baseline depression, demographic factors, marital status, and social support, suggesting that loneliness is a very unique risk factor that cannot be only explained by demographics and life circumstances. Similarly, depression at year 1 predicted the individual differences in loneliness throughout the

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remainder of the study after similar demographic and psychosocial controls, suggesting a cycle of bidirectional influence between these two constructs. Saeri, Cruwys, Barlow, Stronge, and Sibley (2018) similarly studied the directionality of the relationship between social connectedness and mental health, finding social connectedness more often predicts mental health.

Psychosocial interventions for loneliness have typically focused on correcting the low frequency and poor quality of social relationships by providing structured social support and social activities. Examples include befriending programs and group programs that assist people to join social groups, and teach people social skills or psychoeducation on health (Haslam et al., 2019; Masi, Chen, Hawkley, & Cacioppo, 2011). Physical activity interventions have been found to increase social functioning in older adults, but were not effective in reducing social isolation or loneliness, or increasing social support (see meta-analysis by Shvedko, Whittaker, Thompson, & Greig, 2018), suggesting a need for interventions involving more than completing activities as a group. Other interventions with significant reductions in loneliness include humour therapy (Tse et al., 2010), mindfulness-based stress reduction (Creswell et al., 2012), and studies involving human-animal interaction (Banks & Banks, 2005). In the absence of community or face-to-face social programs, researchers have found computer and internet-based programs hold a moderate treatment effect for reducing loneliness (Choi, Kong, & Jung, 2012).

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Only very recently has there been more focus on understanding underlying mechanisms that maintain loneliness, and emerging evidence that social cognitions, namely, cognitive biases related to social threat, hostility and rejection play an important role (Hawkley & Cacioppo, 2010). Interventions that target these factors are few but appear to be more effective in treating loneliness than interventions just focused on increasing social networks alone. In a systematic review and meta-analysis, Masi et al. (2011) found that interventions targeting the cognitive biases underlying loneliness were associated with a moderate effect size (Cohen's $d = -0.59$) compared to very small effect size benefits for the social support interventions (Cohen's $d = -0.16$), social interaction interventions (Cohen's d = -0.06)

and social skills interventions (Cohen's $d = 0.02$). The social cognitive interventions included in this review were, however, very diverse and included reminiscence therapy (Chiang et al., 2010), reframing (Conoley & Garber, 1985), and one study of Cognitive Behavioural Therapy (CBT) (McWhirter & Horan, 1996). More recent reviews have also highlighted the potential for (social) cognitive behavioural therapy interventions that target changing social cognitions to improve loneliness, and highlight the need for more rigorous research in this area (S. Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015; Mann et al., 2017)

CBT targets cognitive biases as well as behaviours that maintain emotional distress. CBT programs have already been shown to be effective in treating depression and anxiety in older adults (Cuijpers, Karyotaki, Pot, Park, & Reynolds, 2014; Gould, Coulson, & Howard, 2012a, 2012b), and given the overlapping nature of depression and anxiety with loneliness, CBT programs for depression and anxiety might also inadvertently impact on comorbid loneliness. CBT is a good candidate for treating loneliness as it can target cognitive biases of underlying social threat perception, as well as cognitive biases related to depression and anxiety in general. In addition, behavioural strategies of activity scheduling (to target activity with other people), graded exposure (for social avoidance), and communication strategies can work together to treat loneliness as well as associated emotional distress related to depression and anxiety (e.g., irritability, anhedonia), which might maintain loneliness.

Transdiagnostic CBT programs for treating loneliness alongside depression and anxiety are limited, with evidence from younger adults showing promising findings. Käll et al. (2020) found that an internet-delivered CBT program reduced loneliness and comorbid social anxiety, but not comorbid depression and worry. Meuret et al. (2016) found improvements in social connection and identification following group CBT for social anxiety disorder. Further, Cruwys et al. (2014) found that greater social connection and identification within the therapy group was associated with improvement in depression. To date, there is no evidence about whether standard treatments for depression and anxiety in older adults also reduce feelings of loneliness. In a secondary analysis of a randomised controlled

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trial developed to treat depression and anxiety in older adults (as the primary aim), we examined the impact of a group CBT program on feelings of loneliness over time. Based on the overlapping nature of symptoms and underlying mechanisms between depression, anxiety and loneliness, we hypothesised that: 1) group CBT would result in significant reductions in loneliness over time compared to a waitlist control group, and 2) reductions in feelings of loneliness generated by group CBT would be maintained at follow-up.

