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The Key to Healthy Ageing: A Meta-review of Interventions Addressing Social Isolation and Loneliness in Older Adults

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Abstract

Social isolation and loneliness have a significant impact on the physical and mental health of older adults, with decreased social interactions having substantial adverse effects on ageing. Following the COVID-19 pandemic, there has been a renewed focus on research on the importance of addressing social isolation and loneliness in the older population, along with the proposal of new interventions. This systematic meta-review aims to compile information from systematic reviews, scoping reviews, and meta-analyses published between 2014 and 2024 to identify which interventions are currently available. A narrative synthesis will be conducted using data extracted from the final reviews to identify effective interventions, as well as the factors that contribute to their success.

The interventions were grouped into five broad categories: psychosocial interventions, technological interventions, health promotion interventions, and other interventions, based on similarities in objectives and services. Psychosocial interventions emerged as the most effective category, followed by technological interventions. The interventions incorporating psychological components, such as counselling and cognitive-behavioural strategies, consistently demonstrated the greatest impact, particularly those that improved social support, addressed maladaptive cognition, and enhanced social skills. Recent high-tech solutions and digital adaptations of psychosocial and leisure interventions show promise in overcoming access barriers, along with multicomponent interventions, animal-assisted therapies, and activity-based programs. Overall, interventions focused on addressing social isolation and loneliness are effective tools in improving the health of older adults and should be incorporated into community and healthcare services. Regarding future research, our recommendation is to explore the long-term impact of these interventions and assess the feasibility of each intervention for implementation.

1   Introduction

The COVID-19 pandemic and the public health measures aimed at preventing the spread of infection, including lockdowns, restrictions on social gatherings and social interactions, led many people to experience loneliness and social isolation firsthand (Savage et al., 2021; Schroyen et al., 2023). As a result, research on the effects of loneliness and social isolation on physical and mental health saw renewed interest. Research during this time explored the lived experiences of older adults during the COVID-19 pandemic, identifying the effects of social restrictions on their lives, leading to the identification of the adverse effects of isolation, and, in particular, the role of perceived loneliness in shaping the adverse impact of social isolation (Cipolletta & Gris, 2021; F. Yang & Gu, 2025). Following the pandemic, studies on the topic have continued, as older adults are at a greater risk of experiencing social isolation and loneliness, even outside the context of the global pandemic, due to diminished mobility, increased fears, and the specific life experiences characteristic of older age (Somes, 2021). The World Health Organisation has deemed social isolation and loneliness a public health priority, given that 1 in 4 older adults experience social isolation (WHO, 2021), indicating that 25% of older people are socially isolated. The University of Michigan National Poll on Healthy Ageing (NPHA) sample showed that loneliness and social isolation trends have decreased among older adults in the United States since the end of the COVID-19 pandemic. However, they noted that social isolation remains higher than before the pandemic, with one in three older adults (34%) reporting feelings of isolation in 2023, compared to 27% in 2018 (NPHA, 2023).

This meta-review aims to synthesise the data available from published reviews to provide a comprehensive overview of the current literature on interventions addressing social isolation in older adults and their effectiveness. This chapter will first introduce the concepts of loneliness and social isolation and explore the risk factors that contribute to their significant prevalence in the older adult population. It will then review the impact of loneliness and social isolation on health and the bidirectional relationship between risk factors and health outcomes of loneliness and social isolation.

1.1   Defining Loneliness and Social Isolation

Loneliness refers to the subjective experience of a painful and unpleasant emotional state resulting from a mismatch between the number and quality of social relationships one actively has as compared to the ones they desire (de Jong Gierveld & van Tilburg, 2006; Hauge & and Kirkevold, 2010). Loneliness can be divided into two dimensions corresponding with a

perceived qualitative or quantitative deficit in relationships. As a result of a qualitative deficit, emotional loneliness occurs, which refers to the perceived absence of an intimate relationship or a close emotional attachment (de Jong Gierveld & van Tilburg, 2006). Secondly, social loneliness occurs when individuals are dissatisfied with the number and frequency of social contacts, thus feeling alone (de Jong Gierveld & van Tilburg, 2006).

Social isolation refers to the objective lack of social connections and the absence of relationships (Somes, 2021). Social isolation may lead to experiences of loneliness, as a lack of contact with other people can result in a negative physical state, sadness, restlessness, and displeasure with the number of social contacts (de Jong Gierveld & van Tilburg, 2006; Grover, 2022). However, this is not always the case. An individual may be isolated but not lonely; thus, is satisfied and does not experience psychological distress on account of limited social contact. While social isolation may result in loneliness, it is worth noting that an individual may still experience loneliness even if they are not isolated, as they may live with others or frequently see friends (Newall & Menec, 2019).

1.2 Loneliness and Social Isolation in Older Adults

1.2.1 Risk Factors

The life events that characterise ageing can increase the risk of older adults experiencing social isolation and loneliness and becoming disconnected from society (Somes, 2021). Cohen-Mansfield and Parpura-Gill (2007) proposed the Model of Depression and Loneliness (MODEL), which conceptualises these events and circumstances into four categories: environmental, health, psychological, and stressful life events, which can introduce obstacles in establishing and maintaining relationships.

Environmental factors may include the necessary change in one's environment due to relocation. Whether for financial or accessibility reasons, one's relocation can lead to the loss of one's neighbourhood social network. Additionally, living in an inaccessible environment can limit one's mobility, creating a barrier to engaging in the community and maintaining social connections (Cohen-Mansfield & Parpura-Gill, 2007; Somes, 2021). Additional environmental factors and resources can include the lack of transportation or the absence of family nearby, which can provide support or transportation if needed.

Health-related barriers may include compromised health due to cognitive decline, chronic pain, fatigue or incontinence, which can limit individuals to their households (Carrasco et al., 2022; Somes, 2021). A particular barrier to social connectivity and actively engaging

during social interactions is difficulties in hearing, as it can contribute to a disconnect and impact the quality of the interactions (Carrasco et al., 2022; Sung et al., 2016). Additional barriers in this category include limited mobility, the loss of the ability to drive, or reliance on medical equipment, which can also restrict older adults to their residence, significantly increasing the risk of social isolation (Somes, 2021).

The third category, psychological factors, includes health-related fears that can present challenges when leaving the house, meeting new people or participating in activities. These health-related fears include but are not limited to, fears of falling, fears of driving, fear of incontinence and subsequent embarrassment (Somes, 2021). Psychological factors may also refer to depression, anxiety and limited social skills. Overreliance on others to establish and maintain social contact, or the loss of a mediator or pre-existing relationships, can uncover these challenges, increasing the risk of loneliness and social isolation (Cohen-Mansfield & Parpura-Gill, 2007; de Jong Gierveld & van Tilburg, 2006).

Lastly, stressful life events which commonly occur in older age, such as deaths, retirement and relocation of friends and family, can result in psychological distress in addition to the sudden loss of a long-standing social network (Somes, 2021). The death of a spouse can also contribute to the other barriers if the widow was previously dependent on their spouse or friends for transportation, caregiving or the maintenance of social connections, all of which can further increase the risk of social isolation during and after the grieving period (Somes, 2021).

A further change in older adults' lives, putting them at greater risk of social isolation and loneliness is becoming a caregiver to their spouse, loved one or friends. Touching on all four categories, becoming a caregiver can limit one's freedom to attend social engagements and meet other people, as it may not be possible to leave one's dependent for an extended period. It can also contribute to a greater financial burden and greater stress in general, in addition to more fears and anxiety when leaving their home. These experiences may also compound with the previously mentioned challenges, making them even more vulnerable (Somes, 2021).

1.2.2   Health Consequences of Social Isolation and Loneliness

Satisfactory social relationships have been associated with a 50% greater likelihood of survival as compared to those with poor and insufficient social relationships (Holt-Lunstad et al., 2010). This difference is comparable to the health benefits of quitting smoking (Newall & Menec, 2019). In fact, a report published by the Health Resources & Services Administration

(HRSA, 2023) stated that the health impact of loneliness and social isolation is equivalent to smoking 15 daily cigarettes (HRSA, 2023; Somes, 2021), which means that social isolation and loneliness have greater effects on older adult's mortality than physical inactivity and obesity (Holt-Lunstad et al., 2010). Loneliness and social isolation have been associated with accelerating the rate of physiological ageing (Hawkley & Cacioppo, 2010), resulting in multiple adverse effects on physical, cognitive, and mental health, as well as shaping individuals' behaviour (Carrasco et al., 2022; Crewdson, 2016).

Two general theoretical models have been proposed to explain how this relationship may be mediated. First, there is the stress-buffering hypothesis (Bekiros et al., 2022), which suggests that social relationships provide resources that promote adaptive behavioural and neuroendocrine responses to the stressors that characterise older adulthood, for example, the risk factors mentioned above. The second proposed model is the "main effects" (Holt-Lunstad et al., 2010), which suggests that social relationships may encourage people to engage in healthy lifestyle behaviours, which in turn improve their health prospects.

1.2.3 Association with Biological Changes

Social isolation and loneliness have been shown to affect health at the biochemical level, inhibiting immune system functioning (Crewdson, 2016; Newall & Menec, 2019). The accumulation of cortisol due to prolonged experiences of stress caused by the decreased social contact reduces the immune system's response to the anti-inflammatory hormone cortisol, increasing the systemic level of inflammation and increasing the risk of infection, illness (Carrasco et al., 2022; Crewdson, 2016), and chronic pain (Jacobs et al., 2006). Furthermore, research has identified a link with cardiovascular health, contributing to high blood pressure and high cholesterol levels (Carrasco et al., 2022; Newall & Menec, 2019) to such an extent that lonely older adults are at a greater risk of cardiovascular deaths and non-fatal coronary events (Somes, 2021).

1.2.4 Consequences on Cognitive and Psychological Health

The inflammatory effects of social isolation and loneliness have been attributed to the acceleration of neurodegeneration observed in older adults experiencing loneliness (Hawkley & Cacioppo, 2010; Somes, 2021). The resulting neurodegeneration of the hippocampus and the brain areas responsible for emotional and cognitive processes corresponds with observed

diminished executive control, dementia and accelerated rates of cognitive decline (Carrasco et al., 2020; Hawkley & Cacioppo, 2010; Roy et al., 2023). Additional research suggests that the relationship between loneliness and cognitive decline is mediated by reduced cognitive activation resulting from a less enriching and stimulating environment (Carrasco et al., 2022; Conde-Sala et al., 2019). As a result, lower cognitive performance and higher prevalence of Alzheimer's disease (Carrasco et al., 2020) and a 30% increase in the likelihood of experiencing a stroke (Somes, 2021) are all associated with loneliness and social isolation in older adults.

Furthermore, research has shown that several emotional and cognitive processes and outcomes are susceptible to the influence of loneliness (Hawkley & Cacioppo, 2010), which aligns with data indicating a relationship between loneliness and various mental health issues (Carrasco et al., 2020). Low self-esteem, decreased capacity for self-regulation, emotional instability, including increased anger and negative thoughts about oneself or others and diminished optimism have all been associated with increased experiences of loneliness (Carrasco et al., 2022; Hawkley & Cacioppo, 2010). However, social isolation and loneliness can independently increase the likelihood of developing depression and anxiety, in addition to worsening the conditions (de la Torre-Luque et al., 2019; Roy et al., 2023). While suicide rates appear to generally increase with old age (Garnett et al., 2023), social isolation and loneliness can mediate and worsen this trend, increasing the risk for suicidal ideation (Conwell et al., 2011) and self-harm (Troya et al., 2019).

1.2.5   Behavioural Consequences

The psychological effects of social isolation and loneliness, which reduce the capacity for self-regulation in older adults, can have additional impacts on unhealthy lifestyle behaviours (Hawkley & Cacioppo, 2010). Loneliness increases the likelihood of older adults engaging in poor eating habits, which can lead to malnutrition (Crewdson, 2016), substance and alcohol abuse (Somes, 2021), sedentary behaviour, and reduced physical activity (Dogra & Stathokostas, 2012; Tully et al., 2019). One study (Farragher et al., 1994) found loneliness was a contributing factor to alcoholism in 43% of the study's patients. With reduced social contact, older adults may be less motivated to engage in physical activity due to decreased social pressure, which can lead to a deterioration in their health (Crewdson, 2016). Loneliness and social isolation may also put them at greater risk of being victims of elder abuse, such as being targets of fraudulent financial schemes and consequently falling for them (Somes, 2021).

1.3   The Bidirectional Relationship Between Risk Factors and Consequences.

One thing that is apparent when outlining the risk factors of social isolation and loneliness in older adults, as well as the consequences of these experiences, is the substantial overlap between the risk factors and outcomes that subsequently exacerbate the situation. The bidirectional relationship between the two means that not only is it difficult to determine a causal relationship between social isolation and physical and cognitive health, but the two also feed into each other. When older adults start to experience feelings of loneliness and social isolation as a result of the aforementioned risk factors, they are more likely to experience adverse health outcomes, which will consequently put them at greater risk of becoming further socially isolated. The interlinked nature of the adverse effects of social isolation and loneliness highlights why older adults are highly vulnerable to experiencing social isolation and loneliness. Thus creating a vicious loop that causes deterioration in their physical, mental, and cognitive health, making it progressively difficult for them to make the necessary changes on their own.

