



# Efficacy of virtual interventions for reducing symptoms of depression in community-dwelling older adults: a systematic review

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## ABSTRACT

**Background:** Older adults experience symptoms of depression, leading to suffering and increased morbidity and mortality. Although we have effective depression therapies, physical distancing and other public health measures have severely limited access to in-person interventions.

**Objective:** To describe the efficacy of virtual interventions for reducing symptoms of depression in community-dwelling older adults.

**Design:** Systematic review.

**Setting:** We searched MEDLINE, EMBASE, Cochrane Libraries, PsycINFO, and gray literature from inception to July 5, 2021.

**Participants and interventions:** We included randomized trials (RCTs) comparing the efficacy of virtual interventions to any other virtual intervention or usual care in community-dwelling adults  $\geq 60$  years old experiencing symptoms of depression or depression as an outcome.

**Measurements:** The primary outcome was change in symptoms of depression measured by any depression scale.

**Results:** We screened 12,290 abstracts and 830 full text papers. We included 15 RCTs (3100 participants). Five RCTs examined persons with depression symptoms at baseline and ten examined depression as an outcome only. Included studies demonstrated feasibility of interventions such as internet or telephone cognitive behavioral therapy with some papers showing statistically significant improvement in depressive symptoms.

**Conclusions:** There is a paucity of studies examining virtual interventions in older adults with depression. Given difficulty in accessing in-person therapies in a pandemic and poor access for people living in rural and remote regions, there is an urgent need to explore efficacy, effectiveness, and implementation of virtual therapies.

**Key words** depression, depressive disorders, virtual, telemedicine, older adults

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## Why does this paper matter?

The pandemic highlighted a need for improved virtual access to interventions that can reduce symptoms of depression in older adults. It is unclear which interventions are efficacious for reducing these symptoms. We identified virtual interventions that reduced symptoms of depression in older adults, including cognitive behavioral therapies.

## Key points

1. Virtual (telephone or videoconference) self-directed or supported cognitive behavioral therapy had statistically significant effects on reducing symptoms of depression in individual studies, but the clinical significance of these findings is unclear.
2. Older adults need access to efficacious psychotherapy interventions (e.g. cognitive behavioral therapy, chronic disease support) to reduce symptoms of depression; however, more studies are needed urgently to establish their efficacy via virtual modalities.

## Impact statement

This is the first systematic review to identify virtual interventions that reduce symptoms of depression in older community-dwelling adults. We highlight the efficacy of virtual psychotherapy interventions for depression management.

## Introduction

Symptoms of depression are one of the most common mental health issues in older adults. Fifteen to 20% of community-dwelling older adults experience ‘substantial symptoms of depression’ (MacCourt and Tourigny-Rivard, 2011). Depressed older adults have poorer quality of life (Doraiswamy *et al.*, 2002), difficulty with day-to-day tasks (Schillerstrom *et al.*, 2008), and higher mortality (MacCourt and Tourigny-Rivard, 2011) compared to those without depression. Efficacious psychotherapies exist to reduce symptoms of depression for older adults with depression (MacQueen *et al.*, 2016), but a lack of access to these interventions during the pandemic has precluded their use (Raue *et al.*, 2017; Yang *et al.*, 2020). Given minimal evidence of efficacy and the risk of adverse events with pharmacologic therapy, psychotherapy is a key initial component of treatment (MacQueen *et al.*, 2016; Sobieraj *et al.*, 2019).

Public health measures to minimize COVID-19 spread increased social isolation for older adults, which can worsen mood (Armitage and Nellums, 2020;

Steinman *et al.*, 2020). However, virtual options may facilitate use of interventions in settings where in person access is not feasible. There is increasing support for the use of virtual care in older adults, and rapid uptake during the COVID-19 pandemic has provided an understanding of usefulness (Watt *et al.*, 2021; Liu *et al.*, 2021). A large retrospective cohort from the United States involving 313,516 telehealth visits in adults over 60 years from 2015 to 2019 (Bernstein *et al.*, 2021) found that 84–87% of urgent and nonurgent primary care issues were resolved (Bernstein *et al.*, 2021). For those patients who needed further visits, 95% of these were resolved in less than three visits (either in person or virtual) (Bernstein *et al.*, 2021). The study also noted that certain conditions could be similarly addressed with either phone or videoconference visits (e.g. UTI) (Bernstein *et al.*, 2021).

However, there are concerns around the barriers faced by older adults when trying to access virtual care. A cross-sectional study of 330 patients found that older adults who are frail or do not have a caregiver were less able to access videoconference-based virtual care (Liu *et al.*, 2021). When examining the accuracy of virtual cognitive testing in a systematic review, many barriers and facilitators to virtual care were identified, including sensory impairment, severe cognitive impairment, physical issues, and issues with technology (Watt *et al.*, 2021).

To inform clinical practice during the COVID-19 pandemic, we conducted a systematic review of randomized controlled trials (RCTs) reporting the efficacy of virtual interventions for reducing symptoms of depression in older adults.