Methods

Participants

This study involved secondary data analysis from 62 older adults (aged 60-84, M = 67.44, SD = 6.19; 64.52% female) from a randomized control trial for the treatment of depression and anxiety (Wuthrich & Rapee, 2013). Participants were recruited from patient flow at the Centre for Emotional Health Clinic at Macquarie University, and advertisements in local newspapers and community organisations. Participant eligibility was based on being aged 60 years or over and having symptoms of *both* a DSM-IV anxiety and unipolar mood disorder, with either being the primary diagnosis. The most common primary disorders were Generalized Anxiety Disorder (GAD; 33.87%), Major Depressive Disorder (MDD; 20.97%), Dysthymia (14.52%), Depressive Disorder Not Otherwise Specified (DDNOS; 11.29%), Social Phobia (9.68%), Posttraumatic Stress Disorder (4.84%), Anxiety Disorder Not Otherwise Specified (ADNOS; 3.23%) and Specific Phobia (1.61%). The most common secondary diagnosis was GAD (30.65%), MDD (22.58%), Social Phobia (14.52%), Dysthymia (11.29%), Specific Phobia (9.68%), ADNOS (4.84%), DDNOS (3.23%), PTSD (1.61%) and OCD (1.61%). The majority (87.10%; n = 54) met full DSM-IV diagnosis criteria for both an anxiety and unipolar mood disorder, with 9.68% (n = 6) meeting full diagnostic criteria for their primary disorder and subthreshold criteria for their secondary diagnosis, and 3.23% (n = 2) having subthreshold symptoms for both their primary and secondary diagnosis. Exclusion criteria were: current self-harm,

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active suicidal intent, psychosis or bipolar disorder. Sample demographic and clinical information is summarised in Table 1.

Measures

Diagnostic Clinical Interview. Diagnostic status was assessed using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Di Nardo, Brown, & Barlow, 1994), a semi-structured clinical interview for diagnosing anxiety, mood and related disorders according to DSM-IV criteria. Disorder severity was rated on a 0-8 scale, with ratings ≥4 indicative of disorders that meet diagnostic thresholds, subthreshold disorders had ratings =3. The ADIS was administered by trained graduate level Clinical Psychology students, with supervision for all diagnostic decisions provided by a licensed Clinical Psychologist. In order to compare changes in anxiety and depression severity over time, we calculated a Mean Severity for Anxiety score (mean of the severity ratings for all threshold and subthreshold anxiety disorders) at pre and post-treatment, as well as a Mean Severity for Depression score (mean severity ratings for all threshold and subthreshold depressive disorders) at pre and post-treatment. Inter-rater reliability from recoding of a random sample of 25% of interviews was excellent (k = 1.00 for mood disorders and GAD, and .81 for Social Phobia).

Cognitive Ability. Cognitive status was assessed using the Addenbrooke's Cognitive Examination - Revised (ACE-R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006). The ACE-R is a cognitive screening measure sensitive to early cognitive decline (Mioshi et al., 2006). The ACE-R assesses attention and orientation, memory, verbal fluency, language and visuospatial abilities, with scores ≤82 indicative of likely dementia (sensitivity = .84, specificity 1.00; Mioshi et al., 2006). Three participants (4.84%) in the present sample scored below this cut-off (range 73-80; two in the CBT condition and one in the waitlist condition) and were retained in analyses.

