Interventions to reduce perceived stress among university students in LMICs: A scoping review

A research study to meet the partial requirements of the Master of Medicine in Psychiatry at the University of Cape Town, South Africa.

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Signed by candidate

10 July 2023

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GLOSSARY OF TERMS

Anxiety – excessive fear, arousal, or avoidance response to perceived environmental or internal threats out of proportion to the actual risk posed (1).

Aramgar – a mobile individualised mindfulness app for smartphones (2).

ASQ – The Academic Stress Questionnaire.

BAI – Beck Anxiety Inventory.

BT – Breathing Therapy.

CASP – Critical Appraisal Skills Programme (3).

CBT – Cognitive Behavioural Therapy.

COVID-19 – Coronavirus Disease 2019.

CRF – Corticotropin-Releasing Factor (4).

CT – Critical Thinking Intervention.

DASS – The Depression, Anxiety and Stress Scale.

Depressive Symptoms – Defined by the DSM-V as including low mood, anhedonia, feelings of guilt and worthlessness, suicidal ideation, plan or intent, fatigue, sleep changes, changes in ability to concentrate and psychomotor agitation or retardation (5).

DSM-V – The Diagnostic And Statistical Manual of Mental Disorders Fifth Edition (6).

EFT – Emotional Freedom Technique.

ESSS – The Educational Stress Scale for Undergraduate Students.

ExamSS – The Exam Stress Scale.

HREC – The Human Research Ethics Committee at the University of Cape Town, South Africa.

HICs – High Income Countries**.** Those countries with a Gross National Income above USD12696 per capita as of 2019 (7).

HPA – Hypothalamic-Pituitary Axis (4).

ICD-11 – The International Classification of Diseases. 11th Revision (8).

LC – Locus Coeruleus (4).

LMICs – Low- and Middle-Income Countries**, further classified as:**

Low Income Country – *Those countries with a Gross National Income of less than USD1045 per capita as of 1 July 2021 (7).*

Lower Middle-Income Country - *Those countries with a Gross National Income between USD1046 and USD4095 per capita as of 1 July 2021 (7).*

Upper Middle-Income Country *- Those countries with a Gross National Income between USD4096 and USD12695 per capita as of 1 July 2021 (7).*

MBI – Mindfulness Based Interventions.

OSF – The Open Science Forum.

PSS – The Perceived Stress Scale.

PRISMA – Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) (9).

PRISMA-ScR – Preferred Reporting Items for Systematic Reviews and Meta Analyses - Extension For Scoping Reviews (10).

RCT – Randomized Control Trial.

SAM – Sympathetic Adreno-Medullary system (11).

SAS – The Speech Anxiety Scale.

SASH – South African Stress and Health study (12).

SIT – Stress Inoculation Training (13).

STAI – The State-Trait Anxiety Inventory.

Perceived Stress/Stress-Related Problems – The psychological processes that are theorized to contribute to a range of physiological and mental states (including anxious, stressed or depressed states) (14). However these do not include clinically defined mental disorders according to the DSM V or ICD 11.

Thematic Analysis - a methodological and standardised approach to qualitative data, as a way of identifying, analysing and reporting themes (15).

UCT – The University of Cape Town, South Africa.

TITLE

Interventions to reduce stress-related problems among university students in LMICs: A scoping review.

ABSTRACT

Introduction

Stress has been defined as the perception that one's resources to meet a demand for change are not adequate. It is also an emotional response to stressors. Stressors and cumulative adversities have been associated with mental health problems. Research suggests that university students are a vulnerable part of the population with exposure to diverse stressors and a high prevalence of mental health problems, including psychological distress, depression, and anxiety. This may be due to experiencing several stressors and decreased access to protective factors, such as family support. Although studies have explored the effectiveness of interventions to prevent stress related problems among university students, most studies originate from high income settings, and primarily focus on studies from these settings. As a result, a synthesis of the current body of evidence regarding interventions to reduce stress in university students focused on low- and middle-income settings, is warranted.

Method

This review used the Arksey & O'Malley (2005) scoping review framework that includes six stages: (1) identification of the research question, (2) identification of relevant studies, (3) selection of studies, (4) charting the data, (5) collating, summarising and (6) collaboration. The following databases were used for the identification of relevant studies: Google Scholar, Academic Search Premier, Africa-Wide Information, CINAHL, ERIC, Health Source: Nursing/Academic Edition, MEDLINE, APA PsycInfo, PubMed, and Scopus. Abstracts of relevant studies were screened before the final articles were selected for inclusion in the review. Eligible studies were reviewed using the CASP checklist. Reporting of methods follows the Preferred Reporting Items for Systematic Reviews and Meta Analyses – Extension for Scoping Reviews (PRISMA-ScR). Data was collected using post-hoc tool designed for this review by the first author. The data extracted included bibliographic information, country of origin, type of study, study population, methodology, interventions, outcome measurement and key findings relating to the review question.

Results

This study identified eight studies. Six were randomised control trials and two were quasi-experimental studies using a pre-test post-test design. Seven studies were from lower-middle income countries and one from an upper middle-income country investigating the

effectiveness of a range of interventions including: Mindfulness Based Interventions (n = 2), Rational Emotive Therapies (n = 3), Cognitive Behavioural Therapies (n = 1), Breathing Therapy and Emotional Freedom Therapies (n = 1), and Critical Thinking Interventions (n = 1). Primary outcome measures focussed on a stressed related variable were all self-report including the Depression, Anxiety and Stress Scale (DASS) (n = 2); the Perceived Stress Scale (PSS) (n = 4); the Exam Stress Scale (ExamSS) (n = 1); and the ASQ (n = 1). Only one study used a validated tool provided in the study participants' first language. Appraisal for this study was done using the CASP Appraisal tool (see Appendix 6). Four papers were rated as high quality (scoring highly in all three domains on the CASP) and 4 were rated as medium (scoring highly in at least 2 of the three domains of the CASP). The results of the analysis showed significant reductions in stress-related problems which were maintained at follow-up. Although all studies provided significant results for the chosen intervention, they were plagued by several limitations.

Conclusion

This scoping review set out to identify interventions to reduce stress in university students in LMIC. The results of this scoping review suggested that there is not enough evidence to make definitive statements on the effectiveness of interventions to reduce perceived stress. The findings highlight the significant limitations of available studies and the need for further research in this area.

Ethics

This study was submitted to the Human Research Ethics Committee at the Faculty of Health Sciences, University of Cape Town, South Africa. HREC Ref: 751/2021. Ethics approval was granted on 21 February 2022. As this is a scoping review, no study participants were involved, and no personally identifiable data was collected. The study protocol was submitted to the Open Science Framework (OSF) on 02 May 2022 and can be accessed at DOI 10.17605/OSF.IO/HUY2R.

INTRODUCTION

Stress was defined succinctly, albeit loosely, by Hans Seyle in 1936 as a non-specific response to a demand for change, which was punctuated by the perception that one's resources to meet that demand were not adequate (16). Although the concept of stress is intrinsically understood across cultures as a universal consequence of existence, the word stress has become an overarching term without a clear and precise definition in scientific literature. As noted by Kemeny (17) in 2003, the concept of stress is only vaguely defined in the literature, and used to describe a wide range of social, psychological and biological states arising as a consequence of distressing events. Although mention will be made of the biological effects of stress, for the purposes of this discussion, the terms "stress" and "stress-related problems" will be used to mean the psychological processes that are theorized to contribute to a range of physiological and mental states (14).

For many, stress can be seen as positive, helping the individual to avoid danger, or to strive forward to meet a looming deadline. But, although stress increases productivity, it only does so to an inflection point. Thereafter, productivity rapidly deteriorates, and negative biological, psychological, and socio-spiritual consequences become more likely. Furthermore, persistently high levels of stress result in fatigue and overloading, in turn causing illness through homeostatic dysregulation (18).

The Neurophysiology of Stress

It has been long hypothesized from a neurobiological perspective, that Corticotropin-Releasing Factor (CRF) is implicated in the pathophysiology of stress, depression and anxiety, and its mechanisms are widely described in medical literature (4). Two important interconnected systems are involved when one experiences stressful events, namely the sympathetic adreno-medullary (SAM) system and hypothalamic-pituitary-adrenocortical (HPA) axis. The combined effect of these two systems produces physiological arousal (alertness), which when sustained can lead to maladaptive behaviours which, in turn, can influence a person's attitude towards seeking help and care (11).

The Relationship between Stress-Related Problems and the Anxious or Depressed State

The link between anxious or depressed state and stress-related problems is well described in the literature. Osman et al. (19) found while studying the Depression Anxiety Stress Scale

(DASS), that it was a measure of “shared causes” across these states, and the delicate interplay between them that affect perceived stress levels.

Although this study does highlight the prevalence of psychopathology to provide a rationale for addressing mental health among university students, the focus is indeed on perceived stress. There is a move in global mental health to be mindful of psychopathologising otherwise normal emotional reactions to distressing life events, given the potential negative consequences of such action. Since Common Mental Disorders (CMDs) are highly comorbid (19) and include a range of somatic, cognitive, and emotional symptoms that interfere with functioning, measuring a wider range of associated symptoms is likely to offer a better transdiagnostic view of mental health conditions among university students. Nonspecific psychological distress is a dimensional diagnosis for mental health conditions that that are characterized by a range of anxiety and depressive symptoms (20). As a unifying factor among CMDs (20-22); it is a useful transdiagnostic construct under which many researchers have explored perceived stress and stress-related problems in university populations (2, 23-29).

Prevalence of Stress-Related Problems

Research suggests that university students are a vulnerable part of the population with a high prevalence of mental health problems, particularly stress, depression and anxiety (12, 30-32). These problems can have significant consequences on their ability to extract the greatest value out of their educational journeys. Worryingly, some studies have found that there has been an increase in the reporting of stress-related problems amongst this population group. As an example, a systematic review and meta-analysis looking at anxiety amongst university students in western countries, found empirical evidence to support the hypothesis that there has been an increase in population anxiety amongst university students over the last 30 years. This increase was especially pronounced in the undergraduate population, rising from 8.95% in 1985 to 15.22% in 2017 (31). A more recent meta-analysis by Quek et al. (30) looking at anxiety amongst medical students from 68 studies among 29 countries, reported a global prevalence of 33.8% (95% CI: 29.2% – 38.7%). However, this review only included one African country, as most studies were from Asia, the Middle East and Europe.

Although there is a paucity of data available on depression and anxiety amongst the general population from low- and middle-income countries (LMICs), more data is beginning to emerge. The South African Stress and Health Study (SASH) (12) was a three-stage, area-probability sample of 4 351 adults over 18 years of age (including all races and ethnic groups in households and single-sex migrant labourer hostels in South Africa). In this study, the authors

identified several subgroups that are particularly vulnerable to stress related disorders. They found a high prevalence of anxiety and depression related disorders amongst 18 – 34-year-olds (anxiety 14.7%; depression 17.6%) and amongst 35 – 49-year-olds (anxiety 8.9%; depression 11.9 %). Of note, this age-group includes the study population of interest identified for this review. Other important factors included being female and being between the ages of 18 – 34 years.

Although not nationally representative, the SASH study and other, more recent studies from LMICs discussed below, have found a high prevalence of depression and anxiety related disorders among university students specifically. For example, a systematic review and meta-analysis of 37 studies with 76 608 participants from 20 LMICs found that 24% of university students experienced depressive symptoms (33). And in a cross sectional study in Turkey amongst 4850 students at a single university, 29.6 -36.7% of students reported clinically significant anxiety (32). In South Africa, a study by Bantjes et al. (34) looking at common mental disorders amongst 14,575 first year students at two local tertiary institutions found that generalised anxiety disorder and depression were the most commonly diagnosed mental disorders with a lifetime prevalence of 22.6% and 24.7% respectively. Finally, Mall et al (35) in 2018 looked at the prevalence of depression and stress amongst 686 first year South African university students. The researchers found a prevalence of 16.1% for depressive symptoms within the last 12 months. Additionally, more than 90% of participants reported experiencing significant stressors in the last 12 months, with 78.6% reporting persistent academic stressors. This suggests a significant prevalence of stress related disorders amongst this vulnerable population group.

The Impact of Coronavirus Disease 2019 (COVID-19) on Stress-Related Problems

COVID-19, its consequent public health control measures with their calamitous socio-economic sequelae, and not least of all, the devastating individual, familial and societal losses, have undoubtedly led to increased levels of reported stress and anxiety among university students. A recent cross-sectional study evaluating the effects of the COVID-19 pandemic on the psychological well-being of 697 dental students at a tertiary institution in Saudi Arabia, recorded elevated levels of stress and anxiety amongst male (60.64%) and female (37.02%) students. Another cross-sectional study by Langsi et al. (36), found that the pandemic had resulted in a three-fold increase in reporting of mental health and emotional symptoms amongst respondents from Sub-Saharan Africa. In addition, Ghebreyesus (37) warned that adversity associated with the pandemic had increased the risk of mental illness and substance

dependence, and the virus itself was linked to psychiatric disorders including anxiety, sleep disorders and depression. Furthermore this pandemic has made existing health problems broadly worse in low and middle income populations, which has added significant pressure on already fragile health care services (38). The severity and extent of these problems are becoming more apparent as new studies are published.

Factors associated with psychological problems among university students.

Several factors have been associated with higher levels of psychological problems among university students in LMICs. According to Bantjes et al. (34) higher education is a complex process with multiple challenges and pitfalls such as leaving home and adapting to new environments, opportunities for and exposure to substance use and financial distress. In addition to these stressors, other factors have been associated with stress and anxiety, including exposure to violence and trauma (39). A study published in 2021 by Myers et al. (40) looking at childhood trauma amongst 1407 students in their first year at two South African universities, reported that 48.4% of respondents had reported childhood traumatic experiences, including physical abuse and neglect, which put them at risk of developing stress related illnesses during higher education.

The implications of stress amongst university studies can have significant consequences. A systematic review by Peltzer and Pengpida (41), looked at the link between depressive symptoms and stress and risk behaviour amongst 20222 undergraduate university students with mean age of 20.8 years from 26 high, middle and low income countries. Results indicated that 24.0 % and 12.8 % of the respondents reported moderate and severe depressive symptoms, with a similar prevalence across high-, middle- and low-income countries. Multivariate logistic regression showed demographic and social variables, stressful or traumatic life events and health risk behaviour was positively associated with severe depressive symptoms.

Current Challenges

It is rather disconcerting that Africa, which represents 16.72% of the world's population, only has 3% of the world's healthcare professionals, but carries 24% of the burden of disease (42). This paucity of healthcare resources in these settings means that LMICs have a great challenge ahead to address this rising disease burden. Furthermore, Mullan et al. (42) noted that many LMICs are scaling up educational services across their communities, and this in turn is resulting in a rapidly growing student population. Some estimates note an increase of 122% of adults enrolled in higher education across LMICs (43). It is therefore likely that stress,

depression, and anxiety are going to become more prevalent amongst this population as time goes on and educational spaces expand. This will place even more pressure on underfunded and inadequate mental healthcare services amongst these populations and brings with it the urgent need to ensure that the psychological needs of students are met, including providing more services for mental health and stress-related issues.

Uptake & Utilization of Student Mental Health Care services

Data suggests an extremely low level of access and utilization of university and college mental health care services globally. For instance, a study involving 13028 college participants in the United States, found that despite most students being covered medically, utilization of mental health services stood at 23.8% for the general student population and only 43.7% of those with mental health problems (44). Access and uptake also seem to be influenced by other demographic factors. The authors also identified a significant disparity between racial and cultural groups, with people of colour and people from poor economic backgrounds accounting for the lowest utilization.

A cross-sectional study by Bantjes et al. (34, 45) at a South African university found only 18.1% of students accessed mental health care services in the previous year, with only 28.9% of those with mental disorders. This study also noted that being black or male was associated with a lower likelihood of seeking treatment. Those that did make use of the services were more likely to receive pharmacological rather than psychological support. 52% of respondents were on psychotropic medication, with 47.3% reporting having accessed psychological therapies. The reason for this preponderance toward medication is not clear from the data, however it may have been a result of easier access to medication due to a paucity of available psychological services. They go further to highlight the need for further research to address such challenges and reduce access barriers in mental health services (45).

Barriers to Access

Students have described several barriers to accessing mental health services. A cross-sectional study by Negash et al. (46) conducted amongst university students in Ethiopia identified the following barriers to seeking help:

(1) Students often thought things would get better without help,
(2) Not knowing the pathways to seek help,
(3) Believing they can solve the problem themselves,
(4) Denying the problem, and

(5) Preferring alternative forms of care.

Importantly they also noted that in addition to these, a much more significant barrier was a lack of access because of a paucity of available services. Those who came from a rural background may have struggled due to having limited knowledge about mental illness, and as a result, fail to access health care services for treatment.

Bantjes et al. (45) found a similar pattern emerging among two South African Universities which were well resourced and services were free. The ultimately found that "black, male and first-generation students with atypical sexual orientations" faced significant barriers to access to mental healthcare including services that were not culturally geared for these groups. In concluding, they recommended further research to better understand the inequalities, increasing targeted outreach programmes and implementation of culturally appropriate services. Masai et al. (47) also noted additional linguistic, perceived stigma, lack of awareness barriers to access while studying a group of international students in Turkey.

