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Interventions for reducing loneliness: An umbrella review of intervention studies

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Abstract

Loneliness is a common phenomenon associated with several negative health outcomes. Current knowledge regarding interventions for reducing loneliness in randomised controlled trials (RCTs) is conflicting. The aim of the present work is to provide an overview of interventions to reduce loneliness, using an umbrella review of previously published systematic reviews and meta-analyses. We searched major databases from database inception to 31 March 2020 for RCTs comparing active versus non-active interventions for reducing loneliness. For each intervention, random-effects summary effect size and 95% confidence intervals (CIs) were calculated. For significant outcomes (p-value < 0.05), the GRADE (Grading of Recommendations Assessment, Development and Evaluation) tool was used, grading the evidence from very low to high. From 211 studies initially evaluated, seven meta-analyses for seven different types of interventions were included (median number of RCTs: 8; median number of participants: 600). Three interventions were statistically significant for reducing loneliness, that is, meditation/mindfulness, social cognitive training and social support. When applying GRADE criteria, meditation/mindfulness (mean difference, MD = −6.03; 95% CI: −9.33 to −2.73; very low strength of the evidence), social cognitive training (8 RCTs; SMD = −0.49; 95% CI: −0.84 to −0.13; very low strength of the evidence) and social support (9 RCTs; SMD = −0.13; 95% CI: −0.25 to −0.01; low strength of the evidence) significantly decreased the perception of loneliness. In conclusion, three intervention types may be utilised for reducing loneliness, but they are supported by a low/very low certainty of evidence indicating the need for future large-scale RCTs to further investigate the efficacy of interventions for reducing loneliness.

KEYWORDS

loneliness, meta-analysis, randomised controlled trial, social, umbrella review

1 | INTRODUCTION

Loneliness, perceived as a deficit between actual and desired quality or quantity of relationships (Cacioppo & Patrick, 2008), is a common condition (Victor et al., 2005). Several social and clinical factors have been proposed as putative risk factors for loneliness and it is widely known that loneliness itself can be considered as a risk factor for other medical conditions, including psychiatric and physical disorders (Courtin & Knapp, 2017; Solmi et al., 2020). Increasing literature has reported that health risks associated with loneliness are similar to the well-established detrimental effects of smoking and obesity (Courtin & Knapp, 2017; Holt-Lunstad, 2017). In particular, loneliness could be particularly problematic in old age due to decreasing economic and social resources, disability, the death of relatives and spouses and changes in family structures (Holt-Lunstad, 2017).

While the epidemiological research regarding the factors predicting loneliness is vast, the research regarding interventions able to reduce loneliness is limited. To the best of our knowledge, only a few studies are available. Approximately 15 years ago, Cattan et al. found, among 30 quantitative publications focusing on the effectiveness of loneliness prevention programs, that only six can be considered as effective interventions (Cattan et al., 2005). In particular, this seminal paper evidenced that educational and social activity group interventions targeting specific groups might alleviate loneliness in older people. In a recent umbrella review of previous systematic reviews and meta-analyses (Jarvis et al., 2020), the authors found that, in older adults, active interventions are able to reduce the sense of loneliness. However, several aspects still need to be clarified. First, loneliness is common in adults and adolescents (Beutel et al., 2017), as well as older adults. Second, data from this umbrella review were pooled together, without giving the estimates for the type of intervention (Jarvis et al., 2020). Finally, another possible important limitation is that the evidence of meta-analyses of randomised controlled trials (RCTs) is better evaluated with the GRADE (Grading of Recommendations Assessment, Development and Evaluation) tool that may provide a reproducible and transparent framework for grading certainty in evidence (Siemieniuk & Guyatt, 2019) and that these works included both RCTs and other types of publication having less strength of evidence (e.g. open label studies).

Given this background, the aim of the present work is to provide an overview of interventions that are able to reduce loneliness using an umbrella review of previously published systematic reviews and meta-analyses.