## Methods

We registered our systematic review with PROSPERO (CRD42020188465) and disseminated our protocol on Open Science Framework (<https://osf.io/6tjcy/>). We followed the Cochrane Handbook for Systematic Reviews of Interventions (Higgins and Green, 2011) and reported as per Preferred Reporting Items for Systematic Reviews and Meta-Analysis criteria (Moher *et al.*, 2010; Page *et al.*, 2021). All methods were reviewed by stakeholders, including persons with lived experience, and feedback was incorporated.

## Search strategy

Our search strategy was developed with an experienced librarian. A second librarian completed a Peer Review of Electronic Search Strategies (PRESS) (McGowan *et al.*, 2016) of the search strategy for all databases. We searched MEDLINE, EMBASE,

Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, and PsycINFO. We searched references of included studies, systematic reviews, and 76 gray (i.e. difficult to locate and unpublished) literature sources based on the Canadian Agency for Drugs and Technology in Health Grey Matters document and expert opinion (Supplementary File 2). All searches were performed in all languages from inception until July 2021 (Supplementary File 1).

### Study selection

We included RCTs comparing the efficacy of any virtual (e.g. telephone, videoconference, or internet-based) nonpharmacologic intervention to usual care or any other virtual nonpharmacologic intervention for reducing symptoms of depression in community-dwelling older adults (defined as  $\geq 60$  years old and average age  $\geq 65$  years old) with depressive symptoms or disorders at baseline or where depression was measured as an outcome (APA, 2013). We excluded interventions that incorporated both virtual and in-person components, as the focus was on interventions that were entirely administered virtually. We also excluded RCTs where the entire study population had a *single* specific medical comorbidity (e.g. heart failure), as these populations were too specific. We included studies where the population had multiple comorbidities, as this is representative of older populations. Two reviewers (ZG, JW) independently completed two study screening levels, after a calibration exercise to ensure agreement, conflicts were reviewed by a third party (i.e. title/abstract and full-text papers).

### Data extraction and risk of bias assessment

After piloting, ZG and PW independently extracted data from included full-text papers and completed a risk of bias appraisal using the Cochrane Risk of Bias Tool for RCTs (Higgins and Green, 2011, Higgins *et al.*, 2011). We extracted the following data: participant characteristics (e.g. age of study population, proportion of female study participants, proportion of participants with symptoms of depression or disorders at RCT baseline, presence of psychiatric comorbidities), study characteristics (e.g. year of publication, authorship, study setting [i.e. urban vs. rural], sample size, study duration, number of RCT intervention arms, inclusion criteria, exclusion criteria), details of intervention, how it was implemented and outcome data (e.g. mean depression scores pre and post intervention) from each intervention group. We extracted outcomes from all follow-up intervals. Where RCTs reported  $\geq 2$  scales for the same outcome, we extracted data from all reported scales. We reported outcomes from the commonly used Patient

Health Questionnaire-9 (PHQ-9) (Spitzer *et al.*, 1999), where available, in order to facilitate comparison between studies. The minimally clinically important difference (MCID) for community-dwelling older adults is 5 points for the PHQ-9 (on a scale from 0 to 27) (Lowe *et al.*, 2004). If there were multiple tools used to measure outcomes, we reported tools specific to symptoms of depression or disorders over a subscale. We did not conduct a meta-analysis due to heterogeneity in study populations across studies, comparison groups (e.g. active vs. usual care), and virtual intervention delivery modalities.

## Results

### Search results

The literature search identified 2633 citations after duplicates were removed (Figure 1). Fifteen RCTs ( $n = 3100$ ) were included in the systematic review, and one study was reported in two publications (Brenes *et al.*, 2017; Brenes *et al.*, 2015).

### Study and patient characteristics

All RCTs were published since 2006 (Table 1). The mean age for all participants in included RCTs was 65.1–79.2 years. In included RCTs, the proportion of female participants ranged from 47% to 100%. Included studies were completed predominately in the United States (number [ $n$ ] = 8) and Australia ( $n = 4$ ). All RCTs excluded persons with suicidality or severe symptoms of depression or disorders (Supplementary Table 3). Nine studies had participants with co-diagnoses of anxiety and depression.

Included RCTs focused on two main groups: persons with symptoms of depression or disorders at baseline ( $n = 5$ ) or those where symptoms of depression were measured as an outcome only ( $n = 10$ ).

### Risk of bias assessment

Allocation concealment ( $n = 10$  unclear) and blinding procedures ( $n = 11$  unclear;  $n = 4$  high risk) were the most important sources of bias (Supplementary Table 4). Blinding of outcome assessment was variable, with only four studies being at low risk of bias. Most studies had low risk of bias for random sequence generation ( $n = 13$ ), incomplete outcome reporting ( $n = 8$ ), and selective reporting ( $n = 12$ ).

### Study outcomes

RCTs WHERE DEPRESSIVE SYMPTOMS OR DISORDERS WERE PRESENT AT BASELINE (PRIMARY OUTCOME).