Loneliness. Feelings of loneliness over the past week were assessed using a single item ("*I felt lonely*") from the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The

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item was on a 4-point likert scale, from 0 = *Rarely or None of the time* to 3 = *Most/All of the time.* Total scores range from 0-3, with higher scores indicating greater loneliness. This single-item has been used to assess loneliness in previous research, including studies with older adults (Hanratty, Stow, Collingridge Moore, Valtorta, & Matthews, 2018; Lee et al., 2019; Lim, Eres, & Peck, 2019; Menec, Newall, Mackenzie, Shooshtari, & Nowicki, 2020).

Depressive Symptoms. The Geriatric Depression Scale (GDS; Yesavage et al., 1982) is one of the most widely used self-report measures of depressive symptoms among older adults. The GDS consists of 30-items assessing depressive symptoms over the past week on a dichotomous (yes/no) response scale. Total scores range from 0 - 30, with higher scores indicative of greater depressive symptoms, and scores of ≥11 differentiating those with major depression from those without with 84% sensitivity and 95% specificity (Brink et al., 1982). The GDS has shown good internal consistency, test-retest reliability, and excellent criterion validity for detecting depressive disorders against diagnostic criteria (Stiles & McGarrahan, 1998; Wancata, Alexandrowicz, Marquart, Weiss, & Friedrich, 2006; Yesavage et al., 1982). Internal consistency was excellent in the current sample (α = .86).

Anxiety Symptoms. The Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) is a widely used 20-item measure of anxiety symptoms in older adults. The presence of anxiety symptoms over the past week are rated on a dichotomous (yes/no) response scale. Total scores range from 0 – 20 with higher scores indicating greater anxiety symptoms and scores above 8/9 differentiating older adults with an anxiety disorder from those without (Pachana et al., 2007). The GAI has shown excellent internal consistency, test-retest reliability, convergent validity with other measures of anxiety, and good criterion validity to predict anxiety disorders against diagnostic criteria (Byrne et al., 2010; Cheung, Patrick, Sullivan, Cooray, & Chang, 2012; Diefenbach, Tolin, Meunier, & Gilliam, 2009; Johnco, Knight, Tadic, & Wuthrich, 2015; Pachana et al., 2007). Internal consistency was excellent in the current sample (α = .89).

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Treatment

Participants were randomly allocated to a 12-week no-contact waitlist condition, or the *Ageing Wisely* group Cognitive Behaviour Therapy (CBT) Program. The manualised CBT program (Ageing Wisely; Wuthrich, 2009) consisted of 12 weekly two-hour sessions, and included psychoeducation about anxiety and depression, behavioural activation, cognitive restructuring, problem solving, graded exposure therapy, assertiveness training, sleep strategies, dealing with loss and bereavement and relapse prevention. Although not designed to target loneliness per se, given the relationship of loneliness to depression and anxiety in this age group, during session six the intervention included brief psychoeducation about the factors associated with loneliness (shyness and poor social networks), and one example of using cognitive restructuring skills to address maladaptive thoughts underlying lonely feelings. Groups contained 6-8 participants and were conducted by licenced Clinical Psychologists or graduate-level Clinical Psychology students who received weekly supervision. Full details of the treatment are included in Wuthrich and Rapee (2013).

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Procedure

The original study was approved by the Macquarie University Human Research Ethics Committee. All participants completed diagnostic interviews, cognitive assessments, and self-report measures during a baseline assessment prior to treatment and at post-treatment. This data was collected again three-months after treatment for the CBT group only. Those randomly allocated to the waitlist control condition were eligible to complete the CBT treatment following completion of the post-treatment assessment, and as such, three-month follow-up data was not assessed. Primary trial outcomes for anxiety and depressive symptoms are reported in Wuthrich and Rapee (2013). This study reports secondary outcomes on changes in loneliness, as well as examining effect size differences on impacts on mean anxiety and mood disorder severity in comparison to loneliness.