What is known about this topic

- Loneliness is a common condition across all ages
- The effectiveness of interventions for decreasing loneliness is poorly explored
- To know which interventions can decrease loneliness is of importance

What this paper adds

- Three interventions were statistically significant for reducing loneliness, meditation/mindfulness, social cognitive training and social support
- The interventions for reducing loneliness are supported by a low/very low certainty of evidence
- Our umbrella review underlines the need for future larger RCTs

2 | METHODS

We performed an umbrella review (i.e. a review of other systematic reviews and meta-analyses) (Aromataris et al., 2015) adhering to the adapted forms of Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) recommendations (Moher et al., 2009) and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines (Stroup et al., 2000).

2.1 | Search strategy and selection criteria

We searched PubMed and PsycInfo databases (last search performed on 31 March 2020) to identify systematic reviews with meta-analyses including RCTs investigating any intervention for reducing loneliness. The following search key was used: "(loneliness) AND (Meta-Analysis[ptyp] OR metaanaly*[tiab] OR metaanaly*[tiab] OR Systematic review [ptyp] OR "systematic review" [tiab])).mp. [mp = ti, ab, ot, nm, hw, fx, kf, ox, px, rx, ui, an, sy, tc, id, tm, mh]". Two reviewers (DG, NV) independently searched titles/abstracts for eligibility, having a high grade of affinity (k = 0.85) and assessed the full text of those articles surviving title/abstract phase. A third reviewer resolved any conflict (JD).

Inclusion criteria were (1) participants: any; (2) intervention: any; (3) comparator: non-active group; (4) outcome: loneliness evaluated with validated tools such as the UCLA loneliness scale (Russell, 1996); (5) study design: RCTs. Exclusion criteria were (1) meta-analyses of observational studies or non-RCT; (2) studies published in languages other than English.

When more than one meta-analysis assessed the same intervention, we only included the one with the larger number of studies, as previously described (Radua et al., 2018; Raglan et al., 2018; Theodoratou et al., 2014), considering the excluded papers as doubled.

2.2 | Data extraction

Two investigators (NV, DG) independently extracted data in a predefined Microsoft Excel spreadsheet. For each meta-analysis, the following was extracted PMID/DOI, first author, publication year, population included in the study, type of intervention, study design, total sample size and the participants randomised to intervention or control group. The type of interventions was grouped in befriending

interventions, technological interventions, meditation (mindfulness), animal therapy/robopets, social cognitive training, social skills training and social support according to a previous relevant review on this topic (Masi et al., 2011).

2.3 | Quality assessment

The methodological quality of each included meta-analysis was assessed with the assessment of multiple systematic reviews (AMSTAR) 2 tool (available at https://amstar.ca/Amstar-2.php), which is a recent update of AMSTAR (Shea et al., 2017), by two independent investigators (JD, DG).

2.4 | Data analysis and assessment of the credibility of the evidence

For each association of meta-analyses providing individual study data, we extracted effect sizes of individual studies and reperformed the meta-analysis calculating the pooled effect sizes and the 95% confidence intervals, under the assumption of random-effects models, since this approach is the most conservative (DerSimonian & Laird, 1986). Heterogeneity was assessed with the I^2 statistic (Higgins et al., 2003).

Evidence from meta-analyses of RCTs was assessed in terms of the significance of the summary effect, using a p-value <0.05. When the p-value for the random effect was <0.05, we evaluated the evidence using the GRADE assessment, that takes into account several important domains in the certainty of the evidence, including study design, risk of bias, inconsistency, indirectness, imprecision and other aspects, such as publication bias (Guyatt et al., 2008). The GRADE assessment was carried out by one investigator (DG) and checked and corrected, if needed, by the senior author of the present manuscript (NV).

3 | RESULTS

3.1 | Literature search

Figure 1 reports the flow diagram of the search, selection and inclusion process. Among 211 articles initially included, 43 full texts were retrieved with a final selection of seven meta-analyses, all published in the last 10 years (Abbott et al., 2019; Choi et al., 2012; Cohen-Mansfield & Perach, 2015; Hagan et al., 2014; Masi et al., 2011; Quan et al., 2019; Siette et al., 2017).

3.2 | Main findings

Among all the interventions explored, three (i.e. meditation/mindfulness, social cognitive training and social support) were better than standard care in improving the sense of loneliness.