Myers (48) noted when studying barriers to treatment access of previously disadvantaged communities in South Africa, found that key structural barriers existed due to pre-existing racial segregation laws. It noted that those of Black, African, and Coloured descent faced significant geographical barriers to accessing services due to poor commuter infrastructure, being far removed from urban centres, and lack of services in their neighbourhoods. This in-turn created financial barriers as these discriminatory practices fuelled poverty due to low incomes, coupled with limited free services provided by the State.

Evidence Based interventions for Stress-Related Problems

One way to address some of these barriers is through delivering targeted, cost-effective, evidence-based interventions to prevent, manage and treat stress related problems among university students. Psychological interventions in particular, have been found to be significantly effective, Regehr et al. (49) performed a systematic review and meta-analysis including 24 studies looking at interventions to reduce stress in students. They included 1431 students in their review who were enrolled in a range of disciplines. Their findings suggested that cognitive, behavioural, and mindfulness-based interventions significantly reduced anxiety symptoms in the study cohort. In their discussion, they noted that even though there were variations in approach (length or components of intervention, different programmes), the results remained consistent. They also found that depression scores were significantly reduced in five out of six studies. A further three studies showed a significant reduction in salivary cortisol levels after a stress inoculation training-based intervention, suggesting a

significant and measurable change in biological stress. Here, subjects were treated using three techniques (1) education regarding sources of stress and reducing biological and psychological stress; (2) imparting of coping skills; and (3) application of new strategies to situations (real or simulated). This was primarily based on Meichenbaum's (13) Stress Inoculation Training (SIT), which was designed to be dynamic and modifiable. These studies suggest that these interventions had a significant impact on biological arousal. A major limitation noted by Regehr et al (49) was the marked overrepresentation of HICs, making the generalizability of their results to low and middle income settings difficult. During this review, several other well-described psychological interventions, some sharing common themes, were identified.

Mindfulness Based Interventions (MBI)

Mindfulness is the "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" and "a way of being" (50). Inspired by the work of Nyanaponika Thera (51) (a Theravada Buddhist monk and scholar), it is this definition coined by Jon Kabat-Zinn in his 1994 book 'Wherever You Go, There You Are', that has become the most widely used and accepted definition today. He further expanded on this definition in 2016, referring to mindfulness as the "moment-to-moment, non-judgmental awareness, cultivated by paying attention in a specific way, that is, in the present moment, and as non-reactively, as non-judgmentally, and as openheartedly as possible." (52) A more neuro-biochemical definition/hypothesis of mindfulness was offered by Jaseja (53), who suggested that mindfulness is ''a complex neural practice that induces changes in neurophysiology and neurochemistry of brain resulting in altered neuro-cognition and behaviour in the practitioner". Engagement in MBIs ranges from formal practices on a regular basis, to informal practices that cultivate a continuity of awareness in all activities of daily living (54). Due to this broad definition, MBIs cover a number of wide ranging interventions such as Mindfulness Based Stress Reduction, that includes practices such meditation and informal practices aimed at improving present state awareness and reducing emotional reactivity (55). Due to their versatility, they can be delivered by facilitators of varying level of expertise. This quality may make these interventions appealing to resource constrained settings where there may be limited expertise.

Rational Emotive Therapies (RET)

Rational Emotive Therapy or Rational Emotional Behaviour therapy found its beginnings in the work of Emotional Education as described by Ellis (56). RET is based on the "A-B-C Theory", the idea that people do not feel negative Consequences (C) because of an Activating

(A) event, rather it is their irrational systems of Belief (B) that result in distress. This belief is rigid and unyielding even in the absence of supporting evidence. At a later stage they learn to Dispute (D) these beliefs, to eradicate the Consequence (C).

In a later paper, Ellis (57) elaborated further on his Cognitive-Emotional Behavioural Therapy based RET, which he advocated for to school counsellors of the time. In it he described it as an educational based approach, namely through the "A-B-C Theory", to learn how personality forms and develops, while developing strong skills to dispute irrational Beliefs (B). This, he postulated, made RET ideal for school counsellors, who were usually trained educators (as most Cognitive-Behavioural Therapies require clinical or therapeutic expertise). He hoped this fact would enable them to grasp the concept more easily. He noted that although he had initially designed RET for "disturbed individuals", he noted its potential for widespread applications across the populace. He defined RET as consisting of individual and group sessions, dramatic presentations, and biblio/tele-therapy.

Cognitive Behavioural Interventions (CBT)

According to Badin et al (58), CBT is based on cognitive science and is integrated with learning theories. The suggested theory relating to anxiety is that those who suffer severe and repeated physiological arousal in specific situations learn to associate the stimulus with the psychological and physiological responses through classical and operant conditioning over time. CBT aims to counteract this conditioning through repeatedly identifying what expectations they had leading into a situation and how that expectation failed to surface once the threat was approached, together with behavioural interventions to reduce the symptoms of anxiety. This results in a reduction of negative automatic thoughts and behaviours through inhibitory learning.

Although CBT is an effective tool to manage anxiety, it does require a competent therapist. According to Rector and Cassin (59), the therapist needs to be competent in five domains:

(1) Generic competences including developing rapport, trust, genuineness, and the ability to build a therapeutic alliance.
(2) Basic competences including knowledge of CBT principles, and a keen understanding of the interplay between cognition, and thoughts, behaviours, and feelings.
(3) Specific techniques that include a thorough conceptualization of problems that makes sense to the client and make an appropriate treatment plan.
(4) Problem-specific competences include knowledge of the cognitive behavioural techniques used to treat specific psychological disorders; and

(5) Meta-competences, including abstract competences necessary to guide the intervention and tailor specific treatment for the needs of individual clients.

Given the level of expertise required to deliver the intervention, CBT may prove difficult to implement in resource-constrained settings, which make up a significant proportion of LMICs.

Breathing Therapy (BT)

There is no formally recognised form of BT that could be identified in the literature, however, there have been several studies that have shown that certain breathing techniques can induce psychological and physiological changes that are commonly used as markers of stress and anxiety (29, 60, 61). A study by Cho et al (61) looking at the effect of mindful breathing exercises on a cohort (n = 36) of undergraduate students attending a university in South Korea. They found that mindfulness breathing had a large effect size in reducing test anxiety and an increase in positive automatic thoughts. A study by Chen et al(60) conducted among 46 psychiatric patients attending an outpatient department in Taiwan similarly found significant reductions in stress markers as measured by the Beck Anxiety Inventory (BAI), and physiological stress markers at the end of the study.

Although both these studies show significant effect of breathing exercises on stress and anxiety symptoms, the only study identified looking at the target population of the incumbent study by Dincer et al(29) which is included in this study, and will be discussed in the review. There are however no clear guidelines for breathing therapies, and as such their implementation and validity is varied. Although breathing therapy does not specify any required expertise, advocating for its implementation in LMIC settings is difficult, as there are not clearly defined and validated protocols for its use.

Emotional Freedom Techniques (EFT)

The Emotional Freedom Technique was first described by Craig (62) in 1995 as “acupuncture without needles”. The cognitive components of EFT come from CBT and exposure therapy with the addition of acupressure to 8 predefined acupuncture points (63). During this time, an attempt is made to link the exposure to new neutral statements through reframing. A systematic review Nelms and Castel (64) did a meta-analysis of all studies of EFT on depressive symptoms. They found EFT to be efficacious in managing depressive symptoms across a wide range of population groups. Although they included a relatively small number of studies (n = 20), they all found a significant effect for EFT. These findings are supported by similar findings for the effectiveness of EFT in Post-Traumatic Stress Disorder (PTSD) (63).

A more recent pilot study by Patterson (65) looking at the effectiveness of EFT amongst 37 nursing students in Southeast United States. They noted a significant reduction in quantitative and qualitative stress measures, as measured by the Perceived Stress Scale (PSS), State–Trait Anxiety Inventory (STAI), and a qualitative survey. Furthermore, in 2020, Dincer et al (29) looked at the effect of BT and EFT on Turkish nursing students They found that the median post-test SUDS and STAI-TX1 scores of the BT and EFT groups were statistically significantly lower compared to the control group, as were the median post-test SAS scores of the Breathing Therapy and EFT groups. There were also significant differences between the pre-test and post-test median scores in both the BT group and the EFT groups. Speaking anxiety scores were found to be statistically significantly different after both BT and EFT, with EFT having a larger treatment effect (Cohen d > 0.8) than BT on anxiety. It is also interesting to note that over 100 clinical trials have proven the efficacy of EFT (63). Although there is robust evidence for these interventions, there have been concerns around facilitator expertise affecting the effectiveness of the intervention may hamper its implementation within LMICs.

Critical Thinking Interventions (CT)

Critical thinking has been defined as thinking of a higher order that asks questions about all assumptions, resulting in a state of so-called "thinking about thinking" (66). It is the process of "skilfully conceptualizing, applying, analysing, synthesizing, and/or evaluating information" (67). This information is gathered from several sources including communication, experience, observation, and reasoning and is based on two components:

(1) Information and belief generation and processing abilities; and
(2) Using intellectual habit commitment to guide behaviour.

Many studies have highlighted the significant effect of CT for a range of indications including improving academic performance and managing stress and anxiety (23, 66-68).

In a 2021 study, Ugwuozor et al (23) examined the efficacy of a CT Intervention amongst 103 undergraduates attending public universities South-South Nigeria. They noted significant reductions in academic stressor scores and examination related anxiety amongst the CT group and found that these results were maintained at follow-up. Although other studies have corroborated the results of this study, there is not enough data to make conclusive statements about its long-term efficacy and cost-effectiveness in LMICs.

Scoping Reviews

Given the large variety of interventions and different methods study methods employed, an appropriate method of reporting and analysing the data is required. Scoping reviews are useful when literature is too large or complex and as such is not amenable to a systematic review. According to Arksey & O'Malley (69), and later updated in 2014 by Colquhoun et al. (70), with the most recent update by Peter et al. (71), scoping reviews are undertaken to:

(1) Determine to extent of research in the field,
(2) Determine whether a systematic review is viable in future,
(3) Collect, analyse, and present findings, and
(4) To identify gaps in the literature.

They follow a methodologically sound framework, and is a scientific method that produces publishable data (70). In this particular review, the use of accredited standardised appraisal tools (CASP, PRISMA-ScR) and numerical and thematic analysis (following a standardised and well described process), ensures that the findings of this study are reproducible, putting them on equal academic rigour with other methods of review (3, 15, 72). This provides a robust argument for their use in academic discourse. They are especially suited to bringing together literature especially in areas with emerging evidence, as is the case with the area of interest identified in the research question.

Although there are some reviews that have looked at interventions for stress related issues in this population group, these were all in HICs, with none of these studies looking at LMICs. A scoping review may be the best method given that most studies reported in the literature would not meet the criteria for inclusion in a systematic review. Furthermore, the size and quality of available data in LMICs is dynamic and evolving, and is thus difficult to quantify, creating a gap in our knowledge. Although they do not comment on the quality of research, scoping reviews can be used to provide an overview of the existing evidence. As noted by Colquhoun et al. (70) scoping reviews provide a broad understanding of the range of available data and brings together different studies with different methodologies. They are a robust form of review, with a clearly defined and standardised methodology.

Summary

In summary, data presented in this literature review has revealed higher rates of stress and anxiety amongst students in certain population groups, with a disproportionately higher prevalence in LMICs (34, 40, 47, 73-75). This is likely associated with other challenges experienced within these settings and the barriers to access to health care as represented by

multiple studies (45-47). These ranged from cultural and social barriers, lack of awareness, and personal beliefs. This was noted even in well-funded settings, where resources were provided free of charge, but utilisation of mental health services is low even amongst individuals with a formally diagnosed with a mental problem (45). This highlights the scale of the challenges faced in mental health services across LMICs, and mirrors findings from HIC (44). The lack of adequate resources with lack of utilisation creates an urgent need for more research to help steer future researchers. The recurrent theme of underrepresentation in the body of data discussed within this literature review provides a vital opportunity to review and present more data relevant to these settings and to identify areas for possible future research in this rapidly growing area of interest. Although several studies have explored the effectiveness of interventions to prevent stress-related problems among university students, most studies originate from high income settings and focus on studies conducted in these settings. There is a dearth of studies synthesizing data from low- and middle-income settings, where several issues such as expertise, resource and labour constraints may present a significant barrier to their implementation. Therefore, given a rise in studies conducted in LMICs, a synthesis of the current body of evidence is warranted to aid in identifying cost-effective and evidence-based interventions in LMICs. Research and knowledge obtained from such studies would be useful in aiding tertiary institutions in LMICs plan cost-effective and user-friendly interventions in their settings.

AIMS AND OBJECTIVES

Rationale

This study conducted a scoping review and synthesis of the current body of literature on non-pharmacological interventions to reduce stress-related problems in university students in Low- and Middle-Income Countries (LMICs). It focused on relevant data published from 2010 to 2020 (and was extended to include 2021 to present the most recent data). Although numerous studies have explored the effectiveness of interventions to prevent stress related problems among university students, most studies originate from high income settings. As a result, a synthesis of the current body of evidence regarding interventions to reduce stress in university students in low- and middle-income settings was warranted, due to the paucity of available data in this area. Research and knowledge obtained from studies such as this one, will be useful in aiding tertiary institutions in LMICs plan cost-effective and user-friendly interventions in their settings.

Objectives

The aim of this study was to review the scope and extent of research available on interventions to reduce stress in university students in LMICs to identify potential areas for further research.

METHODS

Protocol and registration

The protocol for this review was registered with the Open Sciences Forum and can be accessed at DOI: https://doi.org/10.17605/OSF.IO/HUY2R. It provides full details of the methods followed for this study. The framework first described by Arksey & O'Malley (69, 70) was used for this scoping review. This particular methodology was chosen for its rigorous and systematic approach to examining and summarising highly varied data. Their approach describes six stages: (1) identification of the research question, (2) identification of relevant studies, (3) selection of studies, (4) charting the data, (5) collating, summarising, and reporting results, and (6) consultation with stakeholders.

Stage 1: Identification of the research question

The research question we chose was "*What is known about psychological interventions to reduce stress related problems among university students in LMICs?"*

Stage 2: Identifying Relevant Studies

Databases

The following databases were used for the identification of relevant studies: Google Scholar, Academic Search Premier, Africa-Wide Information, CINAHL, ERIC, Health Source: Nursing/Academic Edition, APA PsycInfo, PubMed, Scopus, and The Cochrane Library. Articles published in a foreign language were included if an English language translation was available. Reference lists of included articles were searched for more appropriate studies to be included in this review. A search of grey literature databases was not possible due to the time constraints inherent to MMED research.

Search Strategy

An expert librarian (PM) from The University of Cape Town's (UCT) Bongani Mayosi Health Sciences Library and the first author identified keywords for stress, anxiety, and tertiary students. Standardised terms were also found to describe LMICs from the UCT Libraries. Alternative terms were identified and used to develop a search strategy including Medical Subject Headings (MeSH) terms and relevant operators to comply with individual database requirements. (See Table 1 below, and Appendices 1 - 5 for a full list of search strategies)

Eligibility Criteria

Research included studies from LMICs involving tertiary students. Foreign language articles were excluded unless translations were available. Articles published between 2010 and 2020 (expanded to include 2021) were included in the study. All studies involving children, and those including people outside of the tertiary setting were excluded. Only Primary research study designs were considered for eligibility and any articles duplicating a study already included in the review were included as the same study where applicable. All studies included in the review were peer reviewed and policy documents and conference abstracts reference lists were searched to find more relevant articles.

***Table 1**: Inclusion and Exclusion Criteria*

Inclusion Criteria	Exclusion Criteria
Primary research from LMICs involving tertiary students.	This review did not include studies published in a foreign language for which no English translation could be obtained
Articles published between 2010 and 2022	Those under the age of 18 (children), and all studies including people outside of the tertiary setting were excluded.
Only primary research study designs were be included in the study.	Any article duplicating a study already included in the study, was included as the same study e.g., 1a & 1b.
Only peer reviewed studies included	Policy documents and conference abstracts were excluded, but their reference lists were searched for potential studies for inclusion.
Studies focusing on the area of interest in LMICS	Studies were conducted in LMICs with university/tertiary students only.

