


BMJ Open Living through the psychological consequences of COVID-19 pandemic: a systematic review of effective mitigating interventions

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ABSTRACT

Objective This review assesses interventions and their effectiveness in mitigating psychological consequences from pandemic.

Method Published English literatures were searched from four databases (Medline, PubMed, Embase and PsycINFO) from January 2020 and September 2021. A total of 27 papers with 29 studies (one paper reported three studies) met inclusion criteria. Cochrane risk-of-bias tool is applied to assess the quality of all randomised controlled trials (RCT).

Results All studies were recently conducted in 2020. Publications were from high-income (13, 44.8%), upper middle-income (12, 41.4%) and lower middle-income countries (3, 10.3%) and global (1, 3.5%). Half of the studies conducted for general population (51.7%). One-third of studies (8, 27.6%) provided interventions to patients with COVID-19 and 20.7% to healthcare workers. Of the 29 studies, 14 (48.3%) were RCT. All RCTs were assessed for risk of biases; five studies (15, 35.7%) had low risk as measured against all six dimensions reflecting high-quality study. Of these 29 studies, 26 diagnostic or screening measures were applied; 8 (30.9%) for anxiety, 7 (26.9%) for depression, 5 (19.2%) for stress, 5 (19.2%) for insomnia and 1 (3.8%) for suicide. Measures used to assess the baseline and outcomes of interventions were standardised and widely applied by other studies with high level of reliability and validity. Of 11 RCT studies, 10 (90.9%) showed that anxiety interventions significantly lowered anxiety in intervention groups. Five of the six RCT studies (83.3%) had significantly reduced the level of depression. Most interventions for anxiety and stress were mindfulness and meditation based.

Conclusions Results from RCT studies (11%, 78.6%) were effective in mitigating psychological consequences from COVID-19 pandemic when applied to healthcare workers, patients with COVID-19 and general population. These effective interventions can be applied and scaled up in other country settings through adaptation of modes of delivery suitable to country resources, pandemic and health system context.

INTRODUCTION

COVID-19 was first reported in December 2019.¹ By March 2020, the WHO declared the COVID-19 a pandemic and as of November 2021, there have been over 259 million

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Effective interventions which targeted patients, healthcare workers and general population can be applied and scaled up by other countries.
- ⇒ The heterogeneity of included studies such as the mode of delivery of interventions, participant characteristics and measurement tools prevents efforts to conduct meta-analysis.
- ⇒ There is a lack of assessment of the effects of cointerventions, provided to the participants in the intervention and control groups, which influence the outcomes in both groups.
- ⇒ Measurement of outcome at short duration after interventions does not offer understanding of long-term outcome or its sustainability.

cumulative confirmed cases and 5 million deaths from COVID-19 worldwide.² The rapid global spread of disease has had physical health impacts and psychological consequences on the population.

The COVID-19 outbreak has had direct and indirect impacts on mental health. Many experienced fear and anxiety due to uncertainty about the pandemic's evolution, feelings of hopelessness, despair and grief in the face of uncontrollable events.^{3 4} The impact of public health measures such as quarantine measures, social restrictions and isolation has also resulted in mental health consequences including anxiety, depression and feelings of neglect; anxiety was highly prevalent in people undergoing quarantine or social isolation.^{5–7} The pandemic's indirect effects, such as unemployment due to economic downturn and the death of family members from disease, have led to depression and suicide.^{8–10} Decreased population mobility and high rates of COVID-19 infection were found to be significantly related to an increased prevalence of major depression disorder, which compared with prepandemic,

there were additional 53.2 million cases of major depressive disorder and 76.2 million cases of anxiety disorders in 2020.¹¹

Psychological consequences from the pandemic also developed more significantly in certain groups of people. Long hours of COVID-19 clinical services caused significant pandemic-related burnout for frontline healthcare workers worldwide.^{12–14} Fear of transmitting the infection to family members and increased demand for health services also caused stress and sleep problems among medical professionals.^{15–17}

Multiple mental health interventions have been implemented during previous epidemics such as Ebola and Middle East respiratory syndrome, particularly for healthcare workers experiencing higher levels of burnout and psychological consequences than others.¹⁸ Effective interventions like psychosocial and administrative support in workplaces have been shown to reduce the rates of emotional exhaustion in healthcare workers.¹⁸ Interventions in other population groups during Ebola outbreaks reduced depression, stress and anxiety.^{19–21} Implementing interventions to alleviate mental health problems during the COVID-19 pandemic has proven to be difficult due to various social restrictions; face-to-face interventions seem not feasible where online interventions including telehealth and multimedia application were used as alternatives.^{22–24}

Though various interventions to mitigate psychosocial consequences from the COVID-19 pandemic have been launched, the measures used, their delivery channels and effectiveness on population groups are not well understood. This systematic review assesses interventions and measures used, and the effectiveness of interventions in mitigating psychological consequences on different populations so that effective interventions can be upscaled accordingly. The psychological consequences affect patients who suffered from the illnesses and stress from quarantine and isolation, healthcare workers who suffered from stressful long hours of work and general population facing indirect effects of government measures such as lockdown and limited social activities.

We propose three review questions. First, what interventions are used to mitigate psychological consequences in the population and in healthcare workers? Second, what measures are used for assessing intervention outcome? Third, what is the effectiveness of different interventions? Findings from this review can inform health professionals and governments of effective interventions to prevent or mitigate mental health problems from the COVID-19 pandemic.

METHODS

Search strategy

We used PICO framework, a common tool used to develop literature search strategies, to ensure the comprehensive searches recommended by the Cochrane Collaboration.²⁵ It is used in evidence-based practice to formulate

healthcare-related question. PICO elements include Population, Interventions, Comparisons and Outcomes. In this review, population are individuals in countries or areas affected by COVID-19; interventions are exposure to COVID-19 pandemic and the clinical or non-clinical interventions which mitigate the psychological impact from the pandemic; comparison of outcomes between case and control groups or before and after interventions; and outcome are mental consequences including suicide, depression, anxiety, stress and insomnia/reduced sleep quality. See the full search strategy in online supplemental annex 1.

Published literatures were electronically retrieved from four databases including Medline, PubMed, Embase and PsycINFO. The eligibility criteria are English-language studies between January 2020 and September 2021 where interventions were provided with measurable outcomes. Table 1 provides inclusion and exclusion criteria.

Selection of publications

The search terms were identified based on search strategy and applied to search in title, abstract, keyword and full text. After searching, the duplicated studies or data were removed then the abstracts were reviewed; those were excluded for the following reasons with agreement in inclusion and exclusion criteria.

Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow of this process.

In the process of abstract screening, three researchers (AL, PP and AC) independently reviewed the abstracts. Consensus was reached if two researchers agreed based on eligibility criteria. In case of disagreement, the third researcher reviewed and decided.

Assessment of the risk of bias

The Cochrane risk-of-bias tool²⁵ was applied to assess the methodological quality of 14 randomised controlled trials (RCT) included by this systematic review. There are six domains of risk of bias: (1) random sequence generation (selection bias), (2) allocation concealment (selection bias), (3) blinding of participants, personnel and outcome assessors, (4) incomplete outcome data (attrition bias), (5) selective reporting (reporting bias), and (6) other bias.²⁵ Three authors (AL, PP and AC) separately evaluated each domain and categorised the risk of bias into 'low risk', 'high risk' or 'unclear risk'. The results of assessment were shown in terms of the number of 'low risk' of bias, which is 6 in total. Different criteria were used for making risk of bias judgements for each domain. Insufficient information reported in studies resulted in 'unclear risk' of bias judgement. When there were conflicting views, discussion among the three authors was convened to reach consensus.