In five RCTs, where participants had symptoms of depression or disorders at baseline (Table 2), the

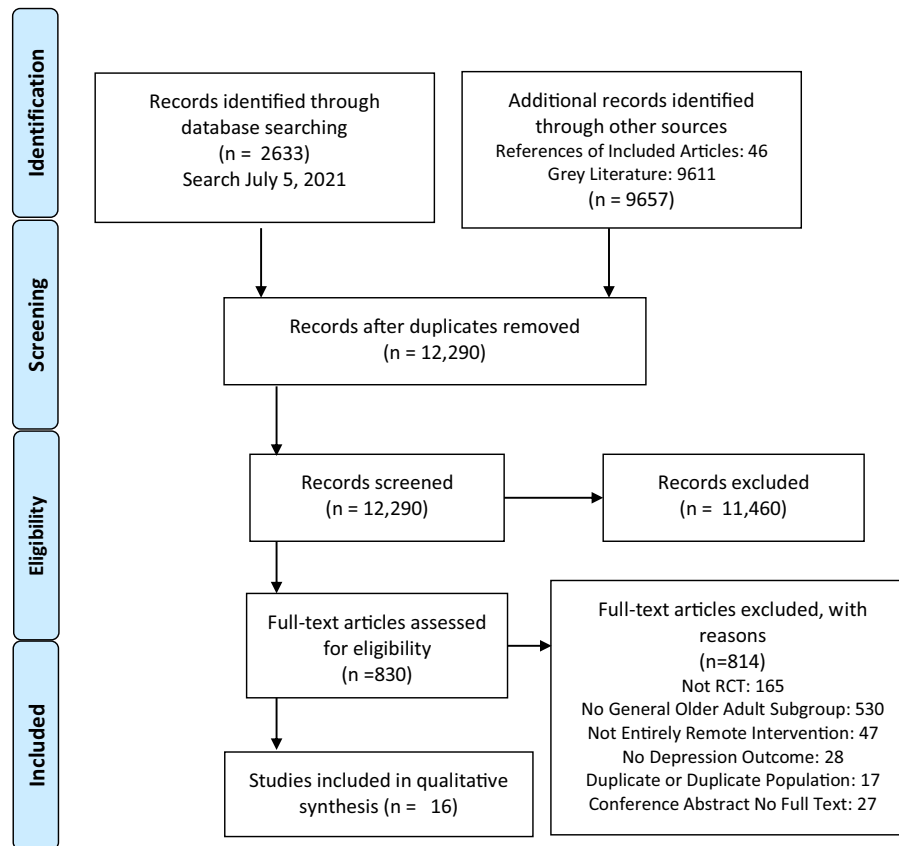


Figure 1. Flow chart.

following therapies were compared to another intervention or usual care: telehealth management of chronic illness (Gellis *et al.*, 2014), problem-solving therapy (Gellis *et al.*, 2014), medication review (Mavandadi *et al.*, 2015), mental health algorithms (Mavandadi *et al.*, 2015), and cognitive behavioral therapy (CBT) (Silfvernagel *et al.*, 2018; Titov *et al.*, 2016; Titov *et al.*, 2015). All interventions were delivered over the telephone or internet. The level of health care provider involvement in interventions varied from entirely self-directed to being closely followed by healthcare providers. Health care providers involved were social workers, counsellors, nurses, or psychologists. The cognitive behavioral therapies used included mindfulness, problem-solving skills, behavioral activation, interpersonal skills, and psychoeducation. Self-guided CBT was done at the pace of the individual and sessions with clinicians ranged from 10 to 35 minutes.

The PHQ-9 was the most common tool used in four RCTs (Table 2 and Supplementary Table 5). All RCTs reported immediate post intervention outcomes at 8–12 weeks, and 4 RCTs reported outcomes at 24- or 52-weeks post intervention. Between study clinical and methodological differences precluded meta-analysis.

Of the four RCTs, two showed a statistically significant difference between groups at the initial follow-up (Titov *et al.*, 2015; Gellis *et al.*, 2012; Szczepanska-Gieracha *et al.*, 2021). Internet CBT with online guidance compared to waitlist control demonstrated efficacy (Titov *et al.*, 2015). In this study, authors explored an 8 week “Managing Your Mood Course”, focused on five online lessons, with reminders, homework, case stories, and secure emailing with a clinical psychologist (Titov *et al.*, 2015). This course involved didactic lessons including case learning with skills training (Titov *et al.*, 2015). When comparing telehealth for chronic illness/depression to nursing check in and education, there was a statistically significant improvement at 3 months, but not at longer follow-up (Gellis *et al.*, 2014). Neither met the between-groups MCID and only had small effect sizes.

Three studies demonstrated a statistically significant group by time interaction between interventions (Mavandadi *et al.*, 2015; Silfvernagel *et al.*, 2018; Shapira *et al.*, 2021). One study examined mental health case management compared to monitoring alone (Mavandadi *et al.*, 2015). Another examined internet CBT with online guidance by a clinician compared to weekly email support by clinicians (Silfvernagel *et al.*, 2018).