Data Analysis

Data analysis was conducted using SPSS (version 26, SPSS Inc., USA). All analyses were conducted as intent-to-treat and as such all participants were analysed in the group to which they were randomised. Descriptive statistics were examined for all baseline variables, with chi-square analyses and t-tests used to determine differences between CBT and waitlist groups. Differences between groups on dependent variables i.e., loneliness, anxiety and depression mean severity pre- to post-treatment were examined using hierarchical mixed models containing random intercept and random slope terms for each subject, as well as fixed effects for treatment, while controlling for cognition and self-reported anxiety and depression at baseline. Three mixed models were conducted that examined differences between groups on the CES-D loneliness variable (pre-post treatment) as the primary outcome, with mean anxiety disorder severity (pre-post treatment) and mean depressive disorder severity (pre-post treatment) as secondary outcomes. Differences in loneliness and both mean anxiety and depressive disorder severity within the CBT treatment group from post-treatment to follow up were examined using paired sample t-tests to assess for maintenance of treatment effects. Effect sizes were calculated based on Cohen's d, with 95% confidence intervals computed using procedures delineated by Odgaard and Fowler (2010).

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Results

Baseline Measures

The groups did not differ significantly in terms of any demographic features (e.g. age, income, education), pre-assessment ACE-R or pre-assessment questionnaires, with the exception that the severity of the primary diagnosis, and mean severity of all anxiety disorders, was significantly higher for the CBT condition compared to the wait list condition at pre-assessment (see Table 1). Means on self-report questionnaires (GAI, GDS) were higher than cut-offs recommended for clinical severity

(Brink et al., 1982; Pachana et al., 2007), corroborating the ADIS severity ratings that the sample were clinically impaired. Although there was no statistical difference between the means of the total ACE-R scores for the two treatment groups, given that cognitive ability varied from normal to impaired (ACE-R range 73-98), pre-assessment cognition was controlled statistically in all further analyses[1]. The mean number of treatment sessions attended was 9.31 (SD=3.11; range =1-12).

Loneliness across time and condition

Using mixed model analyses on the pooled data, the interaction between time (pre-treatment, post-treatment) and group (CBT, waitlist) for loneliness was significant, F(1,40.609) = 7.070, p = .011, d = -0.65, demonstrating a significant improvement with treatment compared to waitlist after controlling for self-reported depression (GDS), anxiety (GAI), and cognitive impairment (ACE-R) at baseline (see Figure 1). Estimated marginal means, standard errors and within group effect sizes for this analysis are presented in Table 2. The paired t-test revealed maintenance of the reduction in loneliness for the CBT group from post-treatment (M=0.70, SD=0.733) to 3-month follow-up (M=1.20, SD=1.056), $t(19) = -1.879$, $p = 0.076$ (Figure 1).

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Mean anxiety and depressive disorder severity across time and condition

The interaction between time (pre, post) and group (CBT, waitlist) for mean anxiety disorder severity was significant, F(1,49.603) = 17.858, $p < .001$, d = -0.89, demonstrating a significant improvement with treatment compared to waitlist after controlling for self-reported depression (GDS), anxiety (GAI), and cognitive impairment (ACE-R) at baseline (see Figure 2). The paired t-test revealed

[1] The differences in loneliness, mean anxiety disorder severity, and mean depression disorder severity remained significant when not controlling for baseline cognition (ACE-R). Loneliness: F(1,41.384) = 7.350, $p = .01$; Mean anxiety severity: F(1,50.176) = 18.480, $p < .001$; Mean depression severity: F(1,46.798) = 34.169, $p < .001$.

maintenance of the reduction in mean anxiety disorder severity for the CBT group from post-treatment (M=3.06, SD=1.47) to 3-month follow-up (M=3.10, SD=2.00), $t(11) = -0.069$, $p = .946$ (Figure 2).

The interaction between time and group for mean depressive disorder severity was also significant, $F(1,45.451) = 30.884$, $p < .001$, d = -1.35, demonstrating a significant improvement with treatment compared to waitlist after controlling for self-reported depression (GDS), anxiety (GAI), and cognitive impairment (ACE-R) at baseline (see Figure 3). The paired t-test revealed maintenance of the reduction in mean depression disorder severity for the CBT group from post-treatment (M=2.43, SD=1.94) to 3-month follow-up (M=2.82, SD=2.07), $t(13) = -0.756$, p = .463.

