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Review article

Interventions to reduce loneliness in caregivers: An integrative review of the literature[☆]Isabelle G. Velloze^a, Dylan J. Jester^{b,c}, Dilip V. Jeste^{b,c,d}, Brent T. Mausbach^{b,*}^a Drexel University College of Medicine, Philadelphia, PA, United States of America^b Department of Psychiatry, University of California San Diego, La Jolla, California, United States of America^c Sam and Rose Stein Institute for Research on Aging, University of California San Diego, La Jolla, California, United States of America^d Department of Neurosciences, University of California San Diego, La Jolla, California, United States of America

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ABSTRACT

Older adults are at an increased risk of loneliness. Many also serve as informal caregivers for persons with dementia and other disabling conditions, further predisposing them to loneliness. The primary objective was to assess current loneliness interventions for caregivers to inform development of effective therapies to improve their quality of life. An integrative review of the literature was conducted using five electronic databases and 12 studies were included for further analysis. Data were extracted regarding the type of intervention implemented, caregiver characteristics, and intervention effects. Five main intervention types emerged: mindful meditation, computer applications, music therapy, peer support, and community programs. Most care recipients had dementia, and most caregivers were spouses. Peer support was the most frequently utilized intervention, and common intervention strategies included providing emotional support, expanding one's social network, and supplying psychoeducational materials. Most interventions had methodological limitations and demonstrated small effect sizes. Hence, there remains a continued need for well-designed interventions that target loneliness in informal caregiver. Caregivers may benefit from interventions that expand their social network to improve their emotional regulation and understanding of their role. Further research on the role of group versus individual therapy is necessary to strengthen interventions and broaden their application.

1. Introduction

Older adults are at an increased risk of loneliness due to increased social isolation. While loneliness and social isolation are often used interchangeably, they represent two distinct concepts. Social isolation is an objective measure of one's social network, whereas loneliness is defined as the subjective experience of social isolation- even if one is not alone, they can still *feel* alone (Hawkey and Cacioppa, 2010). This complex construct of loneliness emphasizes the innate human need to form social connections with others whom they can depend on and trust (Cacioppo et al., 2015). Loneliness can be further divided into emotional and social loneliness (Weiss, 1973). Whereas emotional loneliness refers to the perceived lack of attachment to a significant other, social loneliness describes the perceived lack of a social network or community (Yanguas et al., 2018). Therefore, such experiences of loneliness can vary during the course of one's life and may be something that

individuals feel reluctant to admit or share.

In an aging society, loneliness has emerged as a key public health concern (Leigh-Hunt et al., 2017). Furthermore, recent decades have seen a marked increase in the prevalence of loneliness and associated rates of suicide and opioid misuse (Jeste et al., 2020). According to the U.S. Census Bureau, the population of adults aged 65 years and older is expected to double from around 800 million in 2015 to about 1.6 billion worldwide by 2050 (He et al., 2016). With a rise in single-person households, lower rates of inter-generational living, and decreased social contact, older populations are at the greatest risk of loneliness (Fees et al., 1999; Valtorta and Hanratty, 2012). Loneliness has a powerful effect on the mental, emotional, and physical well-being of older adults like many other chronic diseases and comorbidities associated with old age (Cacioppo and Cacioppa, 2014; Nguyen et al., 2020; Park et al., 2020; Vara-Garcia et al., 2021). It has been associated with increased rates of cognitive decline, depression, anxiety, suicidal ideation, fatigue,

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and pain (Lee et al., 2019; Park et al., 2020; Santos-Orlandi et al., 2019). In addition, loneliness promotes inflammation and is correlated with increased synthesis of proinflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF- α) in adults exposed to acute stress (Jarmka, et al., 2013; Nersesian et al., 2018). Moreover, the association of loneliness and mortality has been well-documented; there is an estimated 26% and 29% increased likelihood of death for those reporting loneliness and social isolation, respectively (Holt-Lunstad et al., 2015). Hence, recent work has focused on interventions to alleviate loneliness in older adults. These studies have recognized the impact of various types of interventions including community support programs (Giebel et al., 2020), mindfulness-based stress reduction (Creswell et al., 2012), religious activities (Milad and Asma, 2018), pet therapy (Banks and Banks, 2002), peer support groups (Lai et al., 2020), and social interventions (Gardiner et al., 2018). However, studies may fail to address the unique psychosocial and socio-structural stressors associated with caregiving (e.g., compassion fatigue and burnout, changing dynamic of the caregiver-care recipient relationship, difficulties with time management) (Harris et al., 2011; Lynch et al., 2018).

Caregiving is a taxing and strenuous role, especially among those who care for adults with Alzheimer's disease and related dementias (Chattillion et al., 2013; Chiao et al., 2015). With the increase in longevity, it is likely that caregivers will disproportionately be the recipient's adult child or spouse. It is estimated that most caregivers are informal, meaning that they are the recipient's relative rather than a paid caregiver (Johns Hopkins Medicine, 2021). The increased responsibility of caring for another person can limit time for social activities outside of caregiving duties, further contributing to social isolation (Bastawrous, 2013). Not only may informal caregivers feel a deprivation of social relationships, but interactions they do have may also lack satisfaction due to friends' or family's ignorance of the challenges a caregiver faces or unwillingness to empathize (Vasileiou et al., 2017). Additionally, sex (males), age (older), and living with the care recipient are significant predictors of loneliness in caregivers (Bramboeck et al., 2020). While many studies have focused on interventions to reduce caregiver burden and improve quality of life (Adelman et al., 2014; Jensen et al., 2015), few have investigated the impact of loneliness on caregivers. Many caregivers are at greater risk of burden due to their reluctance to accept help or denial of a need for services, making it difficult to implement interventions (Brodaty et al., 2005).