***Table 2**: Search Strategy (PubMed) (2102)*

#	Query	Results
#15	Filters: **Full text, Case Reports, Classical Article, Clinical Conference, Clinical Study, Clinical Trial, Comparative Study, Controlled Clinical Trial, Multicentre Study, Observational Study, Pragmatic Clinical Trial, Randomized Controlled Trial, Twin Study, Adult: 19+ years, from 2010 - 2021**	192
#14	Search: **#12 AND #13**	2,749
#13	Search: **"stress reduction" OR reduc* stress OR manag* stress OR "stress management" OR stress relie* OR relie* stress OR coping**	501,231
#12	Search: **#7 AND #8 AND #11**	9,477
#11	Search: **#9 OR #10**	2,337,611
#10	Search: **Afghanistan[Text Word] OR Albania[Text Word] OR Algeria[Text Word] OR American Samoa[Text Word] OR Angola[Text Word] OR Antigua[Text Word] OR Barbuda[Text Word] OR Argentina[Text Word] OR Armenia[Text Word] OR Armenian[Text Word] OR Aruba[Text Word] OR Azerbaijan[Text Word] OR Bahrain[Text Word] OR Bangladesh[Text Word] OR Barbados[Text Word] OR Belarus[Text Word] OR Byelarus[Text Word] OR Belorussia[Text Word] OR Byelorussian[Text Word] OR Belize[Text Word] OR British Honduras[Text Word] OR Benin[Text Word] OR Dahomey[Text Word] OR Bhutan[Text Word] OR Bolivia[Text Word] OR Bosnia[Text Word] OR Herzegovina[Text Word] OR Botswana[Text Word] OR Bechuanaland[Text Word] OR Brazil[Text Word] OR Brasil[Text Word] OR Bulgaria[Text Word] OR Burkina Faso[Text Word] OR Burkina Fasso[Text Word] OR Upper Volta[Text Word] OR Burundi[Text Word] OR Urundi[Text Word] OR Cabo Verde[Text Word] OR Cape Verde[Text Word] OR Cambodia[Text Word] OR Kampuchea[Text Word] OR Khmer Republic[Text Word] OR Cameroon[Text Word] OR Cameron[Text Word] OR Cameroun[Text Word] OR Central African Republic[Text Word] OR Ubangi Shari[Text Word] OR Chad[Text Word] OR Chile[Text Word] OR China[Text Word] OR Colombia[Text Word] OR Comoros[Text Word] OR Comoro Islands[Text Word] OR Mayotte[Text Word] OR Congo[Text Word] OR Zaire[Text Word] OR Costa Rica[Text Word] OR Cote D'ivoire[Text Word] OR Cote D' Ivoire[Text Word] OR Cote Divoire[Text Word] OR Cote D Ivoire[Text Word] OR Ivory Coast[Text Word] OR Croatia[Text Word] OR Cuba[Text Word] OR Cyprus[Text Word] OR Czech Republic[Text Word] OR Czechoslovakia[Text Word] OR Djibouti[Text Word] OR French Somaliland[Text Word] OR Dominica[Text Word] OR Dominican Republic[Text Word] OR Ecuador[Text Word] OR Egypt[Text Word] OR United Arab Republic[Text Word] OR El Salvador[Text Word] OR Equatorial Guinea[Text Word] OR Spanish Guinea[Text Word] OR Eritrea[Text Word] OR Estonia[Text Word] OR Eswatini[Text Word] OR Swaziland[Text Word] OR Ethiopia[Text 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Lesotho[Text Word] OR Basutoland[Text Word] OR Liberia[Text Word] OR Libya[Text Word] OR Libyan Arab Jamahiriya[Text Word] OR Lithuania[Text Word] OR Macau[Text Word] OR Macao[Text Word] OR Macedonia[Text Word] OR Madagascar[Text Word] OR Malagasy Republic[Text Word] OR Malawi[Text Word] OR Nyasaland[Text Word] OR Malaysia[Text Word] OR Maldives[Text Word] OR Indian Ocean[Text Word] OR Mali[Text Word] OR Malta[Text Word] OR Micronesia[Text Word] OR Kiribati[Text Word] OR Marshall Islands[Text Word] OR Nauru[Text Word] OR Northern Mariana Islands[Text Word] OR Palau[Text Word] OR Tuvalu[Text Word] OR Mauritania[Text Word] OR Mauritius[Text Word] OR Mexico[Text Word] OR Moldova[Text Word] OR Moldovian[Text Word] OR Mongolia[Text Word] OR Montenegro[Text Word] OR Morocco[Text Word] OR Ifni[Text Word] OR Mozambique[Text Word] OR Portuguese East Africa[Text Word] OR Myanmar[Text Word] OR Burma[Text Word] OR Namibia[Text Word] OR Nepal[Text Word] OR Netherlands Antilles[Text Word] OR Nicaragua[Text Word] OR Niger[Text Word] OR Nigeria[Text Word] OR Oman[Text Word] OR Muscat[Text Word] OR Pakistan[Text Word] OR Panama[Text Word] OR Papua New Guinea[Text Word] OR Paraguay[Text Word] OR Peru[Text Word] OR Philippines[Text Word] OR Philipines[Text Word] OR Phillipines[Text Word] OR Phillippines[Text Word] OR Poland[Text Word] OR Polish People's Republic[Text Word] OR Portugal[Text Word] OR Portuguese Republic[Text Word] OR Puerto Rico[Text Word] OR Romania[Text Word] OR Russia[Text Word] OR Russian Federation[Text Word] OR Ussr[Text Word] OR Soviet Union[Text Word] OR Union Of Soviet Socialist Republics[Text Word] OR Rwanda[Text Word] OR Ruanda[Text Word] OR Samoa[Text Word] OR Pacific Islands[Text Word] OR Polynesia[Text Word] OR Samoan Islands[Text Word] OR Sao Tome And Principe[Text Word] OR Saudi Arabia[Text Word] OR Senegal[Text Word] OR Serbia[Text Word] OR Seychelles[Text Word] OR Sierra Leone[Text Word] OR Slovakia[Text Word] OR Slovak Republic[Text Word] OR 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	OR Surinam[Text Word] OR Syria[Text Word] OR Syrian Arab Republic[Text Word] OR Tajikistan[Text Word] OR Tadjikistan[Text Word] OR Tadzhikistan[Text Word] OR Tadzhik[Text Word] OR Tanzania[Text Word] OR Tanganyika[Text Word] OR Thailand[Text Word] OR Siam[Text Word] OR Timor Leste[Text Word] OR East Timor[Text Word] OR Togo[Text Word] OR Togolese Republic[Text Word] OR Tonga[Text Word] OR Trinidad[Text Word] OR Tobago[Text Word] OR Tunisia[Text Word] OR Turkey[Text Word] OR Turkmenistan[Text Word] OR Turkmen[Text Word] OR Uganda[Text Word] OR Ukraine[Text Word] OR Uruguay[Text Word] OR Uzbekistan[Text Word] OR Uzbek[Text Word] OR Vanuatu[Text Word] OR New Hebrides[Text Word] OR Venezuela[Text Word] OR Vietnam[Text Word] OR Viet Nam[Text Word] OR Middle East[Text Word] OR West Bank[Text Word] OR Gaza[Text Word] OR Palestine[Text Word] OR Yemen[Text Word] OR Yugoslavia[Text Word] OR Zambia[Text Word] OR Zimbabwe[Text Word] OR Northern Rhodesia[Text Word] OR Global South[Text Word] OR Africa South Of The Sahara[Text Word] OR Sub Saharan Africa[Text Word] OR Subsaharan Africa[Text Word] OR Central Africa[Text Word] OR North Africa[Text Word] OR Northern Africa[Text Word] OR Magreb[Text Word] OR Maghrib[Text Word] OR Sahara[Text Word] OR Southern Africa[Text Word] OR East Africa[Text Word] OR Eastern Africa[Text Word] OR West Africa[Text Word] OR Western Africa[Text Word] OR West Indies[Text Word] OR Indian Ocean Islands[Text Word] OR Caribbean[Text Word] OR Central America[Text Word] OR Latin America[Text Word] OR South America[Text Word] OR Central Asia[Text Word] OR North Asia[Text Word] OR Northern Asia[Text Word] OR Southeastern Asia[Text Word] OR South Eastern Asia[Text Word] OR Southeast Asia[Text Word] OR South East Asia[Text Word] OR Western Asia[Text Word] OR East Europe[Text Word] OR Eastern Europe[Text Word] OR Developing Country[Text Word] OR Developing Countries[Text Word] OR Developing Nation[Text Word] OR Developing Nations[Text Word] OR Developing Population[Text Word] OR Developing Populations[Text Word] OR Developing World[Text Word] OR Less Developed Country[Text Word] OR Less Developed Countries[Text Word] OR Less Developed Nation[Text Word] OR Less Developed Nations[Text Word] OR Less Developed World[Text Word] OR Lesser Developed Countries[Text Word] OR Lesser Developed Nations[Text Word] OR Under Developed Country[Text Word] OR Under Developed Countries[Text Word] OR Under Developed Nations[Text Word] OR Under Developed World[Text Word] OR Underdeveloped Country[Text Word] OR Underdeveloped Countries[Text Word] OR Underdeveloped Nation[Text Word] OR Underdeveloped Nations[Text Word] OR Underdeveloped Population[Text Word] OR Underdeveloped Populations[Text Word] OR Underdeveloped World[Text Word] OR Middle Income Country[Text Word] OR Middle Income Countries[Text Word] OR Middle Income Nation[Text Word] OR Middle Income Nations[Text Word] OR Middle Income Population[Text Word] OR Middle Income Populations[Text Word] OR Low Income Country[Text Word] OR Low Income Countries[Text Word] OR Low Income Nation[Text Word] OR Low Income Nations[Text Word] OR Low Income Population[Text Word] OR Low Income Populations[Text Word] OR Lower Income Country[Text Word] OR Lower Income Countries[Text Word] OR Lower Income Nations[Text Word] OR Lower Income Population[Text Word] OR Lower Income Populations[Text Word] OR Underserved Countries[Text Word] OR Underserved Nations[Text Word] OR Underserved Population[Text Word] OR Underserved Populations[Text Word] OR Under Served Population[Text Word] OR Under Served Populations[Text Word] OR Deprived Countries[Text Word] OR Deprived Population[Text Word] OR Deprived Populations[Text Word] OR Poor Country[Text Word] OR Poor Countries[Text Word] OR Poor Nation[Text Word] OR Poor Nations[Text Word] OR Poor Population[Text Word] OR Poor Populations[Text Word] OR Poor World[Text Word] OR Poorer Countries[Text Word] OR Poorer Nations[Text Word] OR Poorer Population[Text Word] OR Poorer Populations[Text Word] OR Developing Economy[Text Word] OR Developing Economies[Text Word] OR Less Developed Economy[Text Word] OR Less Developed Economies[Text Word] OR Underdeveloped Economies[Text Word] OR Middle Income Economy[Text Word] OR Middle Income Economies[Text Word] OR Low Income Economy[Text Word] OR Low Income Economies[Text Word] OR Lower Income Economies[Text Word] OR Low Gdp[Text Word] OR Low Gnp[Text Word] OR Low Gross Domestic[Text Word] OR Low Gross National[Text Word] OR Lower Gdp[Text Word] OR Lower Gross Domestic[Text Word] OR Lmic[Text Word] OR Lmics[Text Word] OR Third World[Text Word] OR Lami Country[Text Word] OR Lami Countries[Text Word] OR Transitional Country[Text Word] OR Transitional Countries[Text Word] OR Emerging Economies[Text Word] OR Emerging Nation[Text Word] OR Emerging Nations[Text Word]	
#9	Search: **Afghanistan[Mesh] OR Albania[Mesh] OR Algeria[Mesh] OR American Samoa[Mesh] OR Angola[Mesh] OR Antigua And Barbuda[Mesh] OR Argentina[Mesh] OR Armenia[Mesh] OR Aruba[Mesh] OR Azerbaijan[Mesh] OR Bahrain[Mesh] OR Bangladesh[Mesh] OR Barbados[Mesh] OR Republic Of Belarus[Mesh] OR Belize[Mesh] OR Benin[Mesh] OR Bhutan[Mesh] OR Bolivia[Mesh] OR Bosnia And Herzegovina[Mesh] OR Botswana[Mesh] OR Brazil[Mesh] OR Bulgaria[Mesh] OR Burkina Faso[Mesh] OR Burundi[Mesh] OR Cabo Verde[Mesh] OR Cambodia[Mesh] OR Cameroon[Mesh] OR Central African Republic[Mesh] OR Chad[Mesh] OR Chile[Mesh] OR China[Mesh] OR Colombia[Mesh] OR Comoros[Mesh] OR Democratic Republic Of The Congo[Mesh] OR Congo[Mesh] OR Costa Rica[Mesh] OR Cote D'ivoire[Mesh] OR Croatia[Mesh] OR Cuba[Mesh] OR Cyprus[Mesh] OR Czech Republic[Mesh] OR Djibouti[Mesh] OR Dominica[Mesh] OR Dominican Republic[Mesh] OR Ecuador[Mesh] OR Egypt[Mesh] OR El Salvador[Mesh] OR Equatorial Guinea[Mesh] OR Eritrea[Mesh] OR Estonia[Mesh] OR Swaziland[Mesh] OR Ethiopia[Mesh] OR Fiji[Mesh] OR Gabon[Mesh] OR Gambia[Mesh] OR "Georgia (Republic)"[Mesh] OR Ghana[Mesh] OR Gibraltar[Mesh] OR Greece[Mesh] OR Grenada[Mesh] OR Guam[Mesh] OR Guatemala[Mesh] OR Guinea[Mesh] OR Guinea Bissau[Mesh] OR Guyana[Mesh] OR Haiti[Mesh] OR Honduras[Mesh] OR Hungary[Mesh] OR India[Mesh] OR Indonesia[Mesh] OR Iran[Mesh] OR Iraq[Mesh] OR Jamaica[Mesh] OR Jordan[Mesh] OR Kazakhstan[Mesh] OR Kenya[Mesh] OR Democratic People's Republic Of Korea[Mesh] OR Republic Of Korea[Mesh] OR Kosovo[Mesh] OR Kyrgyzstan[Mesh] OR Laos[Mesh] OR Latvia[Mesh] OR Lebanon[Mesh] OR Lesotho[Mesh] OR Liberia[Mesh] OR Libya[Mesh] OR Lithuania[Mesh] OR Macau[Mesh] OR Republic Of North Macedonia[Mesh] OR Madagascar[Mesh] OR Malawi[Mesh]**	1,515,251

	OR Malaysia[Mesh] OR Indian Ocean Islands[Mesh] OR Mali[Mesh] OR Malta[Mesh] OR Micronesia[Mesh] OR Palau[Mesh] OR Mauritania[Mesh] OR Mauritius[Mesh] OR Mexico[Mesh] OR Moldova[Mesh] OR Mongolia[Mesh] OR Montenegro[Mesh] OR Morocco[Mesh] OR Mozambique[Mesh] OR Myanmar[Mesh] OR Namibia[Mesh] OR Nepal[Mesh] OR Netherlands Antilles[Mesh] OR Nicaragua[Mesh] OR Niger[Mesh] OR Nigeria[Mesh] OR Oman[Mesh] OR Pakistan[Mesh] OR Panama[Mesh] OR Papua New Guinea[Mesh] OR Paraguay[Mesh] OR Peru[Mesh] OR Philippines[Mesh] OR Poland[Mesh] OR Portugal[Mesh] OR Puerto Rico[Mesh] OR Romania[Mesh] OR Russia[Mesh] OR Rwanda[Mesh] OR Samoa[Mesh] OR Sao Tome And Principe[Mesh] OR Saudi Arabia[Mesh] OR Senegal[Mesh] OR Serbia[Mesh] OR Seychelles[Mesh] OR Sierra Leone[Mesh] OR Slovakia[Mesh] OR Slovenia[Mesh] OR Melanesia[Mesh] OR Somalia[Mesh] OR South Africa[Mesh] OR South Sudan[Mesh] OR Sri Lanka[Mesh] OR Saint Kitts And Nevis[Mesh] OR Saint Lucia[Mesh] OR Saint Vincent And The Grenadines[Mesh] OR Sudan[Mesh] OR Suriname[Mesh] OR Syria[Mesh] OR Tajikistan[Mesh] OR Tanzania[Mesh] OR Thailand[Mesh] OR Timor Leste[Mesh] OR Togo[Mesh] OR Tonga[Mesh] OR Trinidad And Tobago[Mesh] OR Tunisia[Mesh] OR Turkey[Mesh] OR Turkmenistan[Mesh] OR Uganda[Mesh] OR Ukraine[Mesh] OR Uruguay[Mesh] OR Uzbekistan[Mesh] OR Vanuatu[Mesh] OR Venezuela[Mesh] OR Vietnam[Mesh] OR Middle East[Mesh] OR Yemen[Mesh] OR Yugoslavia[Mesh] OR Zambia[Mesh] OR Zimbabwe[Mesh] OR Africa South Of The Sahara[Mesh] OR Africa, Central[Mesh] OR Africa, Northern[Mesh] OR Africa, Southern[Mesh] OR Africa, Eastern[Mesh] OR Africa, Western[Mesh] OR West Indies[Mesh] OR Indian Ocean Islands[Mesh] OR Caribbean Region[Mesh] OR Central America[Mesh] OR Latin America[Mesh] OR South America[Mesh] OR Asia, Central[Mesh] OR Asia, Northern[Mesh] OR Asia, Southeastern[Mesh] OR Asia, Western[Mesh] OR Europe, Eastern[Mesh] OR Developing Countries[Mesh]	
#8	Search: **University Student OR University Students OR College Student OR College Students OR Undergraduate Student OR Undergraduate Students OR Postgraduate Student OR Postgraduate Students OR Higher Education OR Tertiary Student OR Tertiary Students**	505,200
#7	Search: **#3 OR #6**	1,413,078
#6	Search: **#4 OR #5**	320,720
#5	Search: **Anxiety OR Neuroses Anxiety OR Anxiety Neuroses OR Anxiety States OR Neurotic Anxiety State OR Neurotic OR Neurotic Anxiety State OR Neurotic Anxiety States OR State Neurotic Anxiety OR States Neurotic Anxiety**	320,720
#4	Search: **(("anxiety"[MeSH Terms]) OR (anxiety disorders[MeSH Terms])) OR (anxiety disorder[MeSH Terms])**	174,360
#3	Search: **#1 OR #2**	1,160,429
#2	Search: **Stress, psychological OR Stress OR Stressors OR Psychological Stresses OR Stresses Psychological OR Life Stress OR Life Stresses OR Stress Life OR Stresses Life OR Stress Psychologic OR Psychologic Stress OR Stressor Psychological OR Psychological Stressor OR Psychological Stressors OR Stressors Psychological OR Psychological Stress**	1,160,429
#1	Search: **(stress, psychological[MeSH Terms]) OR (stress, psychologic[MeSH Terms])**	145,170

Stage 3: Study Selection

Using the above search strategy, the titles and abstracts of relevant studies were screened by the 1st author and a research assistant before articles were selected for inclusion in the review. All articles included in the review were assessed using the appropriate Critical Appraisal Skills Programme (CASP) tool (3). (See Appendix 6). Eligible studies were reviewed using the CASP checklists by two separate reviewers, and those studies selected for inclusion were those assessed as having at least medium to high quality data according to the CASP checklist, and those primarily focusing on interventions targeting anxious, stressed, or depressed states. interventions targeting diagnosed mood disorders were excluded. Disputes were settled through discussion and review of study parameters prior to inclusion or exclusion in the final review. Reporting of methods were presented using the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) Extension For Scoping Reviews (10). (See Appendix 7)

Stage 4: Charting Data and Data Extraction

Data extraction tables were constructed using Microsoft Access to manage the database. Extensive information was extracted, including bibliographic information, country of origin, type of study, study population, methodology, interventions, and outcome measurement, follow up rates and key findings relating to the review question. Please see **Appendix 8** and **Appendix 9** for the template used. A thematic analysis of the extent of literature was conducted by the researchers during the review process. Braun and Clark (15) described thematic analysis as a way of identifying, analysing and reporting themes. It includes a methodological and standardised approach to qualitative data and follows six steps: (1) familiarisation with the data, (2) generation of codes, (3) Theme search, (4) reviewing themes, (5) naming and definition, and (6) reporting. The method described by their framework will be used in this review, as it will likely include significant amounts of qualitative data.