1.4   Aim of the Meta-Review

The vast evidence showcasing the adverse effects of social isolation and loneliness demonstrates the importance of social contact and fulfilling relationships in healthy ageing. There is a clear need to implement interventions and support which can help older adults grow and strengthen their social networks before the onset of loneliness starts to affect their health and well-being significantly. In response to this need, a substantial number of publications on the topic have been published, including multiple studies and systematic reviews in recent years. As a result, there is an additional need to summarise and provide a snapshot of the published literature. Thus, this meta-review aims to identify the interventions currently available and evaluate their effectiveness in assisting future policies and programs that can help prevent and reduce social isolation and loneliness in older adults, thereby promoting healthy ageing. This meta-review differs from previously published meta-reviews on interventions for older adults addressing loneliness and social isolation, as it is not limited to a single category of interventions, such as technological interventions, nor is it limited to randomised controlled trials (RCTS) or other study designs. As a result, to our knowledge, this meta-review is the first to produce such a comprehensive summary of existing interventions and their effectiveness in recent years.

2 Methodology

2.1 Data Sources and Search Strategy

The search strategy was developed through collaboration between the two reviewers (C.C. and V.R.) and the supervisor (S.C.). The literature search was conducted across three databases: PsycINFO, a psychology database, and two social science and science databases, SCOPUS and Web of Science, to ensure a broader reach in the published research. Furthermore, these three databases were selected because they are the most commonly used in previous reviews related to the topic, which could help cover a broader scope of published research. The databases were searched based on the identified key terms: (1) older adults, (2) loneliness, (3) social isolation and (4) interventions or a combination of them. The term "review" was not included amongst the search terms to account for potential reviews, which did not include the term in the title. However, a search filter was applied to limit the search to reviews. An additional filter was used to restrict the search to publications between January 2014 and December 2024. The database search was conducted independently by the reviewers (C.C. and V.R.) and further double-checked with the supervisor (S.C.).

2.2 Eligibility Criteria and Study Selection

Papers were deemed eligible for inclusion if they were scoping reviews, systematic reviews, systematic reviews with meta-analyses and other variations of systematic reviews published in English between January 2014 and December 2024. Reviews were included if they contained studies which reported the efficacy of interventions targeting loneliness and social isolation in older adults. The original age inclusion criterion was limited to individuals aged 65 or older. However, many reviews included primary studies that contained participants aged 50 and over; as a result, the age criterion was adjusted to include reviews that stated they focused exclusively on older adults. As the aim of this meta-review is to identify the efficacy of all currently available interventions, there was no criterion on the category and nature of the intervention. Similarly, the criterion for the types of study designs included in each review was not limited.

Published reviews were excluded if they did not explicitly state or discuss the efficacy of the interventions in the study or if the majority of the primary studies were conducted in nursing homes or long-term care facilities. Additionally, reviews that included interventions on populations with cognitive decline, specific illnesses, or those in poor health were excluded.

Consequently, any review that was focused on social isolation and loneliness as a result of the COVID-19 pandemic or interventions implemented during that time frame was excluded.

2.3   Data Extraction

The data extraction was conducted in two stages using standardised data-extraction protocols, which were prepared prior to the data extraction process. The first phase focused on the characteristics of the reviews, the studies they included, and their categorisation by type, as indicated in the template in Appendix 1. During this phase, it was noted that there was significant overlap in the primary studies included in multiple reviews. As a result, a secondary data extraction was conducted, which examined the primary studies covered in each review to identify duplicates. Between the two data extractions, information was collected on the type of interventions, their characteristics, and their effectiveness.

2.4   Study Quality Assessment

The quality of each review was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (JBI Critical Appraisal) (Aromataris et al., 2020), Appendix 2. The JBI Critical Appraisal was chosen due to its suitability for all types of reviews included in this paper, ensuring homogeneity in the evaluation and assessment of each paper. The checklist assesses the methodology employed in the review and the authors' presentation and communication of the data (Aromataris et al., 2020). The quality assessment was used to gain a better understanding of the reviews included in the study; therefore, no cutoff value was established for this purpose. Following an independent evaluation, the decisions of the two reviewers (C.C. and V.R.) were compared, and any disagreements were discussed and resolved with the supervisor (S.C.).
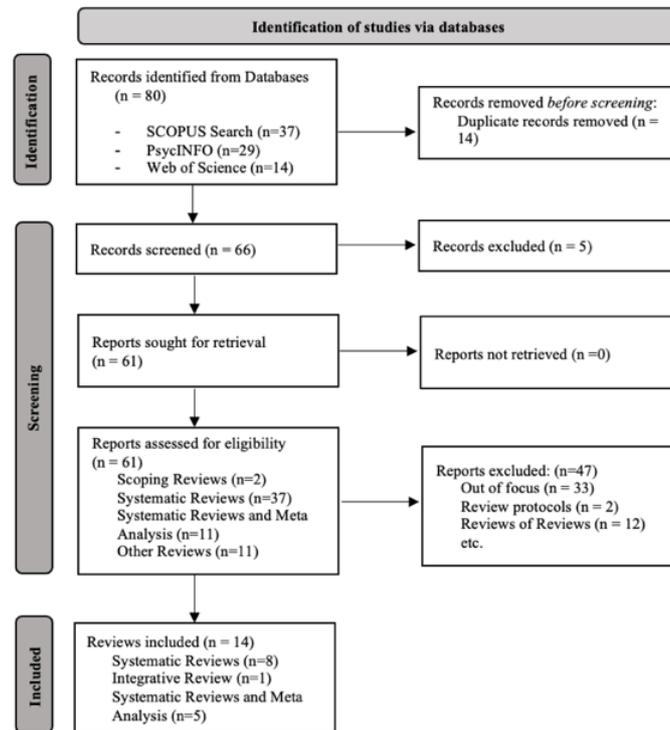
3 Results

Figure 1 PRISMA 2020 Flow diagram of Database Search

The initial database search yielded a total of 69,220 search results across the three databases. The majority of these results were immediately excluded because they focused on loneliness and social isolation stemming from an illness or COVID-19. Additionally, a significant number of articles were excluded as they discussed loneliness and social isolation across multiple age groups. As indicated in Figure 1, following a preliminary selection based on the title, 66 records, following the removal of duplicates (n = 14), were identified as relevant for further screening based on the abstract, which led to the exclusion of 5 more articles. Thus, 61 texts were retrieved and screened in more depth where a total of 47 articles were excluded, 12 records were excluded because they were reviews of reviews, 2 were excluded as they were protocols for systematic reviews which are yet to be completed, and the remaining articles were excluded because they were not in line with the scope of this meta-review. In the end, 14 reviews were included in the meta-review, of which 8 were systematic reviews (Y. R. R. Chen & Schulz, 2016; H. K. Choi & Lee, 2021; Franck et al., 2016; Hagan et al., 2014; Khosravi et al., 2016; Manjunath et al., 2021; Poscia et al., 2018; Zaharia et al., 2024), 1 integrative review (Gardiner et al., 2018), 5 systematic reviews with meta-analysis (Duffner et al., 2024; Fu et al.,

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2022; Hoang et al., 2022; Jin et al., 2021; Yu et al., 2023), of which one review (Yu et al., 2023) also included a meta-regression.

3.1   Characteristics of Included Reviews

A total of 290 primary studies were reviewed across the 14 included reviews, of which, equivalent to 72% (n = 209) of the primary studies were unique to one review. While 27.9% (n = 81) of studies were mentioned in two or more reviews, with one study (Saito et al., 2012) included in 6 reviews (Duffner et al., 2024; Gardiner et al., 2018; Hoang et al., 2022; Manjunath et al., 2021; Poscia et al., 2018; Yu et al., 2023), and another study (Kahlbaugh, Sperandio, et al., 2011) was included in five reviews (Y. R. R. Chen & Schulz, 2016; Franck et al., 2016; Hagan et al., 2014; Khosravi et al., 2016; Yu et al., 2023). The 14 reviews included both qualitative and quantitative research, thus encompassing a broad range of study designs. All reviews except two (Franck et al., 2016; Manjunath et al., 2021) included RCTs, which had experimental designs but did not specifically state the use of RCTs, while three reviews (Fu et al., 2022; Hoang et al., 2022; Jin et al., 2021) included exclusively RCTs. Two reviews (Duffner et al., 2024; Yu et al., 2023) included only quantitative designs, including RCTs and non-RCTs. The remaining reviews included a broad range of qualitative and quantitative study designs, with pilot, observational and case studies. The complete list of included study designs for each review, along with an additional summary of the characteristics of each review, is outlined in Table 1.

Loneliness was an outcome for 77.6% (n = 225) of the primary studies, and social isolation was an outcome for 29% (n = 84) of the studies. Amongst the studies with social isolation as an outcome, 36 directly measured social isolation, 17 measured social networks as an indicator for social isolation, 36 used social support as an indicator, and 6 used both social network and social support as an indicator for social isolation. Lastly, 20% (n = 59) of primary studies measured both loneliness and social isolation. While not the primary focus of this meta-review, it is important to note that several studies (16%, n = 48) included psychological health as an outcome, with 66,7% (n = 32) of these measuring depression.

Of the studies measuring loneliness, the majority relied on pre-existing self-report measures. The most commonly used tool was the University California Los Angeles Loneliness Scale (UCLA-LS) (n = 113). The most frequently used variations of the scale were the 20-item scale (n = 19) and the 3-item scale (n = 10). The DeJong Loneliness Scale (DJGLS) and its variants were the second most used scale by primary studies (n = 46). In 7 studies, an ad-hoc

self-report questionnaire was developed, while 10 studies used interviews. Lastly, 2 studies used observation to measure loneliness, and 8 studies did not specify the measures used.

Similarly, studies measuring social isolation as an outcome relied on self-report measures. The Lubben Social Network Scale (LSNS) was used in 13 studies, and the Duke Social Support Index (DSSI) was used in 5 studies. Measures of social support with specification were used in 12 studies, 7 did not report the measures used, and 1 study developed an ad-hoc questionnaire. Lastly, social isolation/loneliness and overall health/life satisfaction, as a combined measure, were used in 20 studies, and the Geriatric Depression Scale (GDS) was the most used measure for depression (n = 21).

The majority of studies originated from Europe, with a total of 83 studies, with the largest number coming from the United Kingdom (n = 25), and 6 studies conducted in Italy. There were 74 studies originating from North America, with 68 studies conducted in the United States of America, marking it the country with the most studies. Lastly, 51 studies originated from Asia, with the remaining 23 from Oceania, Africa, and South America, and 7 were conducted in multiple countries. The country of origin was not reported for 50 studies.

Table 1 Summary Table of Review Characteristics

Systematic Review	Aims and Objectives	Systematic Review Details				Characteristics of Included Studies				
		Databases Searched	Years Covered	Population	Total Studies	Geographic Info	Study Designs	Age Criterion	Intervention Characteristics	Outcomes
Duffner et al. (2024)	Summarize available evidence on the effectiveness of interventions targeting loneliness and social isolation in older adults living in the general population or long-term care facilities. Identify the components and mechanisms underlying the effective interventions.	MEDLINE, PsycINFO, CINAHL.	Inception to March 2023	Cognitively healthy older adults aged 65 years.	Total: 67 Narrative synthesis (n=67) Meta-analysis (n=27)	United States (n=20) Australia (n=18) Taiwan (n=7) Canada (n=5) Spain (n=5) Sweden (n=3) The Netherlands (n=3) United Kingdom (n=3) Finland (n=2) Hong Kong (n=2) Israel (n=2) Portugal (n=2) Switzerland (n=1) Croatia (n=1) Egypt (n=1) France (n=1) Germany (n=1) Italy (n=1) Japan (n=1)	RCTs (n=27) Non-Randomised Quasi-Experimental Interventions (n=39)	65+	Community-based (n=14) Intergenerational (n=4) ICT (n=9) High-tech (n=4) Spiritual/religious (n=2) Psychological (n=14) Leisure activity (n=5) Pet based (n=1) Combination (n=9)	Loneliness (n=67) Social Isolation (n=28)
Zaharia et al. (2024)	Determine the long-lasting effects of interventions if any and for how long they can be sustained. Analyse the impact of volunteers on the outcomes regarding loneliness and psychological impact.	MEDLINE (PubMed), Web of Science (Scopus), PsycINFO, Web of Science (WOS)	2014-2024	Older community-dwelling individuals who are above 65 years old and who experience	Total: 30	United States (n=6) United Kingdom (n=4) Spain (n=4)	RCTs (n=16) Observational study (n=1) Pilot studies (n=5) Mon-RCTs (n=8)	65+	Psychosocial (n=8) Technological (n=8) Health Promotion (n=3) Physical exercise (n=3) Multicomponent (n=5)	Loneliness (n=24) Social Isolation (n=9)
Yu et al. (2023)	Identify the different designs, nature and associated risk factors of non-pharmacological interventions addressing late-life loneliness. Examine the overall and comparative effectiveness of these interventions using network meta-analysis (NMA), and evaluate whether participant characteristics or research designs influence effectiveness.	MEDLINE, PubMed, EMBASE, Cochrane Database of Systematic Reviews, PsycINFO, CINAHL Plus, ProQuest Dissertations & Theses, JBI, IEEE Xplore	Inception to 2023	Older adults age 60 years or above residing in the community.	Total: 60 Qualitative synthesis (n=60) Quantitative synthesis (n=37)	United States (n=13) United Kingdom (n=7) Netherlands (n=7_=) Philippines (n=1) Japan (n=1) China (n=3) Singapore (n=1) Israel (n=3) Egypt (n=1) India (n=2) Iran (n=2) Canada (n=2) Brazil (n=1) Finland (n =4) Sweden (n =4) Denmark (n=1) Italy (n=1) Portugal (n=1) Spain (n=3)	RCTs (n=49) Non-randomised studies (n=11)	60+	Behavioural activation (n=7) Individual-based exercise (n=7) Group-based exercise interventions (n=4) Health promotion interventions (n=5) Psychological interventions (n=8) Social support interventions (n=27) Social support interventions (n=10) Multicomponent interventions (n=9)	Loneliness (n=60) Social Isolation (n=23)