**Table 1.** Study and patient characteristics

| REFERENCES   | YEAR | COUNTRY   | STUDY DURATION (WEEKS) | OVERALL SAMPLE SIZE AT RANDOMIZATION | MEAN AGE (YEARS) | OVERALL % OF FEMALE PARTICIPANTS | DEPRESSIVE SYMPTOMS OR DISORDER AT BASELINE | DEPRESSIVE SYMPTOMS AS OUTCOME ONLY | TOOL FOR MEASURING DEPRESSION SYMPTOMS | STUDY POPULATION CHARACTERISTICS   |
|--|------|-----------|------------------------|--------------------------------------|------------------|----------------------------------|---|-------------------------------------|--|--|
| Brenes <i>et al.</i> (2017)<br>Brenes <i>et al.</i> (2015) | 2017 | USA       | 60                     | 141                                  | 66.8             | 82                               | No  | Yes                                 | BDI-I                                  | Generalized anxiety disorder (GAD), panic disorder, anxiety disorder not otherwise specified (NOS) |
| Brenes <i>et al.</i> (2012)                                | 2012 | USA       | 24                     | 60                                   | 69.2             | 83                               | No  | Yes                                 | BDI-I                                  | GAD, panic or anxiety disorder NOS   |
| Dear <i>et al.</i> (2015)                                  | 2015 | Australia | 52                     | 72                                   | 65.5             | 60                               | No <sup>a</sup>                             | Yes                                 | PHQ-9                                  | Self-reported anxiety  |
| Gellis <i>et al.</i> (2014)                                | 2014 | USA       | 24                     | 115                                  | 79.2             | 66                               | Yes   | No                                  | PHQ-9                                  | High hospital users, congestive heart failure or chronic obstructive lung disease                  |
| Gould <i>et al.</i> (2019)                                 | 2018 | USA       | 8                      | 40                                   | 68.9             | 60                               | No  | Yes                                 | PHQ-9                                  | GAD, social anxiety, panic disorder, agoraphobia, anxiety disorder NOS                             |
| Gustafson <i>et al.</i> (2021)                             | 2021 | USA       | 94                     | 390                                  | 76.5             | 75                               | No  | Yes <sup>b</sup>                    | PHQ-8                                  |  |
| Hartke and King (2003)                                     | 2003 | USA       | 24                     | 124                                  | 69.7             | 76                               | No  | Yes                                 | CES-D                                  | Caregivers of persons with stroke  |
| Jones <i>et al.</i> (2016)                                 | 2016 | Canada    | 10                     | 46                                   | 65.1             | 87                               | No  | Yes                                 | GDS-30 or PHQ-9                        | Meeting a criterion for GAD or sub-clinical GAD  |
| Kornblith <i>et al.</i> (2006)                             | 2006 | USA       | 36                     | 131                                  | 73.5             | 47                               | No  | Yes                                 | GDS-15, HADS                           | Advanced cancer (e.g. prostate, breast, colon)   |
| Mavandadi <i>et al.</i> (2015)                             | 2015 | USA       | 24                     | 1018                                 | 77.6             | 83                               | Yes   | No                                  | PHQ-9                                  | Clinically relevant symptoms of depression or anxiety or new anxiolytic or antidepressant          |
| Read <i>et al.</i> (2020)                                  | 2020 | Australia | 24                     | 302                                  | 73.0             | 70                               | No  | Yes                                 | GDS, PHQ-9                             | Chronic conditions (>/=2)  |
| Shapira <i>et al.</i> (2021)                               | 2021 | Israel    | 12                     | 82                                   | 72.0             | 80                               | No  | Yes                                 | PHQ-9                                  |  |
| Silfvermager <i>et al.</i> (2018)                          | 2017 | Sweden    | 8                      | 66                                   | 66.1             | 76                               | Yes   | No                                  | MADRS                                  | GAD, social anxiety, agoraphobia, panic disorder, anxiety disorder NOS, specific phobia            |
| Titov <i>et al.</i> (2016)                                 | 2016 | Australia | 12                     | 459                                  | 66               | 64                               | Yes   | No                                  | PHQ-9                                  | Symptoms of anxiety or depression  |
| Titov <i>et al.</i> (2015)                                 | 2015 | Australia | 52                     | 54                                   | 65.3             | 73                               | Yes   | No                                  | PHQ-9                                  | Symptoms of anxiety or depression  |

Abbreviations: Patient Health Questionnaire (PHQ-9, PHQ-8), Montgomery Åsberg Depression Rating Scale (MADRS), or Geriatric Depression Scale (GDS), Centre for Epidemiology Studies Depression Scale (CES-D), Beck Depression Inventory (BDI-I), Cognitive Behavioural therapy (CBT), Hospital Anxiety and Depression Scale-Depression (HADS-D).

<sup>a</sup>Excluded persons with severe depression based on PHQ-9 >19 or >2 on Suicide item. However, depression nor depressive symptoms were inclusion criteria.

<sup>b</sup>Included persons with falls, home care, nursing facility living, emergency department visit, hospital admission or depression.