Stage 5: Collating, Summarizing & Reporting the Results

The results were collated, summarised, and reported in a standardised format. An overview of the literature is presented below using the thematic analysis of the extent of the literature as described in Stage 4 above.

Stage 6: Consultation

Arksey and O'Malley (69) initially identified this as an optional stage in their methodological framework. A more recent update by Colquhoun (70), although acknowledging this an optional stage, highlighted the importance of consultation and added enhancements to this stage. At all stages multiple stakeholders were consulted. These stakeholders included the primary researchers, the Department of Psychiatry at UCT directly involved in student education and Student Representatives from the University of Cape Town. There was also regular consultation with expert librarians at the University of Cape Town.

RESULTS

Selection of sources of evidence

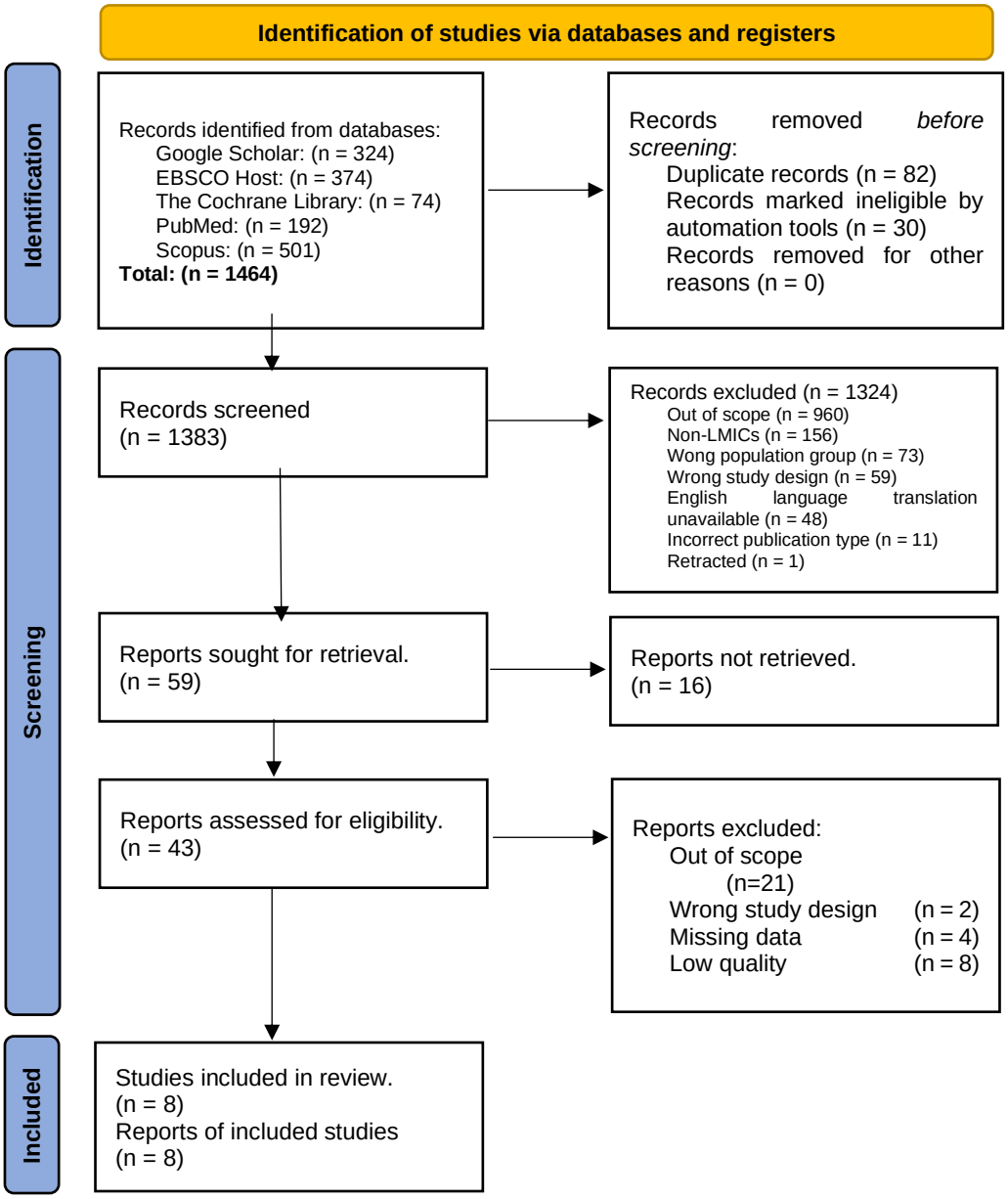

***Figure 1**: PRISMA(9) Flow diagram*

1465 articles were identified through the search strategy from Google Scholar (n =324) EBSCO Host (n = 374); Scopus (n = 501); The Cochrane Library (n = 74); and PubMed (n = 192). 1384 articles remained after the removal of duplicates (n = 82) and those references with no valid sources (n = 30). The remaining articles were screened and 1324 articles were excluded for a number of reasons including being out of scope (n = 960); not being conducted in LMICs (n = 156); wrong population group (n = 73); wrong study design (n = 59); foreign language articles with no English language translation available (n = 48); incorrect types of

publication (n = 11); and those that were retracted (n = 1). 16 articles were inaccessible or unavailable. 44 were identified for full-text review. Of these, 21 were out of scope, 12 had low-quality or missing data, and 2 were the wrong study design. Eight studies were selected for the final review and data extraction. Figure 1 above shows the data selection process.

Characteristics of sources of evidence

Eight studies were included in the final review (2, 23-29). For the full characteristics of the chosen studies, please see **Table 2** below. Six of the studies were randomised control trials (24-29) and 2 were quasi-experimental (pre/post-test) designs (2, 23). Five studies were from Nigeria (Lower-Middle income) (23-26). There was one from Iran (Lower-Middle income) (2), one from Turkey (Lower-Middle income) (29) and one from China (Upper-Middle income) (27). The identified studies looked at a range of interventions including: Mindfulness Based Interventions (MBI) (n = 2) (2, 27), Rational Emotive Therapies (RET) (n = 3) (24-26), Cognitive Behavioural Interventions (CBT) (n = 1) (28), Breathing Therapy (BT) and Emotional Freedom Techniques (EFT) (n = 1) (29), and Critical Thinking Interventions (CTI) (n = 1) (23).

The total number of participants in each study ranged from 52 (25) to 159 (28). Most studies specifically mentioned sample size calculations to ensure they recruited a sufficient number of participants to detect a difference between their study arms (23-29). The interventions were delivered using various methods, including group sessions (n = 7) (23-29), individual sessions (n = 1) (2) and tele-therapy (n = 1) (2). The facilitators were qualified therapists involved in either face to face delivery (n = 3) (2, 27, 28) or virtual delivery (n = 1) (24). Two studies (25, 29) reported using certificated coaches to deliver interventions. Two studies involved self-guided interventions; the first was a specific validated training manual for self-guided practice (n = 1) (26), while the other used audio-guides to deliver intervention content (n = 1) (27). Only one study (23) did not specify the training or expertise of the facilitators. The timing of follow-up assessments varied between studies, ranging from two weeks (25) to three months (23, 24, 28) after receiving the intervention.

These studies included measures of stress-related constructs and are the primary outcomes in this review. The most frequently mentioned measures were the Perceived Stress Scale (PSS) (n = 4) (24-26, 29); the Depression, Anxiety and Stress Scale (DASS) (n = 2) (2, 27); the Exam Stress Scale (ExamSS) (n = 1) (28); and the Academic Stress Questionnaire ASQ (n = 1) (23).

Although these measures have been used and validated in English, only one study specifically mentioned that their version of the DASS had been validated in the local language (27).

***Table 3**: Protocols and key information of studies included in review. (2, 23-29)*

Paper Details	Study Design	Duration and Delivery	Main Outcomes and Follow-Up
Author; Year; Country; Region 1 ***Hall et al*** 2018 China Upper-Middle **Measurement Tools Used in Study:** Depression, anxiety and stress scale (DASS-21) Pittsburgh Sleep Quality Index (PSQI)-Chinese version Adherence questionnaire Demographic information **Design** Randomised Control Trial	**Sampling** Selective **StudyPop** Undergraduates **Control** Waitlist Control **Age** Young Adults (>19 - <40) **Total Participant** 101 **Male** 31 **Femal** 70 **Blinding** Participants blindly allocated to groups **Delivery** 1. Group training sessions. 2. Audioguided individual sessions **Intervention Type** Mindfulness-Based Intervention	**Duration** 24 sessions of 30 minutes each over 12 weeks (2/week), and 2 1.5Hr training sessions on day 1 and day 21. **Delivered by?** Clinical psychologist Audioguides **Quality of Delivery** No fidelity check done, the quality of mindfulness practice was not assessed or factored into the results. Measures were self-reported including adherence questionnaire.	**Outcomes** **Main** Anxiety, stress and depressive symptoms measured using the DASS-21 **2nd** Sleep dysfunction measured by the (PSQI) **3rd** Adherence measured using a researcher designed adherence questionnaire. **Retention** The Control Group had a retention rate of 48.00% (week 4: n = 15, week 7: n = 12), Group 1 40.74% (week4: n = 12, week 7: n = 11), Group 2 62.50% (week4: n = 15, week 7: n = 15), and the Group 3 64% (week 4: n = 17, week 7: n = 16) at the end of the intervention **Follow-up Intervals:** None **Follow-up rates:** N/A
Author; Year; Country; Region 2 ***Ezenwaji et al*** 2019 Nigeria Lower-Middle **Measurement Tools Used in Study:** Perceived stress scale (PSS-10) Oldenburg Burnout inventory-student version (OLBIS) Students' demographic questionnaire (DQ) **Design** Randomised Control Trial	**Sampling** Selective **StudyPop** Undergraduates **Control** No Intervention **Age** Young Adults (>19 - <40) **Total Participant** 52 **Male** 23 **Femal** 29 **Blinding** Participants blindly allocated to groups **Delivery** Group sessions **Intervention Type** Rational Emotive Therapy	**Duration** 24 sessions of 3 hours each over a 12 week period (2/week). **Delivered by?** Experienced REBT coaches **Quality of Delivery** Data collection done by researchers at pre-test, post-test and follow-up. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Stress measured using the PSS (only measured pre-test) **2nd** Symptoms of exhaustion measured using the OLBI-S **3rd** Reduction in disengagement symptoms measured using OLBI-S **Retention** All groups had 100.00% retention at the end of the intervention and at follow up **Follow-up Intervals:** One follow-up 2 weeks post-intervention **Follow-up rates:** 100% at 2 weeks for both groups.
Author; Year; Country; Region 3 ***Agah et al*** 2021 Nigeria Lower-Middle **Measurement Tools Used in Study:** Exam Stress Scale (ExamSS) **Design** Randomised Control Trial	**Sampling** Simple Random **StudyPop** Undergraduates **Control** Waitlist Control **Age** Young Adults (>19 - <40) **Total Participant** 159 **Male** 79 **Femal** 80 **Blinding** Participants blindly allocated to groups, and data de-identified by a 3rd researcher to minimise bias **Delivery** Group sessions **Intervention Type** Cognitive Behavioural Therapy	**Duration** 16 sessions over 8 weeks (2/week). **Delivered by?** Qualified Therapists **Quality of Delivery** Data collection done by researchers at pre-test, post-test and follow-up. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Exam Stress as measured by ExamSS **2nd** **3rd** **Retention** All groups had 100.00% retention at the end of the intervention and at follow up **Follow-up Intervals:** One follow-up 3 months post-intervention **Follow-up rates:** 100% at 3 months for both groups.

Paper Details	Study Design	Duration and Delivery	Main Outcomes and Follow-Up
Author; Year; Country; Region **4** ***Dincer et al*** 2020 Turkey Lower-Middle **Measurement Tools Used in Study:** Perceived Stress Scale (PSS) Subjective units of disturbance scale (SUDS) The state-trait anxiety inventory (STAI TX-1 and TX-2) Speech anxiety scale (SAS) **Design** Randomised Control Trial	**Sampling** Selective **StudyPop** Undergraduates **Control** No Intervention **Age** Young Adults (>19 - <40) **Total Participant** 76 **Male** 8 **Femal** 68 **Blinding** Participants blindly allocated to groups **Delivery** Group sessions **Intervention Type** Breathing Therapy And Emotional Freedom Therapy	**Duration** A single 30 minute session before a public speaking event **Delivered by?** Certified EFT administrator **Quality of Delivery** Single session study, no follow-up sessions, data collected before and after intervention. Measures were self-reported.	**Outcomes** **Main** Stress measured using the PSS & SUDS **2nd** Anxiety measured by STAI **3rd** Speaking anxiety measured by SAS **Retention** All groups had 100.00% retention at the end of the intervention **Follow-up Intervals:** None **Follow-up rates:** N/A
Author; Year; Country; Region **5** ***Ugwuozor et al*** 2021 Nigeria Lower-Middle **Measurement Tools Used in Study:** The Academic Stress Questionnaire (ASQ) The Educational Stress Scale for Undergraduate Students (ESSS) **Design** Quasi-experimental (Pre/Post-Test)	**Sampling** Selective **StudyPop** Undergraduates **Control** No Intervention **Age** Young Adults (>19 - <40) **Total Participant** 103 **Male** 67 **Femal** 36 **Blinding** Not Stated **Delivery** Group sessions **Intervention Type** Critical Thinking	**Duration** 24 sessions of 1 hour each over 12 weeks (2/week) **Delivered by?** Authors (unclear expertise) **Quality of Delivery** Data colletion done by researchers at pre-test, post-test and follow-up. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Stress as measured by ASQ & ESSS **2nd** **3rd** **Retention** All groups had 100.00% retention at the end of the intervention **Follow-up Intervals:** One follow-up 3 months post-intervention **Follow-up rates:** 100% at 3 months for both groups.
Author; Year; Country; Region **6** ***Borjalilu et al*** 2019 Iran Lower-Middle **Measurement Tools Used in Study:** DASS-21 **Design** Pre/Post-Test	**Sampling** Selective **StudyPop** Undergraduates **Control** No Intervention **Age** Young Adults (>19 - <40) **Total Participant** 68 **Male** 20 **Femal** 48 **Blinding** None **Delivery** 12 Individual sessions and 2 group sessions on day 1 and day 20. **Intervention Type** Meditation	**Duration** 12 sessions of unspecified length over 6 weeks (2/week) for the therapy group. The Aramgar group received above plus 20 sessions of varied individualised length dependant on self-reported variables. **Delivered by?** Clinical psychologist **Quality of Delivery** Data collection done by researchers at pre-test and post-test. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Stress as measured by DASS-21 **2nd** Depression as measured by DASS-21 **3rd** Anxiety as measured by DASS-21 **Retention** Rates of retention not reported. **Follow-up Intervals:** None **Follow-up rates:** N/A

Paper Details	Study Design	Duration and Delivery	Main Outcomes and Follow-Up
Author; Year; Country; Region 7 ***Ilechukwu et al*** 2021 Nigeria Lower-Middle **Measurement Tools Used in Study:** Perceived stress scale-10 Socioemographic questionnaire **Design** Randomised Control Trial	**Sampling** Simple Random **StudyPop** Undergraduates **Control** Expert supervised WhatsApp group on stress **Age** Young Adults (>19 - <40) **Total Participant** 150 **Male** 98 **Femal** 52 **Blinding** None **Delivery** Virtual sessions **Intervention Type** Rational Emotive Education	**Duration** 10 sessions of 75 minutes over 10 weeks (1/week) **Delivered by?** WhatsApp (Virtual) **Quality of Delivery** Data collection done by researchers at pre-test and post-test. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Stress as measured by PSS **2nd** **3rd** **Retention** All groups had 100.00% retention at the end of the intervention **Follow-up Intervals:** 1 session/week for 4 weeks at 3 months **Follow-up rates:** 100% at 3 months for both groups.
Author; Year; Country; Region 8 ***Igbokwe et al*** 2019 Nigeria Lower-Middle **Measurement Tools Used in Study:** Perceived stress scale-14 Demographic Questionnaire **Design** Randomised Control Trial	**Sampling** Simple Random **StudyPop** Undergraduates **Control** No Intervention **Age** Young Adults (>19 - <40) **Total Participant** 116 **Male** 40 **Femal** 76 **Blinding** None **Delivery** Group Sessions **Intervention Type** Rational Emotive Behavioural Therapy	**Duration** 20 sessions of 75 minutes over 10 weeks (2/week) **Delivered by?** REBT Manual (Validated) **Quality of Delivery** Data collection done by researchers at pre-test and post-test. No individual session data collected and measures were self-reported.	**Outcomes** **Main** Stress as measured by PSS **2nd** **3rd** **Retention** All groups had 100.00% retention at the end of the intervention **Follow-up Intervals:** One follow-up 2 months post-intervention **Follow-up rates:** 100% at 3 months for both groups.

