

# Impact of Using Mobile Applications on the Psychological Wellbeing of Nurses to Reduce Job Stress and Burnout: Systematic Review and Meta-Analysis

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## ABSTRACT

**Background:** The aim of this study is to investigate the effect of using mobile applications among nurses for reducing their stress and burnout after pandemic by conducting a meta-analysis. In other words, it can be stated that mobile applications have already been researched to be effective in the reduction of stress and burnout. However, it can be stated that no specific meta-analysis was done in this specific field of study and therefore the present research was based on a secondary research design. **Methods:** The study follows a systematic review research design in this research study. Primary studies with RCT designs were collected for this research study. RevMan tool was used for performing meta-analysis. Finally, five research studies were retrieved published between 2021 to 2022, to perform the meta-analysis. Quantitative data was collected for this research study. **Results:** The findings have revealed that there is a specific association between the use of mobile applications-based interventions in the reduction of nursing stress and job burnout effects. All the mobile app interventions except one, were observed to be effective in the reduction of stress and burnout in nursing. The pooled estimate showed  $\chi^2 = 0.5$  which states that the value is statistically significant. **Conclusion:** On a concluding note, it can be stated that this research study has successfully addressed the aim and study objectives. However, future research studies can be conducted to be dependent on primary research designs.

**Keywords:** *Burnout; Job Stress; Mobile Application; Nursing; Psychological Well-Being*

## INTRODUCTION

Psychological wellbeing of nurses is able to get the trust of their patients. This makes the patients more responsive to the instructions they are given. Sometimes, they even take a positive role in their own wellness. Strengthening workplace resilience is an important strategy for organizations to implement to support the psychological well-being of nurses and reduce their stress and burnout. Nurses frequently face emotional adversity and stressors at the workplace that can negatively impact their psychological well-being and result in mental distress. This can affect their capacity for therapeutic work, professional relationships, and overall work performance. In the context of work, resilience is a dynamic process of positive adaptation to adversity that can lead to psychological well-being and increased work performance. Insufficient human resources, frequent night shifts, high pressure of work, long-term as well as indirect exposure to the stimulating environment of patients, violent injuries from patients, and COVID-19 factors are mainly responsible for affecting the mental health of nurses (Ghanbari, Yektatalab, & Mehrabi, 2021). Added to the above-stated factors, it has been

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observed that the long-term lack of effective support in terms of mental health among the nurses creates a major problem for the nurses. These complications have been observed to reduce the quality and patient satisfaction from the services provided by nurses as well as increase medication error rates (Hwang & Jo, 2019). The same has been observed to affect the outcomes of clinical nursing. Thus, some interventions will be needed to improve the mental health status of nurses working in a specific hospital setting. Through mobile devices, online communication and learning can be carried out anytime and anywhere without time or space constraints, which solves this problem well.

Intervention research has been conducted on nurses based on the factors responsible for mindfulness meditation. The same has been observed to deal with pain and stress via mindfulness meditation as well as self-regulation of the problems by dealing with them from several angles (Kaipainen, Välikkynen, & Kilkku, 2017). Recent research has discussed that 45% of the hospital nurses in a Vietnam-based hospital setting suffered from stress, anxiety, and depression symptoms (Young *et al.*, 2020). The same has been observed to be known as psychological distress among the workers, which mainly resulted in the deterioration of the care quality for patients. Therefore, cognitive behavioral therapy (CBT) can be stated to be one such therapeutic process for the treatment of stress, depression, and anxiety among nurses (Lau *et al.* 2020). However, it becomes harder for the nurses to avail of the above-stated therapeutic intervention during their busy schedules. Therefore, the requirement of mobile-based interventions can be stated to be required by these nurses for faster-availing advantages.