Systematic Review	Aims and Objectives	Systematic Review Details					Characteristics of Included Studies			
		Databases Searched	Years Covered	Population	Total Studies	Geographic Info	Study Designs	Age Criterion	Intervention Characteristics	Outcomes
Hoang et al. (2022)	Evaluate interventions targeting older adults associated with a reduction in loneliness and social isolation.	OVID, CINAHL, CENTRAL, Embase, PsycINFO, Web of Science, Scopus	Inception to 2020	Older adults aged 65 and above in the community or long-term care centres.	Total: 70 Qualitative review (n=70) Quantitative review (n=56) Community setting (n=33) Long-Term care (n=11)	United States (n=22) Australia (n=5) Canada (n=2) Netherlands (n=4) United Kingdom (n=4) China (n=4) Finland (n=3) Taiwan (n=3) Sweden (n=2) Hong Kong (n=2) Iran (n=2) Italy (n=2) Italy, United States (n=1) Japan (n=1) Norway (n=1) Russia (n=1) Singapore (n=1) South Africa (n=1)	RCTs (n=70)	65+	Animal therapy (n=6) Combination and Multicomponent Interventions (n=5) Group Counselling (n=6) Music (n=1) Occupational Therapy (n=2) Reminiscence therapy (n=2) Social intervention (n=5) Technology (n=9) CBT (n=4)	Loneliness (n=63) Social Isolation (n=22)
Fu et al. (2022)	Conduct an updated meta-analysis and systematic review on remotely delivered interventions for loneliness in older adults.	PubMed, Cochrane Central Register of Controlled Trials, EMBASE, CINAHL, PsycINFO	Inception to 2021	Older adults over the age of 65	Total: 13	United States (n=6) Canada (n=1) Israel (n=2) Taiwan (n=1) South Africa (n=1) United Kingdom (n=1) China (n=1)	RCTs (n=13)	65+	Telephone interventions (n=6) Video call intervention (n=3) Computer or internet-based interventions (n=4)	Loneliness (n=12) Social Isolation (n=3)
Choi and Lee (2021)	Investigate the trends and summarise the effects of ICT interventions designed to reduce social isolation and loneliness in older adults.	Ovid-Medline, Ovid-EMBASE, Cochrane library	Inception to 2019	Older adults aged 60 older	Total: 23	Canada (n=1) England (n=1) European Union (n=1) Finland (n=1) Finland, Singapore and Japan (n=1) Italy (n=2) Japan (n=5) Macedonia (n=2) Netherlands, Romania and Switzerland (n=1) South Africa (n=1) United States (n=1)	RCTs (n=4) Non-RCTs (n=2) Before studies (n=5) Mixed methods (n=3) In-depth interviews (n=4) Observational and qualitative study (n=1) Review (n=2) Randomized controlled trial protocols (n=2)	60+	Animal robot (n=5) Humanoid agent (n=2) Mobile robot (n=4) Exercise game (n=3) Interpersonal communication (n=2) Online social platform (n=7)	Loneliness (n=20) Social Isolation (n=15)
Jin et al. (2021)	Carry out a systematic review of studies evaluating the effectiveness of technology-based interventions aimed at reducing loneliness among older adults	Cochrane Library, PubMed, Web of Science, SpringerLink, EMBASE	Inception to 2020	Older adults aged 60 or older	Total: 6 Independent Living (n=1) Nursing homes (n=2) NR (n=1)	Taiwan (n=3) Israel (n=1) United Kingdom (n=1) United States (n=1)	RCTs (n=6)	60+	Computer-based video conferencing (n=2) Smartphone-based video conferencing (n=4)	Loneliness (n=6) Social Isolation (n=0)

		Systematic Review Details				**Characteristics of Included Studies**				
Systematic Review	**Aims and Objectives**	**Databases Searched**	**Years Covered**	**Population**	**Total Studies**	**Geographic Info**	**Study Designs**	**Age Criterion**	**Intervention Characteristics**	**Outcomes**
Manjunath et al. (2021)	Evaluate the quality of studies on interventions to address social isolation. Identify effective and practical recommendations for interventions to address social isolation.	MEDLINE, PubMed, PsycINFO, Ageing and Mental Health	Inception to 2019	Older adults above the age of 50	Total: 20	Chile, Mexico, Spain (n=1), Sweden (n=4), United States (n=6), Canada (n=2), Finland (n=1), Japan (n=2), United Kingdom (n=1), Dutch (n=1), Netherlands (n=1), Iran (n=1)	Observational study (n=7), Experimental intervention (n=13)	50+	Group interventions (n=12), Friendship-centred interventions (n=3), Volunteering-based interventions (n=2), Health-promoting interventions (n=2), Person-centred interventions (n=1)	Loneliness (n=17), Social Isolation (n=16)
Gardiner et al. (2018)	Conduct an integrative review of the literature on interventions targeting social isolation and loneliness in older people.	PubMed, MEDLINE, CINAHL, PsycINFO, ScienceDirect, EMBASE	2003-2016	Older adults, as defined by primary studies	Total: 39	Iran (n=1), United Kingdom (n=5), Israel (n=1), Taiwan (n=2), Australia (n=5), United States of America (n=13), Netherlands (n=5), Finland (n=2), Japan (n=1), Hong Kong (n=2), Slovenia (n=1), New Zealand (n=1)	RCTs (n=6), Other quantitative designs (n=21), Qualitative studies (n=10), Mixed method studies (n=2)	Based on the study's definition of older adults.	Social facilitation (n=10), Psychological therapies (n=6), Health and social care provision (n=6), Animal interventions (n=3), Befriending interventions (n=4), Leisure/ skill development (n=7), Multicategories (n=3)	Loneliness (n=37), Social Isolation (n=19)
Poscia et al. (2018)	Summarise and update literature on the effectiveness of interventions targeting loneliness and social isolation among older adults.	PubMed, ISI Web of Science, SCOPUS, The Cochrane Library, CINAHL	2011-2016	Older adults 65 or older	Total: 20 Community-dwelling (n=17) Home care centres (n=3)	Australia (n=5), United Kingdom (n=3), United States (n=1), Iran (n=1), Italy (n=1), Japan (n=1), New Zealand (n=1), Norway (n=1), Netherlands (n=1), NR (n=2)	RCTs (n=4), Quasi-Experimental (n=4), Pre/Post test (n=7), Qualitative (n=5)	Not Reported	Social support interventions (n=7), Social activities (n=2), Physical activity (n=3), Technologies (n=4), Signing sessions (n=1), Horticultural therapy (n=1), Group interventions (n=4), Individual intervention (n=1)	Loneliness (n=18), Social Isolation (n=10)
Franck et al. (2016)	A systematic review on interventions reducing social isolation and depression in older people receiving aged care services in community or residential contexts.	MEDLINE, CINAHL with Full Text, SocINDEX with Full Text, Health Source: Nursing/ Academic Edition, PsycARTICLES, PsycINFO, Academic Search Complete, The Psychology and Behavioural Sciences Collection.	2009-2013	Older adults aged 60	Total: 6	Australia (n=2), United States (n=1), United Kingdom (n=1), Taiwan (n=1)	Experimental designs (n=2), Quasi-experimental (n=2)	60+	Group-based activities (n=3), Individual activity (n=2), Duo activity (n=1)	Loneliness (n=4), Social Isolation (n=2)

Systematic Review	Aims and Objectives	Systematic Review Details				Characteristics of Included Studies				
		Databases Searched	Years Covered	Population	Total Studies	Geographic Info	Study Designs	Age Criterion	Intervention Characteristics	Outcomes
Khosravi et al. (2016)	Identify and assess ICTs designed to reduce social isolation and loneliness in older adults.	Science Direct, ProQuest, PubMed, IEEE Xplore, PsycINFO, Scopus	2000-2015	Seniors aged 50 or older	Total: 34	United States (n=6) Netherlands (n=2) Taiwan (n=1) New Zealand (n=1) Japan (n=1) Israel (n=1) Finland and Slovenia (n=1) Australia (n=1) NR (n=1)	RCT (n=8) Quasi-experimental (n=6) Surveys (n=11) Case study (n=3	50+	General ICTs (n=15) Video games (n=1) Robotics (n=8) Personal reminder information and social management system (PRISMS) (n=1) Asynchronous peer support chat rooms, social network sites (SNSs) (n=5) Health support chat room. (n=1)	Loneliness (n=31) Social Isolation (n=5)
Chen and Schulz (2016)	Summarise the evidence on the impact of ICT interventions on social isolation in the elderly	PsycINFO, PubMed, MEDLINE, EBSCO, SSCI, Communication Studies: a SAGE Full-Text Collection Communication & Mass Media Complete, Association for Computing Machinery Digital Library, IEEE Xplore	Inception to 2015	Older adults aged 55 or older	Total: 30	United States (n=9) Austria (n=1) Canada (n=1) Finland (n=1) Israel (n=1) Netherlands (n=1) New Zealand (n=1) Norway (n=1) Slovenia (n=1) Sweden (n=1) Taiwan (n=1) United Kingdom (n=1)	RCTs (n=6) Cohort studies (n=6) Qualitative studies (n=14)	60+	ICTs (n=30)	Loneliness (n=17) Social Isolation (n=8)
Hagan et al. (2014)	Review the interventions to reduce loneliness or social isolation in order to make recommendations on interventions to implement.	PsycINFO Medline, CINAHL Assia Scopus Social Services Abstracts and Sociological Abstracts	2000-2012	Not Reported	Total: 17	United States of America (n=8) Australia (n=1) Finland (n=1) Holland (n=2) Israel (n=1) Taiwan (n=1) United Kingdom (n=2)	RCTs (n=7) Quasi-experimental (n=2) Mixed methods (n=1) Pilot/Exploratory (n=4) Before and After (n=1)	Not Reported	Group Interventions (n=9) One-to-one (n=3) Monitoring New technologies (n=6)	Loneliness (n=15) Social Isolation (n=5)

3.2 Quality Appraisal of Included Studies

Overall, the reviews had high JBI Critical Appraisal scores, indicating a strong methodological quality, with the majority of studies (n = 9) scoring above 8. Two reviews scored moderately low, with 6 (Poscia et al., 2018) and 5 (Hagan et al., 2014). As the aim of the quality appraisal for this meta-review was not to exclude reviews, those with lower scores were kept in the review because their contents were in line with the topic of this meta-review. The JBI Critical Appraisal score of each review included in the narrative synthesis is presented in Table 2.

Table 2

JBI Critical Appraisal Evaluation Scores of Included Reviews

Author, Year	JBI Evaluation
Duffner et al, 2024	9/11
Zaharia et al, 2024	9/11
Yu et al, 2023	9/11
Hoang et al, 2022	7/11
Fu et al, 2022	7/11
Choi & Lee, 2021	8/11
Jin et al, 2021	8/11
Manjuanth et al, 2021	7/11
Gardiner et al, 2018	7/11
Poscia et al, 2018	6/11
Khosravi et al, 2016	8/11
Chen & Schulz et al, 2016	8/11
Franck et al, 2016	10/11
Hagan et al, 2014	05/11

3.3 Intervention Categories

All reviews assessed non-pharmaceutical interventions, which commonly fell under the umbrella categories of technological, psychological, social or multicomponent interventions. However, there were significant variations in the labelling and assignment of categories across the 14 reviews. In some cases, studies which appeared in multiple reviews received different categories. As a result, to better compare the effectiveness of the interventions across the reviews, the intervention descriptions were evaluated alongside the original categorisations to create a new set of categories and subcategories, which were then individually assigned to each

primary study. A total of 5 general categories were identified, consisting of psychological, technological, health promotion, multicomponent and other interventions.