**Table 2.** Change in depression symptom score associated with virtual interventions

| ARTICLE                                  | DEPRESSION OUTCOME MEASURE |   | SAMPLE SIZE | TIMING OF OUTCOME MEASURE   |  | MEAN DEPRESSION SYMPTOM SCORE             |  | INTERVENTION 2                             | SAMPLE SIZE              | MEAN DEPRESSION SYMPTOM SCORE | INTERVENTION 3              | SAMPLE SIZE | MEAN DEPRESSION SYMPTOM SCORE |                 |
|--|----------------------------|---|-------------|-----------------------------|--|---|--|--|--------------------------|-------------------------------|-----------------------------|-------------|-------------------------------|-----------------|
|  | INTERVENTION 1             | INTERVENTION 2  |             | INTERVENTION 1              | INTERVENTION 2                             | INTERVENTION 1                            | INTERVENTION 2                         |  |                          |                               |                             |             |                               |                 |
| Brenes <i>et al.</i> (2017) <sup>a</sup> | BDI-I                      | Telephone CBT   | 70          | Baseline                    | 21.6 (8.84 SD)                             | Telephone nondirective supportive therapy | 71                                     | 24.4 (9.18 SD)                             | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 58          | 16 weeks                    | -10.77 <sup>b</sup> (95% CI -12.73, -8.81) |   | 63                                     | -7.54 <sup>b</sup> (95% CI -9.44 to -5.64) |                          |                               |                             |             |                               |                 |
|  |                            |   | 50          | 60 weeks                    | -11.3 <sup>b</sup> (95% CI -13.3 to -9.19) |   | 62                                     | -8.37 <sup>b</sup> (95% CI -10.3 to -6.46) |                          |                               |                             |             |                               |                 |
| Brenes <i>et al.</i> (2012)              | BDI-I                      | Telephone CBT   | 30          | Baseline                    | 16.9 (8.2 SD)                              | Information                               | 30                                     | 17.9 (7.7 SD)                              | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 26          | 8 weeks                     | 11.4 (1.1 SE) <sup>c</sup>                 |   | 29                                     | 14.1 (1.1 SE)                              |                          |                               |                             |             |                               |                 |
|  |                            |   | 24          | 24 weeks                    | 10.7 (1.6 SE)                              |   | 26                                     | 13.3 (1.6 SE)                              |                          |                               |                             |             |                               |                 |
| Dear <i>et al.</i> (2015)                | PHQ-9                      | Internet CBT + clinician guided   | 33          | Baseline                    | 10.76 (4.79 SD)                            | Waitlist                                  | 37                                     | 10.78 (4.37 SD)                            | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 33          | 8 weeks                     | 3.63 (3.68 SD) <sup>*</sup>                |   | 37                                     | 10.47 (4.62 SD)                            |                          |                               |                             |             |                               |                 |
|  |                            |   | 33          | 12 weeks                    | 3.93 (3.81 SD)                             |   | -                                      | NR   |                          |                               |                             |             |                               |                 |
|  |                            |   | 33          | 52 weeks                    | 3.93 (3.27 SD)                             |   | -                                      | NR   |                          |                               |                             |             |                               |                 |
| Gellis <i>et al.</i> (2014)              | PHQ-9                      | Telehealth for chronic illness and depression                               | 57          | Baseline                    | 14.9 (6.4 SD)                              | In home nursing + psycho-education        | 58                                     | 15.2 (5.8 SD)                              | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 46          | 12 weeks                    | 7.4 (5.7 SD) <sup>*</sup>                  |   | 48                                     | 13.6 (5.6 SD)                              |                          |                               |                             |             |                               |                 |
|  |                            |   | 46          | 24 weeks                    | 7.9 (5.3 SD) <sup>**</sup>                 |   | 48                                     | 14.1 (5.9 SD)                              |                          |                               |                             |             |                               |                 |
|  |                            |   | 20          | Baseline                    | 8.4 (5.55 SD)                              |   | Waitlist                               | 20   |                          |                               |                             |             |                               | 6.8 (5.48 SD)   |
| 20                                       | 8 weeks                    | 5.71 (1.58 SE) <sup>c</sup>   | 20          | 8.6 (1.19 SE)               |  |   |  |  |                          |                               |                             |             |                               |                 |
| Gustafson <i>et al.</i> (2021)           | PHQ-8                      | Interactive website   | 197         | Baseline                    | 0.71 (0.20 SD)                             | Control                                   | 193                                    | 0.72 (0.20 SD)                             | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 197         | 24 weeks                    | 0.72 (0.19 SD)                             |   | 193                                    | 0.72 (0.19 SD)                             |                          |                               |                             |             |                               |                 |
|  |                            |   | 197         | 52 weeks                    | 0.72 (0.21 SD)                             |   | 193                                    | 0.73 (0.22 SD)                             |                          |                               |                             |             |                               |                 |
|  |                            |   | 24          | Baseline                    | 11.0 (6.25 SD)                             |   | Waitlist                               | 22   |                          |                               |                             |             |                               | 12.18 (5.24 SD) |
| 22                                       | 10 weeks                   | 5.59 (5.10 SD) <sup>c</sup>   | 19          | 12.08 (6.19 SD)             |  |   |  |  |                          |                               |                             |             |                               |                 |
| Jones <i>et al.</i> (2016)               | PHQ-9                      | Internet CBT + guided online  | 18          | 14 weeks                    | 5.37 (5.25 SD)                             | -   | NR                                     | -  | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 64          | Baseline                    | 6.3 (5.3 SD)                               | Waitlist                                  | 18                                     |  |                          |                               |                             |             |                               | 6.3 (5.0 SD)    |
|  |                            |   | 64          | 3.5 weeks                   | 5.2 (4.7 SD) <sup>c</sup>                  |   | 18                                     |  |                          |                               |                             |             |                               | 7.1 (6.1 SD)    |
| Silfvernagel <i>et al.</i> (2018)        | MÅDRS                      | Internet CBT + guided online  | 33          | Baseline                    | 20.27 (6.75 SD)                            | Weekly brief email support by clinician   | 33                                     | 20.03 (7.73 SD)                            | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 33          | 8 weeks                     | 11.75 (8.36 SD) <sup>c</sup>               |   | 33                                     | 16.99 (8.84 SD)                            |                          |                               |                             |             |                               |                 |
| Titov <i>et al.</i> (2015)               | PHQ-9                      | Internet CBT + guided online  | 27          | Baseline                    | 11.04 (5.62 SD)                            | Waitlist                                  | 25                                     | 12.04 (5.42 SD)                            | -                        | -                             | -                           | -           | -                             |                 |
|  |                            |   | 27          | 8 weeks                     | 3.96 (2.48 SD) <sup>*</sup>                |   | 25                                     | 12.68 (5.48 SD)                            |                          |                               |                             |             |                               |                 |
|  |                            |   | 27          | 12 weeks                    | 4.90 (4.05 SD)                             |   | -                                      | NR   |                          |                               |                             |             |                               |                 |
|  |                            |   | 27          | 52 weeks                    | 4.68 (4.47 SD)                             |   | -                                      | NR   |                          |                               |                             |             |                               |                 |
|  |                            |   | 153         | Baseline                    | 10.7 (4.88 SD)                             |   | Orientation + self-guided internet CBT | 140  |                          |                               |                             |             |                               | 10.43 (4.61 SD) |
| 150                                      | 8 weeks                    | 4.39 (3.81 SD) <sup>*</sup>   | 133         | 4.44 (3.67 SD) <sup>*</sup> |  |   |  |  |                          |                               |                             |             |                               |                 |
| 147                                      | 12 weeks                   | 4.30 (3.37 SD)  | 126         | 4.71 (3.79 SD)              |  |   |  |  |                          |                               |                             |             |                               |                 |
| Titov <i>et al.</i> (2016)               | PHQ-9                      | Orientation + clinician guided internet cognitive behavioural therapy (CBT) | 153         | Baseline                    | 10.7 (4.88 SD)                             | Orientation + self-guided internet CBT    | 140                                    | 10.43 (4.61 SD)                            | Self-guided internet CBT | 140                           | 10.43 (4.73 SD)             |             |                               |                 |
|  |                            |   | 150         | 8 weeks                     | 4.39 (3.81 SD) <sup>*</sup>                |   | 133                                    | 4.44 (3.67 SD) <sup>*</sup>                |                          | 133                           | 4.78 (3.90 SD) <sup>*</sup> |             |                               |                 |
|  |                            |   | 147         | 12 weeks                    | 4.30 (3.37 SD)                             |   | 126                                    | 4.71 (3.79 SD)                             |                          | 131                           | 4.75 (3.79 SD)              |             |                               |                 |