CBT, or cognitive behavioral therapy, is a type of psychotherapy that tries to assist individuals in recognizing and altering harmful thinking patterns and behaviors that could be a factor in mental health issues. Although the implementation of mobile-based CBT interventions has been observed to be significantly effective for nurses, the process is associated with a major challenge, which is low adherence. However, there are pieces of evidence that show that mobile-based interventions associated with CBT are effective in making the nurses finish the therapy sessions in a small amount of time, with effective outcomes (Lecomte *et al.*, 2020). Therefore, it can be stated that confusion arises on whether the intervention is effective or not since it has challenges also. The conduct of a research study to analyse the effectiveness of smartphone-based applications on the psychological well-being of nurses to reduce stress and burnout can be stated to be justified.

This research aims to analyze the impact of using mobile applications on the psychological well-being of nurses for the reduction of job stress and burnout. The objectives of this research are: a) to analyze the impact of using mobile applications on the psychological well-being of nurses for reducing job stress; and b) to analyze the impact of using mobile applications on the psychological well-being of nurses for reducing burnout.

## **METHODOLOGY**

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for transparent reporting of systematic reviews and meta-analyses were utilized to conduct the search. Lack of ethics review.

### **Eligibility Criteria**

**Study types:** Randomized controlled trials have been taken into account.

The authors did not include studies that used a case-control, a review, a commentary, or a case-report design. These were reviewed to glean any more applicable research.

### **Study Exclusion and Inclusion Criteria**

The language of publication is English. The articles span a five-year time frame, from 2019 to 2023. Articles are composed in languages other than English. The studies were originally conducted on nurses.

### **Participants and Type of Intervention**

Participants were registered nurses. Usage of mobile application.

### **Search Strategy**

A systematic literature review (SLR) has been followed in the study. The selected design has been observed to be ranked at the topmost part of the hierarchy of the evidence triangle (Moberg, Niles & Beermann,

2019). However, the main focus of this research study was to perform a meta-analysis. This is secondary quantitative design-based research. A thorough review of the literature was done to summarize the results of the research studies in a quantitative manner. A meta-analysis is advantageous when there are many studies on a specific topic that have similar questions and research designs (Lecomte *et al.*, 2020). These studies mainly increase the statistical strength and precision of the estimates. A keyword-based search strategy was used in this research study. The keywords were placed in the search boxes of open access databases such as Google Scholar and PubMed. These two databases were utilized for the research since they were open-access in nature. On a summarizing note, it can be said that both meta-analysis and systematic reviews are significant and evidence-based, which helps in the improvement of clinical practice, future research, and policy decisions. On an overall basis, both meta-analysis and SLR are significant tools for evidence-based studies that can help inform clinical practice and future research directions.

The research question for the current study has been developed using the PICO (Population Intervention Control Outcome).

P–Nurses

I–Mobile applications

C–No mobile applications

O–Treatment of mental health issues developing due to job stress and burnout.

Research Question (RQ) – “What is the effectiveness of mobile applications on the psychological well-being of nurses for the reduction of job stress and burnout?”