Critical appraisal within sources of evidence

The studies chosen for this paper were appraised using the CASP Appraisal tool (3) (see Appendix 6) to assess the quality of the studies. The papers were given an appraisal rating of low, medium, or high quality, depending on the information provided in the paper. Of the 8 studies, four were rated as high quality (scoring highly in all three domains on the CASP) (23, 25, 27, 28) and 4 were medium (scoring highly in at least 2 of the three domains of the CASP) (23, 24, 27, 28). It is important to note that none of the studies included a cost benefit analysis, affecting their final appraisal scoring.

Results of individual sources of evidence

Table 4 below, shows detailed results of studies included in the final review. Of the eight included studies two studies were based on Mindfulness Based Interventions (MBI) (2, 27), three were based on rational emotive therapy (24-26). Cognitive Behavioural Therapy (CBT) (28), Critical Thinking Interventions (CT) (23) and Breathing Therapy (29) were featured in one study each. The result of each individual intervention is discussed below.

Mindfulness Based Interventions (MBI)

Two studies investigated the effectiveness of Mindfulness Based Interventions (MBI) in China (27) and Iran (2). They used the DASS as their primary outcome measure. The first was a randomized control trial by Hall et al (27) in China, looking at the effect of mHealth enhanced MBI on 171 undergraduate students who were randomized to one of four groups. The three intervention groups all received the standard MBI. However, given this study was interested in improving intervention retention, one group received a mHealth (mobile health) enhanced MBI and the other a meme reminder and mHealth-enhanced MBI. The fourth was a waitlist control group. The standard MBI consisted of 24 group sessions of 30 minutes each over 12 weeks (two sessions per week), with two 1.5-hour training sessions on day 1 and on day 21. The mHealth group received plain text reminders to improve adherence to home practice, and those in the meme group received a visual message reminder containing pictures of their favourite animals. Those in the control group were placed on a waiting list and received a standard group MBI at the end of the study.

The intervention was facilitated by a clinical audiologist, and audio-guides were provided for home practice, consisting of 30 minutes self-guided mindfulness sessions. Self-guided individual sessions were self-driven and provided in two languages commonly spoken by the study population. Programme completion in the MBI programme varied across the groups,

with the MBI group losing the most participants (n = 16), followed by the control group (n = 13), mHealth (n = 10) and lastly the meme reminder and mHealth group (n = 9). Reasons why these participants did not complete the intervention are not discussed by the authors.

To explore the effectiveness of the intervention, follow-up assessments occurred at 4 weeks and the end (7 weeks). There was no long-term follow-up. The study found that group by time interactions were statistically significant for stress measured by the DASS indicated improvements for the intervention groups compared to control ($p<0.01$). Medium to large effect size differences (Cohen's d = 0.86 to 2.00) were noted at week 4. At week 7, effect sizes of the significant variables were medium to large (Cohen's d = 0.86 to 2.10).

The second study was a quasi-experimental (pre-/post-test design) by Borjalilu et al (2) conducted in Iran in 2019 and involved 116 participants from an Iranian University. It compared the effectiveness of three methods of intervention for stress management in students based on mindfulness-based stress reduction, including Group 1: Aramgar smartphone mindfulness mobile application only (n = 28); Group 2: blended therapy (a combination of face-to-face therapy and the Aramgar smartphone mindfulness mobile application) (n = 20); and Group 3: face-to-face therapy only (n = 20). There was no control. The study consisted of 12 sessions of unspecified length over 6 weeks (two sessions per week) for the therapy group. The Aramgar group received above plus 20 sessions of varied individualised length dependant on self-reported variables. The blended group received both interventions. Similar to Hall (27), a follow-up assessment was conducted immediately after the intervention (at 6 weeks) using the DASS to measure stress. The post-hoc test revealed that the blended therapy group had the greatest mean score reduction stress ($F = 6.384$, $p < 0.001$) compared to the Aramgar application only group or the face-to-face therapy only group.

These two studies point to the effectiveness of MBIs to reduce stress amongst university students, given they used rigorous RCT methods increasing the internal validity. It is also important to consider the limitations of these findings. First, both studies used a convenience sampling method thereby limiting the generalizability of these results. Secondly, Borjalilu et al (2) used the DASS, which is validated only in English, potentially introducing a threat to internal validity. Finally, because follow-ups were only conducted at 4 weeks and the end of the interventions, the long-term effects remain unknown.

Further concerns regarding generalizability need to be considered in the findings by Borjalilu et al (2), given that in order to be included in the study participants had to have Android device (this would exclude 29% of global smart-device users, and would place an onerous hurdle for

those who may have participated but are either unable to access or are untrained in the use of such devices, thereby excluding a key demographic in study population (76)). Furthermore, the relatively low number of study subjects meant that the results from this study, though promising, cannot be generalised.

Rational Emotive Therapy (RET) Interventions

Three randomized control trials assessed the efficacy of interventions based on Rational Emotive Therapy on stress-related problems (24-26). The first was study by Ezenwaji et al (25) conducted in Nigeria, looked at the effectiveness of a Rational Emotive Behaviour Coaching (REBC) intervention among 52 (males: n = 23; females: n = 29) undergraduate students in Southeast Nigeria. The students were randomly allocated either to a group based REBC intervention (n = 26), or an untreated control group (n = 26). The study used the Perceived Stress Scale (PSS) as the primary outcome measure. All intervention group participants completed the 24 group sessions of 3 hours each, over a period of 12 weeks. The interventions were provided by certified and experienced coaches, and the researchers reported 100% follow-up rates in the study. Data collection occurred at the start and the end of the intervention, with a further follow-up at 3 months. The authors reported a significant decrease in stress symptom scores ($p<0.001$) in the treatment compared to the control group. The authors also reported that this reduction remained sustained at follow-up 3 months after the intervention.

Also in 2019, Igbokwe et al (26) conducted a randomised control trial looking at the effect of Rational Emotive Behavioural Therapy (REBT) as a stress management intervention among 116 undergraduate students in South-Eastern Nigeria. The participants were assigned to an REBT group (n = 58) or an untreated control group (n = 58). Both groups had 100.00% retention at the end of the study and at follow up. The study consisted of 20 group sessions of 1 hour 15 minutes over 10 weeks and was based on a validated REBT manual. Although the REBT manual was validated, the expertise of the facilitators was not specified. Data collection occurred before the intervention, immediately after the end of the intervention and again 8 weeks after the intervention ended using the PSS. The results of the study indicated a significant reduction in the stress levels of the intervention group compared to the control group at post-treatment and at 3 months ($p < 0.001$).

More recently in 2021, Ilechukwu et al (24) examined the effectiveness of Rational Emotive Education (REE) on 150 undergraduate students in Nigeria. The intervention consisted of ten 1¼ hours sessions over 10 weeks (one session per week), and participants were randomly allocated to either a REE group (n =75) or a control WhatsApp group (n = 75). The REE group

were supervised by an expert in the field. Those in the control group were put into a WhatsApp group moderated by the researchers, where motivational posts, pictures, and short videos on stress were shared and discussed, and group activities took place on a weekly basis for 1¼ hours. The main outcome measure used was the PSS, collected before the intervention, immediately after the intervention and 3 months after the intervention had ended. The researchers reported a 100.00% retention rate at the end of the study. The authors reported that at follow-up 3 months later, exposure to the REE brought about a more sustained reduction in mean perceived stress scores among the treatment group compared to the control group ($p < 0.001$), which was confirmed when the authors performed within-group analyses ($p < 0.001$).

Although these studies showed some promising results given, they were all RCTs using validated measurement tools, the authors noted several limitations. Ezwenaji et al (25) had a sample that consisted of only young, undergraduate students who were enrolled at public universities in Southeast Nigeria with a mean age of 20, in their first three years of study. This makes any inferences to older and post-graduate students difficult. Included in this was the lack of inclusion of students from other disciplines/faculties and private universities. Furthermore, the short follow-up period of 3 months meant that projections could not be reliably made about the maintenance effect of the intervention. Also noted by the researchers was a lack of intervention for the control group, meaning that these participants received no intervention even after the study was completed, bringing into questions issues around fair and equitable treatment of study individuals. Finally, if the financial incentive offered to participants for the trial by Ezenwaji et al (25) exceeded the costs of the research activities; this may have led to an increase risk of bias, with participants perhaps feeling more inclined to report more positive outcomes.

Cognitive Behavioural Therapy (CBT)

À randomized control trial by Agah et al (28) looked at the effect of the FEAR-Model of cognitive behavioural therapy (CBT) on examination-induced stress in a sample of 159 university students in Nigeria. The study consisted of 16 sessions of 1 hour each, spread over 8 weeks and was delivered by qualified CBT therapists. The study used a randomized pre-test-post-test control group design and outcomes were measured using the Exam Stress Scale (ExamSS). The participants were randomized into the FEAR-Model of CBT group (n = 80) and a waitlisted control group (n = 79). Data were collected before the intervention, at the end of the intervention and 3 months after the intervention. All participants completed the intervention with no loss to follow-up.

The researchers reported a significant effect of the intervention on stress management based on the ExamSS ($p < 0.05$). At post-treatment, there was a significant effect on examination-induced stress ($p = 0.000$); and at follow-up, the effect was maintained ($p = 0.000$). The effect size of 0.889 was noted for the independent variable at post-treatment. There were also significant differences in exam-induced stress management scores as measured with ExamSS between post-treatment and pre-treatment ($p = 0.000$), post-treatment and at 3 months ($p = 0.000$) and finally, between pre-treatment and at 3 months ($p = 0.000$).

Despite the robust study method, the authors did note some limitations including that because this study focused exclusively on managing examination-induced stress, it did not address the potential impacts of academic-related stress on students' learning capacity, academic performance, physical and mental health as well as substance usage among others. And due to the non-representative sample size, the authors caution against generalising these results to the general population.

Breathing Therapy (BT) and Emotional Freedom Techniques (EFT) Interventions

In 2020, Dincer et al (29) conducted a randomized control trial looking at the effect of two interventions, namely, Breathing Therapy (BT) and Emotional Freedom Therapy (EFT) on 76 Turkish nursing students. They were allocated to 3 groups: a BT group ($n = 26$), an EFT group ($n = 25$) and a no-intervention control group ($n = 25$). The study consisted of a single 30-minute session, with no follow-up. Pre and post-test measures were obtained using the PSS. The EFT group was facilitated by the first author, who is a qualified EFT administrator, while the breathing groups was facilitated by the second author (no credentials were provided). The researchers reported a 100.00% retention of participants at the end of the study.

The researchers found that there was a significant effect of both interventions in the stress scores of the participants. The median post-test scores of the BT and EFT groups were found to be significantly lower compared to the control group ($p < 0.005$). There were also significant differences between the pre-test and post-test median scores in both the BT and EFT groups. Scores were found to be statistically significantly different after both BT and EFT ($p<0.001$). The authors also noted that the effect size of EFT was larger than that of the Breathing Therapy (Cohen $d > 0.8$).

Although this study shows promising results due to its robust design, the authors reported several limitations including time constraints and having only one certified EFT instructor. This resulted the experimental groups having a limited number of students. Furthermore, the

authors noted that they did not measure any physiological parameters or hormonal responses associated with anxiety which may have helped to shed a more detailed light on the effects of the intervention. It is also important to note that the study was carried out in one location and only a single brief (30 minutes) intervention without any long-term data collection poses a significant threat to the validity of the results.

Critical Thinking Interventions (CT)

Ugwuozor et al (23) conducted a quasi-experimental (pre/post-test) design study in 2021, examining the effectiveness of a Critical Thinking Intervention (CT) amongst 103 undergraduates attending public universities South-South Nigeria. It was a, consisting of 24 sessions of 1 hour each, provided over 12 weeks. The sessions were facilitated by the authors; however, their expertise was not provided. Participants were randomly allocated to the CT group (n = 51) or the no-intervention control group (n = 52). The study used Academic Stress Questionnaire (ASQ). This study included a single follow-up at 3 months and reported a retention rate of 100.00% throughout the study for both groups. Retention rates were not further explored by the researchers.

The pre-intervention assessment results showed high academic stressor ratings as measured by ASQ, with no significant differences between the two groups. Immediately after the intervention, there were significant mean differences between the treatment and control groups, in favour of the treatment group in the ASQ (P = 0.000, 95% CI = 104.370, 124.342, SE = 4.105). At 3 months significant mean differences were maintained in the ASQ (P = 0.000, 95% CI = 118.593, 139.496, SE = 4.296). These results showed a significant reduction in stress symptoms, an effect that was maintained at follow-up.

Although this study showed promising results, like all studies discussed earlier, it had several limitations. The use of purposive sampling means that the population sample was not representative of the student population in LMICs posing a threat to internal validity. Secondly, although the ASQ is validated in English, it was not translated in a local language, adding further to the threat to internal validity. Lastly the relatively low number of participants means the results should be interpreted with caution.