**Table 2. Continued**

| ARTICLE                        | DEPRESSION OUTCOME  |                                  | SAMPLE SIZE | TIMING OF OUTCOME MEASURE |                             | MEAN DEPRESSION SYMPTOM SCORE |                | INTERVENTION 2            | SAMPLE SIZE | MEAN DEPRESSION SYMPTOM SCORE | INTERVENTION 3 | SAMPLE SIZE | MEAN DEPRESSION SYMPTOM SCORE |
|--------------------------------|---------------------|----------------------------------|-------------|---------------------------|-----------------------------|-------------------------------|----------------|---------------------------|-------------|-------------------------------|----------------|-------------|-------------------------------|
|                                | MEASURE             | INTERVENTION 1                   |             | MEASURE                   | MEASURE                     | INTERVENTION 2                | INTERVENTION 3 |                           |             |                               |                |             |                               |
| Read <i>et al.</i> (2020)      | PHQ-9               | Internet CBT + guided online     | 150         | Baseline                  | 3.55 (3.63 SD)              | Usual care                    | 152            | 3.32 (3.01)               | -           | -                             | -              | -           | -                             |
|                                |                     |                                  | 150         | 8 weeks                   | 2.34 (2.95 SD) <sup>d</sup> |                               | 152            | 3.61 (3.65 SD)            |             |                               |                |             |                               |
|                                |                     |                                  | 150         | 24 weeks                  | 3.43 (3.81 SD) <sup>d</sup> |                               | 152            | 3.70 (3.49 SD)            |             |                               |                |             |                               |
| Hartke and King (2003)         | CES-D               | Telephone group support therapy  | 43          | Baseline                  | 13.93 (9.71)                | Usual care                    | 45             | 9.49 (6.72)               | -           | -                             | -              | -           | -                             |
|                                |                     |                                  | 43          | 24 weeks                  | 14.16 (10.28) <sup>e</sup>  |                               | 45             | 10.09 (7.55) <sup>e</sup> |             |                               |                |             |                               |
| Kornblith <i>et al.</i> (2006) | GDS-15 <sup>f</sup> | Telephone monitoring + education | 68          | Baseline                  | 3.35 (3.74)                 | Education                     | 60             | 2.83 (3.08)               | -           | -                             | -              | -           | -                             |
|                                |                     |                                  | 68          | 24 weeks                  | 2.98 (3.19)                 |                               | 60             | 3.15 (3.18)               |             |                               |                |             |                               |
| Mavandadi <i>et al.</i> (2015) | PHQ-9               | Mental health case management    | 509         | Baseline                  | 8.83 (4.56)                 | Monitoring                    | 509            | 8.64 (4.27)               | -           | -                             | -              | -           | -                             |
|                                |                     |                                  | 509         | 12 weeks                  | 5.70 (4.48) <sup>c</sup>    |                               | 509            | 6.04 (4.72)               |             |                               |                |             |                               |
|                                |                     |                                  | 509         | 24 weeks                  | 5.68 (4.57) <sup>c</sup>    |                               | 509            | 6.82 (4.91)               |             |                               |                |             |                               |