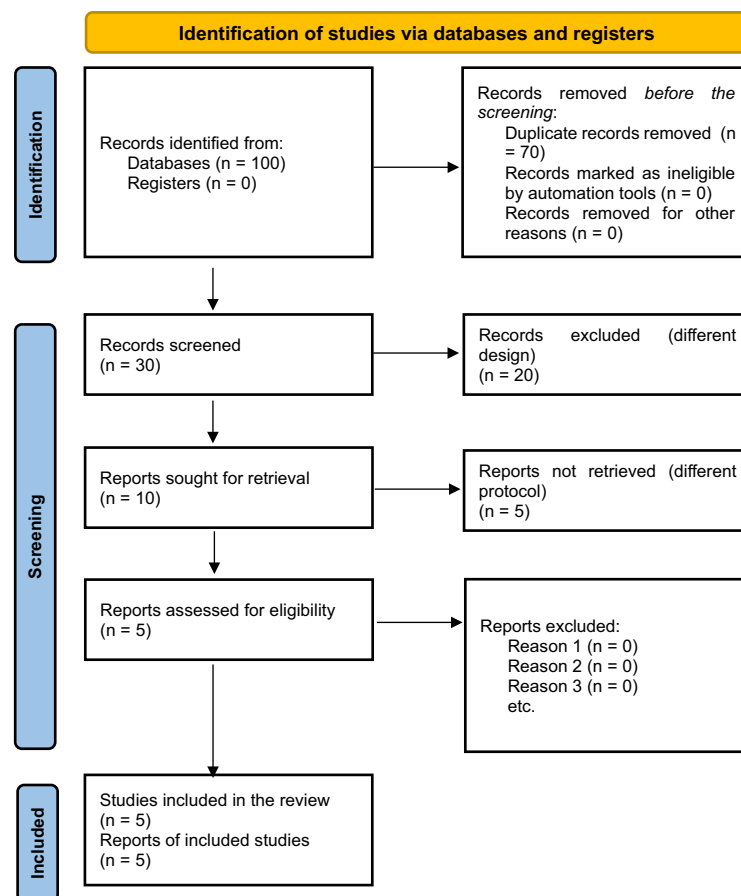


Figure 1: The Flow Diagram of Included and Excluded Studies as per the Recommendations from PRISMA

## Study Selection

The selected studies involved mobile application-based interventions for the reduction of job stress and burnout in nursing. However, some other factors included anxiety and depression among the nurses in healthcare settings. The studies were selected based on the inclusion and exclusion criteria that have been shared in the following part of the chapter.

## Data Extraction

Data for this research study was collected from the selected databases only. Quantitative data was collected from the primary research studies that were selected for this study. These types of data were collected from the findings of the research studies that were selected for this paper. The collected data was imported into the RevMan tool, and the analysis was performed. To identify the impact sizes of the treatment interventions, the sample size was observed for both the experimental and control groups. The following values of statistical data were collected too: mean, SD of stress, depression, anxiety, and burnout, as applicable. These were the dependent variables of the research. The studies were then analysed for the control group with no treatment of other types of treatments and no mobile interventions. The author has extracted this information along with the study design and findings and recorded it in a data extraction table.

The quality of all the collected studies was analysed using the RCT CASP tool (Critical Appraisal Skills Programme). The quality of the collected papers was recorded on another table.

## Data Synthesis

Statistical analysis was performed in the RevMan tool to analyze the quantitative data. To analyze the effect of mobile application intervention on the reduction of job stress and burnout, subgroup analysis was performed in RevMan. Using a random-effects model, RevMan's statistical analysis can be utilized to determine the pooled effect size for this meta-analysis. Calculating the weighted mean difference (WMD) or standardized mean difference (SMD) between the intervention and control groups across all trials for the major outcome measure—such as psychological well-being—is required. Additionally, subgroup studies may be carried out to investigate the impacts of moderator factors, including the kind of mobile application, frequency of use, and demographic details. Sensitivity analysis can also be performed to assess how resistant the findings are to changes in the study's quality and other variables.

## RESULTS

A total of five papers were screened and selected from the total number of papers since they were found to be justified for the current research. Both qualitative and quantitative data were collected from the papers and recorded in the study characteristics table in the next chapter. However, in the subsequent chapters, the quality of the collected series of papers was assessed, a forest plot was drawn after performing the appropriate statistical analysis in the RevMan tool, heterogeneity assessment was done, and finally, bias in the collected papers was analyzed. Finally, the summary of findings was stated, and the chapter was concluded.

## Study Characteristics

**Table 1: Characteristics of the Collected Studies**

Study ID/Author Names	Study Design	Participants	Intervention	Control	Outcome Measure	Follow-up Duration	Results
1. Taylor <i>et al.</i> , (2022).	Randomized Controlled Trial	Nurses (Health workers) – 1095 experimental group and 1087 control group.	Unguided Digital Mindfulness-Based Self-Help App - Headspace	Moodzone (not the digital mindfulness-based self-help App)	Subscales of depression, anxiety, stress, burnout	5 days	An unguided digital MBSH intervention (Headspace) helped reduce healthcare workers' stress. Thus, it can be a part of the interventions required to reduce nursing workforce stress and burnout.
2. Orosa-Duarte <i>et al.</i> , (2021)	Randomized controlled trial	Nurses (healthcare workers)	In-person mindfulness-based program (IMBP) app	General intervention	STAI T and GCS SCS, GLOBAL FFMQ	N/A	When it comes to helping nurses (student nurses) feel less anxious and develop more self-compassion and mindfulness, a smartphone app can be just as beneficial as an IMBP.