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Discussion

This study shows that group CBT for depression and anxiety in older adults is associated with reductions in loneliness that are sustained three months after the intervention. The reductions for self-reported loneliness were associated with moderate to large treatment effects between groups (Cohen's d = -0.65), even after controlling for baseline self-reported anxiety and depression. Although we found large effect size reductions in both clinician-rated anxiety and mood disorder severity between groups (Cohen's d = 0.89-1.35), the effect size reductions in self-reported loneliness were similar in size to the previously reported large effect size changes for self-reported depression and anxiety (Cohen's d = 0.43-0.79) (Wuthrich & Rapee, 2013). This suggests that the reductions in loneliness were over and above changes in anxiety and mood symptoms. Importantly, reductions in loneliness were maintained at the three-month follow-up.

It is not clear what factors drove the reductions in loneliness, but there are several key features that are likely to be implicated in this change. The first is that *Ageing Wisely* was delivered as a group therapy – and so it might be the element of attending a group activity that was the critical ingredient. Recent research shows benefits of group activity on loneliness in younger adults (Haslam et al., 2019), and of group-based CBT on symptoms of anxiety and depression (Cruwys et al., 2014;

Meuret et al., 2016); however, it is not clear if the group nature of the treatment was the critical factor or the treatment components themselves. Other research has shown that social group activities are not associated with decreases in loneliness or with small effects (e.g., Cohen-Mansfield et al., 2018). The finding that reductions in feelings of loneliness were maintained three months post-treatment when group contact had ceased, suggests that it was not only the "group" format that was important. However, the impact of the group nature of this CBT program needs to be examined in further studies that compare group CBT to a non-active group, or to individually delivered CBT.

There are a number of therapy skills in the *Ageing Wisely* program that might have impacted specifically on loneliness. It could be the effect of reduced feelings of depression and anxiety per se that drove the effect, although the fact that loneliness significantly reduced after controlling for baseline anxiety and depression symptoms suggests that is not the only factor. It is more likely that the group CBT program resulted in changes in underlying mechanisms that cause and maintain loneliness such as cognitive biases that were reduced by the cognitive restructuring skills taught (in fact there was one example in the program of how feelings of loneliness might be reduced using cognitive restructuring techniques). Further, activity scheduling which encouraged people to do more activities including social activities might have resulted in both less time to sit alone and dwell but also an increase in social contact. Graded exposure encouraged people with social fears to practice reducing avoidance of social situations and this might have led to more social contact and reduced perception of social threat (fears of rejection or hostility). There is some evidence that social anxiety is linked to loneliness, and so for socially anxious individuals, graded exposure to social events might have been an important addition (Lim, Rodebaugh, Zyphur, & Gleeson, 2016). Unfortunately, the sample size in the current study was too small to examine this hypothesis; however, further research on the topic of shared mechanisms and treatment approaches for loneliness and social anxiety is warranted. Finally, the *Ageing Wisely* program also includes skills to improve communication which might have increased high quality social interactions when individuals did have social contact. Alternatively, it is also

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possible, due to the overlapping nature of depression and anxiety with loneliness, that it was simply the improvement in mood and anxiety that drove the effects. More research is needed to understand the key ingredients in reducing feelings of loneliness, and to examine moderators of change.

Several limitations of this study need to be considered. Firstly, this is a secondary analysis of a previously reported study. This limited our ability to test hypotheses around factors related to baseline loneliness and to dissect which aspects of the CBT treatment may have been related to reducing loneliness. Secondly, loneliness was only measured by one self-report item. Although this item has face validity, and has been used as an indicator of loneliness previously (Hanratty et al., 2018; Lee et al., 2019; Lim et al., 2019; Menec et al., 2020; Sundström, Nordin Adolfsson, & Adolfsson, 2019), it is not clear whether it is a sufficient measure of loneliness, and more research is needed using more extensive measures of loneliness. This may be particularly important as there is emerging evidence that loneliness may be a multi-faceted construct with separate features but strong associations to depression and social anxiety (Fung et al., 2017). There is also little doubt in the variability of a person's experience with and definition of loneliness e.g. more social versus more emotional (Dahlberg & McKee, 2014) or more persistent versus a temporary state. The ability to explore these differences in loneliness may be necessary for the development of more tailored and effective interventions. Thirdly, there was no follow-up data for the waitlist control group and so it is not clear if the difference between groups on loneliness at post-treatment were maintained at follow-up. Fourthly, due to the nature of the waitlist control group, these participants did not receive social contact with a therapist whereas treatment participants received both social contact with a therapist as well as other group members. It is possible that contact between older adults and their therapist as well as other group members may have allowed meaningful social connection. However, the maintenance of reduction in loneliness at post-treatment suggests that social contact is not the only factor that led to a reduction in loneliness. Finally, the small sample size in this study warrants replication of findings in larger samples.