Reviews to date have focused on loneliness interventions in older adults, but neglected research on caregivers. With a growing demand for caregivers, further research is needed to accurately assess strategies to tackle loneliness and its associated health risks in this vulnerable population. Given the scarcity of large and well-designed studies in this area, an integrative review, which involves summarizing current research of various methodologies to advance healthcare practice and policy, was utilized (Whittemore and Knaf, 2005). This integrative review sought to: (1) investigate and synthesize the current interventions being utilized to reduce loneliness in familial caregivers and (2) evaluate the efficacy of such interventions to inform future care delivery and intervention development in this unique population.

2. Method

To analyze studies containing a diverse array of methodologies that assessed interventions targeting loneliness in caregivers, an integrative review of the literature was conducted (Whittemore and Knaf, 2005). As loneliness interventions in caregivers are a specific and narrow area of research, it is well-suited for an integrative review. This approach allowed for greater inclusion of studies, both quantitative and qualitative, so as to obtain a more comprehensive understanding of this topic (Onwuegbuzie and Frels, 2016). Therefore, this methodology can help elucidate the gaps in knowledge in this field and further instruct developing research.

2.1. Literature search

Five electronic databases- PsycINFO, PubMed, Web of Science, ProQuest, and Cumulative Index to Nursing and Allied Health Literature (CINAHL)- were searched in June 2021. Key terms searched for included "loneliness" AND "intervention" AND "caregivers" in all databases. An advanced search was used in the ProQuest database to search for "loneliness" and "caregiver" in the abstract of articles. Following removal of duplicates, 493 unique results were screened.

2.2. Inclusion criteria

Inclusion criteria were developed using the population, intervention, comparison, outcomes, and study design (PICOS) format (Systematic Reviews, 2009).

Population: Informal caregivers

Intervention: Non-pharmacologic therapies including mindfulness meditation, computer-based programs, music therapy, and peer support.

Comparison: Not included as a criterion

Outcomes: Change in loneliness as reported by the UCLA Loneliness scale or clinical surveys

Study Design: Studies with pre- and post-intervention measures including randomized controlled trials, non-randomized controlled trials, pilot studies, quasi-experimental studies, mixed-methods studies, longitudinal studies, and qualitative studies.

Studies were not excluded based on publication date or type of caregiver population. Dissertations, theses, book chapters, and reviews were excluded. As the purpose of this review was to ascertain interventions that effectively treat loneliness in caregivers, studies which only assessed for loneliness correlations were excluded. Randomized controlled trials were included but not required as a criterion of inclusion. Studies with a pre-post design (e.g., no comparison condition) were also included.

2.3. Data extraction

Data extracted from 12 studies included: (1) study aim, (2) study design (methods, groups, and number of participants), (3) caregiver group characteristics (age, gender, and relationship to care recipient), (4) intervention characteristics (type of intervention, mode of delivery, technology use, duration, and follow-up), (5) scale used to measure loneliness (UCLA Loneliness Scale, surveys, etc.), and (6) results of the study specific to loneliness. This included whether the intervention had a statistically significant effect on reducing loneliness, effect sizes, and any qualitative data gathered from surveys reporting participants' perceived change in loneliness or their thoughts regarding the therapy they received.

For each article, a description of purpose, methods, and relevant results were synthesized (see Table 1). Studies were grouped by the type of intervention conducted and relevant findings were compared. This allowed for the emergence of themes and provided a clear way to analyze data from diverse methodologies (Health Development Agency, 2004). Despite many interventions measuring other outcomes including burden, depression, anxiety, and others, analysis of studies was limited to the loneliness outcomes in caregivers.

3. Results

Search results (PRISMA Flow diagram) are summarized in Fig. 1 below. A total of 493 titles and abstracts were screened following the removal of duplicates. Twenty-eight full text articles were screened, of which 12 met the inclusion criteria. Studies were primarily conducted in the U.S. (58.3%), or European countries (33.3%) including the U.K., Italy, Poland, and The Netherlands. Most of the studies focused on family caregivers (91.7%), of which the majority identified as spouses (90.9%). Additionally, all studies had more than 50% of the caregivers

Table 1
Key Characteristics of Included studies.