3. Fiol-DeRoque <i>et al.</i> , (2021)	Randomized controlled trial (RCT)	Nurses	PsyCovid app	General information on mental health	Depression, anxiety, and stress (overall score on the Depression Anxiety Stress Scale-21 [DASS-21])	2 weeks	PsyCovid app was successful to reduce mental health issues among nurses in 2 weeks, at a higher rate than the control group.
4. Keng <i>et al.</i> , (2022)	Randomized controlled trial (RCT)	Nurses	Headspace app	Active control condition	Depression, anxiety, and stress scale 21	1 month	By using Headspace, HCWs may experience downstream advantages such as reduced distress and improved psychological health outcomes. The findings might lead to better psychological support services for HCWs during a pandemic.
5. Xu <i>et al.</i> , (2022)	Randomized controlled trial (RCT)	Emergency care nurses	Mobile mindfulness app	Wait to treat the control	Perceived stress scale and Maslach Burnout Inventory scale	3 months	The findings of the present study show that a brief mindfulness training programme delivered via cutting-edge digital technology somewhat improved stress, burnout, mindfulness, and well-being among emergency personnel members.

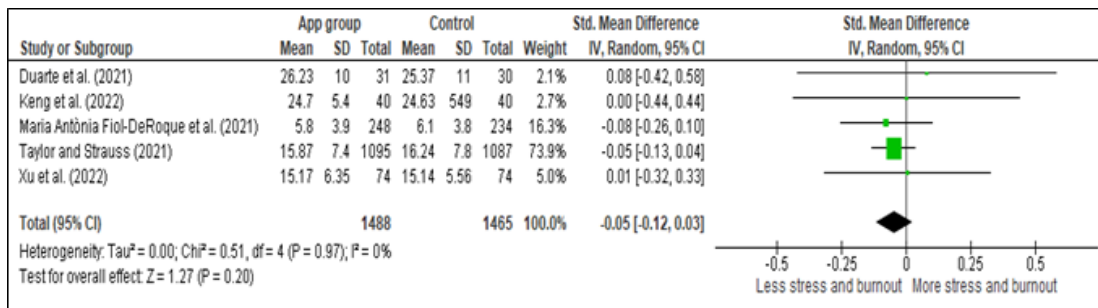
### Description of Interventions used in the Included Studies

Unguided Digital Mindfulness Based Self-Help App, mHealth Intervention App, Mobile Intervention App, PsyCovid App, Headspace App, and Mobile Mindfulness App were the specific interventions in the included studies. In other words, it can be stated that all five papers have used the above-stated five mobile mental health apps to test their effects on the reduction of stress and burnout among nurses. The alternative (control) interventions were observed to be "no mobile health app", "general information on mental health delivery" and "time to wait". All the interventions have been termed mobile app interventions as a whole.