Data extraction and synthesis

Relevant contents in all included articles were extracted and synthesised into three variables in an Excel spreadsheet: (a) characteristics of study: author, year of

Table 1 Search terms, inclusion and exclusion criteria

| Inclusion and exclusion criteria | |
|----------------------------------|---|
| Population | Inclusion: Individuals in countries or areas affected by COVID-19 including patients, healthcare workers, women and minority groups. Exclusion: <ul style="list-style-type: none"> ▶ Individuals in countries or areas not affected by COVID-19. ▶ Individuals having prior psychological symptoms. |
| Intervention/exposure | Inclusion: <ul style="list-style-type: none"> ▶ Exposure to COVID-19 pandemic. ▶ Both clinical and non-clinical interventions, provided by therapists, psychotherapists/ counsellors, psychologists and qualified mental health staff including music and physical activity. Exclusion: Not any. |
| Comparison | Inclusion: <ul style="list-style-type: none"> ▶ Comparing prevalence or degree of psychological consequences before and after interventions in the same group. ▶ Comparing prevalence or degree of psychological consequences in control and intervention groups. Exclusion: Not any. |
| Outcome | Inclusion: Mental health consequences including suicide, depression, anxiety, stress and insomnia/ reduced sleep quality. Outcomes must be quantified as proportions/prevalence rate or defined categorically. Exclusion: Not any. |
| Study design | Inclusion: <ul style="list-style-type: none"> ▶ Randomised controlled trials (RCTs). ▶ Controlled before-and-after studies (CBAS), with baseline and postintervention measurement for both groups. ▶ Experimental research designs. Exclusion: <ul style="list-style-type: none"> ▶ Type of publication: editorials, commentary, letters to the editor, reviews. ▶ Studies that did not have the outcome measures specified in the protocol. |

publication, objective, country, study design; (b) interventions: provider, participant; and (c) outcomes: different types of psychological consequence, and measures used for assessment of psychological consequence.

Patient and public involvement

No patients were involved in this study.

RESULTS

Our search strategies identified a total of 5623 records, of which 5619 were from the four databases and four from hand-searching from references of key articles. After abstract screening, 705 duplicated records were removed while 4602 records were not relevant. The full texts of the remaining 316 records were retrieved and reviewed for eligibility. We found that 289 publications were not relevant to the review questions. Finally, 27 articles comprising 29 studies were included for systematic review.

Study characteristics

Characteristics of 27 included articles are described in table 2. One paper reported three studies,²⁶ totalling 29 studies, all of which were conducted in 2020. Of the 29 studies, one was conducted globally (3.5%)²⁷ and the rest were categorised according to WHO geographical area. Three studies (10.3%) were conducted in the Eastern

Mediterranean region,^{28–30} 10 (34.5%) in the European region,^{31–40} 4 (13.8%) in the Americas^{41–44} and 11 (37.9%) in the Western Pacific.^{26 45–52} Applying the World Bank's income group categories, 13 (44.8%) studies were in high-income group,^{31–33 35–41 43–45} 12 (41.4%) in upper middle-income group,^{26 34 42 46–52} and 3 (10.3%) in lower middle-income group^{28–30}; there were no studies from the low-income group.

On population, out of the total 29 studies, 8 (27.6%) targeted patients with COVID-19,^{28–30 45 48 49 51 52} 6 (20.7%) among healthcare workers^{31 34 35 44 46 47} and more than half (51.7%) were general population.^{26 27 32 33 36–43 50} Out of the 29 studies, 14 (48.3%) were RCTs.^{27–29 33 34 38–42 44} (2B,3)^{48 50} The remaining 15 (51.7%) were non-RCT studies.

The interventions reported by the studies can be classified into three types: 19 online-based interventions (65.5%),^{26 27 29–31 33 35 36 38 40–45 47 48} 6 on-site-based interventions (20.7%)^{28 34 39 49–51} and 4 combined online and on-site interventions (13.8%).^{32 37 46 52}

On outcome measurement, out of the total 29 studies, only 1 (3.5%) assessed suicide ideation,⁴⁵ while 14 (48.3%) measured depression outcome,^{32 35 38–41 43–47 50–52} 24 (82.8%) measured anxiety,^{26 28 29 32 34–36 38–52} 9 (31.0%) measured psychological stress,^{30 35–40 43 50} 9 (31.0%) measured sleep quality^{27 33 35 43 45 47–49 52} and 6 (20.7%) measured other outcomes such as loneliness and

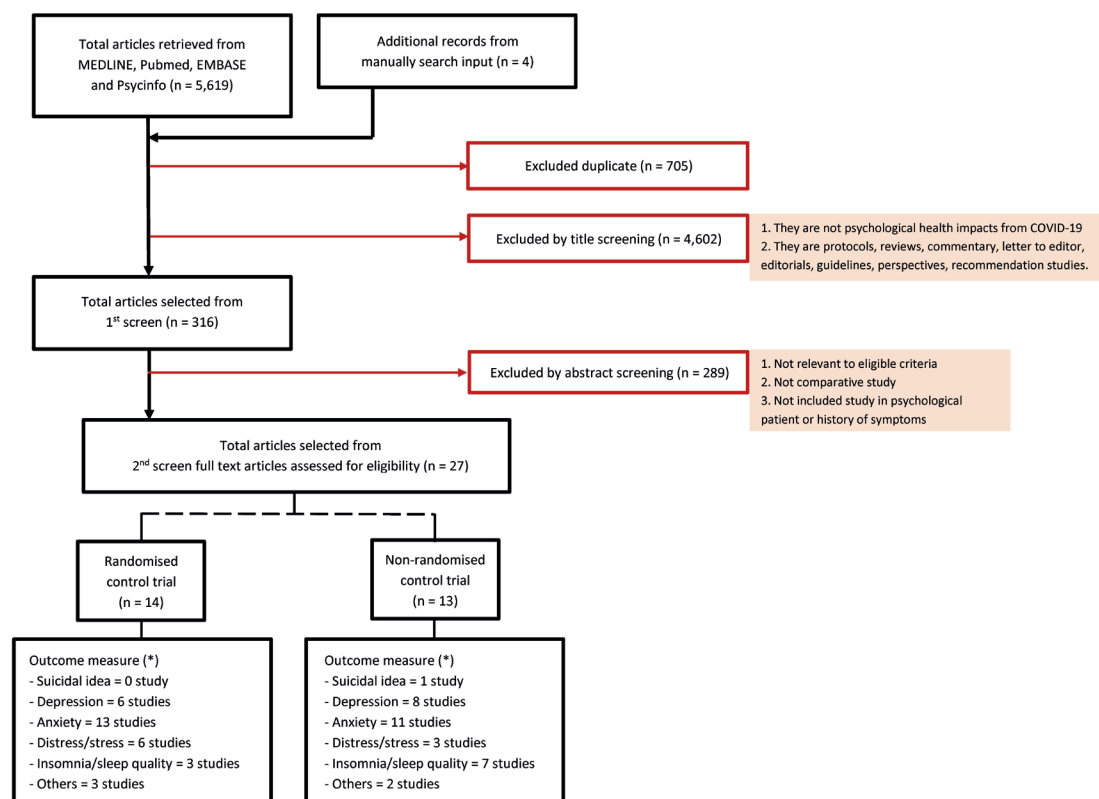


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the review process. *Some studies measure multiple outcomes.

self-compassion.^{26 31 36 41 44} Table 2 shows the characteristics of the studies.

Measures used for the assessment of psychological consequences

Out of 29 studies, 20 measures were used to assess psychological outcomes. We categorised the measures based on the outcome they measured including suicidal ideation, depression, anxiety, stress and insomnia (online supplemental annex 2).