3.3.1   Psychosocial Interventions

The first category refers to psychosocial interventions, which combine psychological, social, and psychosocial interventions. These three types of interventions are commonly separated. However, the decision was made to group them for this meta-review due to the substantial overlap between the three intervention types. Psychological interventions typically included a social component, as they were commonly implemented in group settings. Likewise, social interventions provided participants with tools to build and maintain social contact, thus incorporating psychological and psychosocial concepts. Psychosocial interventions comprised the second-largest category, accounting for 34.1% (n = 99) of the primary studies, as reported by 11 of the 14 reviews (Y. R. R. Chen & Schulz, 2016; Duffner et al., 2024; Franck et al., 2016; Fu et al., 2022; Gardiner et al., 2018; Hagan et al., 2014; Hoang et al., 2022; Manjunath et al., 2021; Poscia et al., 2018; Yu et al., 2023; Zaharia et al., 2024). There are 7 subcategories that fall under the criterion of psychosocial interventions. The reviews did not present sufficient data to determine the subcategory for one study (Walshe et al., 2016).

Group and community interventions (n = 24) consist of any general group activity or meetings which aim to establish a space where older adults can socialise in mixed groups or gender-based social clubs (Franck et al., 2016; Gleibs et al., 2011), participate in activities designed for cognitive enhancement (Lökk, 1990; Manjunath et al., 2021), or games which focused on psychosocial concepts. For example, one intervention (M.-F. Chen & Tsai, 2022) proposed weekly 90-minute sessions where groups of older adults played a four-theme board game that introduced themes of gratitude, apologies, love, and farewell (M.-F. Chen & Tsai, 2022; Yu et al., 2023).

While similar in nature to the previous subcategory, the friendship and social facilitation (n = 16) interventions propose more directed and guided group meetings and discussions such as the Shared Interest Group (Cohen-Mansfield et al., 2007; Gardiner et al., 2018), which not only provided a topic of discussion but intentionally grouped participants based on interests. Furthermore, these interventions aim to establish friendships through in-person groups like in the friendship clubs' interventions (Gardiner et al., 2018; Hemingway & Jack, 2013; Manjunath et al., 2021), via group telephone calls (Fu et al., 2022; Hoang et al., 2022; Mountain et al.,

2014; Zaharia et al., 2024), or friendship enrichment programs that build social skills in addition to a social network (Gardiner et al., 2018; Stevens et al., 2006).

Mentoring, counselling, and social support (n = 20) interventions consist of group meetings, programs, and telephone services (Duffner et al., 2024; Fu et al., 2022; Yu et al., 2023) which are focused on counselling, providing emotional and social support by teaching coping skills first by identifying the barriers in participants lives contributing to loneliness, social isolation, and other struggles and then providing the necessary tools to overcome them (Creswell et al., 2012a; Duffner et al., 2024; Gardiner et al., 2018; Hagan et al., 2014). This subcategory also includes a person-centred intervention, which was more individualised; however, it similarly looked at developing a sense of control related to feelings of loneliness and social isolation (Andrew & and Meeks, 2018).

The therapy (n = 24) interventions consist of individual or group psychotherapy (Duffner et al., 2024; Zaharia et al., 2024), Cognitive Behavioural Therapy (CBT) (Hoang et al., 2022; Yu et al., 2023; Zaharia et al., 2024), Behavioural Activation (BA) Therapy (Duffner et al., 2024; Fu et al., 2022; Hoang et al., 2022; Yu et al., 2023; Zaharia et al., 2024), or occupational therapy (Duffner et al., 2024; Hoang et al., 2022; Yu et al., 2023; Zaharia et al., 2024) conducted in person or through digital means, providing online therapy via videoconferencing tools and messaging apps like WhatsApp (H. K. Choi & Lee, 2021; Fu et al., 2022; Hoang et al., 2022; M. A. Jarvis et al., 2019a).

Next, we have volunteering interventions (n = 5) and intergenerational interventions (n = 3), which comprise the smallest portion of the psychosocial interventions. Volunteering interventions encouraged the older adults to volunteer in various settings, including libraries (Bartlett et al., 2013), religious volunteering (Gil-Lacruz et al., 2019; Manjunath et al., 2021) or providing assistance to a disabled child during the Foster Grandparent intervention (Hoang et al., 2022; Rook & Sorkin, 2003; Yu et al., 2023). Intergenerational interventions, on the other hand, refer to meetings between older adults and younger participants for mentorship and activities (Duffner et al., 2024).

Lastly, we have reminiscence therapy interventions (n = 8), which consisted of storytelling interventions where older adults were encouraged to reflect on their lives and experiences and share them with the group. While the majority of reminiscence therapy cases were conducted within groups of older adults, one case (Gaggioli et al., 2014) introduced an intergenerational component, where older adults shared their experiences with younger participants (Duffner et al., 2024; Poscia et al., 2018).

3.3.2 Technological Interventions

The second category, technological interventions (n = 104), was present in all reviews (Y. R. R. Chen & Schulz, 2016; H. K. Choi & Lee, 2021; Duffner et al., 2024; Franck et al., 2016; Fu et al., 2022; Gardiner et al., 2018; Hagan et al., 2014; Hoang et al., 2022; Jin et al., 2021; Khosravi et al., 2016; Manjunath et al., 2021; Poscia et al., 2018; Yu et al., 2023; Zaharia et al., 2024). Of which, one review (Jin et al., 2021) was solely focused on technological interventions, while two other reviews (H. K. Choi & Lee, 2021; Khosravi et al., 2016) focused primarily on technological interventions but included interventions that fell in different categories. The technological intervention category comprises 10 subcategories. However, 6 out of 104 studies in this category, as reported in the reviews, did not have sufficient information to be placed in a specific subcategory.

The first subcategories of technological interventions were carried out using information and communications technology (ICTs) (n = 47), which is an umbrella term for generic technologies, applications and services. Due to the large number of interventions, ICTs are further subdivided for clarity into 4 subcategories. ICTs: general (n = 19), consists of interventions and studies which assess the impact of internet use on loneliness and social isolation (Y. R. R. Chen & Schulz, 2016; Gardiner et al., 2018; Hagan et al., 2014; Hoang et al., 2022; Khosravi et al., 2016, 2016; Zaharia et al., 2024) and ICTs: social network sites (n = 7), which specifically looked at the use of social media (Y. R. R. Chen & Schulz, 2016; Gardiner et al., 2018; Khosravi et al., 2016; Zaharia et al., 2024).

ICTs: interpersonal communication (n = 11) includes the use of smartphones, computers and tablets for video chats, phone calls and messaging with family members (Duffner et al., 2024; Fu et al., 2022; Hagan et al., 2014; Jin et al., 2021; Meyer et al., 2010; Tsai et al., 2020), volunteers (Duffner et al., 2024; Fu et al., 2022; Kahlon et al., 2021) or nurses (Arnaert & Delesie, 2007; Khosravi et al., 2016). In some cases, the interpersonal communication interventions were paired with training to ease users into using new tools (Y. R. R. Chen & Schulz, 2016; Gardiner et al., 2018; Tsai et al., 2010); however, the focus remained on facilitating contact.

ICTs: multifunctional software (n = 10) comprised of interventions which provided and trained older adults to use software designed to assist older adults with communication, health care and daily life. For example, the Palette V2 Platform (H. K. Choi & Lee, 2021; Rochat et al., 2018), which matches users based on shared interest, encouraging participants to meet for social activities, or the telehealth systems (Y. R. R. Chen & Schulz, 2016; Dhillon et al., 2011)

to provide medical assistance and health education. Additionally included software like PRIMA (H. K. Choi & Lee, 2021; S. J. Czaja et al., 2015) or PRISMA (H. K. Choi & Lee, 2021; S. J. Czaja et al., 2015; Khosravi et al., 2016; Weinert et al., 2008) which contain multiple features such as e-mail, games, calendars, and several more features along with a training and instructions manual to assist use (H. K. Choi & Lee, 2021; Khosravi et al., 2016; Yu et al., 2023). Some software was focused on assisting participants' health, including Care TV (Khosravi et al., 2016; Poscia et al., 2018; van der Heide et al., 2012), which included alarms and care services, welfare, housing and family contact along with web-based telehealth systems (Y. R. R. Chen & Schulz, 2016; Dhillon et al., 2011) and my-AHA which collect data on participants health (H. K. Choi & Lee, 2021; Vercelli & Rainero, 2019)

The training/skill development interventions (n = 20) refer to either one-on-one or group training on how to use digital devices such as the computer (Blažun et al., 2012a; Duffner et al., 2024; Fu et al., 2022; Hoang et al., 2022; Khosravi et al., 2016; Slegers et al., 2009; Woodward et al., 2011; Yu et al., 2023), iPads or other tablets (Y. R. R. Chen & Schulz, 2016; Damnée et al., 2019; Duffner et al., 2024), and basic IT skills, (Blažun et al., 2012a; Y. R. R. Chen & Schulz, 2016; Gardiner et al., 2018; Khosravi et al., 2016) to assist videoconferencing, and social media use (Y. R. R. Chen & Schulz, 2016; Duffner et al., 2024).

The following category is high-tech interventions (n = 25), 3 of which (Duffner et al., 2024; Khosravi et al., 2016; Knowles et al., 2017; Lin et al., 2020a; O'Connor et al., 2014a; Zaharia et al., 2024) include the use of virtual reality to create a virtual space where older adults can socialise (Duffner et al., 2024; Khosravi et al., 2016; Knowles et al., 2017; O'Connor et al., 2014b; Zaharia et al., 2024). The remaining high-tech interventions consisted of robotic technology, including humanoid robots or agents (n = 10), including assistive robots that improved older adults independence, promoting physical activity or improving their walking capacity (H. K. Choi & Lee, 2021; D'Onofrio et al., 2018; Khosravi et al., 2016; Ring et al., 2013). Additional humanoid robots included conversational agents referring to humanoids robots allowing social interaction with the technological tools which record data on users behaviour (Bickmore et al., 2005a; H. K. Choi & Lee, 2021, 2021; Duffner et al., 2024; N. Fields et al., 2021a; Hoang et al., 2022; Khosravi et al., 2016; Ring et al., 2013; Yu et al., 2023). The last type of high technological robots interventions included technological pets (n = 12), such as virtual pets (Y. R. R. Chen & Schulz, 2016; Machesney et al., 2014), or interactive artificial intelligence companions such as the Artificial Intelligence Robot (AIBO) (Banks et al., 2008; H. K. Choi & Lee, 2021; Gardiner et al., 2018; Hagan et al., 2014, 2014), or PARO the artificial seal (Duffner et al., 2024; Hoang et al., 2022; Khosravi et al., 2016; Poscia et al.,

2018; Robinson et al., 2013) which are interactive robots with language ability, emotional expressions, and spontaneous needs for example sleep.

Lastly, there are videogame interventions (n = 6), which implemented weekly group sessions to play a range of Nintendo Wii games (Bell et al., 2011; Y. R. R. Chen & Schulz, 2016; Franck et al., 2016; Hagan et al., 2014; Kahlbaugh et al., 2011a; Khosravi et al., 2016; Yu et al., 2023). The remaining video game interventions are exergames, which encourage physical activity by requiring players to move around (H. K. Choi & Lee, 2021; Duffner et al., 2024). In some cases, they were implemented alone or with a companion (Duffner et al., 2024; Xu et al., 2016), which could include peers, volunteers or younger participants.

3.3.3   Health Promotion Interventions

The third category contains health promotion interventions (n = 44) reported in 7 reviews (Duffner et al., 2024; Gardiner et al., 2018; Hoang et al., 2022; Manjunath et al., 2021; Poscia et al., 2018; Yu et al., 2023; Zaharia et al., 2024), and made up of 3 subcategories.

The health and social care programs and educational interventions (n = 11) comprise educational programs and discussion groups aimed at identifying strategies to promote healthy ageing (Manjunath et al., 2021; Rahimi Foroushani et al., 2014). These included discussion groups led by healthcare professionals (Carandang et al., 2020; Yu et al., 2023) and social workers (Dahlberg & and McKee, 2014; Yu et al., 2023), which identified the challenges and consequences of ageing, in addition to sharing problem-solving strategies, available services, and providing health education related to the issues brought up during the discussion (Duffner et al., 2024; Hoang et al., 2022; Manjunath et al., 2021; Yu et al., 2023).

The second subcategory is physical activity (n = 18), comprising interventions that focus on introducing or increasing the amount of movement and physical exercise older adults engage in. Such interventions included dance (Ehlers et al., 2017; Hoang et al., 2022), online group exercise programs (Baez et al., 2017; Hoang et al., 2022; Yu et al., 2023), group Tai chi practices (Chan et al., 2017; Duffner et al., 2024; Hoang et al., 2022; Yu et al., 2023) and yoga (Hoang et al., 2022; Wang, 2010).

The final subcategory, multicomponent health interventions (n = 18), encompasses a blend of the aforementioned intervention types, thereby providing opportunities for exercise programs in addition to health education. Furthermore, these interventions include pain management (Honigh, 2013; Poscia et al., 2018; Vlaming, 2013), visits from nurses who care for participants needs in addition to developing a social bond (Gardiner et al., 2018), identifying

at-risk members of the community (Bartsch et al., 2013; Bartsch & Rodgers, 2009; Gardiner et al., 2018) and education on nutrition (Pinheiro et al., 2020; Yu et al., 2023).