**Table 2: Mobile app Interventions for Reducing the Stress and Burnout among Nurses in a Healthcare Setting**

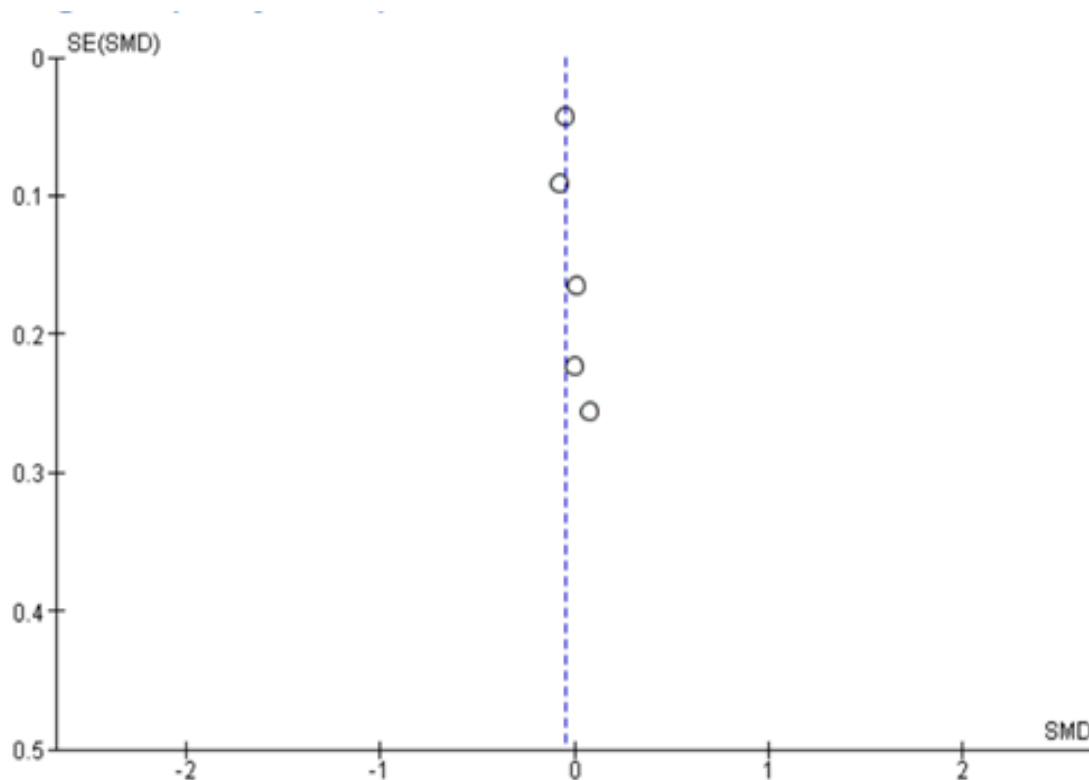
Meta-analysis ID	Authors	Experimental Group (EG) Year	EGN (Number of Participants)	EG SD (Standard Deviation)	EG Mean	Control Group (CG) Year	CGN	CG SD	CG Mean
1	Taylor <i>et al.</i> , (2022).	2021	1095	7.40	15.87	2021	1087	7.80	16.24
2	Orosa-Duarte <i>et al.</i> , (2021)	2021	31	10	26.23	2021	30	11	25.37
3	Fiol-DeRoque <i>et al.</i> , (2021)	2021	248	3.9	5.8	2021	234	3.8	6.1
4	Keng <i>et al.</i> , (2022)	2022	40	5.40	24.7	2022	40	5.49	24.63
5	Xu <i>et al.</i> , (2022)	2022	74	6.35	15.17	2022	74	5.56	15.14

A meta-analysis of the six reported RCTs has shown a significant reduction in stress and job burnout after using the mobile app interventions. The highest effect size was observed for the Headspace app usage, which reduced stress ( $p = 0.01$ ), which is less than 0.05, and therefore the results can be stated to be significant. On the other hand, the control group has shown lower reductions in stress, and therefore, mobile app interventions can be stated to be effective in reducing job stress and burnout among nurses.



**Figure 2: Effect of Mobile App Interventions on Job Stress and Burnout**

The effect of mobile app-based interventions on the reduction of job stress and burnout among nurses in a healthcare setting has been shown in the above figure. The Forest plot has shown that the mobile apps were successful in mainly reducing stress and burnout among the nurses and therefore have favored the left side of the plot. However, only one study favored that right side and therefore proved that the app-based interventions were less effective than the general mental stress and burnout reduction methods.



**Figure 3: The Effect of Mobile App-Based Interventions in the Reduction of Job Stress and Burnout among Nurses in a Healthcare Setting**

Figure 3 has been generated by a Funnel plot using RevMan 4.5 review manager. Funnel plot asymmetry was utilized to evaluate publication predisposition in the meta-analysis. Publication bias was not found in the meta-analysis of studies with mobile interventions for reducing stress and burnout among nurses.