Author	Aim	Intervention	Sample Characteristics	Method/Analysis	Relevant Results
Tkatch, et al., 2017	Test feasibility and effectiveness of online mindful meditation on older adult caregiver quality of life, burden, and psychosocial well-being	Mindfulness meditation: 8-week intervention which included 8 modules delivered twice weekly online/phone/web (3 offered in-person). Participants logged in for 60 min per week from their homes and practiced at their convenience	Caregivers of older adults ($n = 40$) <u>Age:</u> $M = 71$ <u>Gender:</u> Female (80%) <u>Relationship:</u> Not assessed <u>Setting:</u> U.S. - caregivers accessing senior community centers in South Florida	<u>Feasibility pilot study</u> Complete baseline and post-intervention survey after final session including the 3-item UCLA Loneliness scale	- Significant decrease in loneliness ($p = 0.03$) -No effect size reported
Gustafson et al., 2019	Assess effectiveness of eHealth interventions on Alzheimer's caregivers to preserve their psychological, social, and practical needs	Computer-based system: Randomized participants used the ν -CHESS program for 6 months designed to help with motivation, decision making, stress reduction, and access to services. Also provided with sensors to use if desired, to help with tracking the care recipient	Family caregiver of Alzheimer's care recipient ($n = 16$ Experimental, $n = 15$ Control) <u>Age:</u> 55–64 (19% E, 20% C), 65–74 (44% E, 60% C), 75+ (37% E, 20% C) <u>Gender:</u> Female (69% E, 53% C) <u>Relationship:</u> Spouse (94% E, 87% C), Adult child (0 E, 7% C), Other (6% E, 6% C) <u>Setting:</u> U.S. – caregivers from the Wisconsin Alzheimer's Disease Research Center	<u>Randomized controlled trial</u> Surveys completed at 0, 2, 4, and 6 months including the 20-item UCLA loneliness scale	- Statistically non-significant difference in loneliness between ν -CHESS and control group ($p > 0.12$) - Cohen's $d = 0.54$ - ν -CHESS may be associated with preventing the worsening of loneliness if larger sample size used
Clair et al., 1993	Assess the implementation of music therapy to reduce feelings of loneliness and strengthening the relationship between familial Alzheimer's caregivers and their care recipient	Music Therapy: Caregiver and Alzheimer's care recipient attended weekly sessions of lunch followed by a music therapy session which included group singing, hoop drum playing and ballroom dancing for 6 weeks	Family caregivers of Alzheimer's care recipients ($n = 4$) <u>Age:</u> 65–76 <u>Gender:</u> Female (75%) <u>Relationship:</u> Spouse (100%) <u>Setting:</u> U.S. – recruited from a local chapter of the Alzheimer's Association and Related Disorders and the outpatient clinic of a Veterans Affairs Medical Center in the Midwest	<u>Pilot Study</u> Measured weekly and then 1 month post intervention using the 20-item UCLA Loneliness Scale. Caregivers also provided written and oral comments about their music therapy Experiences	- No significant change in loneliness over the course of the sessions - Participants mentioned the program provided a stimulating environment to find new social contacts - All participants would recommend the therapy to others
Hartke and King, 2013	Evaluate effectiveness of telephone support groups for dementia caregivers and spousal stroke caregivers	Peer support group: Randomized participants took part in 8 one-hour weekly telephone support sessions. Groups consisted of about 2 group facilitators and 1–4 caregivers	Stroke caregivers ($n = 43$ Experimental, $n = 45$ Control) <u>Age:</u> $M = 69.7$ E, 69.7 C <u>Gender:</u> Female (74% E, 78% C) <u>Relationship:</u> Spouse/partner (100%) <u>Setting:</u> U.S.- spouses of stroke survivors receiving acute rehabilitation at a major suburban medical center	<u>Randomized controlled trial</u> Assessed for loneliness via 10-item UCLA Loneliness Scale at baseline, immediately after, and 6 months post intervention	- At baseline, treatment group had significantly higher loneliness than control ($p < 0.05$) - Effect size not reported - No significant change in loneliness over time within or between groups
O'Connor et al., 2014	Determine feasibility of online virtual support groups for dementia caregivers and its effect on burden and negative affect	Peer support group: Participate in 1 hour weekly virtual reality support groups through the Second Life program for 8 weeks. Group consisted of 3–4 caregivers, psychologist, and project coordinator	Family caregivers of dementia care recipients ($n = 10$) <u>Age:</u> $M = 60.86$ <u>Gender:</u> Female (100%) <u>Relationship:</u> Spouse (43%), Daughter (71%), Sister (14%) <u>Setting:</u> U.S.- urban Tuscan, Arizona area	<u>Feasibility Pilot study</u> Completed pre and post intervention measures including 20-item UCLA Loneliness Scale	Statistically non-significant decrease in loneliness - Effect size not reported
Trail et al., 2020	Examine effect of online support groups/ communities on decreasing social isolation and depression in military caregivers	Peer support group: Caregivers joined the Military Veteran Caregiver Network which provides discussion forums and webchats, support/interest groups, and webinars all moderated by trained paid staff. Comparison group participants belonged to military caregiver	Caregivers of ill or wounded veterans ($n = 212$) <u>Age:</u> <40 years (58.5%), 40–59 years (34.9%) <u>Gender:</u> Female (93.9%) <u>Relationship:</u> Spouse (89.2%) <u>Setting:</u> U.S.- caregivers	<u>Longitudinal study</u> Participants completed surveys at baseline, 3 months, and 6 months including a 3-item short scale for measuring loneliness (rate how often they: feel they lack companionship, feel left out, and feel isolated)	- Significant decrease in loneliness at 3 months ($p < 0.05$) but not at 6 months - Greater change in loneliness for those who engaged more with the community - The average time spent on the community website at 3

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Table 1 (continued)