3.3.4   Multi-component Interventions

Multicomponent interventions are a broad category, encompassing any multi-step interventions or those that cross over the boundaries of other intervention categories. This category includes 10 studies reported across 5 reviews (H. K. Choi & Lee, 2021; Duffner et al., 2024; Fu et al., 2022; Hoang et al., 2022; Yu et al., 2023). While there is significant variation across the interventions in this category, no distinct subcategories are proposed due to the small number of studies included. A study (Jing et al., 2018a) reported in 2 reviews (Fu et al., 2022; Yu et al., 2023) combined Cognitive Behavioural Therapy with Baduanjin Exercise, a traditional Chinese exercise that incorporated physical activity, breathing regulation and psychological adjustment (Jing et al., 2018a). Another study of a similar nature combined CBT with technological acceptance, psychoeducation for loneliness, a help desk, and individualised messages (H. K. Choi & Lee, 2021; Fu et al., 2022; Hoang et al., 2022; M. A. Jarvis et al., 2019b). The second form of study included leisure activities. One study (Hoang et al., 2022; M. M. Y. Tse et al., 2012) combined exercise programs with arts and crafts and music activities, while another study (Bartlett et al., 2013; Poscia et al., 2018) integrated services and activities to create connecting points for older adults. Lastly, under this category, there are two distinct interventions: a three-stage intervention (Franse et al., 2018; Yu et al., 2023) and a five-stage intervention (Duffner et al., 2024; Honigh-de Vlaming et al., 2013; Yu et al., 2023). The three-stage intervention identified the patient's needs, which informed a personalised care plan that also took into consideration the participants' opinions and input. Ultimately, participants engaged in social support groups, physical exercise programs, and social activities tailored to their specific needs and abilities (Franse et al., 2018). The five-stage intervention included a mass media campaign, educational meetings on healthy ageing, psychosocial discussion groups, social activities and training for the intermediaries (Honigh-de Vlaming et al., 2013).

3.3.5   Other Interventions

The fourth category, other interventions (n = 31), consists of miscellaneous interventions that did not fit under the aforementioned categories. These were reported in 7 reviews (Duffner et al., 2024; Franck et al., 2016; Gardiner et al., 2018; Poscia et al., 2018; Yu et al., 2023;

Zaharia et al., 2024). Most of the interventions falling under this category were standalone. However, there was sufficient overlap across some studies to determine 4 subcategories.

First, there are animal interventions (n = 7) and animal therapy, which look at either the effect of owning a pet (n = 1) (Krause-Parello, 2012) and animal therapy programs (n = 6) with a certified therapy dog (Duffner et al., 2024; Hoang et al., 2022). Then there are leisure interventions (n = 15) which include listening to radio programs (Duffner et al., 2024; Travers & Bartlett, 2011; Yu et al., 2023), singing groups (n = 5) (Duffner et al., 2024; Franck et al., 2016; Hoang et al., 2022; Poscia et al., 2018; Yu et al., 2023), and horticultural programs (n = 5) (Duffner et al., 2024; Franck et al., 2016; Gardiner et al., 2018; Poscia et al., 2018) which teach participants how to garden. Also included in this category included a meditation intervention (Duffner et al., 2024; Pandya, 2021; Yu et al., 2023), religious intervention (Borji & Tarjoman, 2020; Duffner et al., 2024; Yu et al., 2023), a meal delivery service (Thomas et al., 2016; Yu et al., 2023), a behavioural intervention focused on COVID-19 (Gilbody et al., 2021; Yu et al., 2023) and a Lifestyle Engagement Activity Program (LEAP) which trained nurses to implement social support and recreational activities into homecare (Low et al., 2015; Poscia et al., 2018). Lastly, this category includes 3 studies (Cattan & Ingold, 2003; Howat et al., 2004; Wylie, 2012) which conducted exploratory studies within the community to identify the preexisting strategies and interventions the general population was already implementing (Gardiner et al., 2018).

3.4 Effectiveness of Proposed Interventions

Overall, the interventions appeared to have promising results, with 66.5% (n = 193) of interventions reducing loneliness measures and 16.9% (n = 49) reducing social isolation. Of note are the results showing 62% of interventions reported significant changes in their outcome measures, which indicated the intervention was beneficial. A summary of the number of effective interventions across each category and subcategory is presented in Table 3.

3.4.1 Effectiveness of Psychosocial Interventions

A total of 74% (n = 74) of the reported studies involving psychosocial interventions presented results reported statistically significant effects indicating the effectiveness of an intervention, 53% (n = 53) of those which measured loneliness reported a decrease however, it was not always statistically significant, and 12% (n = 12) reported a reduction in social

isolation. Duffner et al, (2024). reviewed 28 studies categorised as psychosocial interventions, of which 67% (n = 18) were found to be effective interventions. Under the group and community interventions, 4 studies (Coll-Planas et al., 2017; Ehsan et al., 2021; Gonyea & Burnes, 2013; Saito et al., 2012) reported a reduction in loneliness; however, only 2 studies (Coll-Planas et al., 2017; Saito et al., 2012) had statistically significant changes which were sustained after the intervention ended. Duffner et al, (2024) reported on only one friendship intervention (Cattan et al., 2011a), which was implemented via telephone calls and showed statistically significant reductions in loneliness and social isolation. There were 6 studies (Coll-Planas et al., 2021; Creswell et al., 2012b; Elsherbiny & Al Maamari, 2018; Hernández-Ascanio et al., 2023; Lai et al., 2020; Roberts & Windle, 2020) under the mentoring, counselling and social support intervention all reduced loneliness of these, the one-to-one mentoring (Roberts & Windle, 2020), group telephone support (Lai et al., 2020) and mindfulness-based stress reduction program (Creswell et al., 2012b) had statistically significant reductions in loneliness. The single-reported intergenerational group reminiscence intervention (Gaggioli et al., 2014) significantly reduced emotional loneliness. Three interventions under the therapy subcategory reported reduced loneliness; however, only online occupational therapy (Larsson et al., 2016) and internet-based cognitive-behavioural therapy (S. Shapira et al., 2021) had statistically significant reductions in loneliness.

Zaharia et al. (2024) included 16 studies on psychosocial interventions, 87% (n = 15) of which were found to be effective. All 15 studies showed a statistically significant reduction in loneliness, and in one study, a statistically significant reduction in social isolation was also observed. They reported on two group and community interventions: a psychosocial rehabilitation intervention (Ristolainen et al., 2020) and a general intervention (Bartholomaeus et al., 2019), both of which showed a statistically significant reduction in loneliness. Zaharia et al. (2024) reported on 2 digital friendship and social interventions consisting of telephone calls, one of these studies (Mountain et al., 2014) reported a statistically significant reduction in loneliness, while the effectiveness of the second study (Sandu et al., 2021) cannot be determined as they measured the satisfaction of participants based on the volunteers perception. All 4 mentoring and counselling interventions reported a reduction in loneliness, with one study (Chow et al., 2019) indicating a reduction in social isolation as well. Of these, the eudaimonic well-being (Friedman et al., 2019), bereavement counselling (Chow et al., 2019), and social prescribing (Foster et al., 2021) interventions were statistically significant, while the psychotherapeutic social support intervention (Lorente-Martínez et al., 2022) based on the loneliness model was not. The one reminiscence therapy intervention (Diwan et al., 2023)

reported by Zaharia et al. (2024) reported a statistically significant reduction in loneliness. Lastly, there were 7 therapeutic interventions, all of which showed statistically significant reductions in loneliness. One study (Larsson et al., 2016) found an increase in social networks, indicating an improvement in social isolation.

Yu et al. (2023) contained 23 psychosocial interventions, of which 95.6% (n = 22) showed a reduction in loneliness, 8.7% (n = 2) showed a reduction in social isolation, and 60.9% (n=14) were statistically significant. There are 3 interventions within the group and community intervention categories, two of which (Andersson, 1985; Keisari et al., 2022) did not reduce loneliness, while the educational board game (M.-F. Chen & Tsai, 2022) reported statistically significant reductions in loneliness. All 3 of the reported mentoring, counselling, and social support interventions reported statistically significant reductions in loneliness, with the community-based educational, cognitive, and social support intervention (Saito et al., 2012) significantly reducing social isolation as well. The culturally specific reminiscence therapy intervention (S. Li et al., 2022) showed a significant improvement in loneliness. However, the multicomponent psychosocial intervention, which focused on reminiscence therapy with both in-person and digital components (Hernández-Ascanio et al., 2023), did not show a significant difference in loneliness levels. Zaharia et al. (2024) reported on multiple therapeutic interventions with varying degrees of success. The 3 interventions with statistically significant reductions in loneliness included CBT and mindfulness (S. Shapira et al., 2021), as well as therapy focused on improving coping strategies and self-esteem (Sayied & Abd-Elaziz, 2015). While the psychosocial rehabilitation program (Routasalo et al., 2009), CBT (Parry et al., 2016), and internet-based occupational therapy (Larsson et al., 2016) did not show statistically significant changes in loneliness and social isolation. A large portion (n=7) of therapeutic interventions focused on BA, of which 5 were statistically significant, with the one using a digital intervention (N. G. Choi et al., 2020a) also reducing social isolation.

Hoang et al. (2022) reported on 25 interventions that fell under the category of psychosocial interventions. Of these, 84% (n = 21) showed a reduction in loneliness measures, 2% (n = 2) reported a reduction in social isolation, and 72% (n = 18) showed statistically significant effects. There were 3 friendship interventions, one conducted via telephone calls (Mountain et al., 2014), which had a small effect size but reported a statistically significant reduction in loneliness. They reported on 1 group intervention (Andersson, 1985) and 1 volunteering intervention (Rook & Sorkin, 2003), which did not have significant effects on loneliness levels. Mentoring, counselling, and social support interventions made up 28% (n = 7) of the psychosocial interventions reported by Hoang et al. (2022), and only two were not

effective. The culturally specific bereavement counselling group (Chow et al., 2019) and the community-based program, which focused on cognitive social support to improve community knowledge and networking skills, also measured and found statistically significant effects on social isolation. Therapy interventions made up another large portion of these studies (32%, n = 8), of which the online occupational therapy intervention (Larsson et al., 2016) significantly decreased loneliness and social isolation, and 6 studies reduced considerably loneliness; however, 2 studies, one psychosocial group rehabilitation program (Routasalo et al., 2009) and one CBT intervention focused on the fear of falling (Parry et al., 2016) did not change loneliness levels. Lastly, the 3 reminiscence therapy interventions all showed a significant reduction in loneliness.

Fu et al. (2022) reported only 4 studies under this category. They included telephone support (Lai et al., 2020), telephone visitor calls (Mountain et al., 2014), psychotherapy (Nelson et al., 2019), and tele-BA (N. G. Choi et al., 2020), which showed a statistically significant reduction in loneliness. The tele-behavioural intervention also showed improvements in social isolation.

Manjunath et al. (2021) contained 11 interventions; 81.8% (n = 9) were effective, and 18.2% (n = 2) did not measure social isolation and loneliness as an outcome. Among the interventions by Manjunath et al. (2021) was one that focused on mentoring, counselling, and social support (Andrew & and Meeks, 2016), targeting the individual's sense of control and ability to cope with isolation, which in turn decreased loneliness and social isolation levels. The 2 friendship and social facilitation interventions reported showed significant effects in reducing loneliness. Additionally, the weekly friendship clubs (Hemingway & Jack, 2013) also reduced social isolation by developing new social ties. There were 6 group and community interventions amongst these, and 5 reduced loneliness at significant levels. The social activation program (Arnetz et al., 1983) also reduced social isolation. Lastly, one group intervention (Bogat & Jason, 1983) measured life and mental satisfaction; however, it reported no significant differences. The remaining 2 interventions reported by Manjunath et al. (2021) involved volunteering, where older adults acted as volunteers, and both showed positive outcomes in terms of happiness and health. However, these interventions did not measure social isolation or loneliness.

Under the psychosocial category, Gardiner et al. (2018) reported 16 studies, with 75% (n = 12) reporting effective interventions. Friendship and social facilitation interventions made up 56.3% (n = 9) of the studies. Two of these studies (Cohen-Mansfield et al., 2007; T. Tse & Howie, 2005) did not measure loneliness and social isolation directly; however, the shared

interest group (Cohen-Mansfield et al., 2007) observed the formation of friendships outside the groups, and the participants of the adult day groups (T. Tse & Howie, 2005) reported value in the companionship. The Senior Companion Programme (Butler, 2006) and friendship clubs (Hemingway & Jack, 2013) have been shown to decrease loneliness and social isolation significantly. Interestingly, another adult daycare centre intervention (Iecovich & Biderman, 2012) found no statistically significant change in loneliness. Friendship Enrichment Programs also showed conflicting findings (Stevens et al., 2006), reporting a significant reduction in loneliness within a year of the program. In contrast, another Friendship Enrichment Program (Martina & Stevens, 2006) showed no significant differences in loneliness outcomes between the control and intervention groups. Lastly, there were 2 telephone befriending services (Cattan et al., 2011b; Kime et al., 2012), which reported significant reductions in loneliness and social isolation (Cattan et al., 2011b). Both mentoring, counselling, and social service interventions reported by Gardiner et al. (2018) were effective in reducing loneliness at a significant level, with one community intervention (Saito et al., 2012) also significantly decreasing social isolation. The group reminiscence therapy (Liu et al., 2007) and group humour therapy (M. M. Y. Tse et al., 2010) significantly reduced loneliness in participants while also increasing life satisfaction. Additionally, humour therapy improved the perception of pain. On the other hand, the therapy interventions were ineffective, with the psychosocial group rehabilitation program (Routasalo et al., 2009) showing no difference in loneliness or social networks despite an observed increase in friendships in the follow-up a year later. The cognitive enhancement program (Winningham & Pike, 2007) showed no changes in loneliness over time in the intervention group; however, there was a significant increase in loneliness measures for the control group.