Suicidal ideation was assessed by using one measure, the 9-item Beck Depression Inventory (BDI), whereas depression and anxiety were assessed by using seven and eight measures, respectively. The Hospital Anxiety and Depression Scale (HADS) was most used for the assessment of depression, while the Spielberger State-Trait Anxiety Inventory (STAI) was used in six studies (25.0%) on anxiety.^{26 28 29 34 36 48} Two different measures were used to assess both depression and anxiety, including the Patient Health Questionnaire-4 and HADS. The Brief Symptom Inventory-18 and Depression Anxiety Stress Scale-21 were used to assess depression, anxiety and psychological distress.

Stress was evaluated primarily using five measures (55.6%) in nine studies, though the 10-item Perceived Stress Scale (PSS-10) was most commonly used. Among the other outcomes, insomnia assessments were distinctive in that they consisted of five tests, each of which measured the patients' sleep quality. The Insomnia Severity Index was widely used to determine sleep quality

in four studies.^{27 33 35 45} There were several measures assessing outcomes beyond the focus of this study, one test for self-compassion and two tests for loneliness.^{26 36 41 44}

Interventions, measurements and effectiveness

Table 3 (RCT studies) and table 4 (non-RCT studies) describe study design, providers of intervention, target population, intervention, measurement and psychological outcome (see full description in online supplemental annex 3).

Of 24 anxiety interventions from 18 publications, 21 (87.5%) significantly lowered anxiety in intervention groups; 11 were RCT^{26 28 29 34 39 41–43 48 50} and 10 quasi-experimental studies.^{26 32 36 44–47 49 51 52} Among the 11 RCT studies, five interventions (45.5%) were mindfulness and meditation based.^{26 39 42 43 50} Two studies (18.2%) applied specific techniques such as emotional freedom techniques³⁴ and progressive muscle relaxation and deep breathing techniques.⁴⁸

Fourteen studies provided different interventions to reduce depression, of which 11 (78.6%) significantly reduced depression.^{32 38–41 43 44 46 50–52} Of 14 studies, 5 (35.7%) of them were RCT; 4 (28.6%) related to mindfulness and meditation-based stress reduction,^{43 50} focusing on mind-body exercises including yoga⁴⁰ and tai chi,³⁹ and 1 (7.1%) provided empathetic conversations through phone calls.⁴¹

Of nine studies on insomnia, seven (77.8%) found that the interventions significantly reduced insomnia or improved sleep quality.^{27 33 43 47–49 52} Of these nine

Table 2 Characteristics of the 29 included studies*

| | Characteristics (%) | Reference |
|---|---------------------|-------------------------------------|
| Geographical area (WHO regions) | | |
| Eastern Mediterranean region | 3 (10.3) | 28–30 |
| European region | 10 (34.5) | 31–40 |
| Region of the Americas | 4 (13.8) | 41–44 |
| Western Pacific region | 11 (37.9) | 26 45–52 |
| Global | 1 (3.5) | 27 |
| Income groups (World Bank) | | |
| High-income economies | 13 (44.8) | 31–33 35–41 43–45 |
| Upper middle-income economies | 12 (41.4) | 26 34 42 46–52 |
| Lower middle-income economies | 3 (10.3) | 28–30 |
| Global | 1 (3.5) | 27 |
| Participants | | |
| Patients with COVID-19 (confirmed/suspected) | 8 (27.6) | 28–30 45 48 49 51 52 |
| Healthcare workers | 6 (20.7) | 31 34 35 44 46 47 |
| General population (included student and teacher) | 15 (51.7) | 26 27 32 33 36–43 50 |
| Study design | | |
| Randomised controlled trial | 14 (48.3) | 26 28–30 34 35 39–43(2B,3) 48 50 |
| Non-randomised controlled trial | 15 (51.7) | 26 27 31–33 36–38 4445–47 49 51 52 |
| Intervention | | |
| Online | 19 (65.5) | 26 27 29–31 33 35 36 38 40–45 47 48 |
| On-site | 6 (20.7) | 28 34 39 49–51 |
| Combined online and on-site | 4 (13.8) | 32 37 46 52 |
| Psychological outcome | | |
| Suicidal idea | 1 (3.5) | 45 |
| Depression | 14 (48.3) | 32 35 38–41 43–47 50–52 |
| Anxiety | 24 (82.8) | 26 28 29 32 34–36 38–52 |
| Stress | 9 (31.0) | 30 35–40 43 50 |
| Insomnia/sleep quality | 9 (31.0) | 27 33 35 43 45 47–49 52 |

*There are 29 studies out of 27 papers.

studies, only two (22.2%) were RCT, with one (11.1%) using a mobile meditation application,⁴³ and the other using progressive muscle relaxation and deep breathing techniques.⁴⁸

Of the total nine interventions against stress, seven (77.8%) had shown significant positive outcomes in stress reduction.^{30 36–39 43 50} One study (11.1%) shows no association of interventions and outcome,⁴⁰ while one (11.1%) study showed positive and negative results due to timing of assessment.⁴⁵ Of the total 29 studies, three (10.3%) reported the effectiveness of interventions on self-compassion; participants reported significantly higher perception of self-compassion than those in the control group.^{26 36 44} One of 29 studies (3.4%) using preassessment and postassessment shows improvement of loneliness.⁴¹ Only one study (3.4%) examined suicide, 30 min telephone consultation was provided which was effective after 1 week.⁴⁵

Risk of bias

The quality of reporting for 14 RCT studies was assessed using the Cochrane risk-of-bias tool. Table 5 shows the risk of bias by six domains. These RCT studies had no risk of attrition bias (incomplete outcome data) or reporting bias (selective reporting). Of 14 studies, five (35.7%) had low risk of bias for all six dimensions reflecting high-quality RCT. Most studies had unclear reporting on the risk of allocation concealment, random sequence generation and blinding participants and personnel.^{26 28 39 42 48} Two studies (14.3%) reported high risk of bias on blinding of participants and personnel.^{40 50}

DISCUSSION

Study characteristics

All 29 studies in this review were carried out in 2020 in all geographical continents except Africa and Australia. The majority of studies (25, 86.2%) were from high-income

Table 3 Characteristics of the reviewed randomised controlled trial (RCT) studies, intervention, measurement and psychological outcome

| Author | Provider (channel) | Target population | Intervention | Significance | | | | | Suicidal idea |
|--|--|---|--|---|---------|---------|------------|----------------------------|---------------|
| | | | | N=total sample Nc: control Ni: intervention | Anxiety | Stress | Depression | Insomnia/ sleep quality | |
| Dincer and Inangil ³⁴ (Turkey) | Certified emotional freedom technique | Nurses | Activating and deactivating signals to brain by stimulating points on skin | N=72 Nc=37 Ni=35 | * | | | | |
| Fiol-DeRoque <i>et al</i> ³⁵ (Spain) | Self-conducted (online application) | Healthcare workers | PsyCovidApp, targeting emotional skills, healthy lifestyle behaviour, burnout and social support | N=436 Nc=234 Ni=248 | NoAssoc | NoAssoc | NoAssoc | NoAssoc | |
| Guan <i>et al</i> ²⁶ (study 2B) (China) | Self-conducted (online) | General population | Self-compassion writing task | N=79 Nc=39 Ni=40 | * | | | | |
| Guan <i>et al</i> ²⁶ (study 3) (China) | Self-conducted (online) | College students | Self-compassion meditation and writing tasks | N=95 Nc=45 Ni=50 | * | | | | |
| Kahlon <i>et al</i> ⁴¹ (USA) | Trained callers (telephone based) | Homebound older adults and people with disabilities | Phone call with empathetic conversations | N=240 Nc=120 Ni=120 | * | | * | | |
| Khademi <i>et al</i> ²⁸ (Iran) | Self-conducted | Patients with COVID-19 | Performed mandala colouring | N=70 Nc=35 Ni=35 | * | | | | |
| Liu <i>et al</i> ⁴⁸ (China) | Trainer | Patients with COVID-19 | Jacobson's relaxation techniques | Intervention=51 Nc=26 Ni=25 | * | | | * | |
| Malboeuf-Hurtubise <i>et al</i> ⁴² (Canada) | Trained students in psychology (video) | School students | Mindfulness-based interventions and philosophical discussions on COVID-19 | N=37 (pre-post intervention assessment) | * | | | | |