Author	Aim	Intervention	Sample Characteristics	Method/Analysis	Relevant Results
Charlesworth et al., 2008	Determine efficacy and cost of social support interventions on dementia caregivers versus standard care	organizations and were not part of MVCN at baseline, but were allowed to join later if desired 1:1 Peer support: Befriender facilitators were volunteers trained to provide 1:1 emotional support to caregivers through weekly home visits for at least 6 months	who joined MCVA from 9/2016 till 2/2017 Family caregivers of dementia care recipients ($n = 116$ Experimental, $n = 120$ Control) <u>Age:</u> $M = 68.4$ E, 67.6 C <u>Gender:</u> Female (66% E, 63% C) <u>Relationship:</u> Spouse (66% E, 69% C) <u>Setting:</u> U.K.- caregivers of a community-dwelling relative	<u>Randomized controlled trial</u> Data collected at baseline, 6, 12, and 24 months using a 2-item loneliness scale which asked: Over the past 7 days, how much have you felt distressed by feeling lonely? How much have you been feeling lonely even when you are with people?'	months was significantly associated with a decrease in feelings of loneliness ($p < 0.05$) - Effect size not reported - No difference between intervention and control group with respect to loneliness at any time-point ($p = 0.945$ at 6 months, $p = 0.23$ at 12 months, $p = 0.529$ at 24 months) - Effect size not reported
Nichols et al., 2014	Assess the effectiveness of the REACH VA program on improving loneliness in veterans who identify as caregivers of Alzheimer's care recipients	1:1 Peer Support: Caregivers participated in 4 telephone sessions with a trained VA staff member who provided informational and emotional support over the course of 2–3 months. Additional sessions and telephone peer support groups were optional	Family caregivers of Alzheimer's care recipients ($n = 125$) <u>Age:</u> $M = 70.7$ <u>Gender:</u> Female (90.4%) <u>Relationship:</u> Spouse (79.2%), adult children (16%) <u>Setting:</u> U.S. – caregivers accessing VA services across the country	<u>Pilot study</u> Data collected at baseline and at 2–3 months using a questionnaire asking if they experienced feeling lonely often, sometimes, or never. Also completed an evaluation form at the end of the program.	- Statistically significant decrease in loneliness ($p = 0.003$) - Effect size not reported - Caregivers noted increased understanding of their role, had their feelings validated, and felt supported by VA staff
Smith et al., 2018	Investigate the impact of befriending and peer support on dementia caregivers and assess experiences of receiving the intervention	1:1 Peer support: Caregivers receiving one-to-one befriending or peer support from volunteers at least weekly via telephone, email, or face-to-face over the course of 6 months	Dementia caregivers already receiving weekly peer support/befriending services ($n = 19$) <u>Age:</u> $M = 63.6$ <u>Gender:</u> Female (73.7%) <u>Relationship:</u> Spouse (68.4%), Adult child (26.3%), Adult grandchild (5.3%) <u>Setting:</u> U.K. – caregivers accessing befriending or peer support services in South East England	<u>Mixed-methods study</u> Questionnaires at baseline, 3, and 6 months which included the 20-item UCLA Loneliness Scale. 8 caregivers also completed qualitative phase of semi-structured interviews asking about their experiences and analyzed for themes	- Statistically non-significant reductions in loneliness over three time points ($p = 0.19$) - Effect size not reported - Themes emerged include: felt like someone there for them, help them get through difficult situations, reduced social isolation
Stewart et al., 2006	Analyze how accessible peer support programs via telephone can improve health outcomes of Alzheimer's family caregivers	1:1 Peer support: New family caregivers were matched with peer helpers (caregivers with 5+ years of experience) and had weekly 1:1 telephone sessions for a total of 20 sessions. Sessions offered information, affirmation, and emotional support	Family caregivers of Alzheimer's ($n = 47$) and stroke ($n = 19$) <u>Age:</u> $M = 60$ <u>Gender:</u> Female (66%) <u>Relationship:</u> Spouses (59%), Daughters/Sons (36%), Siblings (5%) <u>Setting:</u> Canada- recruited caregivers in Edmonton, Calgary, and Central Alberta	<u>Qualitative study</u> Complete pre-test interview in-person, and post-test and delayed post-test (12 weeks after) interviews via telephone to provide qualitative data. Interviews underwent content analysis	- Interviews revealed 37% felt decreased loneliness - "Knowing you are not alone" was a prevalent theme identified by participants - More willing to reach out to peer helpers for support instead of family
Dröes et al., 2006	Investigate the positive effects of the Meeting Centres Support Program on dementia caregivers in The Netherlands	Meeting Centres Support Program: Control group attended psychogeriatric day care. Experimental group attended MCSP- a social club in community centers. Person with dementia attend 3 times/week while caregivers attend 8–10 informational meetings and bi-weekly long-term discussion groups over 7 months	Caregivers of dementia care recipients ($n = 94$ Experimental, $n = 34$ Control) <u>Age:</u> $M = 64.5$ E, 60.8 C <u>Gender:</u> Female (83.1% E, 76.9% C) <u>Relationship:</u> Spouse/partner (64.8% E, 38.5% C) Daughter/son (26.8% E, 53.8% C), Other (8.5% E, 7.7% C) <u>Setting:</u> Netherlands – caregivers attending MCs in Netherlands	<u>Quasi-experimental design</u> Measured at baseline/within first month and at 7 months including the De Jong-Gierveld Loneliness Scale	- Statistically non-significant difference in loneliness between the two groups ($p = 0.43$) - Caregivers who felt lonelier at the start benefited significantly from the intervention ($p = 0.02$) - Cohen's $d = 0.04$
Evans et al., 2018	Determine if there is a comparable benefit of the Dutch Meeting Centres Support Program on dementia caregivers in Italy, Poland, and the U.K.	Meeting Centres Support Program: Maintained study protocol set forth by Dröes et al. Control group attended psychogeriatric day care	Family caregivers of dementia care recipients ($n = 121$ Experimental, $n = 87$ Control) <u>Age:</u> $M = 64.2$ E, 64.2 C <u>Gender:</u> Female (73.1%,	<u>Quasi-experimental design</u> Measured at baseline/within the first month and then at 6 months including the 3-item UCLA Loneliness Scale. Participants in the	- No significant difference in loneliness between groups ($p = 0.68$) - Cohen's $d = 0.06$ - MCSP loneliness scores improved slightly from