Poscia et al. (2018) reported 5 interventions, of which 5 were effective in reducing loneliness and, 2 studies also reduced social isolation. Mentoring, counselling, and social support interventions consisted of a preventative senior centre addressing psychosocial problems (Bøen et al., 2012), which found a greater reduction in loneliness levels of the intervention group; however, it was not statistically significant, and the effective community-based program improving networking and community knowledge (Saito et al., 2012). The reminiscence therapy intervention (Gaggioli et al., 2014) significantly decreased emotional loneliness but had a lesser effect on social loneliness. In contrast, culturally appropriate volunteer services (Bartlett et al., 2013) also reduced loneliness. Chen and Schulz (2016) reported on only one psychosocial intervention, the telephone befriending service intervention (Cattan et al., 2011b), also reported by Duffner et al, (2024) and Gardiner et al. (2018), which

significantly reduces loneliness and social isolation. Franck et al. (2016) reviewed a gender-based social club (Gleibs et al., 2011), which was primarily effective for male participants, increasing social identity and life satisfaction, and a reminiscence therapy intervention (Chiang et al., 2010), which significantly reduced loneliness.

Hagan et al. (2014) contained 8 psychosocial interventions with varying degrees of effectiveness. These included 3 friendship and social facilitation interventions, the senior companion program (Butler, 2006), which significantly reduced loneliness and social isolation. The friendship enrichment programme (Martina & Stevens, 2006) which did not report results; and the adult day care centres (Iecovich & Biderman, 2012) had no significant effects. All 3 mentoring, counselling and social support interventions were effective; however, only the mindfulness-based stress reduction program (Creswell et al., 2012a) measured loneliness as an outcome, while the community mentoring services (Dickens et al., 2011; Greaves & Farbus, 2006) measured and reported statistically significant improvements in social support indicating improvements in social isolation.

3.4.2 Effectiveness of Technological Interventions

Technological interventions demonstrated mixed effectiveness; 48 studies reduced loneliness, and 12 reduced social isolation. Duffner et al, (2024) reported on a total of 19 studies which used technological interventions; 52.6% (n = 10) were classified as effective, and 9 of these 10 decreased loneliness levels. The interpersonal communication interventions that relied on ICTs found telephone support (n = 3) (Kahlon et al., 2021) and videoconferencing (Tsai et al., 2020; Tsai & Tsai, 2011) to have statistically significant effects on loneliness. In contrast, another telephone contact intervention (Heller et al., 1991) reported non-significant improvements in mental health scores. Of the 6 technological training and skill development interventions, 5 reported statistically non-significant results. Only one study (Fokkema & Knipscheer, 2007) noted a significant change in emotional loneliness, with sustained effects up to 3 years later. The exergaming intervention (Xu et al., 2016) also reported a significant reduction in loneliness. The high-tech virtual reality horticultural therapy (Lin et al., 2020b) and grief counselling sessions (Knowles et al., 2017) reduced loneliness. However, only the virtual horticultural treatment was statistically significant and had sustained effects. High-tech interventions also included 3 humanoid agents/robots, of which only the personal assistive (S.-C. Chen et al., 2020) reduced loneliness at significant levels with sustained effects, the social robot (N. Fields et al., 2021b) and the humanoid robot with video call features (Follmann et

al., 2021) reduced loneliness at non-significant levels. The 3 technological pet interventions included in Duffner et al, (2024) significantly reduced loneliness levels, with one study (Tkatch et al., 2021) measuring sustained effects.

Zaharia et al. (2024) reported on 7 interventions, all of which reduced loneliness and 5 also reduced social isolation; 5 of the 7 interventions had statistically significant effects. Zaharia et al. (2024) reported on virtual reality grief counselling (Knowles et al., 2017), also mentioned in Duffner et al, (2024) Additionally, they reviewed an activity program using ICTs focused on laughter (Ae-Ri et al., 2023), which decreased loneliness and depression at significant levels. They also reported on an intervention using the PRISM software (S. J. Czaja et al., 2018) and the use of social media (Rolandi et al., 2020), which significantly reduced social isolation and loneliness. Lastly, Zaharia et al. (2024) reported on 2 technological training and skill development interventions. The intervention on digital literacy (Ngiam et al., 2022) did not change loneliness. However, it decreased support and well-being, and the training session incorporated into the volunteering program (J. Fields et al., 2021) did not significantly increase social support or reduce loneliness.

Yu et al. (2023) contained 17 interventions, of which 29.4% (n = 5) reported statistically significant results, showcasing the effectiveness of the interventions. Among these 17 studies, Yu et al. (2023) reported on a humanoid conversational agent (Bickmore et al., 2005b) and a telephone contact intervention (Heller et al., 1991), which showed no significant differences in loneliness measures between the intervention and control groups. The technology program intervention, using the PRIMA software (S. Czaja et al., 2021), showed significant improvements in loneliness levels and social support, indicating a reduction in social isolation. There were 5 training and skill development interventions reported, of which only one intervention (Fokkema & Knipscheer, 2007) showed a significant reduction in loneliness, specifically reducing emotional loneliness. Lastly, 2 video game interventions were evaluated. The Wii exergame intervention (J. Li et al., 2017) showed no significant changes, while the Wii intervention with participants' game of choice and an assistant (Kahlbaugh et al., 2011b) showed significant reductions in loneliness.

Hoang et al. (2022) contained 17 technological interventions, of which 11.8% (n = 2) reduced social isolation and 58.8% (n = 10) reduced loneliness. However, only 29.4% (n = 5) had significant results. There were 5 interventions, which included the use of ICTs. The first (GustafsonJr. et al., 2019) assessed and found that internet use improved loneliness, while the interpersonal communication interventions using videoconferencing (Dodge et al., 2015; Tsai & Tsai, 2011) significantly reduced loneliness while the third interpersonal communication

intervention using telephone contact (Heller et al., 1991) did not have significant effects. Hoagn et al. (2022) reported on two humanoid agents (Bickmore et al., 2005a; Sidner et al., 2018), neither of which were effective in reducing loneliness. In contrast, the other two high-tech interventions assessed the use of technological pets, the PARO robot seal (Robinson et al., 2013), which significantly reduced loneliness, and the AIBO robot dog (Banks et al., 2008), which reduced social isolation and loneliness at levels comparable to changes with living dogs. Lastly, the 3 training and skill development interventions focused on computer training had no significant effects on loneliness scores or social isolation. There were 5 interventions that did not report details on the intervention and findings.

Fu et al. (2022) reported on only 6 technological interventions consisting of 3 training and skill development interventions and three interpersonal communication interventions using ICTs. The videoconferencing program with family members (Tsai et al., 2020) and telephone support calls with trained volunteers (Kahlon et al., 2021) significantly decreased loneliness. However, the third study (Heller et al., 1991), which included telephone contact, improved mental health scores at non-significant levels. The remaining three interventions involved training and skill development. Two focused on computer operation and internet use (N. Shapira et al., 2007; Slegers et al., 2009), and one on video call skills (S. Shapira et al., 2021). Two of which, the video call training and the internet training paired with leisure activities, were effective in reducing loneliness.

Choi and Lee (2021) reviewed 22 technological interventions, of which 45% % (n = 10) were effective. The ICTs: interpersonal communications with the iPad-based communication app (Barbosa Neves et al., 2019) were non-significant, while the video communication intervention (Hemberg & Santamäki Fischer, 2018) did not have sufficient information reported in the review to determine effectiveness. They also reported on 6 technological software, 4 of which did not have data reported on their efficacy, one using PRISM (S. J. Czaja et al., 2018), which significantly reduced social isolation and loneliness, and the LEAP software (Lara et al., 2016) promoted a healthy lifestyle. They included 3 videogame interventions two of which did not include data on effectiveness, and the Wii exergame (J. Li et al., 2017) found no significant differences in loneliness. Lastly, 6 high-tech humanoid agents were reviewed, of which one study (Beer & Takayama, 2011) measured social isolation as an outcome, and two studies (Bickmore et al., 2005a; Ring et al., 2013) measured loneliness as an outcome. Amongst these three, the conversational agent (Ring et al., 2013) significantly reduced loneliness, and the mobile remote presence system (Beer & Takayama, 2011) reduced social isolation, while the computer software humanoid agent (Bickmore et al., 2005a) showed

no significant changes in loneliness. The remaining three interventions measured alternative outcomes. The assistive telepresence (n =2) robot interventions (Koceska et al., 2019; Koceski & Koceska, 2016) reported participant satisfaction with their use and incorporation into daily life, and there was insufficient information on the Astro robot (D'Onofrio et al., 2018) to determine its effectiveness. The PARO seal robot was used in 3 technological pet interventions, which reported promising results, improving physiological values (Wada et al., 2004a, 2004b; Wada & Shibata, 2007). The remaining 2 technological pet interventions used an artificial robotic dog and found a significant reduction in loneliness (Banks et al., 2008; Kanamori et al., 2003) and social isolation (Banks et al., 2008).

Jin et al. (2021) reported on a total of 5 interventions, comprising 3 interpersonal communication interventions with ICTs and 2 training skill development interventions. Of the 3 interpersonal communication interventions, the 2 videoconferencing programs (Tsai et al., 2020; Tsai & Tsai, 2011) significantly reduced loneliness, while the third (Tsai et al., 2015) reported no significant difference. With regards to the training and skill development interventions, the 15-week intervention (N. Shapira et al., 2007) found internet use reduced feelings of loneliness, while the other (Slegers et al., 2008) found no significant effects. Manjunath et al., (2021) reported on only two technological interventions, one focused on telephone contact (Heller et al., 1991) which found non-significant improvements in mental health scores, and a multifunction software PRISM (S. J. Czaja et al., 2018) which significantly reduced both loneliness and social isolation.

Gardiner et al. (2018) reported on 7 technological interventions 5 of which were effective. Interventions which incorporated ICTs were three, two of which assessed the impact of internet usage, while one (Heo et al., 2015) found that increased internet usage was associated with an increase in social support and reduced loneliness, the other study (Toepoel, 2013) found that the passive use of internet was not associated with social connectedness. The videoconference program with family members (Tsai et al., 2010b) reported lower loneliness and increased social connectedness, with significant improvements in loneliness and social isolation. There was one high-tech technological pets' intervention (Banks et al., 2008) which found no statistical difference between the use of a living pet dog and an AIBO, robotic pets, which in either case revealed significant attachment to the pet and significantly reduced loneliness and social isolation. Lastly, they included 3 training and skill development interventions on internet use (Fokkema & Knipscheer, 2007), social networks, (Ballantyne et al., 2010) and general computer skills (Blažun et al., 2012b) all of which reported significant reduction in loneliness.

Poscia et al. (2018) contained 4 technological interventions all of which were effective. They included 2 training and skill development interventions for basic computer skills, one-on-one and group classes (R. B. Jones et al., 2015) which significantly improved social networks and contacts, and group classes reduced loneliness. There was one ICTs: Multifunctional software intervention which found CareTV (van der Heide et al., 2012) significantly reduced loneliness. Lastly, Poscia et al. (2018), reported on one high-tech: technological pets' intervention, using the PARO (Robinson et al., 2013) which also significantly reduced loneliness.

Khosravi et al. (2016) reported on 33 technological interventions, of which 78.8% (n = 26) had statistically significant results indicating the interventions were effective. There were 12 interventions which implemented ICTs technology, 6 looked at general computer use finding that it was effective in reducing loneliness. The 2 interpersonal communication interventions which used videoconferencing, and the 2 multifunctional software, CareTv (van der Heide et al., 2012) and PRISMS (Weinert et al., 2008) reported significant reductions in loneliness. The remaining ICTs interventions (n = 5) assessed social network sites, one intervention (Hutto & Bell, 2014) reported a significant reduction in loneliness, the remaining 4 interventions reported a non-significant reduction in loneliness. Of note is one intervention (Brandtzæg, 2012) which found social network sites users had higher loneliness levels than non-users. There were 8 studies addressing training and skill development interventions which reported mixed results. Reporting non-significant changes in loneliness and social isolation measures was an intensive group training intervention (White et al., 2002) and a long term, 6 months intervention (Woodward et al., 2011). The remaining interventions effectively reduced social isolation, of note is an 8-week training intervention (Cotten et al., 2013) which reduced social isolation as well, and one intervention (Blažun et al., 2012b) which noted significant effects only on individuals living in towns as compared to rural areas, and those who used the computer for communication via emails. Falling under the videogame subcategory was one intervention (Kahlbaugh, Sperandio, et al., 2011) using Wii games, they reported significant reductions in loneliness. Within this review there were 8 interventions involving high-tech technology, the first intervention reviewed included a 3D virtual support group, which reduced loneliness and depression. High-tech interventions also included 3 humanoid agents and robots, specifically conversational agents (Ring et al., 2013), mobile remote presence systems (Beer & Takayama, 2011) and computerised relational agents (Bickmore et al., 2005a) of which all three reduced loneliness however the computerised relational agent was not significant. Lastly, 5

interventions evaluated the effects of technological pets using either the PARO or AIBO robot, which all significantly reduced loneliness.