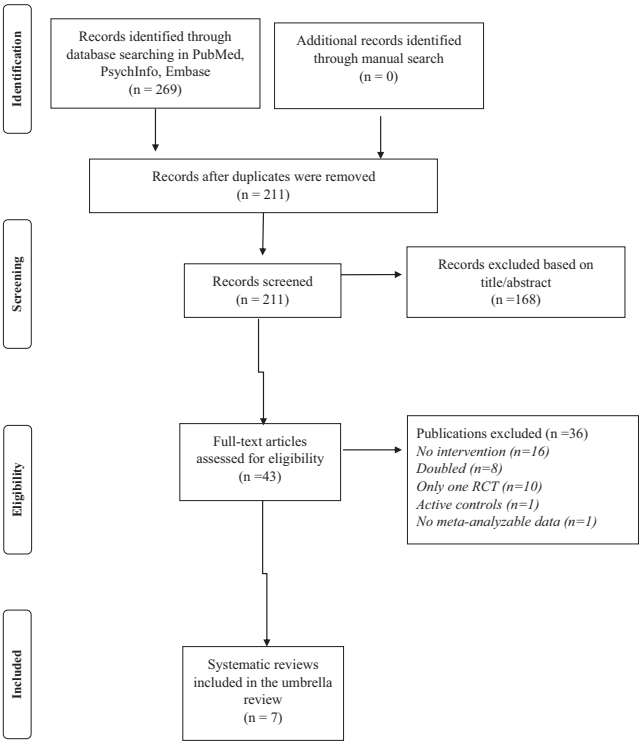

FIGURE 1 PRISMA flow chart

Table 1 reports the descriptive findings of the seven meta-analyses included. The median number of the RCTs included was 8 (range: 2–9) with a median number of participants of 600 (282 to the active interventions and 288 to controls). The UCLA loneliness scale was the most used among the scales investigating loneliness. In one outcome, high heterogeneity was found (social cognitive training, $I^2 = 61\%$). No study suffered from possible publication bias. Three interventions reached the statistical significance at the p-value < 0.05: These interventions were meditation/mindfulness, social cognitive training and social support.

Table 2 shows the evidence according to the GRADE for the three statistically significant interventions. In two RCTs (Hagan et al., 2014; Quan et al., 2019), meditation/mindfulness significantly decreased perception of loneliness (MD = −6.03; 95% CI: −9.33 to −2.73); however, this evidence was supported by a very low strength of the evidence, mainly owing to high risk of bias and indirectness. Similarly, social cognitive training (8 RCTs; SMD = −0.49; 95% CI: −0.84 to −0.13) (Jiska Cohen-Mansfield & Rotem Perach, 2015; Masi et al., 2011; Quan et al., 2019) and social support (9 RCTs; SMD = −0.13; 95% CI: −0.25 to −0.01) (C. Masi et al., 2011) were supported by a very low and low strength of evidence respectively. Again, the risk of bias in the RCTs included was high.

3.3 | Quality assessment

Table S1 reports the quality assessment. Among the seven meta-analyses included, five were rated as critically low, one low and one

TABLE 1 Descriptive findings of the meta-analyses included

Type of intervention	Number of studies	Scale for assessing loneliness	Intervention	Controls	Sample size	Type of metric	Effect size (95% CI)	*p*	I^2	*p*-value Egger
Befriending intervention	5	Own scale (*n* = 2); EQ−5D ONS (*n* = 1); SELSA-S (*n* = 1); QOL-BREF (*n* = 1)	382	388	770	SMD	−0.003 (−0.16 to 0.16)	0.98	0	0.85
Technological interventions	4	de Jong Gierveld loneliness scale (*n* = 3); UCLA loneliness scale (*n* = 1)	209	181	529	Hedges's g	0.20 (−0.04 to 0.43)	0.10	0	0.92
Meditation (mindfulness)	2	UCLA loneliness scale (*n* = 2)	65	67	132	MD	−6.03 (−9.33 to −2.73)	0.0003	20	NA
Animal therapy/ robopets	3	UCLA loneliness scale (*n* = 3)	44	45	89	SMD	−0.38 (−0.80 to 0.05)	0.08	3.1	0.24
Social cognitive training	8	UCLA loneliness scale (*n* = 5); Ando-Osada-Kodama loneliness scale (*n* = 1); de Jong Gierveld loneliness scale (*n* = 2)	453	469	941	SMD	−0.49 (−0.84 to −0.13)	0.007	61	0.89
Social skills training	2	Asher Loneliness Scale (*n* = 1); de Jong Gierveld loneliness scale (*n* = 1)	121	137	258	SMD	0.02 (−0.24 to 0.78)	0.89	0	NA
Social support	9	UCLA loneliness scale (*n* = 6); de Jong Gierveld loneliness scale (*n* = 1); own scale (*n* = 1); OARS social resource rating scale (*n* = 1)	703	732	1,483	SMD	−0.13 (−0.25 to −0.01)	0.03	2.4	0.29
Total (median)	8		282	288	600					