Abbreviations: Patient Health Questionnaire (PHQ-9), Montgomery Åsberg Depression Rating Scale (MADRS), or Geriatric Depression Scale (GDS), Centre for Epidemiology Studies Depression Scale (CES-D), Beck Depression Inventory (BDI-I), Cognitive Behavioural therapy (CBT).

<sup>a</sup> Results of RCT reported across two papers [Brenes, Danhauer & Lyles, 2015, Gellis, Kenaley & Have, 2014].

<sup>b</sup> Reported as Mean Change.

<sup>c</sup> Reported as significant for the group by time interaction only.

<sup>d</sup> Reported as significant for the group interaction and the group by time interaction.

<sup>e</sup> Non-significant change.

<sup>f</sup> Study reports Hospital Anxiety and Depression Scale – Depression subscale, symptoms were significantly reduced when examining this tool.

\* *p*-value < 0.05, compared to control.

\*\* *p*-value at 0.05.

Another showed significant change within groups but not between the three comparison groups of: i) internet CBT with orientation and clinician guidance, ii) internet CBT with orientation, and iii) internet CBT alone (Titov *et al.*, 2016). One study examined a Zoom group intervention during COVID-19 (Shapira *et al.*, 2021). In this intervention, participants did twice weekly online guided group sessions with social workers (Shapira *et al.*, 2021). The goal was to provide social interaction and education on cognitive behavioral techniques (Shapira *et al.*, 2021). There was a statistically different change between pre and post loneliness scores (Shapira *et al.*, 2021). None of the studies reporting the PHQ-9 met the MCID.

RCTs WHERE PARTICIPANTS DO NOT HAVE BASELINE SYMPTOMS OR DIAGNOSIS OF DEPRESSION, BUT WHERE SYMPTOMS OF DEPRESSION WERE MEASURED AS AN OUTCOME

Ten RCTs measured symptoms of depression solely as an outcome (Table 2 and Supplementary Table 5). Interventions focused on CBT investigated a range of support from an initial orientation to weekly clinician support and included various aspects of therapy such as relaxation (Supplementary Table 5 for details). Most studies ( $n = 5$ ) looked at populations with anxiety (Brenes *et al.*, 2017; Brenes *et al.*, 2015; Dear *et al.*, 2013; Gould *et al.*, 2019; Jones *et al.*, 2016; Brenes *et al.*, 2012). The following therapies were studied: telephone and internet delivery of CBT (Brenes *et al.*, 2017; Brenes *et al.*, 2015; Jones *et al.*, 2016; Brenes *et al.*, 2012; Dear *et al.*, 2015; Read *et al.*, 2020); nondirective supportive therapy (Brenes *et al.*, 2017; Brenes *et al.*, 2015); psychologist and breathing exercises (Gould *et al.*, 2019); interactive website (Gustafson *et al.*, 2021); online group intervention (Shapira *et al.*, 2021); support groups (Hartke and King, 2003); and assessment and follow-up of physical symptoms/quality of life/social support (Kornblith *et al.*, 2006). Five studies reported outcomes with the PHQ-9, one with PHQ-8, one with Centre for Epidemiology Studies Depression Scale, two with the Beck depression inventory (BDI-I), and one with the Geriatric Depression Scale (GDS). Outcomes were reported between 4 and 60 weeks and three reporting at 24 months (Brenes *et al.*, 2012; Read *et al.*, 2020; Hartke and King, 2003). All studies showed improvement in depression scores and none reported harms. When examining internet CBT with clinician guidance compared to waitlist control, there was a statistically significant outcome at 8 weeks (Dear *et al.*, 2015). Another study demonstrated a significant group and group by time

interaction for guided internet CBT compared to usual care (Read *et al.*, 2020).

## Discussion

The need for virtual interventions that can reduce symptoms of depression and depressive disorders in older adults transcend the COVID-19 pandemic. Challenges with transportation, mobility, living rurally, lack of access to services locally, and cost all lead to poor access to psychotherapy for community-dwelling older adults (Wuthrich and Frei, 2015). Using virtual interventions helps to bridge some of the gaps to access for older adults (Gould and Hantke, 2020).