Chen and Schulz (2016) included 22 interventions, 81% (n = 18) were effective in reducing either loneliness or social isolation. Of these interventions 8 reviewed the effect of general internet use on loneliness and social isolation, 5 found significant reduction in loneliness and one intervention reduced social isolation (Nahm et al., 2003), and two interventions (Karimi & Neustaedter, 2012; Khvorostianov et al., 2012) reduced both social isolation and loneliness. Additional ITC's intervention included a video-conferencing interpersonal communication intervention (Dhillon et al., 2011) and web-based telehealth system (Tsai et al., 2010b) which significantly reduced social isolation and loneliness, while the social network sites (Aarts et al., 2015) was not effective. They included 9 training and skill development interventions 6 which significantly reduced loneliness' and one (Torp et al., 2008) which significantly reduced social isolation. Lastly, a video game intervention using Wii games played with a partner and (Kahlbaugh, Sperandio, et al., 2011) a high-tech intervention involving technological pets (Machesney et al., 2014) which significantly reduced loneliness.

Franck et al. (2016) and Hagan et al. (2014) only had one technological intervention which was an effective video game intervention where older adults played Wii games with an assistant (Kahlbaugh, Sperandio, et al., 2011) which was also included in multiple reviews (Y. R. R. Chen & Schulz, 2016; Khosravi et al., 2016; Yu et al., 2023).

3.4.3 Effectiveness of Health Promotion Interventions

A total of 44 studies reported on health promotion interventions, of which 68.2% (n = 30) reduced loneliness, 13.6% (n = 6) reduced social isolation, and 45.5% (n = 20) were deemed effective via significant results. Duffner et al, (2024) included two health and social care programs, the multistep general case management intervention (Taube et al., 2018), which was not effective, and the educational health program (Collins & Benedict, 2006) which significantly reduced loneliness. The health interventions focused on physical activities were all effective, two of which (Mays et al., 2021; Sen & and Prybutok, 2021) measured outcomes other than social isolation and loneliness, one intervention (Chan et al., 2017) assessing group Tai Chi Qigong significantly reduced loneliness, and increased social support. The multicomponent interventions combining health education, physical activity and social activities (Rodríguez-Romero et al., 2021) were significantly effective in reducing loneliness, while the rehabilitation program (Ollonqvist et al., 2008) reduced loneliness but was non-

significant. Likewise, the multicomponent health intervention, which combined exercise, psychotherapy and audiological rehabilitation, found non-significant changes in loneliness.

There are 8 interventions reported in Yu et al. (2023), which fell under the health, social care and educational interventions, and 5 which fell under multicomponent health interventions; none of these reported significant effects in reducing loneliness. The physical activity interventions reported mixed effects. Two interventions, Tai Chi Qiqong (Chan et al., 2017) and an exercise with social engagement (Larsen et al., 2021), significantly reduced social isolation, while three other exercise interventions reported no difference between the intervention and control groups.

Hoang et al. (2022) reported on 2 health, social care and educational interventions, specifically a case management intervention (Taube et al., 2018) and home visits providing training and education on assistive devices (de Craen et al., 2006) which did not report significant effects. The physical activity interventions reported similar results with the online group exercise program (Baez et al., 2017), and the group yoga (Wang, 2010) being non-significant. The geriatric rehabilitation program reduced loneliness (Ollonqvist et al., 2008) and improved changes in subjective health, while the multicomponent intervention including exercise, psychotherapy and group audiological rehabilitation (C. A. Jones et al., 2019) showed no significant differences.

Zaharia et al. (2024) assessed a physical activity intervention which assessed physical exercise guided by videos online (Granet et al., 2022) which significantly reduced loneliness, anxiety and depression. Manjuanth et al. (2021) reported on two health and social care program, educational interventions (Collins & Benedict, 2006; Rahimi Foroushani et al., 2014) which were effective in reducing loneliness.

Gardiner et al. (2018) reported on one health, social care program intervention which consisted of CareTV that significantly reduced social isolation. Additionally, they included 7 multicomponent health interventions, two of which the Queensland Project to Reduce Social Isolation in Older People (Bartlett et al., 2013) which included fitness and arts programs, which had no significant effect on loneliness and social isolation, and the geriatric rehabilitation multi-component (Ollonqvist et al., 2008) which decreased loneliness and improved subjective health. The multi-strategy psychosocial support program (Alaviani et al., 2015) based on the constructs of Pander's Health Promotion model significantly reduced loneliness. Two studies looked at the senior reach gatekeeper model (Bartsch et al., 2013; Bartsch & Rodgers, 2009), which found community referrals were effective in decreasing social isolation. Lastly there are 2 multicomponent interventions of note, the eden alternative model (Bergman-Evans, 2004)

which reduced levels of boredom and helplessness but not loneliness, and the CARELINK program (Nicholson & Shellman, 2013) which noted the control group which did not receive the intervention were twelve more likely to be socially isolated.

Poscia et al. (2018) also reported on the Queensland Project to Reduce Social Isolation in Older People (Bartlett et al., 2013), in addition to a multicomponent health intervention including a mass media campaign, healthy aging educational groups and psychosocial courses and befriending interventions (Honigh, 2013), which also had non-significant effects. However, there were also two multicomponent health interventions involving the CARELINK program (Nicholson & Shellman, 2013) and multi-strategy psychosocial support program based on Pander's Health Promotion model (Alaviani et al., 2015) mentioned in Gardiner et al. (2018), as well, which were effective. Lastly, they reviewed a physical activity intervention, Let's Go community mobility program (Mulry & and Piersol, 2014), which improved participants' social life and relationships.

3.4.4   Effectiveness of Multicomponent Interventions

The multicomponent interventions included 10 studies, of which 3 interventions were effective, 3 were ineffective, and 4 did not report results. The multicomponent intervention (Honigh-de Vlaming et al., 2013) reported in Duffner et al, (2024) and Yu et al. (2023) reported non-significant changes in loneliness and social isolation measures. Yu et al. (2023), included two additional interventions: the combination of CBT and Baduanjin exercise (Jing et al., 2018b) which significantly reduced loneliness, and a multistage health promotion intervention (Franse et al., 2018) which were ineffective. Hoang et al. (2022) contained 6 interventions which fell under this category, however included results only for 2 interventions, these were a psychosocial digital intervention which combined CBT, psychoeducation on loneliness, and technology acceptance activities (M. A. Jarvis et al., 2019b) and a leisure intervention combined with an exercise program (M. M. Y. Tse et al., 2012) which significantly reduced social isolation and loneliness. Fu et al. (2022) reported on two effective multicomponent interventions the combined CBT and Baduanjin exercise (Jing et al., 2018b) and the CBT interventions aimed at technology acceptance (M. A. Jarvis et al., 2019b) also reported in Hoang et al. (2022) and Choi and Lee (2021).

3.4.5   Effectiveness of Other Interventions

Amongst the interventions falling under this category 22 reduced loneliness, and 9 studies reduced social isolation, of which 18 studies were effective. Duffner et al, (2024) reported on 10 effective interventions, 7 reduced loneliness and 3 reduced social isolation. They reported on one animal therapy intervention (Vrbanac et al., 2013) which was deemed effective. Additionally, they included 7 leisure interventions, consisting of 3 horticultural interventions which significantly reduced loneliness (Y.-M. Chen & Ji, 2015; Chu et al., 2019), and social isolation (M. M. Y. Tse, 2010), two singing interventions which reported improvement in social support (Galinha et al., 2022), and a radio program intervention (Travers & Bartlett, 2011) and virtual interactive coursed on leisurely activities (S.-Y. Yang et al., 2022) which effectively reduced social isolation and loneliness. Lastly, they included 2 spiritual interventions, a religious intervention (Borji & Tarjoman, 2020) and a meditation program (Pandya, 2021) which significantly reduced loneliness.

Zaharia et al. (2024) reported on one intervention (Coll-Planas et al., 2015) which implemented activities for older adults by building a network across health centres, senior centres and other members of the community. The intervention reduced loneliness and social participation and increased the number of social contacts.

Yu et al. (2023) reported on 5 leisure interventions, 3 focused on singing, the bi-weekly singing practice paired with time for socialisation significantly reduced social isolation (Galinha et al., 2022), and the community choir paired with activities promoting cognitive, physical and psychosocial engagement (Cohen et al., 2006) significantly reduced loneliness, however the weekly singing intervention (Johnson et al., 2020) showed no significant results. Lastly, one intervention (S.-Y. Yang et al., 2022) involving interactive online courses showed significant reductions in loneliness. The remaining interventions included two effective spiritual interventions (Borji & Tarjoman, 2020; Pandya, 2021) also reported in Duffner et al, (2024), and a meal delivery intervention which reduced loneliness, but it was non-significant. Lastly, Yu et al. (2023), reported on a behavioural intervention which guided participants to engage in activities that were feasible during social distancing which were significant in reducing loneliness.

Hoang et al. (2022) contained 6 animal therapy interventions, 3 of these interventions did not specify results, while the remaining interventions (Banks & and Banks, 2005; Banks & Banks, 2002; Sollami et al., 2017) reported statistically significant results. Of the 3 leisure

exercises included in the review, only the effective singing intervention (Johnson et al., 2020) reported results.

Gardiner et al. (2018) reviewed 2 animal interventions, one of which looked at the effect of owning a pet (Krause-Parello, 2012) and the animal-assisted therapy (Banks & and Banks, 2005), which significantly reduced social isolation. In addition, they evaluated 2 indoor horticultural interventions, the indoor gardening group paired with discussions (M. M. Y. Tse, 2010) was significant in reducing social isolation and loneliness, while intervention solely focused on indoor gardening (Brown et al, 2004) reported no change in the perception of loneliness. Furthermore, they reviewed 3 interventions (Cattan & Ingold, 2003; Howat et al., 2004; Wylie, 2012) which assessed the strategies implemented by older adults to manage loneliness. These studies showed that older adults found home or hospital volunteer visits and community clubs to be effective. Older adults suggested that interventions should recognise that older adults have diverse needs and abilities which should be taken into consideration when designing and implementing interventions.

Lastly, Poscia et al. (2018) included 3 interventions which fell under this category, including a horticultural intervention (Perkins, 2012) and singing sessions with musicians (Davidson et al., 2014), which did not effectively reduce loneliness. The Lifestyle engagement activity program (Low et al., 2015) reduced self and family engagement; however, there were no significant differences in loneliness measures. Franck et al. (2016) contained two leisure interventions: a horticultural intervention paired with discussion sessions (M. M. Y. Tse, 2010) and a radio program (Travers & Bartlett, 2011), which significantly reduced both loneliness and social isolation.

Table 3:

Summary of Effective Interventions

Row Labels	Count of Decrease in Loneliness	Count of Decrease in Social Isolation	Effective Interventions (%)
Psychosocial Intervention	**69**	**16**	**72.7% (n = 72)**
Friendship and Social Facilitation	10	3	12
Group and Community Interventions	14	3	13
Mentoring, Counselling, Social Support	12	3	16
Reminiscence Therapy	8		7

Therapy	22	4	17
Volunteering	2	2	4
Intergenerational			2
General			2
Technological Intervention	**48**	**12**	**63.5% (n = 66)**
General			
High-tech	3		2
High-tech: Humanoid Agents/Robots	6	1	5
High-tech: Technological Pets	9	1	12
ICTs: General	14	4	18
ICTs: Interpersonal Communication	7	1	6
ICTs: Multifunction Software	5	2	6
ICTs: Social Network Sites	5	1	2
Training/Skill Development	15	6	14
Video Games	3		2
Health Promotion Intervention	**30**	**6**	**45.5% (n = 20)**
Health & Social Care Program, Educational Interventions	9		3
Multicomponent Health Interventions	13	5	9
General	1		1
Physical activity	7	1	7
Multicomponent	**5**	**2**	**30.0% (n = 3)**
Other Category	**22**	**9**	**58.0% (n = 18)**
Animal Intervention	4		5
Exploratory Study	4	4	–
Leisure - General	2	1	2
Leisure - Horticultural Intervention	4	2	3
Leisure - Singing	2	1	3
Spiritual	2		2
Other uncategorised	4	1	3
Grand Total	**193**	**49**	**62.0% (n = 180)**

4   Discussion

This meta-review aimed to provide a comprehensive overview of interventions available to reduce loneliness and social isolation in older adults, thereby supporting healthy ageing. The systematic search resulted in the inclusion of 14 reviews, which amassed the findings of 290 studies. To our knowledge, this meta-review is the first to produce a comprehensive summary of existing interventions and their effectiveness. Based on the characteristics of the individual interventions, the studies were grouped into five broad categories: psychosocial interventions, technological interventions, health promotion interventions, and other interventions. Overall, the reviews reached a consensus that the current interventions available are promising, with 62% (n = 180) of primary studies reporting significant results. Of note, Duffner et al, (2024) stated that the interventions from their review had comparable effects to non-pharmacological interventions for various psychiatric disorders. Consequently, the results indicate that implementing and promoting interventions aimed at reducing loneliness and social isolation in older adults' communities would be beneficial to support healthy ageing.