Note: Abbreviations: CI, confidence interval; MD, mean difference; NA, not available; OARS, Older Americans Resources and Services; QOL-BREF, World Health Organization Quality of Life, Brief Version; SELSA-S, Social and Emotional Loneliness Scale for Adults (short form); SMD, standardised mean difference; UCLA, University of California, Los Angeles.

TABLE 2 Evidence from the randomised controlled trials included in the umbrella review

Certainty assessment							No of patients		Effect		
Nº of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Active intervention	No treatment	Relative (95% CI)	Absolute (95% CI)	Certainty
Meditation (mindfulness)											
2	Randomised trials	Very serious[a]	Not serious	Serious[b]	Not serious	None	65	67	–	MD −6.03 (−9.33; - 2.73)	⨁◯◯◯ VERY LOW
Social cognitive training											
8	Randomised trials	Very serious[a]	serious[c]	Not serious	Not serious	None	453	469	–	SMD −0.49 (−0.84; −0.13)	⨁◯◯◯ VERY LOW
Social support											
9	Randomised trials	Very serious[a]	Not serious	Not serious	Not serious	None	703	732	–	SMD −0.13 (−0.25; − 0.01)	⨁⨁◯◯ LOW

Note: Abbreviations: CI, Confidence interval; MD, Mean difference; SMD, Standardised mean difference.

[a]More than 30% of the RCTs included with at high risk of bias.

[b]<100 participants in both arms.

[c]I^2 between 50% and 75%.

moderate. Six of the seven meta-analyses did not previously publish or register the protocol and none reported the sources of funding. These two items were the most important in decreasing the quality of the meta-analyses included.

4 | DISCUSSION

In the present umbrella review including seven systematic reviews with meta-analysis with a mean of eight RCTs and 600 participants, it was found that among seven explored interventions, only three reached a statistical significance; these were: (1) meditation/mindfulness; (2) social cognitive training; and (3) social support. Using the GRADE, these interventions are supported by a low/very low strength of evidence.

Previous to the present review, literature had identified both successful and unsuccessful loneliness reduction strategies, as summarised by Masi et al. (2011). Among them, five of the six reviews concluded that loneliness can be mitigated with specific interventions (Masi et al., 2011). However, it is important to note that all these reviews concluded that the efficacy of the interventions is unclear and that more rigorous research is needed in this area. This is in agreement with findings from the present review (Masi et al., 2011). Our umbrella review further indicates that only some intervention types are able to reduce the perception of loneliness. In particular, mindfulness (a psychological process purposely bringing—through meditation—one's attention to experiences occurring in the present moment without judgement) is able to significantly reduce the perception of loneliness (Creswell, 2017). However, this evidence is supported by only two RCTs with high risk of bias. One can speculate that simply bringing greater awareness to the present moment is somewhat able to positively impact loneliness and social interactions (Lindsay et al., 2019). It is likely that bringing greater awareness to social interactions might increase attentiveness to social cues and one's own emotional reactions to them, finally reducing perceived loneliness (Lindsay et al., 2019). Furthermore, the practice of meditation has been shown to reduce levels of depressive symptoms (Reangsing et al., 2020) and increase both social cognition (Campos et al., 2019) and self-efficacy (Pandya, 2019), all of which may result in a reduction in loneliness. Moreover, social cognitive training (i.e. the mental operations involved in understanding, perceiving and interpreting our social world) (Kurtz & Richardson, 2012) and social support (i.e. the perception and actuality that one is cared for, has assistance available from other people) (Vaux, 1988) seem to be able to significantly reduce the sense of loneliness, again supported by a low/very low certainty of evidence. Social cognitive training is likely to be successful in reducing loneliness as it positively changes maladaptive social perception and cognition (e.g. dysfunctional and irrational beliefs, false attributions and self-defeating thoughts and interpersonal interactions) (Cacioppo et al., 2015). Social support is fundamental, especially for lonely people who live in disadvantaged locations (e.g. mountain district), and also in terms of the development of neighbourhoods (Gelmini et al., 2020). Importantly, previous literature has shown that poor social support has a moderating effect on social integration (Ding et al., 2017). Indeed, difficulties in relation to social integration are likely to increase feelings of loneliness. These findings support the concept that, despite the theoretic utility of social cognitive training and social support, the causes of loneliness are probably unique in each person and matching specific therapies with specific interventions is challenging (Masi et al., 2011).