Continued

Table 3 Continued

| Author | Provider (channel) | Target population | Intervention | N=total sample Nc: control Ni: intervention | Significance | | | | |
|---|-------------------------------------|------------------------------------|---|---|--------------|---------|------------|-------------------------------|------------------|
| | | | | | Anxiety | Stress | Depression | Insomnia/ sleep quality | Suicidal idea |
| Parizad <i>et al</i> ²⁹ (Iran) | Nurses | Patients with COVID-19 | Guided imagery session with five audio tracks | N=110 Nc=55 Ni=55 | * | | | | |
| Shaygan <i>et al</i> ³⁰ (Iran) | Self-conducted (online multimedia) | Patients with COVID-19 | Cognitive-behavioural techniques, stress management, mindfulness and positive psychotherapy | N=48 Nc=22 Ni=26 | | * | | | |
| Smith <i>et al</i> ⁴³ (USA) | Self-conducted (online application) | Obstetric and gynaecology patients | Mobile meditation app: encouragement, mindfulness meditation, sleep stories, nature sounds | N=101 Nc=51 Ni=50 | * | * | * | * | |
| Solianik <i>et al</i> ³⁹ (Lithuania) | Tai chi instructor (online) | General population >60 years | Tai chi practice | N=30 Nc=15 Ni=15 | * | * | * | | |
| Wadhen and Cartwright ⁴⁰ (UK) | Yoga teacher (online) | General population | Yoga class via Zoom meetings | N=34 Nc=17 Ni=17 | NoAssoc | NoAssoc | * | | |
| Zhang <i>et al</i> ⁵⁰ (China) | Self-conducted (online) | Residents | Mindfulness-based stress reduction programme | N=51 Nc=28 Ni=29 | * | * | * | | |
| NoAssoc denotes no association between measure and postintervention symptoms. Grey shade denotes not applicable. *Denotes statistically significant association with postintervention mental health improvements. | | | | | | | | | |

Table 4 Characteristics of the reviewed non-randomised controlled studies (NRS), intervention, measurement and psychological outcome

| Author | Provider (channel) | Target population | Intervention | N=total sample Nc: control Ni: intervention | Anxiety | Stress | Depression | Insomnia/ sleep quality | Suicidal idea |
|--|---|------------------------|---|--|---------|--------|------------|-------------------------------|------------------|
| Guan <i>et al</i> ²⁶ (China) | Self-conducted (online) | Young adults | A live session of self-compassion meditation | N=64 (pre-post intervention assessment) | * | | | | |
| Giordano <i>et al</i> ³¹ (Italy) | Trained music therapist | Clinical staff | Music therapy supplemented by guided imagery and music | N=34 (pre-post intervention assessment) | | | | | * |
| González-García <i>et al</i> ³⁶ (Spain) | Mindfulness teacher and psychologist (online) | University students | Mini lectures, mindfulness and compassion practices and self-reflection exercises | N=66 (pre-post intervention assessment) | * | * | * | * | |
| Gorbeña <i>et al</i> ³⁷ (Spain) | Facilitators (interview and music playlists) | University students | Well-being and personal development programme | N=151 Nc=39 Ni=112 | | * | | * | |
| Kim <i>et al</i> ⁴⁵ (South Korea) | Psychiatrists (telephone based) | Patients with COVID-19 | 30 min telephone consultation providing information and support for COVID-19 infection and hospital isolation | Week 1, n=33 Week 2, n=19 (pre-post intervention assessment) | † | | † | † | † |
| Li <i>et al</i> ⁴⁶ (China) | Teacher (video) | Nurses | Simulation training about using personal protective devices | N=60 (pre-post intervention assessment) | * | | * | | |
| Liu <i>et al</i> ⁴⁷ (China) | Self-conducted | Nurses | Diaphragmatic breathing relaxation training | N=140 (pre-post intervention assessment) | * | | NoAssoc | * | |
| Luo <i>et al</i> ⁴⁹ (China) | Nurses | Patients with COVID-19 | Auricular point pressure | N=84 Nc=18 Ni=66 | * | | | * | |
| Matiz <i>et al</i> ³² (Italy) | Socio-health educator and psychologist | Schoolteachers | Mindfulness-oriented meditation training programme | N=67 (pre-post intervention assessment) | * | | * | | |

Continued

Table 4 Continued

| Author | Provider (channel) | Target population | Intervention | N=total sample Nc: control Ni: intervention | Anxiety | Stress | Depression | Insomnia/ sleep quality | Suicidal idea |
|---|--|------------------------|---|---|---------|--------|------------|-------------------------------|------------------|
| Niu <i>et al</i> ⁵¹ (China) | Nurses | (Suspected) COVID-19 | Providing information about isolation, treatment and social-emotional support | N=137 (pre-post intervention assessment) | * | | * | | |
| Philip <i>et al</i> ³³ (France) | Self-conducted (online application) | General population | KANOPEE app with virtual agent interaction | N=47 (pre-post intervention assessment) | | | | * | |
| Riva <i>et al</i> ³⁸ (Italy) | Self-conducted | General population | 360° virtual reality (VR) video entitled 'The Secret Garden' and a series of social exercises | N=38 (pre-post intervention assessment) | NoAssoc | * | * | | |
| Sylvia <i>et al</i> ⁴⁴ (USA) | Psychologists, physicians, social workers, nurses (online) | Healthcare workers | Stress management and resilience training, relaxation response programme | N=102 (pre-post intervention assessment) | * | | * | | |
| Tunuguntla <i>et al</i> ²⁷ (global level) | Self-conducted (online) | General population | Yoga and meditation with sound therapy | N=820 (pre-post intervention assessment) | | | | * | |
| Yang <i>et al</i> ⁵² (China) | Psychotherapist and nurse (in person and online) | Patients with COVID-19 | Psychotherapy, empathy, muscle and breath relaxation and cognitive-behavioural therapy | N=35 (pre-post intervention assessment) | * | | * | * | |
| NoAssoc denotes no association between measure and postintervention symptoms. Grey shade denotes not applicable. *Denotes statistically significant association with postintervention mental health improvements. †Denotes mixed results of association and no association due to difference in timing of outcome measurement. | | | | | | | | | |

Table 5 Risk of bias assessments for all 14 RCT studies

| | Random sequence generation | Allocation concealment | Blinding of participants and personnel | Incomplete outcome data | Selective reporting | Other bias | Number of low risks out of six criteria |
|---|----------------------------|------------------------|--|-------------------------|---------------------|------------|---|
| Dincer and Inangil ³⁴ | Low | Low | Low | Low | Low | Low | 6 |
| Fiol-DeRoque <i>et al</i> ³⁵ | Low | Low | Low | Low | Low | Low | 6 |
| Guan <i>et al</i> ²⁶ (study 2B) | Unclear | Unclear | Unclear | Low | Low | Low | 3 |
| Guan <i>et al</i> ²⁶ (study 3) | Unclear | Unclear | Unclear | Low | Low | Low | 3 |
| Kahlon <i>et al</i> ⁴¹ | Low | Low | Low | Low | Low | Low | 6 |
| Khademi <i>et al</i> ²⁸ | Low | Unclear | Unclear | Low | Low | Low | 4 |
| Liu <i>et al</i> ⁴⁸ | Unclear | Unclear | Unclear | Low | Low | Low | 3 |
| Malboeuf-Hurtubise <i>et al</i> ⁴² | Unclear | Unclear | Low | Low | Low | Unclear | 3 |
| Parizad <i>et al</i> ²⁹ | Low | Low | Low | Low | Low | Low | 6 |
| Shaygan <i>et al</i> ³⁰ | Low | Low | Low | Low | Low | Low | 6 |
| Smith <i>et al</i> ⁴³ | Low | Low | Unclear | Low | Low | Low | 5 |
| Solianik <i>et al</i> ³⁹ | Unclear | Unclear | Low | Low | Low | Low | 4 |
| Wadhen and Cartwright ⁴⁰ | Low | Unclear | High | Low | Low | Low | 4 |
| Zhang <i>et al</i> ⁵⁰ | Low | Unclear | High | Low | Low | Low | 4 |