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Table 1 (continued)

Author	Aim	Intervention	Sample Characteristics	Method/Analysis	Relevant Results
		while experimental group attended the MCSP (see above) for 6 months	67.6% C) <u>Relationship:</u> Spouse/partner (54.9% E, 56.9% C), Daughter/son (34.1% E, 37.5% C), Other (11.0% E, 5.6% C) <u>Setting:</u> Italy ($n = 63$ E, $n = 25$ C), Poland ($n = 23$ E, $n = 21$ C), U.K. ($n = 35$ E, $n = 41$ C) - caregivers who were attending MCs in Italy, Poland and the UK	intervention also completed user satisfaction surveys at 3 and 6 months	baseline to follow up while control remained the same - MCSP group felt lonelier than control group at both baseline and follow up - Feelings of loneliness decreased most in MCSP caregivers in Poland

Note: Abbreviations:

E= Experimental Group.

C= Control Group.

M= mean.

n = number of participants.

D-CHESS = Dementia–Comprehensive Health Enhancement Support System.

MVCN = Military Veteran Caregiver Network.

REACH VA = Resources for Enhancing All Caregivers Health in the Department of Veterans Affairs.

VA = Veteran Affairs.

MCSP = Meeting Centres Support Program.

MCs = Meeting Centres.

identifying as female. Care recipients included persons with dementia (75%) or stroke (16.7%), veterans (8.3%), and older adults (8.3%). A majority of studies (81.2%) also utilized an intervention that included an online/virtual component. The study designs included four pilot studies, three randomized controlled trials, two quasi-experimental studies, one mixed methods study, one longitudinal study, and one qualitative study.

3.1. Description of interventions

Of the 12 included studies, five intervention types emerged: mindfulness meditation, computer programs, music therapy, peer support, and community activity groups. The description of each intervention's components is summarized in Table 1. Peer support programs, including one-on-one personal contact ($n = 4$ studies) and support groups ($n = 3$ studies) were the most frequently used intervention for caregivers. One-on-one support (Charlesworth et al., 2008; Nichols et al., 2014; Smith et al., 2018; Stewart et al., 2006) involved caregivers being paired with a trained volunteer, in some cases an experienced caregiver, and having scheduled interactions to provide information and emotional support. Similarly, peer support groups (Hartke and King, 2003; O'Connor et al., 2014; Trail et al., 2020) provided caregivers with scheduled contact with a group of fellow caregivers and trained facilitators. A prevalent theme to emerge from these interactions was the caregiver feeling less alone and like someone was there solely for them. Only the 1:1 peer intervention conducted through the Resources for Enhancing All Caregivers Health in the Department of Veterans Affairs (REACH VA) found a statistically significant decrease in loneliness ($p = 0.003$) (Nichols et al., 2014). Albeit not statistically significant, the remaining studies did find a reduction in feelings of loneliness among caregivers.

The components of the community activity group (Dröes et al., 2006; Evans et al., 2018) included various types of support ranging from discussion forums and social activities for caregivers to reminiscence and music therapy. Furthermore, the Meeting Centres Support Program (MCSP) also maintained care for persons with dementia three times per week, providing respite for the caregivers. Hence, caregivers reported the MCSP offered much needed social contact and emotional support. Again, there was no statistically significant difference in loneliness between the intervention and control groups over the course of the intervention.

The computer-based system intervention (Gustafson et al., 2019)

consisted of participants utilizing the Dementia–Comprehensive Health Enhancement Support System (D-CHESS). This program allowed caregivers to access services at their own convenience including discussion groups, journaling features, interactive planner tools, and private messaging with specialists, family, and friends. Participants were provided with external sensors to use, if desired, to provide global positioning system (GPS) tracking, caregiver alerts, and item location. Even though results were not statistically significant ($p > 0.12$), the effect size of $d = 0.54$ suggests that the D-CHESS platform may alleviate loneliness in a larger, well-powered, sample.

Music therapy (Clair et al., 1993) involved in-person sessions in which the caregiver and Alzheimer's care recipient spent time having lunch together before moving onto a session of dancing, singing, and hoop drum playing. This intervention aimed to provide a means of interaction between the caregiver and care recipient so as to help reestablish emotional intimacy and strengthen their relationship. While there were changes in loneliness for three of the four participants, these differences were not statistically significant.