Importantly, several interventions expected to reduce perceptions of loneliness did not. For example, among the interventions included in this umbrella review, technological interventions did not significantly affect the sense of loneliness in the RCTs included in the analysis. In this period of Corona Virus Disease 2019 (COVID-19) pandemic, several articles have reported that new technologies, such as video calls, can reduce loneliness, particularly in older people living in nursing home (Vilendrer et al., 2020). However, a recent Cochrane review including three cluster quasi-randomised trials reported that there is currently uncertain evidence on the effectiveness of video call interventions to reduce loneliness in older adults (Noone et al., 2020). One can similarly speculate that pets (or robopets) are not able to reduce loneliness. Indeed, for these specific interventions, we found only three small RCTs (only 89 participants), making it difficult to reach robust conclusions. Observational research, on the contrary, has reported that these interventions are associated with a reduced perception of loneliness, for example, in women who are not married or cohabiting (Zasloff & Kidd, 1994).

Findings from the present umbrella review suggest that interventions and policy to reduce loneliness should focus on meditation/mindfulness, social cognitive training and social support. When implementing such intervention and policy, it is important to consider the target population and how to best engage with them. Since the present study found technological interventions not to be effective novel intervention delivery approaches are required, suggesting that further work of a qualitative nature is needed to further elucidate avenues to intervention.

The present umbrella review has both strengths and limitations. One clear strength is that a stringent quantitative criteria to grade the evidence using the GRADE were applied (the same tool used by the Cochrane reviews (Siemieniuk & Guyatt, 2019)). Moreover, this review only included RCTs, differently from previous reviews, and this choice may attenuate the risk of clinical heterogeneity. In this sense, only one intervention reported a high I^2, that is, >50%. Among the limitations, potentially the most important is that five of the systematic reviews and meta-analyses included were of poor quality. For example, some studies can be biased since authors developed their own measure of loneliness, possibly affecting their results. At the same time, the clinical nature of the studies included does not allow one to understand the motivations of why psychological (individual) interventions are more effective than social (collective) ones for treating loneliness. A second limitation is that the detected evidence, even if significant, was supported by a high risk of bias in the RCTs included. Finally, in our umbrella review, we have included both community-dwelling (Golden et al., 2009) and nursing home (Jansson et al., 2017) participants that differ in their characteristics,

also when considering the prevalence of the feel of loneliness and this choice may influence our results/quality assessment. Meta-analyses have some inherent shortcomings which may give general results regarding interventions that cannot be generalised to all sections of the community, for example, by gender, age group and by setting.

In conclusion, a few interventions are available for reducing loneliness and, among them, only three (i.e. meditation/mindfulness, social cognitive training and social support) show promise to reduce this phenomenon. These interventions are, however, supported by a low/very low certainty of evidence according to the GRADE criteria. We believe that our research further shows that there is an important difference between the relevant negative health and social outcomes traditionally associated with loneliness and the interventions that we have available so far, indicating the necessity of further research regarding this important issue.

CONFLICT OF INTEREST

None.

AUTHORS' CONTRIBUTION

Veronese and Allocco analysed the data; Veronese, Smith and Yang involved in statistical analysis; Galvano, D'Antiga, Vecchiato and Solmi collected the data; Furegon, Veronese, Gareri and Gelmini prepared the manuscript; De Leo, Trabucchi and Demurtas critically revised the data.

DATA AVAILABILITY

The data are available upon reasonable request sending an email to the corresponding author.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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