We identified 15 RCTs evaluating the efficacy of virtual interventions for reducing symptoms of depression in older adults. These studies demonstrate that virtual interventions are feasible, and in some studies demonstrated efficacy. Harm was not reported in any study. However, there was insufficient evidence to establish whether these interventions lead to clinically meaningful outcomes or durable results for patients. Virtual interventions were delivered via telephone or internet and had varied degrees of involvement from clinicians.

CBT is a well established and effective intervention for depression in person (Olthuis *et al.*, 2016; Gotzsche and Gotzsche, 2017; Wuthrich and Rapee, 2013; Jayasekara *et al.*, 2015; Huibers, 2011; Hall *et al.*, 2016) and appears to adapt and be feasible in the virtual setting. However, the virtual setting does not completely eliminate issues of access to CBT associated with cost and the need for clinician involvement (Wuthrich and Frei, 2015).

There are factors to consider regarding feasibility of different virtual care modalities. A qualitative interview study looked at virtual care in a urban geriatric medicine clinic (not specific to interventions for depression) (Watt *et al.*, 2022). Eight major barriers were identified in this study including the challenges associated with rapid uptake of virtual care due to COVID-19, providing virtual care to a medically complex population, the importance of ensuring caregivers are involved, difficulty with understanding the accuracy of virtual assessments compared to in person, issues with inequitable access, difficulties with changing clinic processes, technology issues, and the importance of technology uptake by older adults (Watt *et al.*, 2022). These barriers, although focused on geriatric medicine clinic and not depression interventions, are likely transferable to other virtual interventions. Especially given the overlap with the barriers identified in a



systematic review of the accuracy virtual cognitive tools (Watt *et al.*, 2021).

There are additional social and health factors that impact accessibility of virtual care. Older adults without an available caregiver, or who are more frail, are less able to access videoconferencing options (Liu *et al.*, 2021). Video-conferencing provides more information to the health care provider and more direct contact for patients, and while we don't have evidence to suggest that this is necessarily better than telephone-based virtual care; it does have advantages (Liu *et al.*, 2021). Virtual care does enable a larger reach for programming, but there is a need to consider issues like individual access or capability with technology for any client (Watt *et al.*, 2022). But providers must further consider the issues facing rural persons specifically such as internet bandwidth (Watt *et al.*, 2022). Along with these there is very little literature speaking to the potential applicability of virtual care across different languages or ethnicities and how this may impact patient outcomes (Liu *et al.*, 2021; Watt *et al.*, 2021; Watt *et al.*, 2022). These issues can, however, be further examined and services optimized to ensure intersectional factors are considered when delivering virtual care.

Our study has several strengths. We completed a rigorous search of indexed databases and grey literature. Despite this, we were unable to complete a meta-analysis due to important clinical heterogeneity. There were several limitations to included studies such as unclear or high risk of bias from participant and assessor blinding. All trials excluded persons with severe depression and persons experiencing suicidality; thus, it is unclear if these interventions are suitable or effective in these patient groups. No studies included persons with cognitive impairment or substance use disorders. Studies did not report diversity in race and ethnicity hence we cannot extrapolate to these populations.

## Conclusion

Even prior to the COVID-19 pandemic, there was a need for improved accessibility to psychotherapy and interventions such as CBT for depression management in older adults. However, there is a need for further studies examining the efficacy and cost of virtual care for treating symptoms of depression and disorders in older adults. Future work should examine other barriers to virtual care, ensure inclusive participant recruitment, and establish efficacy for virtual psychotherapy for depression. A deeper understanding regarding the patient experience and perceptions of virtual care for mental illness is needed.

## Conflict of interest

ZI reports conflicts are that they have received honoraria from Lundbeck and Otsuka, outside of the submitted work.

## Source of funding

ZG is funded by the Canadian Institutes of Health Research, Hotchkiss Brain Institute, and O'Brien Institute of Public Health. SES is funded by a Tier 1 Canada Research Chair in Knowledge Translation. ACT is funded by a Tier 2 Canada Research Chair in Knowledge Synthesis.

## Description of authors' roles

All authors were involved in the development of the protocol, research questions, revisions, and final manuscript.

ZG, PW, JW, and JHL were involved in abstract, full text, data extraction, and risk of bias assessment.

## Disclosures

This study was funded by the Canadian Institutes of Health Research (CIHR): <https://cihr-irsc.gc.ca/e/52108.html>. This was presented at a webinar with the BrainXChange in September 2020: <https://brainxchange.ca/Public/Events/Archived-Webinars-Events/2020/How-can-we-best-help-older-adults-with-depression>. This work was posted as a report on the CIHR website: <https://cihr-irsc.gc.ca/e/52057.html>.

## Acknowledgments

This study was funded by the Canadian Institute for Health Research. We would like to thank Diane Lorenzetti and Jessie McGowan who are expert information scientists who aided in the development of the search.

We are grateful for the guidance of Dr Barbara Liu University of Toronto and the Regional Geriatric Program of Ontario as well as Charlene Retzlaff, social worker in the Family Caregiver Centre at Alberta Health Services.

## Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S1041610222000412>

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