Mindfulness meditation (Tkatch et al., 2017) referred to the implementation of weekly modules which discussed factors of self-care and mediation for the purposes of improving self-compassion. This intervention was found to promote positive emotional regulation and provide a sense of calmness, aiding in loneliness relief. Additionally, this program resulted in a significant decrease in loneliness in the caregivers over the course of eight weeks ($p < 0.05$).

3.2. Dropout & design limitations

The included studies with higher drop-out rates discussed factors such as the caregiver feeling too busy (O'Connor et al., 2014; Stewart et al., 2006), declining care recipient health or death (Charlesworth et al., 2008; Dröes et al., 2006; Gustafson et al., 2019; Hartke and King, 2003; Stewart et al., 2006), care recipient transferring to a nursing home (Dröes et al., 2006; Gustafson et al., 2019), caregiver's perceived lack of need for support (Hartke and King, 2003; Smith et al., 2018), and even declining health of the caregiver (Dröes et al., 2006) as main reasons for withdrawal. Similarly, caregivers facing greater burden may decide not to seek out or participate in a clinical study due to the stress of their duties. Consequently, many studies allowed for selection bias to occur by utilizing caregivers who were already accessing supportive services (Smith et al., 2018; Nichols et al., 2014; Tkatch et al., 2017) or the

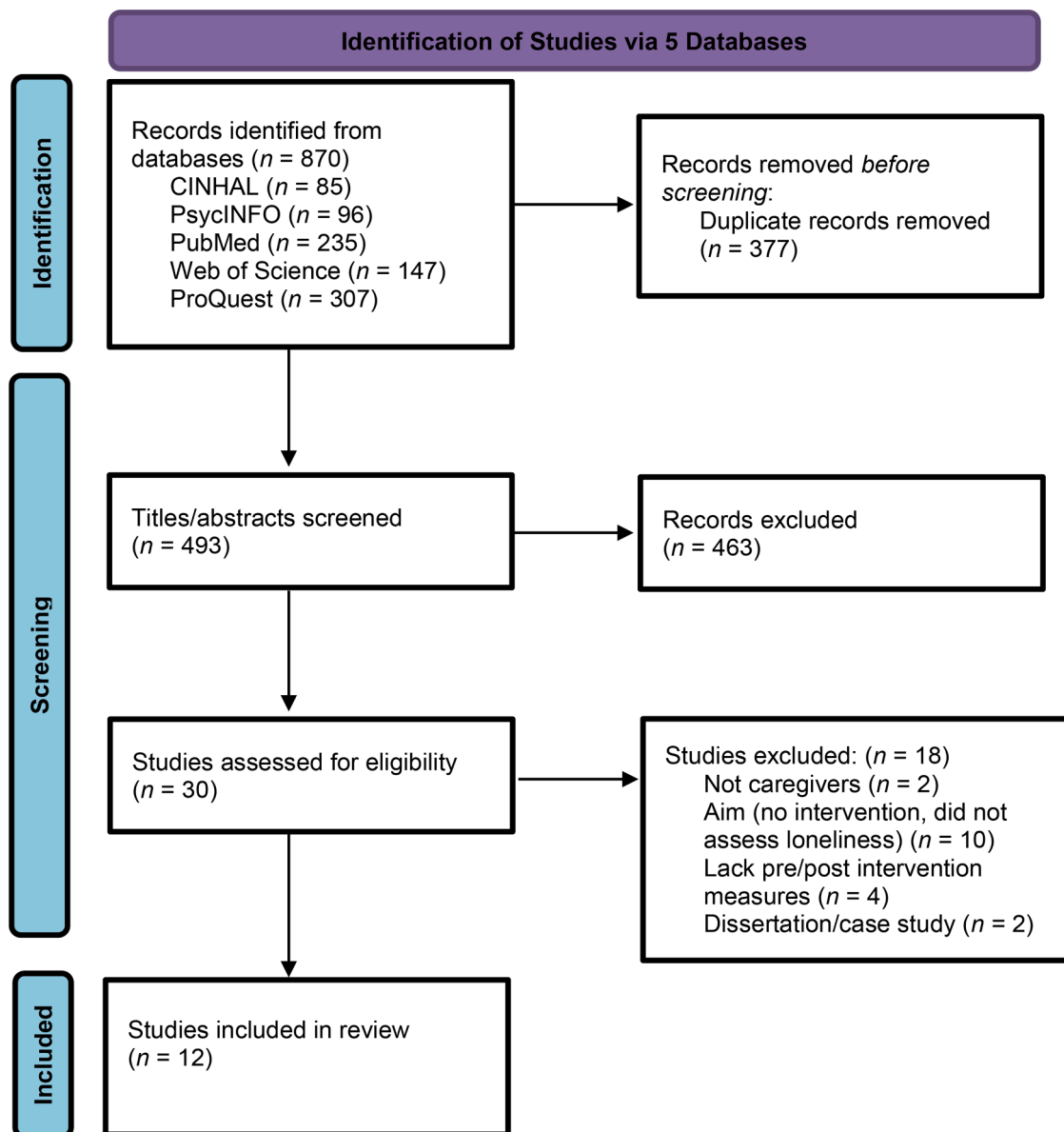


Fig. 1. PRISMA flow diagram.

studies allowed caregivers to choose the intervention rather than randomizing participants (Dröes et al., 2006; Evans et al., 2018; Trail et al., 2020). This also eliminated rural caregivers from studies as they were unable to access the support services where participants were recruited from. As a result, study findings should be interpreted with caution as those who participate are likely caregivers who are already able and willing to seek outside support, and this may not extend to more burdened caregivers who may fear stigmatization if they were to ask for help.