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In conclusion, the current findings suggest that group CBT targeting depression and anxiety reduces loneliness among older adults, compared to a waitlist control condition. Further, this reduction in loneliness among the CBT group was observed after controlling for cognition and self-reported depression and anxiety and was maintained at 3-month follow-up. However, it is not clear what aspects of the treatment program led to a reduction in loneliness, or if it was just the alleviation of the symptoms of depression and anxiety per se. Previous research suggests loneliness shares underlying mechanisms with depression and anxiety (Golden et al., 2009; Hawkley & Cacioppo, 2010). Thus, further research investigating what aspects of CBT lead to a reduction in loneliness, particularly dismantling studies, may shed light on the mechanisms underlying loneliness and also the relationship between loneliness, and depression and anxiety, in order to allow continued development of effective interventions.

Clinical Implications:

- CBT programs aimed at treating anxiety and depression may also lead to longer-term reductions in feelings of loneliness among older adults.
- Older adults who experience loneliness will likely benefit from CBT programs.
- Loneliness may share underlying mechanisms with anxiety and depression.

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Table 1: Sample demographic and clinical information

	Total Sample (N = 62)	***CBT* (N = 27)**	***Wait List* (N = 35)**		
	M (SD)	**M (SD)**	**M (SD)**	***t***	***p***
Age	67.44 (6.19)	66.92 (5.93)	67.80 (6.53)	-.53	.602
ACE-R Total Score	90.93 (5.14)	90.50 (5.19)	91.26 (5.16)	-.67	.574
GDS	17.11 (6.15)	18.23 (6.67)	16.34 (5.75)	1.11	.273
GAI	10.28 (5.29)	11.35 (4.91)	9.47 (5.50)	1.37	.176
Loneliness (CES-D item 14)	1.53 (.91)	1.70 (0.82)	1.39 (.97)	1.32	.192
ADIS-IV Primary disorder severity	6.05 (1.00)	6.37 (.63)	5.80 (1.16)	2.31	.025
ADIS-IV Mean anxiety disorder severity	4.90 (1.05)	5.43 (.74)	4.48 (1.07)	4.120	<.001
ADIS-IV Mean depressive disorder severity	5.33 (1.21)	5.67 (1.05)	5.06 (1.27)	2.00	.051
	n (%)	**n (%)**	**n (%)**	**χ^2**	***p***
Female	40 (64.52)	18 (66.66)	22 (62.86)	.10	.756
Highest Education Level				-	.463
Primary School	2 (3.23)	2 (7.41)	0 (0.00)		
High School	16 (25.81)	6 (22.22)	10 (29.41)		
TAFE/Trade	22 (35.48)	9 (33.33)	13 (38.24)		
University Degree	21 (33.87)	10 (37.04)	11 (32.35)		
Family Income, %				-	.952
>$83,200	3 (4.84)	1 (3.70)	2 (5.71)		
$41,600 – 83,199	16 (25.81)	8 (29.63)	8 (22.86)		
$15,600 – 41,599	21 (33.87)	9 (33.33)	12 (34.29)		
<$15,599	17 (27.42)	7 (25.93)	10 (28.57)		
Not specified	5 (8.06)	2 (7.41)	3 (8.57)		
Continent of Birth				-	.694
Australia/New Zealand	38 (61.30)	16 (59.30)	22 (62.86)		
Asia/Middle East	4 (6.50)	2 (7.40)	2 (5.70)		
Europe	13 (21.00)	6 (22.20)	7 (20.00)		
Africa	5 (8.1)	3 (11.10)	2 (5.70)		
North/South America	2 (3.20)	0 (0)	2 (5.70)		
Marital Status, %				-	.213
Married/Partnered	30 (48.39)	15 (55.56)	15 (42.86)		
Widowed	8 (12.90)	1 (3.70)	7 (20.00)		
Separated/Divorced	20 (32.26)	10 (37.04)	10 (28.57)		
Single, never married	4 (6.45)	1 (3.70)	3 (8.57)		
Employment Status				-	.090
Working Full-time	4 (6.45)	4 (14.81)	0 (0.00)		
Working Part-time	12 (19.35)	5 (18.52)	7 (20.00)		
Retired/Not Working	46 (74.19)	18 (66.67)	28 (80.00)		
Stable Psychotropic Medication	12 (19.35)	6 (22.22)	7 (20.0)	.25	.616
Primary Anxiety Disorder	33 (53.32)	18 (66.67)	15 (42.86)	3.47	.077
Primary Mood Disorder	29 (46.77)	9 (33.33)	20 (57.14)		