4.1   Characteristics of Effective Interventions

Psychosocial interventions were found to be the most effective intervention category, with 72.7% (n=72) of studies under the category reporting significant reductions in loneliness and social isolation. In the individual reviews and meta-analyses, interventions incorporating psychological components, such as counselling-based interventions, had the greatest effect size and the most consistent effects in reducing loneliness and social isolation. Zaharia et al. (2024) noted that effective interventions improved social support and social skills, addressed maladaptive social cognition and increased opportunities for social interaction. These four characteristics were commonly found in psychosocial interventions along with health promotion interventions, which provided psychological and health education (Zaharia et al., 2024). In line with the observations in Zaharia et al (2024), other reviews suggested that the success of psychosocial interventions was tied to their direct approach, addressing the social skills and psychological processes that could be at the root of loneliness and social isolation by providing coping strategies (Hoang et al., 2022). These findings are consistent with those from previous meta-reviews, which have found that the most effective interventions addressing loneliness and social isolation are those targeting abnormal and maladaptive social cognition, via CBT and psychological reframing (Masi et al., 2011; Patil & Braun, 2024). Current

evidence suggests that social support interventions, which aim to foster friendships, are more effective in reducing social isolation (Hansen et al., 2024). This meta-review is unable to comment on the effect of friendship-focused interventions on social isolation, as only 4 of the 16 interventions included measures related to social isolation and reported a reduction in 3. Nonetheless, the results of this meta-review show that such interventions are effective in improving loneliness, as 10 of the 16 interventions reported a decrease in loneliness, and overall, 12 of these interventions were deemed effective. Consequently, we can build upon the results from Hansen et al. to sustain the benefits of friendship and social support interventions, in their potential to reduce both loneliness and social isolation.

Technological interventions were the second most effective category; however, many reviews expressed concern over difficulties in implementing technological interventions due to the digital divide (M.-A. Jarvis et al., 2020; Zaharia et al., 2024). The digital divide refers to the tendency of older adults to use the internet and technologies less than their younger counterparts (McDonough, 2016). As they tend to use technologies less, they may struggle to take up new tools provided to them. Additionally, they may struggle with the usability of the applications and tools if they were not designed with their needs (Gomez-Hernandez et al., 2023). Duffner et al, (2024) found that technological interventions were the least effective among the interventions reported in their review, attributing this to older adults being less technologically adept (Duffner et al., 2024). Nonetheless, our review showed that technological interventions were effective in 63.5% (n = 66) of the interventions, indicating an overall positive result, which sustains previous findings reported in a systematic umbrella review of technological interventions (Balki et al., 2022) addressing social isolation, connectedness, and loneliness in older adults. Furthermore, two reviews specifically noted the positive effects of using ICTs (Y. R. R. Chen & Schulz, 2016; H. K. Choi & Lee, 2021). Chen and Schulz (2016) noted that ICTs were successful in increasing social connectedness and social support; however, this effect was limited to 6 months following the intervention. Of note, Choi and Lee (2021) reported older adults' positive attitudes towards computer use, they found older adults felt comfortable using the systems with minimal training and noted an increase in use. This suggests that, while concerns about the digital divide are understandable, older adults are willing and capable of engaging with technology and may therefore benefit from such interventions. The more recent interventions, utilising high-tech technologies such as humanoid agents, virtual reality, and multifunctional software, show promising results. In some cases, as seen in Hoang et al. (2022), they are among the interventions with the largest effect sizes, although this could be attributed to a smaller number of reviews compared to other

categories. Studies on technological interventions, especially those implementing more modern technologies, are still limited (Khosravi et al., 2016). Thus, reviews encourage the continued study of these interventions to explore their impact and potential benefits in alleviating loneliness and social isolation further. In fact, some meta-reviews argue that we have yet to fully capitalise on the full potential of technological interventions in alleviating loneliness (Masi et al., 2011).

Furthermore, the results showed that psychosocial and leisure interventions, implemented via digital means such as telephone calls or video calls, were effective. These findings are significant as they can help broaden the reach of interventions to members of the population who may be unable to leave the house and engage in in-person interventions. As noted by Duffner et al, (2024), technological interventions are beneficial when the barriers to in-person contact are high, and thus, alternatives are needed. Duffner et al, (2024) and Jin et al. (2021) also note that technology can be a tool rather than a solution, for example, in making psychosocial or leisure interventions more accessible, serving as a starting point for conversations, supporting and maintaining contact with family and friends, and accessing information (Duffner et al., 2024; Jin et al., 2021; Khosravi et al., 2016).

The findings from this meta-review identify the beneficial effects of animal therapy, whether high-tech robotic pets or live animal therapy interventions, as well as the success of multicomponent interventions, which are congruent with previous meta-reviews (Patil & Braun, 2024). A systematic review of reviews published prior to COVID-19 identified effective interventions, as those which are purpose-driven, that is, promote active engagement in the interventions and help rebuild the lost identity of lonely older adults (Patil & Braun, 2024). These findings align with our observations that interventions surrounding activities such as singing and horticultural therapy were particularly effective. In line with these findings, interventions where older adults are part of providing the service, such as in volunteering or intergenerational interventions, also appear to be effective.

Overall, there were debates over the effectiveness of group interventions versus one-on-one interventions, with some reviews leaning towards concluding that group interventions are more effective. For example, Zaharia et al. (2024) found that group interventions were particularly effective in health promotion interventions, as the group environment better supported the establishment and maintenance of health behaviours. Additionally, Manjuanth et al. (2021) observed that group interventions were more effective when they lasted longer, reducing social isolation while improving mental and physical health outcomes and decreasing loneliness. In contrast, Gardiner et al. (2018) found no difference between the group

interventions and in-person interventions (Gardiner et al., 2018). Nonetheless, other meta-reviews (Masi et al., 2011) have also indicated that group interventions were more effective in reducing social isolation. However, the reviews included in this meta-review made some key observations that provide new insights into this discussion. Firstly, Poscia et al. (2018) proposed that the group component may mask the effectiveness of the actual intervention, essentially arguing that participants may perceive improvements simply due to meeting regularly with others, regardless of the nature of the intervention. Building on this, Hoang et al. (2022), highlights that increasing social contact and establishing new friendships is not sufficient to guarantee a good quality relationship. As a result, it leaves the possibility for the persistence of emotional loneliness, as participants may not receive the social connection they seek. Similar concerns were raised in a meta-review (Masi et al., 2011), which found a small effect size in reducing loneliness in interventions that increased social interaction and enhanced social support. They also proposed that this may occur as lonely people may have specific thought patterns and behavioural tendencies which inhibit them from establishing friendships. Poscia et al. (2018) argue that in-person interventions may be better suited in establishing higher quality bonds by empowering participants to engage socially. These considerations are linked to the effectiveness of psychosocial interventions, where interventions that provide participants with skills to maintain and establish social connections are more effective. Consequently, we need to approach these findings favouring group interventions with greater caution, and when developing group interventions, we should incorporate tools and assistance to better support the development of stronger interventions.

4.2   Strengths and Limitations

The combined strengths and limitations of this meta-review is the inclusion of various study designs and not limiting inclusion to RCTs as this allowed for a more comprehensive overview of the available interventions. However, this means that we were unable to conduct a meta-analysis and determine statistically the effectiveness of each intervention, due to qualitative studies and the heterogeneity across the reviews. A further limitation was the reliance on the information presented by the reviews, on account of the large number of primary studies included, the primary studies were not assessed individually, as a result there was a mismatch on the reported information, for example, study design, duration and in some cases the results. This means that some characteristics of the interventions may have unintentionally been excluded from this meta-review. Furthermore, despite our best efforts, some reviews may

not have appeared during the systematic search of our databases and were therefore not included in the summary. A possibility made greater due to our limiting the search to literature published in English.

Despite these limitations, this meta-review succeeded in its goal in providing a summary of current literature and identifying the effective interventions to reduce loneliness and social isolation in older adults. The key strength of this review is the rigorous methodology that was maintained while conducting the research. Starting from the initial database search, which two independent researchers conducted, and the selection of interventions was also conducted independently. Furthermore, for two data extractions that were conducted, ensure the collection of two levels of information, the conclusions from the reviews and information about the primary studies.

4.3   Recommendations and Future Directions

A common consensus found across the reviews was the weak quality of the available literature, which makes it challenging to confidently conclude and report on the effectiveness of the available interventions (Hansen et al., 2024; Hoang et al., 2022). The primary issue in current research is the lack of heterogeneity in the sample population, study design and most importantly, the measures used. Furthermore, there is a lack of a clear definition and operationalisation of the concepts of loneliness and social isolation, which once again poses a difficulty in comparing studies to determine effectiveness. As a result, we support the recommendations from other systematic reviews and meta-reviews to conduct more rigorous research on the topic, thereby improving the quality of available evidence and thus enabling us to be more confident about the effectiveness of interventions.

However, due to the findings that these interventions are effective, we also recommend that further research should focus on identifying the long-term benefits and effectiveness of interventions, which remains a big gap in current research. This is a feature that has been added to only a few studies and reported explicitly in two reviews included in this meta-review (Duffner et al., 2024; Zaharia et al., 2024). Future research is needed not only to determine if the interventions provide sustained effects in the measures of loneliness and social isolation, but an interesting focus may also be evaluating if they changed participants' behaviour, such as making them more outgoing, and active participants in maintaining social connections, seeking activities within the community. Additionally, we propose that future research should investigate the feasibility of these interventions on a larger scale to better identify the

interventions that can be integrated into community services, healthcare, and social services for older adults. Such research would be beneficial as it would support the development of new policies and services for older adults to support healthy ageing on a larger scale.

4.4   Conclusion

The literature indicates that social connections and satisfaction in the frequency and quality of social interactions are a fundamental component for healthy ageing. Prolonged experiences of social isolation and loneliness increase the mortality rate, along with accelerating cognitive decline, increasing the risk of memory issues, dementia, Alzheimer's, depression and anxiety, along with shaping their quality of life. Given its importance, in order to sustain healthy ageing, there is a need to provide older adults with the necessary tools and activities for social connections via interventions.

This meta-review helps identify the available interventions, identifying common types of interventions including psychosocial interventions promoting group meetings centred on providing social support and psychotherapy, technological interventions which provide tools to facilitate communications at a distance, in addition to software and robotic technologies which help maintain communication and provide day-to-day support. Health promotion interventions focus on physical exercise and health education to promote healthy ageing. Within the categories, the majority showed promising results, with all subcategories including some effective studies. However, doubts remain on the long-term effectiveness of these interventions, with some cases showing the need for the continuation of the intervention for the effectiveness to be sustained. Findings indicate that the most effective interventions are those that address some of the root causes of loneliness and social isolation. Thus, psychosocial interventions, which provide participants with coping skills for stress and psychological support, and technological interventions, which provide tools to maintain contact with friends and family, appear to be the most effective.

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Appendix

Appendix 1 – Data Extraction Template

Author: _____   Year: _____

Publication Overview

Type of Review	
Years Covered	
Geographic Info	
Total Studies	
Types of studies included	

Population

Age	
Characteristics	
Gender	
Settings	

Interventions

Overarching Categories	
Types	
Duration	
Themes	

Findings and Results

Outcome Measures	Primary	
	Secondary	
Results		
Barriers and Facilitators		

Limitations

Limitations of Studies	
Limitations of Review	

Future Directions

Comments:

JBI CRITICAL APPRAISAL CHECKLIST FOR SYSTEMATIC REVIEWS AND RESEARCH SYNTHESES

Reviewer_____Date_____

Author_____Year_____ Record Number_____

	Yes	No	Unclear	Not applicable
1. Is the review question clearly and explicitly stated?	☐	☐	☐	☐
2. Were the inclusion criteria appropriate for the review question?	☐	☐	☐	☐
3. Was the search strategy appropriate?	☐	☐	☐	☐
4. Were the sources and resources used to search for studies adequate?	☐	☐	☐	☐
5. Were the criteria for appraising studies appropriate?	☐	☐	☐	☐
6. Was critical appraisal conducted by two or more reviewers independently?	☐	☐	☐	☐
7. Were there methods to minimize errors in data extraction?	☐	☐	☐	☐
8. Were the methods used to combine studies appropriate?	☐	☐	☐	☐
9. Was the likelihood of publication bias assessed?	☐	☐	☐	☐
10. Were recommendations for policy and/or practice supported by the reported data?	☐	☐	☐	☐
11. Were the specific directives for new research appropriate?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

_____
_____
_____

Critical Appraisal Checklist for Systematic Reviews and Research Syntheses - **3**