3.3. Thematic analysis

A primary theme to emerge from the studies was the use of interventions in strengthening a caregiver's ability to regulate their emotions. All too often caregivers put the needs of the care recipient first and ignore their own well-being in the process. Through the use of mindfulness meditation or peer support groups/befrienders, caregivers were advised on the ways to implement self-care and self-compassion as part of their daily routine. Trained befrienders instructed caregivers with how to express their emotions and come to terms with the

difficulties they are facing (Smith, et al., 2008). Additionally, the MCSP provided a safe space for participants to discuss their thoughts thanks to the strong emotional support provided by fellow caregivers and trained staff (Dröes et al., 2006; Evans et al., 2018). As mindfulness meditation was one of the only interventions to find a significant decrease in loneliness ($p < 0.05$), and other research has demonstrated the benefits of mindfulness meditation in promoting emotional regulation, these findings highlight the need for future research to further investigate emotional regulation as a mediator of loneliness (Hölzel et al., 2011; Tkatch et al., 2017).

Another common theme among interventions was the use of peer support services as a way to supplement the relational loss that caregivers feel. As previously discussed, caregivers often allow their duties to consume them, preventing them from maintaining pre-existing relationships. Moreover, their family and friends may not understand the unique challenges caregivers face, further creating a divide between a caregiver and their previous support network Charlesworth et al. (2008). found that many caregivers in the study reported limited local contact or informal support from relatives. Therefore, caregivers highlighted how peer-support interventions reminded them that they were

not alone in what they were facing (Nichols et al., 2014; O'Connor et al., 2014; Stewart et al., 2006). Of the services offered by the D-CHESS system, the "Support" area, which provides peer-support discussions, was the most frequently utilized service (Gustafson et al., 2019). Additionally, music therapy provided a new avenue for caregivers to reconnect with their loved one and provided a stimulating environment to meet new friends (Clair et al., 1993). Having someone who they could consider a friend allowed caregivers to feel special, like someone was there just for them, which in turn enabled the development of successful relationships and decreased feelings of loneliness (Smith et al., 2018; Trail et al., 2020). Due to the complexity of certain chronic health conditions, it can be challenging for caregivers to adapt to their new position. Therefore, it comes as no surprise that the second most used part of the D-CHESS system was the "Tools" area which assisted in decision making and planning services (Gustafson et al., 2019). In addition, caregivers in the 3D virtual support group commented on learning specific techniques and tools, such as elder care legal issues, as one of the best parts of the group (O'Connor et al., 2014). Through instruction and provision of written materials and resources provided during sessions, caregivers gained an improved understanding of the care recipient's disease and tools to tackle specific issues (Hartke and King, 2003; Nichols et al., 2014; Stewart et al., 2006). However, whether becoming more informed allowed a caregiver to better acclimate to their role and thereby improve their ability to manage the adverse effects of caregiving is not yet known.

4. Discussion

This review identified five types of interventions developed to reduce loneliness in caregivers. Although a majority of studies did not present statistically significant results, this review identified some promising areas for future inquiry. Peer support was the most frequently utilized intervention method with results indicating that other caregivers undergoing a similar situation can effectively empathize and support fellow caregivers in their journey. In addition, services that provided emotional and informational support were at the forefront of combating loneliness in caregivers. While the inclusion of diverse methodologies allowed for a more complete understanding of the interventions currently available, it also informed us of their limitations and areas for improvement.

Findings from this review highlight the need for future studies with larger sample sizes and extended duration of the intervention. Given the burden that caregivers face, it can be difficult for them to remain in a study or participate in any task that takes time away from their caregiving responsibilities, especially when the care recipient becomes too impaired (Brodaty et al., 2005). Thus, the challenge to recruit caregivers and maintain participation levels for an extended period of time may have contributed to the small effect sizes and lack of significant findings in a majority of the included studies. Additionally, a number of studies included in this review failed to examine the severity of the care recipient's primary diagnosis (e.g., dementia, stroke) or the number of years that a caregiver had been in their position. A study by Bramboeck et al. (2020) found that caregiver loneliness was highest during the early stages of the recipient's disease. Although this may seem counterintuitive, this finding suggests that caregivers likely become acclimated to social isolation as their recipient's disease progresses. Moreover, Park et al. (2020) discussed how individuals with the greatest levels of loneliness were those experiencing significant stress, which likely triggered inflammatory pathways leading to adverse health outcomes. This further establishes the need for loneliness interventions that target caregivers in the beginning stages of their role and address this maladaptive social cognition to prevent the deterioration of their mental-health and well-being.