Note. ACE-R = Addenbrooke's Cognitive Examination Revised, ADIS-IV = Anxiety Disorder Interview Schedule for DSM-IV, GDS = Geriatric Depression Scale, CES-D = Centre for Epidemiological Studies Depression Scale, GAI = Geriatric Anxiety Inventory

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Table 2: Estimated Marginal Means, Standard Errors & Effect Sizes for Loneliness, Mean Anxiety Disorder Severity, and Mean Depressive Disorder Severity Over Time

Parameter	*CBT*			*Wait List*		
	EMM	SE	Cohen's d (95% CI)	EMM	SE	Cohen's d (95% CI)
Loneliness (CESD item 14)						
Pre-treatment	1.59	.209	1.25 (0.62, 1.88)	1.36	.169	0.11 (-0.41, 0.63)
Post-treatment	.593	.169		1.24	.194	
Mean Anxiety Disorder Severity						
Pre-treatment	5.20	.246	2.33 (1.55, 3.11)	4.58	.200	0.45 (-0.07, 0.97)
Post-treatment	2.68	.307		4.01	.227	
Mean Depressive Disorder Severity						
Pre-treatment	5.48	.272	2.48 (1.70, 3.26)	4.98	.217	0.52 (-0.02, 1.06)
Post-treatment	2.02	.319		4.25	.260	

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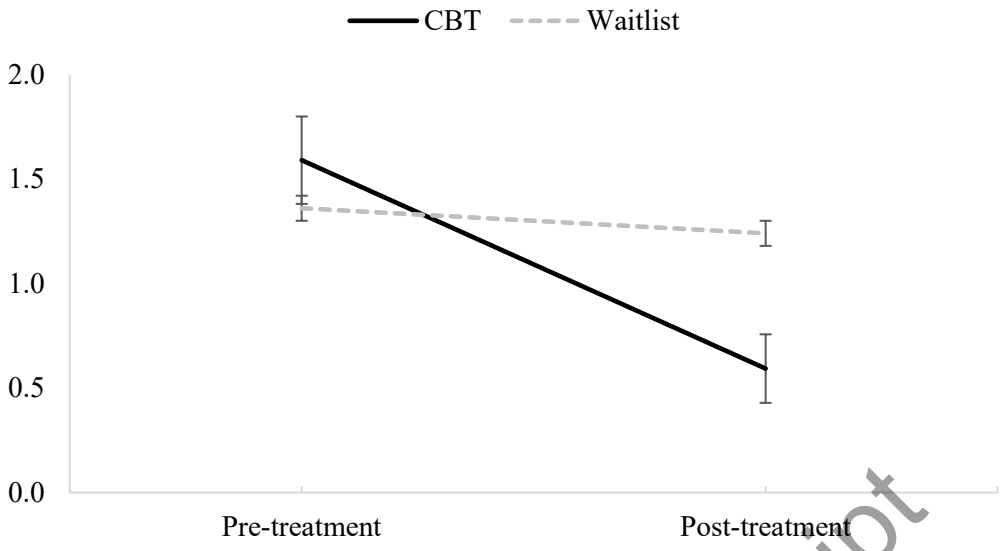
Figure 1. Mean loneliness across time and condition



Note: Means represent estimated marginal means and error bars represent standard error.