RCT, randomised controlled trial.

and upper middle-income countries. Therefore, the varieties of interventions in this review can be useful for adaptive application in different country contexts, although there is no study from low-income countries. Psychological impacts are caused by direct consequences of the pandemic,^{53–55} and by public health and social containment measures used by governments, notably movement restrictions and lockdowns.⁵⁶ Over a half (19, 65.5%) of the psychological interventions reviewed in this study were delivered to patients with COVID-19, healthcare workers and general population via an online platform, as on-site intervention was not possible in the pandemic context. The psychological consequences from this pandemic are diverse, requiring a wide range of interventions and tools for measuring subsequent psychological outcomes, including suicidal ideation, depression, anxiety, stress and insomnia.

Each outcome was evaluated using a variety of tools. The BDI was the most commonly used to assess suicidal ideation, followed by the HADS for screening depression, the STAI for screening anxiety, the PSS for screening stress and the Insomnia Severity Index for screening insomnia. The measures were all used for screening rather than diagnosis. Several measures were validated, with Cronbach's alpha values greater or equal to 0.7 indicating high reliability. The majority of the tools were self-assessment questionnaires that participants in the study could complete using the sample scoring system. However, no articles reported on the sensitivity and specificity of each measure.

Interventions and psychological outcomes

Overall, most interventions have positive impact in mitigating psychological consequences in patients with COVID-19, healthcare workers and general population. A single intervention can have combined effects on multiple psychological outcomes; for example, one RCT using mobile meditation application, including verbal and written encouragement, mindfulness meditation, sleep stories and nature sounds, has significant positive effects on reduction of depression, anxiety, stress and insomnia.⁴³ However, another study using an online application targeting emotional skills, healthy lifestyle behaviour, burnout and social support reported no significant difference in the same measured outcomes.³⁵

Almost all 14 RCT studies that included mindfulness and meditation interventions to reduce depression, anxiety and stress showed significantly improved outcomes (depression,^{39–41 43 50} anxiety,^{26 28 29 34 39–43 50} stress^{39 43 50}) with the exception of one study,⁴⁰ which did not improve anxiety. Stress, anxiety and depression are caused by sympathetic nervous system activation due to widespread depolarisation throughout the brain and body; on the other hand, meditation and deep breathing lead to parasympathetic nervous system activation due to widespread inhibition and hyperpolarisation.⁵⁷ Recently, mindfulness and meditation-based interventions have increasingly been integrated into mental health interventions⁵⁸; meditation practices facilitate training of the self-regulation of attention and awareness, thereby enhancing control of mental processes, and consequently

increasing well-being. Meditation and breathing techniques such as yoga and tai chi, targeting body and mind, are also applied and are effective in reducing stress, anxiety and depression.^{59 60} Yoga, for example, helps with intellectual and mental exercise, improves the psychological management and monitoring of stress and negative emotions and supports mental balance.^{60–62} Mindfulness and meditation-based interventions are readily available, and do not pose threats or risks. It can be applied as a first-line or complementary intervention for stress, anxiety, depression and some emotional disorders during COVID-19.

Moreover, combining mindfulness intervention with online application technology can benefit people who are quarantined or in isolation wards with no direct access to psychotherapy. In this review, online multimedia psychoeducational interventions were demonstrated to significantly reduce stress³⁰; mindfulness-based stress reduction, cognitive-behavioural techniques, stress management techniques and positive psychotherapy have been delivered via WhatsApp. Nowadays, internet-based, self-administrated multimedia and education can promote access to mental health interventions, particularly amidst COVID-19. Online-based interventions enable people to social distance and be time efficient and cost-effective.

The pandemic does not allow in-person on-site intervention, causing a major shift to remote care^{63–65} and telemedicine; the use of electronic communication to deliver healthcare services at a distance becomes a key supporting measure for health service delivery systems during this pandemic.^{66 67} Several channels of telemedicine are accessible by patients and health professionals including telephone calls, video calls, interactive mobile health applications (m-Health), short message service, email, secure remote patient monitoring and videoconferencing. Video call via social media is the most common channel of communication, but special communication software (eg, Zoom) or current messenger applications (eg, WhatsApp and WeChat) are popular and convenient options as well.⁶⁸

Furthermore, several countries have developed digital health technology to facilitate healthcare delivery through an online platform.^{69 70} Several challenges remain; online interventions cannot replace in-person therapy, notably when there is high risk of suicide which necessitates the presence of a psychotherapist or human interaction.^{71 72} Furthermore, several online counselors⁶⁵ raised concerns from their experiences, such as a lack of non-verbal language for interpreting patients who struggle to verbally communicate their feelings⁷³ or significantly shorter counselling periods through the telephone due to 'more superficial responses to questions'.⁷⁴ However, the pandemic has raised awareness for the necessity of the online interventions where limitations can be resolved, as several studies have reported benefits of online services.^{75–78}

Bias assessment

The most common reason across items of bias assessment was related to incomplete or unclear reporting in the RCT.⁷⁹ Between 2011 and 2014, 24.7% of the RCTs included in the Cochrane Review demonstrated an unclear risk of bias in the domain of incomplete outcome data.⁸⁰ But all 14 RCTs in the review presented complete outcome data and reported loss to follow-up for risk of attrition bias. In this review, each article was assessed by at least two authors and we compared the risk of bias assessment for each item in terms of 'high', 'low' or 'unclear' risk of bias between the two reviews.

More than half of the studies had unclear risk on allocation concealment because the method of concealment was not described, or due to inadequate detail to allow a clear judgement. Similarly, 50.1% of the reported April 2011 issue of the Cochrane Database of Systematic Reviews had unclear risk of bias on allocation concealment.⁸¹ Concealment of randomised allocation prevents an influence of patient characteristics on allocation to intervention and control groups. One study found that lack of adequate allocation concealment was associated with overestimation of treatment effect.⁸²

Two studies reported high risk of bias on blinding of participants and personnel.^{40 50} Blinding of participants and personnel prevents differences in patient management between groups and blinding of outcome assessors also prevents knowledge of the assigned intervention group influencing outcome measurement. However, both studies were conducted through online platform and the group memberships were not blind.

Limitations

Causal interpretations are limited by 15 non-randomised controlled study designs. In addition to variation in sample size across studies, there were also variations in the mode of delivery of interventions, participant characteristics and measurement tools across different study sites. Furthermore, a majority of the trials included small sample sizes which is commonplace for studies on psychological interventions. High heterogeneity of selected studies led to inability to conduct meta-analysis. There was also a lack of assessment of cointerventions, which provide external sources of support to the participants in the intervention and control groups and may have influenced the results of the outcomes of an intervention. Lastly, postintervention outcomes from the studies were measured from short follow-up durations, so it is not possible to conclude the long-term psychological effects of those interventions.