***Table 4**: Detailed results of included studies (2, 23-29).*

Group Characteristics	Results	Tools + Calculations
1 ***Hall et al*** 31 (31.0%) men and 70 (69.0%) women with a mean age of22.30 years (SD=2.63) were recruited in this study. 55 (54.5%) undergraduates, 39 (38.6%) master students and 7 (6.9%) PhD students. Participant Origin: Mainland China (n = 62, 61.4%), Macao (n = 35, 34.7%), Hong Kong (n = 2, 2.0%) and Taiwan (n = 2, 2.0%). One hundred and one students were enrolled in the trial and participated the baseline survey, and 54 students completed the entire study. Group by time interactions were statistically significant for depression (p<0.01), anxiety (p<0.01), stress (p<0.01), subjective sleep quality (p<0.01), sleep latency (p<0.05), and habitual sleep efficiency (p<0.05), indicating improvements for the intervention groups compared to control. Medium to large effect size differences (Cohens's d=0.86 to 2.00) were obtained at week 4. At week 7, effect sizes of the significant variables were medium to large (Cohen's d=0.86 to 2.10), except the effect of habitual sleep efficiency, which was small (0.18). Statistically significant effects for adherence across all three intervention groups during the period between week 1 and week 4 (p<0.05). Compared to the no text (M=2.60, SD=1.17) and animal meme (M=2.59, SD=0.98) groups, the plain text message group (M=3.62, SD=1.83) reported higher average adherence.	Based on the categorical scores of DASS-21 and PSQI, a large proportion of students reported moderate or higher levels of depression (55.5%), anxiety (64.3%) and stress (47.0%) symptoms. The majority of the students (82.2%) reported sleep dysfunction based on the PSQI. DASS-21, PSQI Group by time interactions were statistically significant for depression, anxiety, stress, subjective sleep quality, sleep latency and habitual sleep efficiency, indicating improvements for the intervention groups compared to wait-list control. Medium to large effect size differences obtained at week 4. At week 7, effect sizes of the significant variables were medium to large, except the effect of habitual sleep efficiency, which was small. Adherence ANOVA results showed a statistically significant effects for adherence across all three intervention groups during the period between week 1 and week 4. Compared to the no text and animal meme groups, the plain text message group reported higher average adherence. However, post-hoc pairwise comparisons did not reveal statistically significant differences between groups. There were no statistically significant effects across the three intervention groups during the second period between week 4 and week 7, and during the entire study period (week1–week7). Drop out analysis Results from logistic regression showed that fourth year students (reference: first year students), OR=0.13, p<0.01, had lower odds of dropping out. Students with previous mindfulness experience (reference: no experience) OR=3.57, p<0.01), and who were experiencing language barriers (reference: no barrier), OR=6.50, p<0.01), had increased odds of drop out.	**Analysis of Variance (ANOVA)** Week 1 – Week 4 G2: M2.60 (SD1.17), G3: M3.62 (SD1.83) G4: M2.59 (SD0.98) F = 2.73 (SD2, 41), p = 0.048* Week 4 – Week 7 G2: M2.33 (SD1.04) G3: M2.78 (SD2.03) G4: M2.29 (SD1.45) F = 0.41 (SD2, 39), p = 0.093 Week 1 – Week 7 G2: M2.58 (SD0.93) G3: M3.26 (SD1.76) G4: M 2.46 (SD1.14) F = 1.48 (SD2, 39), p = 0.073 **Confidence Interval** A statistically significant effect for adherence across all three intervention groups during the period between week 1 and week 4 (p<0.05). Compared to the no text (M=2.60, SD=1.17) and animal meme (M=2.59, SD=0.98) groups, the plain text message group (M=3.62, SD=1.83) reported higher average adherence. However, post-hoc pairwise comparisons did not reveal statistically significant differences between groups. There were no statistically significant effects across the three intervention groups during the second period between week 4 and week 7, and during the entire study period (week1–week7). Results from logistic regression showed that fourth year students (reference: first year students), OR=0.13, p<0.01, had lower odds of dropping out. Students with previous mindfulness experience (reference: no experience) OR=3.57, p<0.01), and who were experiencing language barriers (reference: no barrier), OR=6.50, p<0.01), had increased odds of drop out. **T-Test**

Group Characteristics	Results	Tools + Calculations
2 *Ezenwaji et al* Intervention: 12 (46%) males and 14 (54%) females Control: 11 (42%) males and 15 (58%) females No statistically significant difference, x2 (1)=0.078, P=.782. Mean age: Intervention: 19.81±1.72 years Control: 20.15±1.83 years No statistically significant difference: t (50) = -0.703, P = 0.485, 95% CI = -1.33462, 0.64231. Attendance to the sessions was 100% and no drop-out or report of adverse effects. A significant decrease in OLBI-S-exhaustion and disengagement scores in the treatment group compared to the control (p = 0.000). Follow-up assessment indicated a significant decline in OLBI-S-exhaustion and disengagement scores in the treatment group compared to the control (p = 0.000). Post-treatment, significant mean differences in OLBI-S-exhaustion and disengagement between treatment and control in favour of the treatment group (p = 0.000). At follow-up, significant mean differences in OLBI-S exhaustion and OLBI-S-disengagement between the treatment and control in favour of those in the treatment group (p =0.000).Tthe reduction in OLBI-S-disengagement scores at post-treatment was sustained at follow-up for the treatment group.	ANOVA: There was no significant difference between the treatment and control groups in perceived stress, in the pre-treatment measure as assessed using PSS-10 and no significant difference between the undergraduate students in the treatment and control groups on OLBI-S-exhaustion & disengagement scores. The posttreatment measure revealed a significant decrease in OLBI-S-exhaustion and disengagement scores among undergraduate students in the treatment group compared to students in the control group. Follow-up assessment indicated a significant decline in OLBI-S-exhaustion and disengagement scores among students in the treatment group compared to the control group. Because of the significant differences observed between the treatment group and control group at post-treatment and follow up, the authors conducted a Post-hoc analyses with the aid of Bonferroni corrections: Post-hoc analyses results indicated no significant difference in the mean of both pre-treatment groups as assessed using PSS-10, OLBI-S-exhaustion and disengagement respectively. Post-treatment, significant mean differences in OLBI-S-exhaustion and disengagement were observed between the treatment and control group participants in favour of those in the treatment group. At follow-up, significant mean differences in OLBI-S exhaustion and OLBI-S-disengagement were also observed between the treatment and control group participants in favour of those in the treatment group. OLBI-S-disengagement t-test: Paired t test analyses indicated a significant difference between pre- and post-treatment, pre-treatment and follow up OLBI-S-exhaustion scores, implying that there was a significant mean change in OLBI-S-exhaustion scores of participants in treatment group from. No significant difference was found between post-treatment and follow-up groups in OLBI-S-exhaustion scores implying that the reduction in OLBI-S-exhaustion scores at post-treatment was sustained at follow-up for the treatment group participants. OLBI-S-disengagement t-test: The results of the paired t test analyses indicated a significant difference between pre- and post-treatment, pre-treatment and follow up OLBI-S-disengagement, implying that there was a significant mean change in OLBI-S-disengagement scores of participants in treatment group from pre to post-treatment. No significant difference was found between post-treatment and follow-up groups in OLBI-S-disengagement. This implies that the reduction in OLBI-S-disengagement scores at Time 2 was sustained at Time 3 for the treatment group participants	**Analysis of Variance (ANOVA)** Pre-treatment PSS-10-perceived stress Intervention: (34.98±2.85), Control (35.18±2.93) F(1,51)= 0.035, P=.853, h2p =0.001, DR2=_0.018, SE=0.68 OLBI-S-exhaustion scores: Intervention: (24.09±6.22), Control (20.68±5.81) F(1,51)=2.371, P=.131, h2p =0.052, DR2=_0.053, SE=1.39. OLBI-S-disengagement scores: Intervention: (27.28±3.73), Control (27.18±4.03) F(1,51)=0.004, P=.949, h2p =0.000, DR2=_0.124, SE=0.93 Post-treatment OLBI-S-exhaustion scores: Intervention: (10.86±2.34) Control: (21.15±5.81) F(1,51)=41.789, P=.000, h2p =0.493, DR2=0.634, SE=1.00. OLBI-S-disengagement scores: Intervention (11.49±2.02) Control: (26.82±3.54) F(1,51)=196.036, P=.000, h2p = 0.820, DR2=0.869, SE=0.69 . Follow-up OLBI-S-exhaustion scores: Intervention: (11.03±2.79) Control: (22.24±6.89) F(1,51)=34.012, P=.000, h2p =0.442, DR2=0.467, SE=1.21. OLBI-S-disengagement scores: Intervention: (12.70±2.74) Control: (26.79±4.42) F(1,51)=108.941, P=.000, h2p =0.717, DR2=0.765, SE=0.85. **Confidence Interval** Pre-treatment: PSS-10: P = 0.853, 95% CI = -1.965, 2.366, SE = 1.074 OLBI-S-exhaustion: P = 0.131, 95% CI = -7.885, 1.058, SE = 2.217 OLBI-S-disengagement: P = 0.949, 95% CI = -3.060, 2.871, SE = 1.470 At Time 2, significant mean differences in OLBI-S-exhaustion: P = 0.000, 95% CI = 7.079, 13.499, SE = 1.592 OLBI-S-disengagement: P = 0.000, 95% CI = 13.129, 17.548, SE = 1.096 At Time 3, OLBI-S exhaustion: P = 0.000, 95% CI = 7.336, 15.091, SE = 1.923 OLBI-S-disengagement: P = 0.000, 95% CI = 11.375, 16.823, SE = 1.351 **T-Test** OLBI-S-exhaustion: Pre- and post-treatment: t (51) = 5.877, P = 0.000, 95% CI = 4.20349, 8.56574, SE Mean = 1.086. Pre-treatment and follow up: t (51) = 4.552, P = 0.000, 95% CI = 0.21401, 8.28599, SE Mean = 1.263. Post-treatment and follow-up: t (51) =-0.833, P= 0.409, 95% CI =-2.16349, 0.89426, SE Mean = 0.762. OLBI-S-disengagement Pre- and post-treatment: t (51) = 6.789, P = 0.000, 95% CI = 5.68847, 10.46537, SE Mean = 1.189. Pre-treatment and follow up: t (51) = 6.641, P = 0.000, 95% CI = 5.21936, 9.74217, SE Mean = 1.126. Post-treatment and follow-up: t (51) =-1.582, P = 0.120, 95%CI = -1.35260, 0.16030, SE Mean = 0.377.

Group Characteristics	Results	Tools + Calculations
3 *Agah et al*	There was a significant effect of intervention on participants' examination stress management as measured with ExamSS. This result means that participants' examination stress management scores of the intervention groups were significantly different at post-treatment and follow-up measures. Before the treatment, there was no significant difference among the treatments and control groups at initial examination-induced stress of participants as measured with ExamSS. At the post-treatment level, the intervention had a significant effect on participants' examination-induced stress and after the post-treatment, a follow-up result still shows that intervention had a significant effect on participants' examination-induced stress as measured with ExamSS. The effect size indicates that the treatment variable accounted for large effect in reducing examination-induced stress scores of participants. There were significant differences in the examination-induced stress management scores of participants as measured with ExamSS between post-treatment and pre-treatment, post-treatment and follow-up and between pre-treatment and follow-up. This result equally indicates that the examination-induced stress management scores of participants measured with Exam Stress Scale (ExamSS) decreased after the intervention program with FEAR-Model of cognitive behavioural therapy.	**Analysis of Variance (ANOVA)** Pre-treatment: F= 0.762, p = 0.384, d = 0.244 Post-treatment: F = 24.723, p = 0.000, d = 0.889 Follow-up: F = 15.076, p = 0.000, d = 0.615 **Confidence Interval** Pre-treatment: Treatment: Mean (SD) = 69.06 (3.67), 95% CI = 68.14–69.42 Control: Mean (SD) = 68.47 (4.48) Post-treatment: Treatment: Mean (SD) = 45.77 (4.60), 95% CI = 46.94–48.42 Control: Mean (SD) = 49.68 (6.19) Follow-up: Treatment: Mean (SD) = 30.41 (4.73), 95% CI = 31.11–32.58 Control: Mean (SD) = 33.26 (4.59) **T-Test** Post-treatment and pre-treatment (X diff = 21.036, p = 0.000) Post-treatment and follow-up (X diff = 15.890, p = 0.000) Pre-treatment and follow-up (X diff = 36.926, p = 0.000).
Treatment group 38 males (47.5%) and 42 females (52.5%) Waitlisted control group 41 males (51.9%) and 38 (48.1%) females. No significant gender difference was observed among the study participants. Treatment-group: 22 (27.5%) : <2H exam prep time, 27 (33.8%): 3-4 H exam prep time, 31 (38.7%) : >4H59 exam prep time. Waitlisted control group: 25 (31.6%) : <2H exam prep time, 28 (35.4%): 3-4 H exam prep time, 26 (32.9%) : >4H59 exam prep time. No significant examination preparation time difference was observed among the participants Treatment group: 15 (20.0%): year 1, 17 (21.3%): year 2, 18 (22.5%): year 3, 29 (36.2%): year 4. Waitlist control group: 14 (17.7%): year 1, 23 (29.1%): year 2, 15 (19.0%): year 3, 27 (34.2%): year 4. No significant difference in year of study was observed among the participants.		
There was a significant effect of intervention on stress management as measured with ExamSS ($p < 0.05$). At the post-treatment level, intervention had a significant effect on examination-induced stress as measured with ExamSS ($p = 0.000$); and after the post-treatment, a follow-up result still shows that intervention had a significant effect on examination-induced stress as measured with ExamSS ($p = 0.000$).The effect size of the independent variable at post-treatment for the dependent measure (ExamSS) was 0.889. There were significant differences in the examination-induced stress management scores of participants as measured with ExamSS between post-treatment and pre-treatment ($p = 0.000$), post-treatment and follow-up ($p = 0.000$) and between pre-treatment and follow-up ($p = 0.000$).		

Group Characteristics	Results	Tools + Calculations
4 ***Dincer et al***	The descriptive characteristics of the students in the EFT, Breathing Therapy, and control groups were homogeneously distributed.	**Analysis of Variance (ANOVA)**
Age: p = 0.597 BT: 20.42 ±0.75, EFT: 20.44 ±0.76, Control: 20.24 ±0.92 Gender: p = 0.88 Female: BT: 23 (88.5%), EFT: 23 (92%), Control: 22 (88%) Male: BT: 3 (11.5%), EFT 8 (8%), Control: 3 (12%) Accommodation: p = 0.74 Living with parents/relatives: BT: 4 (15.4%) EFT: 4 (16%), Control: 2 (8%) Student dormitory: BT: 19 (73.1%), EFT: 20 (80%), Control: 22 (88%) With housemate: BT: 3 (11.5%), EFT: 1 (4%), Control: 1 (4%) Economic status: p = 0.92 Good: BT: 3 (11.5%), EFT: 2 (8%), Control: 3 (12%) Average: BT: 11 (42.3%), EFT: 13 (53%), Control: 10 (40%) Poor: BT: 12 (46.2%), EFT: 10 (40%), Control: 12 (48%) Stressed Personality: p = 0.54 Have: BT: 23 (88.5%), EFT: 22 (88%), Control 24 (96%) Do not: BT: 3 (11.5%), EFT: 3 (12%), Control: 1 (4%)	The median pre-test SUDS scores were not significantly different across the groups. The median post-test SUD scores of the Breathing Therapy and EFT groups were statistically significantly lower compared to the control group. The median pre-test STAI-TX1 and STAI-TX2 scores of the groups were similar. The median post-test STAI-TX1 scores of the Breathing Therapy and EFT groups were significantly lower in the intervention groups compared to the control group. The median post-test scores of STAI-TX2 were not different across the groups. There were no statistically significant differences across the pre-test SAS scores of the groups. The median post-test SAS scores of the Breathing Therapy and EFT groups were found to be significantly lower compared to the control group. There were significant differences between the pre-test and post-test median scores in both the Breathing Therapy group and the EFT groups. Speaking anxiety scores were found to be statistically significantly different after both Breathing Therapy and EFT.	**Confidence Interval** Power analysis 89,8% **T-Test**
The median post-test SUD scores of the Breathing Therapy and EFT groups were statistically significantly lower compared to the control group ($p<0.001$). The median post-test STAI-TX1 scores of the Breathing Therapy and EFT groups were significantly lower in the intervention groups compared to the control group ($p<0.001$). The median post-test scores of STAI-TX2 were not different across the groups ($p>0.005$). The median post-test SAS scores of the Breathing Therapy and EFT groups were found to be significantly lower compared to the control group ($p<0.05$).There were significant differences between the pre-test and post-test median scores in both the Breathing Therapy group and the EFT groups. Speaking anxiety scores were found to be statistically significantly different after both Breathing Therapy and EFT ($p<0.001$). The effect size of EFT on speaking anxiety was larger than that of the Breathing Therapy (Cohen d > 0.8).		

Group Characteristics	Results	Tools + Calculations
5 *Ugwuozor et al*	Before the intervention, assessment results showed that the ratings regarding academic stressors measured by ASQ was high, with no difference between those in the treatment group and those in no-treatment control group. However, after the CTI intervention, the assessment indicated a significant reduction in the academic stressors rating of the participants in the treatment group when compared to those in the no-treatment control group. Follow-up assessment further showed additional significant reduction in the academic stressors rating of the participants in the treatment group when compared to those in the no-treatment control group.	**Analysis of Variance (ANOVA)** ANOVA Pre-test: ASQ: F(1,102) = 0.031, P=.861 h(2/p) = 0.000 ESSS: F(1, 102) =.028, P=.867, h(2/p) = 0.000 Post-test: ASQ: F(1,102) = 776.43, P = 0.001, h(2/p) = 0.885 ESSS: F(1, 102) = 1647.5, P>0.001, h(2/p) = 0.942 Follow-up: ASQ: F(1,102) = 977.77, P>0.001, h(2/p) = 0.906 ESSS: F(1,102) = 1754.5, P>0.001, h(2/p) = 0.946
Mean age: 24.62. Male 65% female 35%. 80.3% were single 78% had religious affiliations 48% were financially prosperous. All participants were in their final year.	Before the intervention, assessment results showed that stress level of participants measured by ESSS was high, with no difference between those in the treatment group and those in the no-treatment control group, Assessment after the CTI intervention program indicated a significant reduction in level of stress of the participants in the treatment group when compared to those in the no-treatment control group. The follow-up assessment specified that there was further significant reduction in stress level measured of the participants in the treatment group, compared to those in the no-treatment control group. The results mean that CTI was effective in reducing the level of stress among undergraduates in the Nigerian Universities. Thus, the hypothesis that CTI will result in stress reduction among undergraduates who are exposed to a treatment intervention group, compared to a no-treatment control group, was accepted. Post-hoc analyses: There was no significant difference in the mean of both pre-test groups as assessed using ASQ, and ESSS, respectively. After CTI, significant mean differences between the treatment and control group participants were noted in favour of those in the treatment group in ASQ and ESSS respectively. At follow-up, significant mean differences in ASQ and ESSS were also observed between the treatment and control group participants were noted in favour of those in the treatment group.	**Confidence Interval** Bonferroni corrections Pre-Test ASQ: P = 0.861, 95% CI=_13.936, 16.075, SE = 6.16 ESSS: P = 0.872, 95%CI=_3.860, 4.421, SE = 1.702 Post-Test: ASQ: P = 0.000, 95%CI=104.370, 124.342, SE = 4.105 ESSS: P = 0.000, 95%CI=46.630, 52.710, SE = 1.250 Follow-Up: ASQ: P = 0.000, 95%CI=118.593, 139.496, SE = 4.296 ESSS: P = 0.000, 95%CI=47.083, 52.848, SE = 1.185
Post-test significant mean differences between the treatment and control in favor of the treatment group in ASQ (P=.000, 95%CI=104.370, 124.342, SE=4.105), and ESSS (P=.000, 95%CI=46.630, 52.710, SE= 1.250) respectively. Follow-up significant mean differences in ASQ (P=.000, 95%CI=118.593, 139.496, SE=4.296), and ESSS (P=.000, 95%CI=47.083, 52.848, SE=1.185) were also observed between the treatment and control in favor of the treatment group.		**T-Test**