Another gap in this area of research is comparing the efficacy of group versus one-on-one peer support interventions. Each support style has its own strengths as individual interventions can be tailored to the

caregiver whereas group interventions provide the opportunity to engage with other caregivers and increase their social network. For this reason, it would be important to understand whether the mode of delivery for peer support alters the efficacy of such interventions and which types of caregivers may benefit most. To this extent, cultural and gender diversity remains a limitation of most of the included studies. Much of the caregiving literature has focused on white women who are typically well-educated and wealthy. Interestingly, research on the effects of loneliness on health outcomes has shown that loneliness may have a greater impact on cognitive decline in males (Park et al., 2020). Compared to female caregivers, male caregivers have a heightened risk of loneliness and depression when transitioning into the informal caregiver role despite also reporting an increased social network size (Zwar et al., 2020). This underscores the importance of developing effective psychosocial treatments to mitigate loneliness among all caregivers, and especially the unique and growing population of male caregivers. Given that differences may exist between male and female caregivers (McDonnell and Ryan, 2013; Robinson et al., 2014) and among different racial and ethnic groups (Liu et al., 2021; Rote and Moon, 2018), interventions should be developed with the intention to generalize to these populations.

Although this literature review included studies which measured the effects of the proposed intervention on loneliness, several interventions were not primarily designed to specifically target loneliness (Charlesworth et al., 2008; Dröes et al., 2006; Nichols et al., 2014; Tkatch et al., 2017; Trail et al., 2020). All studies included other measures of depression, anxiety, burden, or stress in an effort to improve overall caregiver well-being. There have been a number of literature reviews focusing on interventions specific to reducing loneliness in older adults which have found significant results (Cohen-Mansfield and Perach, 2015; Gardiner et al., 2018; O'Rourke et al., 2018). Such reviews often included interventions involving face-to-face contact for support groups, animal contact, skills courses, leisure programs, and reminiscence therapy- some of which may not be feasible for caregivers. On the other hand, interventions utilizing teleconference and the Internet were also successful at reducing loneliness in older adults (Blazun et al., 2012; Tsai et al., 2010). This calls into question why similar interventions were not as successful in the caregiver population and to what extent the findings of this review were affected by the intervention goal. That is, studies primarily targeting burden or depression may select different predisposing factors (e.g., stress reduction) from studies primarily targeting loneliness (e.g., social networking).

Due to the extensive workload of caregivers, it is not always possible to leave their care recipient to attend in-person activities. For this reason, the use of a virtual platform to ameliorate loneliness will become vital to reach this population. Virtual platforms may also be relevant during the SARS-COV-2 (COVID-19) pandemic and can be used to reach rural caregivers and those with transportation limitations (Kaufman et al., 2010). Convenience of the intervention is instrumental to caregiver adherence, and the use of evidence-based smartphone interventions will have important applications. This includes innovations such as use of smartphones to promote interactive programs that can provide tips for caregivers, mindfulness exercises, journals to record triggers, and even daily questionnaires to monitor distress and loneliness (Zhang et al., 2016). This way, caregivers can be more attuned to the negative impacts of their role and have access to supportive resources in the palm of their hand. Furthermore, the aforementioned literature reviews determined key factors contributing to the success of interventions such as encouraging shared activity, having participants assist in the design and implementation of interventions, and promoting personal development (Cohen-Mansfield and Perach, 2015; Gardiner et al., 2018; O'Rourke et al., 2018), all of which could be tailored for virtual platforms.

4.1. Limitations

There remains inconsistency into what mechanisms of an intervention affect loneliness, and further research is required to better understand the biopsychosocial factors that should be targeted to prevent the development of loneliness. In order to include a wide range of interventions, this review did not discriminate between the types of care recipients that caregivers were looking after. While a majority of studies did focus on dementia caregivers (Charlesworth et al., 2008; Clair et al., 1993; Dröes et al., 2006; Evans et al., 2018; Gustafson et al., 2019; Nichols et al., 2014; O'Connor et al., 2014; Smith et al., 2018; Stewart et al., 2006) others examined interventions in caregivers of stroke care recipients (Hartke and King, 2003; Stewart et al., 2006), veterans (Trail et al., 2020), and older adults (Tkatch et al., 2017). Due to the potential discrepancy in caregiver burden that these various sub-groups may face, it is vital that future studies assess the level of caregiver burden as well as analyze the recipient-dependent factors that affect caregiver loneliness. Moreover, meta-analysis was not conducted due to the small sample sizes and varied study designs of the included studies. The included studies used a variety of scales to measure loneliness which may have impacted the significance of the outcomes measured. Therefore, limiting such variability by utilizing a standardized loneliness scale may be important for future meta-analyses. When larger, well-designed studies are conducted, future researchers will be able to better synthesize results through meta-analysis and meta-regression.

5. Conclusion

As the older population continues to grow exponentially worldwide, the number of family caregivers will continue to expand. The disruption to their daily routine and limited social contact increases the risk of loneliness in caregivers, as well as the myriad of negative health outcomes associated with it. While a wide range of interventions have been developed to target loneliness in this population, these programs may fall short of expectations. A majority of studies reported a small degree of success in reducing loneliness when implementing interventions targeting social connectedness, though larger effect sizes may be needed to see clinically significant improvements in loneliness. Accordingly, further research is necessary to generate interventions which target caregivers in the earlier stages of their role, provide informational and emotional support, and contain virtual components so as to encourage greater participation and understanding of this issue.

Declaration of Competing Interest

The authors declare no potential conflicts of interests.

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