CONCLUSION AND POLICY IMPLICATIONS

Of the total reviewed 29 studies, 26 diagnostic or screening measures were applied; 8 for anxiety (30.9%), 7 for depression (26.9%), 5 for stress (19.2%), 5 for insomnia (19.2%) and 1 for suicide (3.8%). Most studies conducted in high-income and upper middle-income

countries. Half of studies targeted general population and the remaining in patients with COVID-19 and healthcare workers. Among 14 RCT studies, most interventions were effective in reducing psychological consequences.

Despite study limitations, the use of measurement tools and the strength of evidence from this review suggest an overall positive impact of the different interventions in terms of reducing psychological consequences in the population and healthcare workers. These effective interventions can be replicated and applied in other country settings, for which modes of delivery can be adjusted in line with country resources, epidemic situation and social and health system contexts. Moreover, it is necessary to improve the use of evidence in psychological interventions in mental health services.

We recommend that these effective interventions can be replicated and applied in other country settings, for which modes of delivery can be adjusted in line with country resources, epidemic situation and social and health system contexts. In the first quarter of 2022, the pandemic is still far from over due to low immunisation coverage in African countries and continued emergence of variants of concerns in the context of pressure to resuming the economic activities and opening the country borders.⁸³ In ending the acute phase of the pandemic, rapid scale-up and promoting vaccine acceptance are key policy actions.⁸⁴

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Annex 1: Search term and results

- 1) PUBMED = 1,564
 - COVID* OR novel corona* OR nCoV* OR 2019nCoV OR severe acute respiratory syndrome coronavirus 2 OR severe acute respiratory pneumonia outbreak OR SARS CoV 2 OR SARS-CoV-2 (206,274)
 - therap*[MeSH Terms] OR intervention[MeSH Terms] OR consultation[MeSH Terms] (7,081,376)
 - Mental Health [MeSH terms] OR Mental Disorders [MeSH terms] OR Mental Illness [MeSH terms] OR Suicide OR Depression OR Anxiety OR Psychological Distress [MeSH terms] OR Emotional Distress [MeSH terms] OR Insomnia [MeSH terms] (1,846,124)
- 2) EMBASE = 1,114
 - COVID* (sh) or novel corona*.mp. or nCoV*.mp. or 2019nCoV.mp. or severe acute respiratory syndrome coronavirus 2 (sh) or severe acute respiratory pneumonia outbreak (sh) or SARS CoV 2.mp. or SARS-CoV-2.mp. (81,488)
 - (treatment or therap*).mp. or intervention (sh) or consultation (sh) (13,205,742)
 - (Mental Health or Mental Disorders or Mental Illness).mp. or Suicide (sh) or Depression (sh) or Anxiety (sh) or Psychological Distress.mp. or Emotional Distress.mp. or Insomnia (sh) (1,017,858)
- 3) PsycInfo = 1,524
 - DE "Coronavirus" OR DE "COVID-19" OR DE "Severe Acute Respiratory Syndrome" (6,545)
 - intervention or program or counseling (1,095,058)
- 4) MEDLINE(OVID) = 1,417
 - (COVID* or novel corona* or nCoV* or 2019nCoV or severe acute respiratory syndrome coronavirus 2 or severe acute respiratory pneumonia outbreak or SARS CoV 2 or SARS-CoV-2).mp. (124,422)
 - (therap* or therap* or intervention or consultation).mp. (6,269,680)
 - (Mental Health or Mental Disorders or Mental Illness or Suicid* or Depression or Anxiety or Psychological Distress or Emotional Distress or Insomnia).mp. (638,321)

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Annex 2**Table A2 Tools for the assessment of psychological consequences with score classification**

| Outcomes | Tools | Method description | Score Classification | Studies |
|---------------------------------|---|--|--|---|
| 1. Suicidal Ideation Assessment | 1.1 Beck Depression Inventory (BDI) (item 9) | A 21-item, self-reported rating inventory that measures attitudes and symptoms of depression. Item-9 of the test asked the potential to kill oneself (49). | Score 1-10: Normal Score 11-16: Mild Mood Disturbance Score 17-20: Borderline Clinical Depression Score 21-30: Moderate Depression Score 31-40: Severe Depression Score over 40: Extreme Depression | Kim et al., 2020(44) |
| 2. Depression Assessment | 2.1 Patient Health Questionnaire-9 (PHQ-9) | A 9-item assessment that is used to assess the frequency the patients experience depressive symptoms according to DSM-IV depression criteria(50). | Score 0-4: Normal Score 5-9: Mild Score 10-14: Moderate Score 15-19: Moderately Severe Score 20-27: Severe | Niu et al., 2021(50) Yang et al., 2020(51) |
| | 2.2 Patient Health Questionnaire for Depression-8 (PHQ-8) | An 8-item assessment that consists of 8 of the 9 criteria on which the DSM-IV diagnosis of depressive disorders is based (51). | Score 0-4: Normal Score 5-9: Mild Score 10-14: Moderate Score 15-19: Moderately Severe Score 20-24: Severe | Kahlon et al., 2021(39) |
| | 2.3 Patient Health Questionnaire-4 (PHQ-4) | A 4-item questionnaire that aims to allow for brief and accurate measurement of core symptoms or signs of depression and anxiety (52). | Score 0-2: Normal Score 3-5: Mild Score 6-8: Moderate Score 9-12: Severe | Sylvia et al., 2021(42) |
| | 2.4 Depression Anxiety Stress Scale (DASS-21) | A 21-item test, short version of the original self-report questionnaire (DASS-42 item) to evaluate depression, anxiety, and stress symptoms with 7 items per subscale; (1) DASS-21 Depression, (2) DASS-21 Anxiety, and (3) DASS-21 Stress (53). | Depression Score 0-9: Normal Score 10-13: Mild Score 14-20: Moderate Score 21-27: Severe Score over 28: Extremely Severe Anxiety Score 0-7: Normal Score 8-9: Mild Score 10-14: Moderate Score 15-19: Severe | Riva et al., 2021(36), Wadhen et al., 2021(38), Fiol-DeRoque et al., 2021(33) |

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| Outcomes | Tools | Method description | Score Classification | Studies |
|-----------------------|--|---|--|--|
| | | | Score over 20: Extremely Severe Stress Score 0-14: Normal Score 15-18: Mild Score 19-25: Moderate Score 26-33: Severe Score over 34: Extremely Severe | |
| | 2.5 Hospital Anxiety and Depression Scale (HADS) | A 14-item assessment used to measure anxiety and depression symptoms in medical patients. The HADS produces two scales with 7 items in each scale; one for anxiety (HADS–A) and one for depression (HADS–D) (54). | Depression and Anxiety Score 0-7: Normal Score 8-10: Borderline abnormal (borderline case) Score 11-21: Abnormal | Solianik et al., 2021(37), Smith et al., 2021(41), Matiz et al., 2021(30), Kim et al., 2020 (HADS-D)(44) |
| | 2.6 Self-rating Depression Scale (SDS) | A 20-item assessment to assess the subjective symptoms of depression for up to one week(55). | Score <50: Normal Score 50-59: Mild Depression Score 60-69: Moderate to Marked Major Depression Score >70: Extreme Major Depression | Liu et al., 2021(46), Li et al., 2020(45) |
| | 2.7 Brief Symptom Inventory 18 (BSI-18) | An 18-item questionnaire, taken from the 53-item Brief Symptom Inventory (BSI). The scale includes three subscales (somatization, depression, and anxiety) (56). | The interpretation of the BSI-18 uses Global Severity Index (GSI) of distress represents sum across the 3 subscales range from 0-72. Higher scores indicate higher levels of psychological distress. | Zhang et al., 2021(49) |
| 3. Anxiety assessment | 3.1 Spielberger State-Trait Anxiety Inventory (STAI) | A 40-item self-report tool consisting of two parts for measuring state and trait anxiety with 20 questions in each section(57). | Score 20-31: Mild Score 32-42: Mild to Moderate Score 43-53: Moderate to Severe Score 54-64: Relatively Severe Score 65-75: Severe Score ≥ 76: Very Severe | Parizad et al., 2021(27), Khademi et al., 2021(26), González-García et al., 2021(34), Liu et al., 2020(47), Dincer et al., 2021(32), Guan et al., 2021(43) |