Group Characteristics	Results	Tools + Calculations
6 *Borjalilu et al*	The participants' mean age was 24.29 ± 3.21 years. In terms of demographics, 71% of them were female, 47% were single, and 37% were married; 29% of the students were employed and the others were unemployed. The results of parallel investigations on the three groups proved no significant difference between the three groups in terms of age (P > 0.05). The demographic features of the participants are given in Table 1. There was a significant difference in the mean reduction of depression score (posttest score minus pretest score) between Group 1, Group 2, and Group 3 (F = 5.24, P < 0.001). There was a significant difference in the mean reduction of anxiety score between Group 1, Group 2, and Group 3 (F = 4.384, P< 0.001). Therewas a significant difference in the mean reduction of stress score between Group 1, Group 2, and Group 3 (F = 6.384, P < 0.001). The Post hoc test showed that Group 2 had the greatest mean score reduction on stress, depression, and anxiety among the three groups.	**Analysis of Variance (ANOVA)** Depression F = 5.24 p < 0.001 Anxiety F = 4.384 p < 0.001 Stress F = 6.384 p < 0.001 **Confidence Interval** Depression (mean) Aramgar mobile application (Group 1) Pre-test = 15.2 ±16.21 Post-test = 12.22±5.34 Blended intervention (Group 2) Pre-test = 15.68±5.34 Post-test = 8.11±4.96 Face-to-face sessions (Group 3) Pre-test = 16.11±5.56 Post-test = 9.45±5.67 Anxiety (mean) Aramgar mobile application (Group 1) Pre-test = 13.54±5.01 Post-test = 11.23±4.34 Blended intervention (Group 2) Pre-test = 14.67±4.53 Post-test = 8.34±5.45 Face-to-face sessions (Group 3) Pre-test = 13.45±5.04 Post-test = 10.61±4.73 Stress (mean) Aramgar mobile application (Group 1) Pre-test = 14.34±5.45 Post-test = 11.43±4.57 Blended intervention (Group 2) Pre-test = 15.76±6.67 Post-test = 9.76±5.45 Face-to-face sessions (Group 3) Pre-test = 15.54±5.34 Post-test = 10.34±4.34 **T-Test**
Mean age: Total: 24.29 ±3.21, G1: 24.61±3.23, G2: 24.23±3.01, G3: 24.53±3.00 Gender Female: Total: 48 (71%), G1: 18, G2: 10, G3: 12 Male: Total: 20 (29%), G1: 10, G2: 10, G3: 8 Marital status Single: Total: 32 (47%), G1: 15, G2: 8, G3: 13 Married: Total: 25 (37%), G1: 10, G2: 8, G3: 3 Widowed/ divorced/ separated: Total: 11 (16%), G1: 3, G2: 4, G3: 4 Job status Employed: Total: 20 (29%), G1: 10, G2: 4, G3: 5 Never employed: Total: 48 (71%), G1: 18, G2: 16, G3: 15		
There was a significant difference in the mean reduction of depression score (posttest score minus pretest score) between Group 1, Group 2, and Group 3 (F = 5.24, P < 0.001). There was a significant difference in the mean reduction of anxiety score between Group 1, Group 2, and Group 3 (F = 4.384, P< 0.001). Therewas a significant difference in the mean reduction of stress score between Group 1, Group 2, and Group 3 (F = 6.384, P < 0.001). The Post hoc test showed that Group 2 had the greatest mean score reduction on stress, depression, and anxiety among the three groups.		

Group Characteristics	Results	Tools + Calculations
7 *Ilechukwu et al*	The baseline result revealed that the Religious Education students perceived stress level is very high with no significant difference recorded between the treatment and control groups. In addition, the results also show that at post-treatment assessment, exposure to the REE brought about more significant reduction in mean perceived stress scores among the treatment group, compared with participants in the control group. At follow-up, results revealed more sustenance of the significant decrease in mean perceived stress scores of the treatment group compared with participants in the control group. The paired sample t test (within-group) analysis results revealed a significant change in mean perceived stress scores of the religious education students in the treatment group. That is to say that the within-group analysis showed a significant change in mean perceived stress scores of the religious education students in the treatment group at Time 1 paired with Time 2; this significant change in mean perceived stress scores among religious education students was sustained at Time 2 paired with Time 3. On the other hand, the significant change in mean perceived stress score of religious education students in the control group at Time 1 paired with Time 2 was still at the high perceived stress range and this outcome was retained at Time 2 paired with Time 3.	**Analysis of Variance (ANOVA)** Pre-test [F = 1.28, P = 0,259] Post-test [F = 2450,76, p < 0.001] Follow-Up [F = 2533.27, p < 0,001] **Confidence Interval** Pre-test Treatment: n = 75, M±SD 36.14±3.72, 95% CI = 35.29–37.00, t = –1.133, p = 0.259 Control: n = 75, M±SD 36.85±3.92, 95% CI = 35.95–37.76 Post-test Treatment: n = 75, M±SD 12.35±2.89, 95% CI = 11.80–12.89, t = –49.505, p < 0.001 Control: n = 75, M±SD 35.35±4.90, 95% CI = 34.60–36.09 Follow-Up Treatment: n = 75, M±SD 11.79±3.49, 95% CI = 10.98–12.59. t = –50.332, p < 0.001 Control: n = 75, M±SD 36.49±2.43, 95% CI = 29.48–32.50
Male: Int(n(%)) = 48 (32.0%), Con(n(%)) = 50 (33.3%), x2 = 0.118, p = 0.864 Female: Int(n(%)) = 27 (18.0%), Con(n(%)) = 25 (16.7%) Age: Int(Mean±SD) = 22.67±4.07, Con(Mean±SD) = 21.64±2.68, x2 = 1.823, p = 0.071 Residence Campus: Int(n(%)) = 34 (22.7%), Con(n(%)) = 27 (18.0%), x2 = 1.354, p = 0.319 Off-campus: Int(n(%)) = 41 (27.3%), Con(n(%)) =48 (32.0%) Monthly allowance Less than 20K: Int(n(%)) = 16 (10.7%), Con(n(%)) = 20 (13.3%), x2 = 1.227, p = 0.541 20K–50K: Int(n(%)) = 31 (20.7%), Con(n(%)) = 33 (22.0%) Above 50K: Int(n(%)) = 28 (18.7%), Con(n(%)) = 22 (14.7%) Year of study 1st year: Int(n(%)) = 17 (11.3%), Con(n(%)) = 25 (16.7%), x2 = 2.873, p = 0.412 2nd year: Int(n(%)) = 21 (14.0%), Con(n(%)) = 20 (13.3%) 3rd year: Int(n(%)) = 22 (14.7%), Con(n(%)) = 15 (10.0%) Final year: Int(n(%)) = 15 (10.0.5%), Con(n(%)) = 15 (10.0%) Ethnicity Hausa: Int(n(%)) = 12 (8.0%), Con(n(%)) = 9 (6.0%), x2 = 0.844, p = 0.839 Igbo: Int(n(%)) = 17 (11.3%), Con(n(%)) =15 (10.0%) Yoruba: Int(n(%))= 35 (23.3%), Con(n(%)) = 38 (25.3%) Others: Int(n(%))= 11 (7.3%), Con(n(%)) = 13 (8.7%) Location Urban: Int(n(%)) = 38 (25.3%), Con(n(%)) = 42 (28.0%), x2 = 0.429, p = 0.624 Rural: Int(n(%)) = 37 (24.7%), Con(n(%)) = 33 (22.0%)		**T-Test** PSS-10 Treatment Time 1: Mean±SD = 36.15±3.72, t = 49.214, df =74, p < 0.001 Time 2: Mean±SD = 12.35±2.89 Time 2: Mean±SD = 12.35±2.89, t = 1.28, df =74, p = 0.202 Time 3: Mean±SD = 11.79±3.49 Control Time 1: Mean±SD = 36.85±3.92, t = 2.432, df = 74, p = 0.017 Time 2: Mean±SD = 35.35±3.24 Time 2: Mean±SD = 35.35±3.24, t = –2.520, df = 74, p = 0.014 Time 3: Mean±SD = 36.49±2.43
Exposure to the REE brought about more significant reduction in mean perceived stress scores among the treatment group compared with the control group (p < 0.001). Follow-up results a sustained significant decrease in mean perceived stress scores of the treatment group compared with the control group (p < 0.001). Within-group analysis showed a significant change in mean perceived stress scores of the treatment group at Time 1 paired with Time 2 (p < 0.001); this significant change in mean perceived stress scores was sustained at Time 2 paired with Time 3 (p = 0.202). The significant change in mean perceived stress score of the control group at Time 1 paired with Time 2 (p = 0.017) was still at the high perceived stress range and this outcome was retained at Time 2 paired with Time 3 (p = 0.014).		

Group Characteristics	Results	Tools + Calculations
8 *Igbokwe et al*	The mean stress of the no-intervention control group were not significantly different across the 3 Times of measure. For the intervention group, the mean stress scores show a significant decrease in stress across the Times of. Result of t test showed that for Time 1 (the baseline data), there was no significant difference between the mean stress level of the intervention group and the control group. The two-way mixed repeated measures ANOVA results showed that there was a significant overall main effect of time on students' stress level scores. In addition, there was a significant main effect of group on students' stress level. Also, our ANOVA result indicated that the interaction between Time and group was significant. Significant differences observed across the groups over time were explored further via a post-hoc analysis for pairwise comparison. The post-hoc result showed that for students in the intervention group, the difference in their mean stress scores across the 3 Times of measure was significant with all P values<.001, this was however not the case for the control group. Again, a between-group pairwise comparison for each Time showed a significant difference between the stress level of the intervention group and the control groups for Time 2 and Time 3 with all P values<.001. These results support our proposition of the significant effect of REBT in reducing stress among English education students.	**Analysis of Variance (ANOVA)** Time: Sum of Squares (SS) = 7965.661, df = 2, Mean of Squares (MS) = 3982.830, Error(df) = 228, F = 218.938, p <0.001, np2 = 0.658 Groups: SS = 16249.667, df = 1, MS = 16249.667, Error(df) = 114, F = 392.173, p <0.001, np2 = 0.775 Time X Group: SS = 7841.316, df = 2, MS = 7841.316, Error(df) = 228, F = 215.520, p <0.001, np2 = 0.654 **Confidence Interval** Within-group pairwise comparison at different times for each group. Intervention Time (I) = 1 Time (J) = 2, Mean difference (I-J) = 18.379, p <0.001, 95% CI (17.022, 19.737) Time (J) = 3, Mean difference (I-J) = 21.655, p <0.001, 95% CI (20.275, 23.035) Time (I) = 2 Time (J) = 1, Mean difference (I-J) = -18.379, p <0.001, 95% CI (-19.737, -17.022) Time (J) = 3, Mean difference (I-J) = 3.276, p <0.001, 95% CI (2.224, 4.328) Time (I) = 3 Time (J) = 1, Mean difference (I-J) = -21.655, p <0.001, 95% CI (-23.035, -20.275) Time (J) = 2, Mean difference (I-J) = -3.276, p <0.001, 95% CI (-4.328, -2.224) Control Time (I) = 1 Time (J) = 2, Mean difference (I-J) = 0.241, p = 1.00, 95% CI (-2.225, 2.708) Time (J) = 3, Mean difference (I-J) = -0.017, p = 1.00, 95% CI (-2.510, 2.475) Time (I) = 2 Time (J) = 1, Mean difference (I-J) = -0.241, p = 1.00, 95% CI (-2.708, 2.225) Time (J) = 3, Mean difference (I-J) = -0.259, p = 1.00, 95% CI (-2.657, 2.140) Time (I) = 3 Time (J) = 1, Mean difference (I-J) = 0.017, p = 1.00, 95% CI (-2.475, 2.510) Time (J) = 2, Mean difference (I-J) = 0.259, p = 1.00, 95% CI (-2.140, 2.657) Between-group pairwise comparison of stress levels at different times. Time 1 Group (I) = Intervention, Group (J) = Control, Mean difference (I-J) = 0.397, p = 0.492, 95% CI (-0.752, 1.545) Group (I) = Control, Group (J) = Intervention, Mean difference (I-J) = -0.397, p = 0.492, 95% CI (-1.545, 0.752) Time 2 Group (I) = Intervention, Group (J) = Control, Mean difference (I-J) = 18.534, p <0.001, 95% CI (16.608, 20.461) Group (I) = Control, Group (J) = Intervention, Mean difference (I-J) = -18.534, p <0.001, 95% CI (-20.461, -16.608) Time 3 Group (I) = Intervention, Group (J) = Control, Mean difference (I-J) = 22.069, p <0.001, 95% CI (20.605, 23.533) Group (I) = Control, Group (J) = Intervention, Mean difference (I-J) = -22.069, p <0.001, 95% CI (23.533, -20.605)
Age: Int(Mean±SD) = 21.22±1.80, Con(Mean±SD) = 20.47±1.45, t-test = 2.500, p = .014 Gender Male: Int(n(%)) = 21 (52.50), Con(n(%)) = 19 (47.50), x2 = 0.153, p = 0.696 Female: Int(n(%)) = 37 (48.68), Con(n(%)) = 39 (51.32) Year of study Year 1: Int(n(%)) = 10 (45.45), Con(n(%)) = 12 (54.55), x2 = 0.983, p = 0.805 Year 2: Int(n(%)) = 18 (54.54), Con(n(%)) = 15 (45.46) Year 3: Int(n(%)) = 21 (52.5), Con(n(%)) = 19 (47.50) Year 4: Int(n(%)) = 9 (42.86), Con(n(%)) = 12 (57.14) Residence: Off campus: Int(n(%)) = 23 (52.27), Con(n(%)) = 21 (47.73), x2 = 0.036, p = 0.849 Campus: Int(n(%)) = 35 (48.61), Con(n(%)) = 37 (51.39) Marital status: Single: Int(n(%)) = 47 (47.47), Con(n(%)) = 52 (52.53), x2 = 1.732, p = 0.189 Married: Int(n(%)) = 11 (67.71), Con(n(%)) = 6 (35.29) Monthly allowance: N10,000 or less 35: Int(n(%)) = (52.24), Con(n(%)) = 32 (47.76), x2 = 8.029 .018 N10,000 - N20,000: Int(n(%)) = 15 (37.50), Con(n(%)) = 25 (62.50) >N20,000: Int(n(%)) = 8 (88.89), Con(n(%)) = 1 (11.11) Ethnicity: Ibo: Int(n(%)) = 44 (46.81), Con(n(%)) = 50 (53.19), x2 = 3.460, p = 0.326 Hausa: Int(n(%)) = 2 (66.67), Con(n(%)) = 1 (37.33) Yoruba: Int(n(%)) = 5 (83.33), Con(n(%)) = 1 (16.67) Others: Int(n(%)) = 7 (53.85), Con(n(%)) = 6 (46.15) Parent relationship status: Parents alive and together: Int(n(%)) = 30 (44.78), Con (n(%)) = 37 (52.22), x2 = 5.096, p = 0.165 Both parents alive but separated: Int(n(%)) = 2 (28.57), Con(n(%)) = 5 (71.43) One parent alive: Int(n(%)) = 18 (50.06), Con(n(%)) = 13 (39.94) Neither parents alive: Int(n(%)) = 8 (72.72), Con(n(%)) = 3 (27.28)		
There was a significant overall main effect of time on students' stress level scores ($p < 0.001$).There was also significant main effect of group on students'stress level, ($p < 0.001$). ANOVA results indicated that the interaction between Time and group was significant ($p < 0.001$) and the difference in their mean stress scores across the 3 Times of measure was significant ($p < 0.001$). Between-group pairwise comparison for each Time showed a significant difference between the stress level of the intervention group and the control groups for Time 2 and Time 3 ($p < 0.001$).		

T-Test

DISCUSSION

Summary of evidence

This study identified six RCTs (24-29) and two quasi-experimental (pre-/post-test) design (2, 23) studies from LMICs exploring the effectiveness of a range of interventions including: MBI (n = 2) (2, 27), RET (n = 3) (24-26), CBT (n = 1) (28), BT and EFT (n = 1) (29), and CTI (n = 1) (23). Appraisal for this study was done using the CASP Appraisal tool (3) (see Appendix 6) to assess the quality of the studies. Four papers were rated as high quality (scoring highly in all three domains on the CASP) (23, 25, 27, 28) and 4 were rated as medium (scoring highly in at least 2 of the three domains of the CASP) (2, 24, 26, 29). It is important to note that given the nature of these studies (psychological/psychosocial in nature) blinding of participants to intervention was not possible, resulting in a high risk of participant and observer bias.