### Study Quality Assessment

**Table 3: Quality Assessment Table**

Study ID	Did the Trial Focus on a Clear Issue?	Was the Assignment of Interventions Randomized?	Were all the Participants Accounted for the Conclusion?	Were all Participants Blinded to the Treatment?	Were the Groups Similar at the Start of the Trial?	Were the Groups Treated Equally?	How Precise was the Treatment Effect?	Were all Clinically Important Outcomes Considered?	Are the Benefits Worth the Harms and Costs?
Taylor <i>et al.</i> , (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Orosa-Duarte <i>et al.</i> , (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fiol-DeRoque <i>et al.</i> , (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Keng <i>et al.</i> , (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Xu <i>et al.</i> , (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

### Risk of Bias Assessment



Source: (RevMan)

**Figure 4: Risk of Bias Graph: Review Authors' Judgements about Each Risk of Bias Item Presented as Percentages Across All Included Studies.**

Figure 4 shows the risk of bias representation. All 5 RCTs were considered for the assessment.



Source: (RevMan)

**Figure 5: Risk of Bias Summary: Review Authors Judgements about Each Risk of Bias Item for Each Included Study**

Therefore, it can be stated that the results have shown a Forest plot, which favours the fact that the mobile app-based interventions were effective in reducing stress and anxiety among the nurses. The selected mobile app-based interventions had one single AI interface and were therefore considered to be similar. Most of the interventions were related to mHealth and mindfulness app-based interventions. All the selected research studies were quality appraised and were observed to be justified for the selection process.

## **DISCUSSION**

Although it has been found that mobile-based CBT therapies are highly helpful for nurses, implementing them is still fraught with difficulties due to low adherence. The use of mobile-based treatments in conjunction with CBT, however, is successful in getting nurses to complete therapy sessions quickly and effectively (Lecomte *et al.*, 2020). As a result, because the intervention has obstacles as well, it is unclear if it is beneficial or not. The conduct of a study to evaluate the impact of smartphone-based applications on nurses' psychological wellness to lower stress and burnout can also be justified. The goal of the current research was to test as well as demonstrate the effectiveness of mobile app-based psychological intervention for the reduction of stress and burnout among nurses in a specific healthcare setting (Basit, Mathews & Kunik, 2020). However, a secondary research study was conducted in this paper, and the evidence gathered in the meta-analysis was from primary sources. The evidence collected in this meta-analysis parallels the previously researched results, which specifically report the effectiveness of mobile app interventions for the reduction of stress and job burnout among nurses and nursing students. The findings have indicated that the intervention (mobile app base) was effective in reducing stress and burnout symptoms among nurses (Kim & Park, 2019). A random effects model was used in the analysis process, and the heterogeneity value was observed to be 0. The results of this research paper have been observed to correlate with the previous findings that result from the small effectiveness of mobile app-based interventions. For example, four of the research studies out of five have reported that the interventions had small to large effects on the reduction of stress and burnout among nurses. The effect size of one of the research studies was observed to be comparatively higher than the other studies (Taylor *et al.*, 2022). The results of this research study have been observed to be in line with the specific previous study shreds of evidence (Hwang & Jo, 2019). The meta-analysis has been observed to yield both large and small effect sizes for stress and job burnout. To simplify the analysis, stress and burnout were combined as one variable. However, the difference in effect sizes can be observed to be a difference in the baseline scores of the specific research participants. The online self-help interventions had a specific pooled effect size of stress and therefore have been considered to be small.

The five RCT-based analyses on the use of mobile app interventions for the psychological well-being of the patients reported that reduction of stress and job burnout is possible for the nurses (Young *et al.*, 2022). However, one of the research studies reported that the control group did show a higher reduction in stress and job burnout compared to the intervention group (Xu *et al.*, 2022). Statistical significance was observed for all the relationships that were established in the research study and therefore can be stated to be justified.