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| Outcomes | Tools | Method description | Score Classification | Studies |
|----------|--|---|--|--|
| | 3.2 Anxiety - Generalized Anxiety Disorder scale (GAD-7) | A 7-item questionnaire to detect symptoms of generalized anxiety disorder based on seven core symptoms and assess the frequencies with which respondents experience these symptoms within the prior 2 weeks (58). | Score 0-4: Normal Score 5-9: Mild Score 10-14: Moderate Score >=15: Severe | Kahlon et al., 2021(39), Luo et al., 2021(48), Niu et al., 2021(50), Yang et al., 2020(51) |
| | 3.3 Self- Rating Anxiety Scale (SAS) | A 20-item assessment evaluating a variety of anxiety symptoms, including both psychological and somatic symptoms, that respondents experience within the past month (59). | Score 0-4: Normal Score 5-9: Mild Score 10-14: Moderate Score >=15: Severe | Liu et al., 2021 (46), Guan et al., 2021(43), Li et al., 2020(45) |
| | 3.4 Behavior Assessment Scale for Children-3rd edition, (BASC III) | A test to identify and manage behavioral and emotional strengths and weaknesses of children and adolescents from three perspectives: teacher, parent and self (starting at age 8) (60). | Interpretation using the mean score. Higher scores indicate higher levels of anxiety. | Malboeuf-Hurtubise et al., 2021(40) |
| | 3.5 Patient Health Questionnaire-4 (PHQ-4) | See 2.3 | | Sylvia et al., 2021 (42) |
| | 3.6 Depression Anxiety Stress Scale (DASS-21) | See 2.4 | | Riva et al., 2021(36), Fiol-DeRoque et al., 2021(33), Wadhen et al., 2021(38) |
| | 3.7 Hospital Anxiety and Depression Scale (HADS) | See 2.5 | Score 20-44: Normal Score 45-59: Mild to Moderate Anxiety Score 60-74: Marked to Severe Anxiety levels | Solianik et al., 2021(37), Smith et al., 2021(41), Matiz et al., 2021(30), Kim et al., 2020 (44) |
| | 3.8 Brief Symptom Inventory 18 (BSI-18) | See 2.7 | | Zhang et al., 2021 (49) |

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| Outcomes | Tools | Method description | Score Classification | Studies |
|---|---|---|--|---|
| 4. Psychological distress and stress assessment | 5. The General Health Questionnaire (GHQ-12) | A 12-item test, self-administered to evaluate mental distress and common mental disorders. There were multiple versions of GHQ including GHQ-60, GHQ-30, GHQ-28, and GHQ-12 (61). | The average sum of its items provides a scalar indicator of the degree of mental distress. Score of 11 or 12: typical Score >15: Suggesting evidence of distress Score >20: Severe problems with psychological distress | Gorbeña et al., 2021 (35) |
| | 4.1 Perceived stress 14-item (PSS-14) | A 14-item scale used as a psychological instrument to measure the perception of stress, with seven positive items and seven negative items (62). | Score 0-18: Low Stress Score 19-37: Moderate Stress Score 38-56: High Stress | Wadhen et al., 2021(38), Shaygan et al., 2021 (28) |
| | 4.2 Perceived Stress Scale 10-item (PSS-10) | A 10-item questionnaire about feelings and thoughts during the last month(63) . | Score 0-13: Low Stress Score 14-26: Moderate Stress Score 27-40: High Perceived Stress | Riva et al., 2021(36), Solianik et al., 2021(37), Smith et al., 2021(41), González-García et al., 2021(34) |
| | 4.3 Depression Anxiety Stress Scale (DASS-21) | See 2.4 | Score 0-13: Low Stress Score 14-26: Moderate Stress Score 27-40: High Perceived Stress | Fiol-DeRoque et al., 2021(33) |
| | 4.4 Brief Symptom Inventory 18 (BSI-18) | See 2.7 | | Zhang et al., 2021 (49) |
| 5. Insomnia assessment | 5.1 Insomnia Severity Index (ISI) | A 7-item assessment to assess current sleep characteristics(64). | Score 0-7: No clinically significant insomnia Score 8-14: Subthreshold Insomnia Score 15-21: Clinically Significant Insomnia (Moderate) Score 22-28: clinically Significant Insomnia (Severe) | Tunuguntla et al., 2021(25), Philip et al., 2020(31), Fiol-DeRoque et al., 2021(33), Kim, et al., 2020(44) |
| | 5.2 St. Mary's Hospital Sleep Questionnaire (SMH) | A 14-item test asking about patient's sleep experience and comprises items to demonstrable reliability, with some open-ended questions(65). | The test needs to be evaluated by experts. | Luo et al., 2021 (48) |

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| Outcomes | Tools | Method description | Score Classification | Studies |
|----------|--|---|--|---|
| | 5.3 PROMIS (Patient-Reported Outcomes Measurement Information System) Sleep Disturbance Short Form | Items focus on perceptions of sleep quality, sleep depth, and restoration associated with sleep, perceived difficulties with getting to sleep or staying asleep, and perceptions of the adequacy of and satisfaction with sleep (66). | Score <55: None to slight Score 55-59.9: Mild Score 60-69.9: Moderate Score >70: Severe | Smith et al., 2021 (41) |
| | 5.4 Pittsburgh Sleep Quality Index (PSQI) | An 18-item index measuring seven sleep dimensions (67). | The overall PSQI score ranges from 0 to 21, with higher scores reflecting poorer sleep quality. A revised PSQI score of 7 or higher is considered poor sleep quality. If the score of any individual dimension is higher than 1, there is a problem with that specific dimension. | Liu et al., 2021(46), Yang et al., 2020(51) |
| | 5.5 Sleep State Self-Rating Scale (SRSS) | A 10-item assessment used to assess sleep state. | SRSS over or equal to 23 points is considered to have sleep problems. | Liu et al., 2020(47) |

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Annex 3**Table A3** Characteristics of the reviewed studies, intervention, measurement and psychological outcome

| Author | Study Design | Provider (channel) | Target population | Intervention | N = Total sample Nc: Control, Ni: intervention) | Psychological outcome | Measurement and findings |
|------------------------------------|--------------|---------------------------------------|---|---|---|---|---|
| Dincer and Inangil, Turkey(32) | RCT | Certified emotional freedom technique | Nurses | Activating and deactivating signals to brain by stimulating points on skin | N = 72 Ni = 35 Nc = 37 | Anxiety | STAI (+) |
| Fiol-DeRoque et al., Spain(33) | RCT | Self-conducted (online application) | Health care workers | PsyCovidApp, targeting emotional skills, healthy lifestyle behaviour, burnout, and social support | N = 436 Ni = 248 Nc = 234 | Depression Anxiety Stress Insomnia | PHQ-8 (na) GAD7 (na) DASS-21 (na) ISI (na) |
| Guan, et al. (Study 2B), China(43) | RCT | | General population | Self-compassion writing task | N = 79 Ni = 40 Nc = 39 | Anxiety Self-compassion | PHQ-4 (+) SCS (+) |
| Guan et al. (Study 3), China(43) | RCT | | College students | Self-compassion meditation and writing tasks | N = 95 Ni = 50 Nc = 45 | Anxiety Self-compassion | PHQ-4 (+) SCS (+) |
| Kahlon et al., US(39) | RCT | Trained callers (Telephone-based) | Homebound older adults and people with disabilities | Phone call with empathetic conversations | N = 240 Nc = 120 Ni = 120 | Depression Anxiety Loneliness | GAD7 (+) GAD7 (+) UCLA Loneliness Scale (+), De Jong Loneliness Scale (na) |
| Khademi et al., Iran(26) | RCT | Self-conducted | COVID-19 patients | Performed mandala colouring | N = 70 Ni = 35 Nc = 35 | Anxiety | GAD-7 (+) |
| Liu et al., China(47) | RCT | Trainer | COVID-19 patients | Jacobson's relaxation techniques | Intervention = 51 Ni = 25 | Anxiety Insomnia | STAI (+) SRSS (+) |