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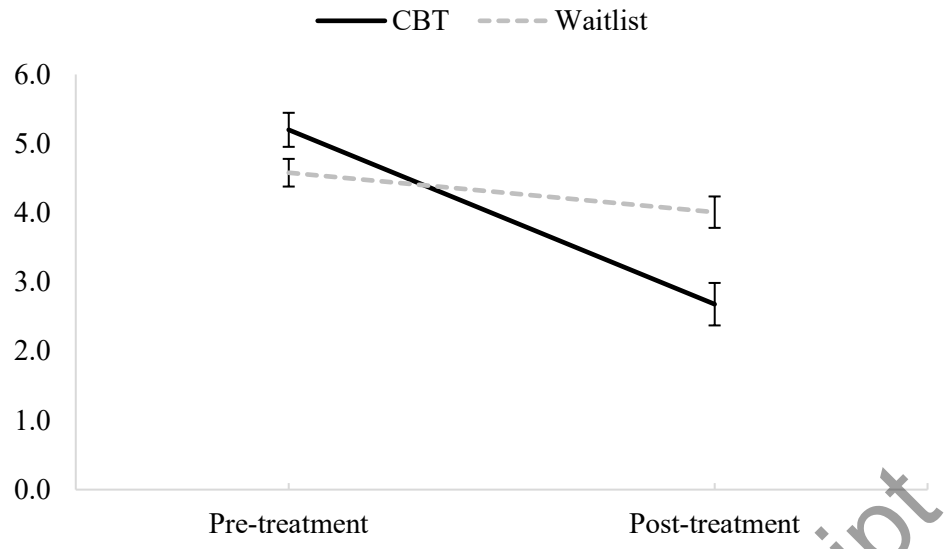
Figure 2. Mean anxiety disorder severity across time and condition.



Note: Means represent estimated marginal means and error bars represent standard error.

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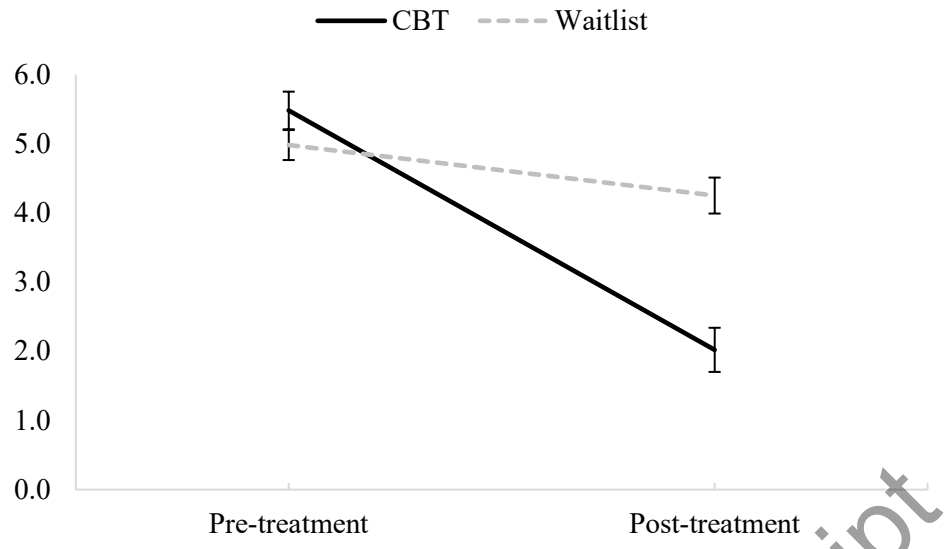
Figure 3. Mean depression disorder severity across time and condition.



Note: Means represent estimated marginal means and error bars represent standard error.

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