The absence of heterogeneity can be stated to be the result of using similar types of mobile app interventions in the research. To summarize the consequences of the review, mobile interventions have been observed to reduce stress, anxiety, and job burnout. The present meta-analysis has been observed to uncover various ramifications for the training of nurses to be capable of using mobile apps to reduce mental stress and job burnout while working (Wang *et al.*, 2018). On the other hand, the findings were generalized for the student nurses, who are currently working as interns in the hospital sector.

A major strength of a study has been observed to be associated with reviews of only RCT-based research examinations. The second specific strength of the paper is associated with the comprehensive analysis of the viability of using mobile app-based interventions in the reduction of stress and job burnout. However, it can be stated that the meta-analysis has some major limitations. At first, it can be stated that only English publications were included in the review and meta-analysis. On the other hand, only five studies were included in the review. Therefore, it can be stated that data generalization is another limitation of the current research study. On the other hand, future research studies should be conducted by considering research papers with RCT backgrounds and specific follow-up periods (Young *et al.*, 2020). There was one research study,



which had no follow-up period and therefore can be stated to have lower quality than the other studies (Orosa-Duarte *et al.*, 2021). Third, it can be stated that there was substantial variability in the total number of sessions, which mainly ranges from 4 to 40. Therefore, multiple session-based research studies provide reproducible and valid research findings. On the other hand, more RCTs are also required to generate a combined finding quantitatively and also without statistical significance heterogeneity.

In the future, it can be stated that a meta-analysis of the current pandemic-focused study mainly informed on what types of mobile interventions were effective in reducing stress and burnout in nursing. There can also be a long-term mental health problem that cannot be treated or managed by using mobile app-based interventions. There can also be serious long-term health problems, which can act as a confounding factor in the reduction of stress and burnout in nursing. Moreover, during the pandemic period, mobile app-based interventions were observed to be effective in reducing nurse stress and burnout. Future research studies can specifically focus on people from a specific and vulnerable population during the quarantine period. Future studies should also focus on using data from in-person interviews—qualitative data and not only quantitative data. Since the current study was performed using a secondary quantitative research design, it was not possible to include the qualitative research study.

## **CONCLUSION**

The meta-analysis has been observed to show that mobile app-based interventions had significant effects on stress and job burnout reduction among nurses. The mobile-based interventions have been observed to help in the reduction of stress and job burnout among nurses. The RCTs needed for the identification of effectiveness were specifically collected. The research study has been observed to address all the aims and objectives. On an additional basis, more RCTs can lead to the reduction of stress and burnout among nurses as well as enhance their psychological wellbeing. On an overall basis, it can be stated that this research provides a specific basis for the development of future app-based interventions addressing stress and anxiety in the pandemic context. There were similar mobile interventions, which were used in this research study. In conclusion, it can be stated that the research study specifically examines the overall effectiveness of mobile apps, which are based on psychological interventions in reducing burnout and stress among nurses. A specifically notable strength of the study was observed to be the inclusion of RCTs that enhances both the validity and the finding's reliability. The comprehensive analysis of the mobile app-based interventions in the reduction of burnout has provided specific pieces of evidence on their effectiveness. Moreover, it can be stated that the lack of follow-up periods on one of the specific studies reduces the overall study quality. Future research studies must consider the incorporation of follow-up periods for the assessment of the long-term impacts of mobile apps in the management of mental health issues in nursing. The mobile app-based interventions' effectiveness is associated with the COVID-19 pandemic era and therefore these virtual interventions can be stated to be effective. Finally, it can be said that only English publications were included in the research and therefore no specific information source based on some other languages was included in the study. In conclusion, this study shows the potential advantages of psychological therapies based on mobile apps for lowering stress and burnout in nurses. The results imply that these treatments may be successful in enhancing nurses' psychological health. To overcome the stated shortcomings, further research is required, which should include studies in several languages, more RCTs, standardized intervention sessions, follow-up periods, and consideration of qualitative data. Future research can give more reliable evidence and help with the creation and use of mobile app-based therapies to promote nurses' mental health by overcoming these constraints.

## **Conflict of Interest**

The authors declare that they have no competing interests.

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