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| Author | Study Design | Provider (channel) | Target population | Intervention | N = Total sample Nc: Control, Ni: intervention) | Psychological outcome | Measurement and findings |
|---------------------------------------|--------------|--|------------------------------------|--|---|---|---|
| | | | | | Nc = 26 | | |
| Malboeuf-Hurtubise et al., Canada(40) | RCT | Trained students in psychology (Video) | School students | Mindfulness-based interventions and philosophical discussions on COVID-19 | N = 37 (Pre-post intervention assessment) | Anxiety | BASC III (+) |
| Parizad et al., Iran(27) | RCT | Nurses | COVID-19 Patients | Guided imagery session with five audio tracks | N = 110 Nc = 55 Ni = 55 | Anxiety | STAI (+) |
| Shaygan et al., Iran(28) | RCT | Self-conducted (online multimedia) | COVID-19 patients | Cognitive behavioural techniques, stress management, mindfulness, and positive psychotherapy | N = 48 Ni = 26 Nc = 22 | Stress | PSS (+) |
| Smith et al., US(41) | RCT | Self-conducted (online application) | Obstetric and gynaecology patients | Mobile meditation app: encouragement, mindfulness meditation, sleep stories, nature sounds | N = 101 Ni = 50 Nc = 51 | Depression Anxiety Stress Insomnia | HADS (+) HADS (+) PSS (+) PROMIS (+) |
| Solianik et al., Lithuania(37) | RCT | Tai chi instructor (online) | General population >60 years | Tai chi practice | N = 30 Ni = 15 Nc = 15 | Depression Anxiety Stress | HADS (+) HADS (+) PSS-10 (+) |
| Wadhen et al., UK(38) | RCT | Yoga teacher (online) | General population | Yoga class via zoom meetings | N = 34 Nc = 17 Ni = 17 | Depression Anxiety Stress | DASS-21 (+) DASS-21 (na) DASS-21 (na), PSS (na) |
| Zhang et al., China(49) | RCT | Self-conducted (Online) | Residents | Mindfulness-Based Stress Reduction program | N = 51 Ni = 29 | Depression Anxiety | BSI-18 (+) BSI-18 (+) |

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| Author | Study Design | Provider (channel) | Target population | Intervention | N = Total sample Nc: Control, Ni: intervention) | Psychological outcome | Measurement and findings |
|------------------------------------|--------------|---|---------------------|--|--|--|--|
| | | | | | Nc = 28 | Stress | BSI-18 (+) |
| Kim et al., South Korea(44) | NRS | Psychiatrists (Telephone-based) | COVID-19 patients | Ward telephone providing information and support for COVID-19 infection and hospital isolation | Week1 n=33 Week2 n=19 (Pre-post intervention assessment) | Suicidal idea Depression Anxiety Insomnia | BDI: week1 (+), week2 (na) HADS: week1 (+), week2 (na) HADS: week 1 (+), week 2 (na) ISI: week 1 (+), week 2 (na) |
| Guan, et al. (Study 2A), China(43) | NRS | Self-conducted (online) | Young adults | A live session of self-compassion meditation | N = 64 (Pre-post intervention assessment) | Anxiety | PHQ-4 (+) |
| Giordano et al., Italy(29) | NRS | Trained music therapist | Clinical staff | Music therapy supplemented by guided imagery and music | N = 34 (Pre-post intervention assessment) | Others: fear/ worry | MTC (+) |
| González-García et al., Spain(34) | NRS | Mindfulness teacher and psychologist (online) | University students | Minilectures, mindfulness and compassion practices and self-reflection exercises | N = 66 (Pre-post intervention assessment) | Anxiety Stress Self-compassion | DASS-21 (+) DASS-21 (+) DASS-21 (+) |
| Gorbeña, et al., Spain(35) | NRS | Facilitators (interview and music playlists) | University students | Well-being and Personal Development Program | N = 151 Ni = 112 Nc= 39 | Stress | PSS (+) |
| Li et al., China(45) | NRS | Teacher (Video) | Nurses | Simulation training about using personal protective devices | N = 60 (Pre-post intervention assessment) | Depression Anxiety | SDS (+) SAS (+) |
| Liu et al., China(46) | NRS | Self-conducted | Nurses | Diaphragmatic breathing relaxation training | N = 140 (Pre-post | Depression | SDS (na) |

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| Author | Study Design | Provider (channel) | Target population | Intervention | N = Total sample Nc: Control, Ni: intervention) | Psychological outcome | Measurement and findings |
|------------------------------|--------------|--|----------------------|--|---|--|---|
| | | | | | intervention assessment) | Anxiety Insomnia | SAS (+) PSQI (+) |
| Luo et al., China(48) | NRS | Nurses | COVID-19 patients | Auricular point pressure | N = 84 Ni = 66 Nc = 18 | Anxiety Insomnia | GAD-7 (+) SMH score (+) |
| Matiz et al., Italy(30) | NRS | Socio-health educator and psychologist | School teachers | Mindfulness-oriented meditation training program | N = 67 (Pre-post intervention assessment) | Depression Anxiety | HADS (+) HADS (+) |
| Niu et al., China(50) | NRS | Nurses | (Suspected) COVID-19 | Providing information about isolation, treatment, and social emotional support | N = 137 (Pre-post intervention assessment) | Depression Anxiety | PHQ-9 (+) GAD-7 (+) |
| Philip et al., France(31) | NRS | Self-conducted (online application) | General population | KANOPEE app with virtual agent interaction | N = 47 (Pre-post intervention assessment) | Insomnia | ISI (+) |
| Riva et al. Italy(36) | NRS | Self-conducted | General population | 360° VR video entitled 'The Secret Garden' and a series of social exercises | N = 38 (Pre-post intervention assessment) | Depression Anxiety Stress | DASS-21 (+) DASS-21 (na) DASS-21 (+), PSS (+) |
| Sylvia et al., US(42) | NRS | Psychologists, physicians, social workers, nurses (online) | Health care workers | Stress management and resilience training, relaxation response program | N = 102 (Pre-post intervention assessment) | Depression Anxiety Self-compassion | PHQ-4 (+) PHQ-4 (+) SCS (+) |

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| Author | Study Design | Provider (channel) | Target population | Intervention | N = Total sample Nc: Control, Ni: intervention) | Psychological outcome | Measurement and findings |
|--|--------------|--|-----------------------|--|---|-----------------------------------|------------------------------------|
| Tunuguntla et al., Global level(25) | NRS | Self-conducted (online) | General population | Yoga and meditation with sound therapy | N = 820 (Pre-post intervention assessment) | Insomnia | ISI (+) |
| Yang et al., China(51) | NRS | Psychotherapist and nurse (in- person and online) | COVID-19 patients | Psychotherapy, empathy, muscle and breath relaxation, and cognitive behavioural therapy | N = 35 (Pre-post intervention assessment) | Depression Anxiety Insomnia | PHQ-9 (+) GAD-7 (+) PSQI (+) |

RCT: Randomised controlled trial

NRS: Non-randomised controlled study

+ = Statistically significant association with post-intervention mental health improvements.