Although all the studies provided significant results that suggest the effectiveness of these interventions, with a majority applying the gold standard RCT study designs, further replication of these studies is required before we can draw definitive conclusions regarding their effectiveness. The interventions under investigation in all of the above mentioned studies showed significant reduction in stress symptoms among university students (2, 23-29). Several studies included data that suggested this reduction was maintained at 2 weeks (25), 2 months (26), and 3 months(24) after the RET intervention had ended. Both CBT and CTI also showed significant reductions in stress symptoms and effects were maintained 3 months after the intervention had ended (23, 28).

The studies included in this review shared some strengths and weakness. First, as more studies are conducted investigating the effectiveness of interventions to reduce stress among university studies, it is important to consider how these studies measure stress. As discussed in the introduction, stress is poorly defined, and the term has come to mean an overarching number of psychological and physiological states (17). In the studies included in this review, the DASS (n = 2) (2, 27); PSS (n = 4) (24-26, 29); ExamSS (n = 1) (28); and the ASQ (n = 1) (23) were used. Although the abovenamed formal reporting measures have been validated in other studies internationally predominantly in English (77-80), most studies included in this review did not report on the validity the tool for their local population with the exception of two (2, 27). Of these, only one provided a validated tool in a local language (27).

Second, most studies lacked long-term follow-up data. Three studies involved only a single post-intervention data collection (2, 27, 29), one included data collected two weeks after the end of the intervention period (25), another included data collected two months after the end

of the intervention (26), while only three studies included data collected three months after the end of intervention period (23, 24, 28) . This means no inferences could be made about the long-term maintenance of the intervention effect. Future studies should consider longer term follow-up.

Third, although many of these studies utilized a task-sharing model to deliver the intervention (2, 23, 26, 27, 29), fidelity and competency in intervention delivery were not mentioned in several of the studies (2, 23-26, 28, 29). Task-sharing has shown to be an effective way of addressing the scarcity of specialist mental health professionals in LMICs (81). However, it is important to ensure that non-specialists receive appropriate training and supervision to competently deliver manualized interventions (82). Future researchers should take this into consideration when designing studies to study the effectiveness of these interventions.

Further, most studies (23-26, 28) (n = 5) reported 100% retention to the intervention as well as 100% follow-up, however, three studies did not (2, 27, 29). One study in particular did look at improving adherence to MBIs through the use of telemedicine (27). However, given that the data on adherence relied on self-report and the quality and length of practice was not adequately reported or measured, it is difficult to interpret these results accurately. This makes it very difficult to plan interventions targeted towards the study population of interest, that are not only effective, but also address the challenge of low uptake amongst this population.

Sixth, the inclusion and exclusion criteria for the studies were rather varied, with certain studies (n = 5) (23-26, 28), selecting for students who scored significantly higher on stress measures than the surveyed population, while other studies (n = 3) (2, 27, 29), relied on volunteers, and had no lower threshold for reported stress. One study in particular excluded all participants who did not have access to a particular type of electronic device (2). These different criteria also mean that implementing standardized programmes focused on the well-being within student services will remain a challenge, as none of these individual samples are themselves representative of the student population, and this highlights the need for further study in this area.

Furthermore, it was not possible to ascertain whether these interventions provided better value than existing interventions, as none of these studies did comparisons to answer this question. It is therefore evident that although these interventions may be effective non-pharmacological treatments for stress-related problems, further research is required to confirm these findings.

Limitations

By their nature, scoping reviews merge data from a variety of sources with varying study types, and present an overview of the data (83). As such, they do not formally interrogate the quality of the evidence. However, the results were reported using the PRISMA-ScR guidelines, which provide a robust framework to report the findings of the scoping review (10) (See Appendix 2). The studies included in this review were also assessed for quality using the CASP checklist (3), with only 4 studies scoring highly in all domains (23, 25, 27, 28). Finally, due to the limited nature of this review, data synthesis was limited to full-text, English articles published between January 2010 and February 2022. This decision was taken for practical reasons. It is important to note however, that this may have led to potentially relevant studies in other languages not being included in the final review.

Conclusions

This scoping review set out to identify non-pharmacological interventions to reduce stress in university students. Several interventions were identified including MBI, CBT, CTI, RET, BT, and EFT. Based on the identified research papers, it was not possible to make any definitive recommendations of any of these interventions as effective treatment methods for stress-related problem. This study highlights the significant limitations of available studies and highlights the need for further research in this area. This would help in identifying cost-effective measures that present better value than existing structures and interventions.

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Appendix 1

Scopus Search 22-02-2022

#	Search String	Results
1	TITLE-ABS-KEY **("Stress psychological" OR "stress" OR "Psychological stresses" OR "Stresses Psychological" OR "Life Stress" OR "Life Stresses" OR "Stress Life" OR "Stresses Life" OR "Stress Psychologic" OR "Psychologic Stress" OR "Stressor Psychological" OR "Psychological Stressor" OR "Psychological Stressors" OR "Stressors Psychological" OR "Psychological Stress")**	2,814,015
2	TITLE-ABS-KEY **(anxiety OR "Neuroses Anxiety" OR "Anxiety Neuroses" OR "Anxiety States" OR "Neurotic Anxiety State" OR neurotic OR "Neurotic Anxiety States" OR "State Neurotic Anxiety" OR "States Neurotic Anxiety")**	473,688
3	TITLE-ABS-**KEY ("University Student" OR "University Students" OR "College Student" OR "College Students" OR "Undergraduate Student" OR "Undergraduate Students" OR "Postgraduate Student" OR "Postgraduate Students" OR "Higher Education" OR "Tertiary Student" OR "Tertiary Students")**	337,404
4	TITLE-ABS-KEY **("deprived countries" OR "deprived country" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "developing countries" OR "developing country" OR "developing economies" OR "developing economy" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "lami countries" OR "lami country" OR "less developed countries" OR "less developed country" OR "less developed economies" OR "less developed economy" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed countries" OR "lesser developed country" OR "lesser developed economies" OR "lesser developed economy" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "LMIC" OR "LMICS" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "low income countries" OR "low income country" OR "low income economies" OR "low income economy" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR "lower income countries" OR "lower income country" OR "lower income economies" OR "lower income economy" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "middle income countries" OR "middle income country" OR "middle income economies" OR "middle income economy" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "poor countries" OR "poor country" OR "Poor Economies" OR "Poor Economy" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer countries" OR "poorer country" OR "Poorer Economies" OR "Poorer Economy" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "third world" OR "transitional countries" OR "transitional country" OR "Transitional Economies" OR "Transitional Economy" OR "under developed countries" OR "under developed country" OR "under developed economies" OR "under developed economy" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "under served countries" OR "under served country" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "underdeveloped countries" OR "underdeveloped country" OR "underdeveloped economies" OR "underdeveloped economy" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "underserved countries" OR "underserved country" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world")**	400,585
5	TITLE-ABS-KEY **(Afghanistan OR Albania OR Algeria OR "American Samoa" OR Angola OR Argentina OR "Argentine Republic" OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR "Burkina Faso" OR Burundi OR "Cabo Verde" OR "Cape verde" OR Cambodia OR Cameroon OR "Central African Republic" OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR "Costa Rica" OR "Côte d'Ivoire" OR Cuba OR Djibouti OR Dominica OR "Dominican Republic" OR Ecuador OR Egypt OR "El Salvador" OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Gaza OR "Georgia Republic" OR Georgian OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR "Guinea Bissau" OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kirgizstan OR Kyrgyzstan OR "Lao PDR" OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR "Marshall Islands" OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nauru OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR "Papua New Guinea" OR Paraguay OR Peru OR Philippines OR Phillippines OR Philipines OR Phillipines OR Principe OR Romania OR Rwanda OR Ruanda OR Samoa OR "Sao Tome" OR Senegal OR Serbia OR "Sierra Leone" OR "Solomon Islands" OR Somalia OR "South Africa" OR "South Sudan" OR "Sri Lanka" OR "St Lucia" OR "St Vincent" OR**	4,882,588

	Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR "Syrian Arab Republic" OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadzhik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR "West Bank" OR Yemen OR Zambia OR Zimbabwe)		
6	ALL **("stress reduction" OR "reduc* stress" OR "manag* stress" OR "stress management" OR "stress relie*" OR "relie* stress" OR coping)**		795,181
7	**#1 OR #2**		3,188,608
8	**#4 OR #5**		5,086,832
9	**#3 AND #6 AND #7 AND #8**		1404
11	FILTER:		501
	Year:	**2010 - 2021**	
	Type:	**ARTICLES, CONFERENCE PAPERS**	
	Subjects:	**MEDICINE; PSYCHOLOGY; BIOCHEMISTRY, GENETICS AND MOLECULAR BIOLOGY; NEUROSCIENCE; MULTIDISCIPLINARY; HEALTH PROFESSIONS; NURSING; DENTISTRY.**	
	Exclusions:	**UNITED STATES, SOUTH KOREA, UNITED KINGDOM, HONG KONG, AUSTRALIA, GERMANY, CANADA, SPAIN, SAUDI ARABIA, SWEDEN, MACAO, JAPAN, SINGAPORE, ITALY, NORWAY, SWITZERLAND, BELGIUM, NETHERLANDS, PORTUGAL, UNITED ARAB EMIRATES, POLAND, TAIWAN, DENMARK, FRANCE, AUSTRIA, BRUNEI DARUSSALAM, GREECE, HUNGARY, QATAR, CYPRUS, ESTONIA, OMAN, PUERTO RICO, SLOVAKIA, URUGUAY** **REVIEWS, SYSTEMATIC REVIEWS**	

Appendix 2

The Cochrane Library 22-02-2022

ID	Search	Hits
#1	MeSH descriptor: [Stress, Psychological] explode all trees	6674
#2	"Stress, psychological" OR Stress OR Stressors OR "Psychological Stresses" OR "Stresses Psychological" OR "Life Stress" OR "Life Stresses" OR "Stress Life" OR "Stresses Life" OR "Stress Psychologic" OR "Psychologic Stress" OR "Stressor Psychological" OR "Psychological Stressor" OR "Psychological Stressors" OR "Stressors Psychological" OR "Psychological Stress"	68494
#3	#1 OR #2	68663
#4	MeSH descriptor: [Anxiety] explode all trees	8823
#5	MeSH descriptor: [Anxiety Disorders] explode all trees	7539
#6	Anxiety OR "Neuroses Anxiety" OR "Anxiety Neuroses" OR "Anxiety States" OR "Neurotic Anxiety State" OR "Neurotic" OR "Neurotic Anxiety States" OR "State Neurotic Anxiety" OR "States Neurotic Anxiety"	61410
#7	#4 OR #5 OR #6	63020
#8	“University Student” OR “University Students” OR “College Student” OR “College Students” OR “Undergraduate Student” OR “Undergraduate Students” OR “Postgraduate Student” OR “Postgraduate Students” OR “Higher Education” OR “Tertiary Student” OR “Tertiary Students”	7274
#9	#3 OR #7	118534
#10	#8 AND #9	1559
#11	(Afghanistan OR Albania OR Algeria OR "American Samoa" OR Angola OR "Antigua And Barbuda" OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR "Republic Of Belarus" OR Belarus OR Byelarus OR Belorussia OR Byelorussian OR Belize OR "British Honduras" OR Benin OR Dahomey OR Bhutan OR Bolivia OR "Bosnia And Herzegovina" OR Bosnia OR Herzegovina OR Botswana OR Bechuanaland OR Brazil OR Brasil OR Bulgaria OR "Burkina Faso" OR "Burkina Fasso" OR "Upper Volta" OR Burundi OR Urundi OR "Cabo Verde" OR "Cape Verde" OR Cambodia OR Kampuchea OR "Khmer Republic" OR Cameroon OR Cameron OR Cameroun OR "Central African Republic" OR "Ubangi Shari" OR Chad OR Chile OR China OR Colombia OR Comoros OR "Comoro Islands" OR "Iles Comores" OR Mayotte OR "Democratic Republic Of The Congo" OR "Democratic Republic Congo" OR Congo OR Zaire OR "Costa Rica" OR "Cote D'ivoire" OR "Cote D' Ivoire" OR "Cote Divoire" OR "Cote D Ivoire" OR "Ivory Coast" OR Croatia OR Cuba OR Cyprus OR "Czech Republic" OR Czechoslovakia OR Djibouti OR "French Somaliland" OR Dominica OR "Dominican Republic" OR Ecuador OR Egypt OR "United Arab Republic" OR "El Salvador" OR "Equatorial Guinea" OR "Spanish Guinea" OR Eritrea OR Estonia OR Eswatini OR Swaziland OR Ethiopia OR Fiji OR Gabon OR "Gabonese Republic" OR Gambia OR "Georgia (Republic)" OR Georgia OR Georgian OR Ghana OR "Gold Coast" OR Gibraltar OR Greece OR Grenada OR Guam OR Guatemala OR Guinea OR "Guinea Bissau" OR Guyana OR "British Guiana" OR Haiti OR Hispaniola OR Honduras OR Hungary OR India OR Indonesia OR Timor OR Iran OR Iraq OR "Isle Of Man" OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR "Democratic People's Republic Of Korea" OR "Republic Of Korea" OR North Korea OR South Korea OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kirgizstan OR "Kyrgyz Republic" OR Kirghiz OR Laos OR "Lao Pdr" OR "Lao People's Democratic Republic" OR Latvia OR Lebanon OR "Lebanese Republic" OR Lesotho OR Basutoland OR Liberia OR Libya OR "Libyan Arab Jamahiriya" OR Lithuania OR Macau OR Macao OR "Republic Of North Macedonia" OR Macedonia OR Madagascar OR "Malagasy Republic" OR Malawi OR Nyasaland OR Malaysia OR "Malay Federation" OR "Malaya Federation" OR Maldives OR "Indian Ocean Islands" OR "Indian Ocean" OR Mali OR Malta OR Micronesia OR "Federated States Of Micronesia" OR Kiribati OR "Marshall Islands" OR Nauru OR "Northern Mariana Islands" OR Palau OR Tuvalu OR Mauritania OR Mauritius OR Mexico OR Moldova OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR "Portuguese East Africa" OR Myanmar OR Burma OR Namibia OR Nepal OR "Netherlands Antilles" OR Nicaragua OR Niger OR Nigeria OR Oman OR Muscat OR Pakistan OR Panama OR "Papua New Guinea" OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR "Polish People's Republic" OR Portugal OR "Portuguese Republic" OR "Puerto Rico" OR Romania OR Russia OR "Russian Federation" OR Ussr OR "Soviet Union" OR "Union Of Soviet Socialist Republics" OR Rwanda OR Ruanda OR Samoa OR "Pacific Islands" OR Polynesia OR "Samoan Islands" OR "Navigator Island" OR "Navigator Islands" OR "Sao Tome And Principe" OR "Saudi Arabia" OR Senegal OR Serbia OR Seychelles OR "Sierra Leone" OR Slovakia OR "Slovak Republic" OR Slovenia OR Melanesia OR "Solomon Island" OR "Solomon Islands" OR "Norfolk Island" OR "Norfolk Islands" OR Somalia OR "South Africa" OR "South Sudan" OR "Sri Lanka" OR Ceylon OR "Saint Kitts And Nevis" OR "St. Kitts And Nevis" OR "Saint Lucia" OR "St. Lucia" OR "Saint Vincent And The Grenadines" OR "Saint Vincent" OR "St. Vincent" OR Grenadines OR Sudan OR Suriname OR Surinam OR "Dutch Guiana" OR "Netherlands Guiana" OR Syria OR "Syrian Arab Republic" OR Tajikistan OR Tadjikistan OR Tadzhikistan OR Tadzhik OR Tanzania OR Tanganyika OR Thailand OR Siam OR "Timor Leste" OR "East Timor" OR Togo OR "Togolese Republic" OR Tonga OR "Trinidad And Tobago" OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Uzbek OR Vanuatu OR "New Hebrides" OR Venezuela OR Vietnam OR "Viet Nam" OR "Middle East" OR "West Bank" OR Gaza OR Palestine OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR "Northern Rhodesia" OR "Global South" OR	106598

	"Africa South Of The Sahara" OR "Sub Saharan Africa" OR "Subsaharan Africa" OR "Africa, Central" OR "Central Africa" OR "Africa, Northern" OR "North Africa" OR "Northern Africa" OR Magreb OR Maghrib OR Sahara OR "Africa, Southern" OR "Southern Africa" OR "Africa, Eastern" OR "East Africa" OR "Eastern Africa" OR "Africa, Western" OR "West Africa" OR "Western Africa" OR "West Indies" OR "Indian Ocean Islands" OR Caribbean OR "Central America" OR "Latin America" OR "South And Central America" OR "South America" OR "Asia, Central" OR "Central Asia" OR "Asia, Northern" OR "North Asia" OR "Northern Asia" OR "Asia, Southeastern" OR "Southeastern Asia" OR "South Eastern Asia" OR "Southeast Asia" OR "South East Asia" OR "Asia, Western" OR "Western Asia" OR "Europe, Eastern" OR "East Europe" OR "Eastern Europe" OR "Developing Country" OR "Developing Countries" OR "Developing Nation" OR "Developing Nations" OR "Developing Population" OR "Developing Populations" OR "Developing World" OR "Less Developed Country" OR "Less Developed Countries" OR "Less Developed Nation" OR "Less Developed Nations" OR "Less Developed Population" OR "Less Developed Populations" OR "Less Developed World" OR "Lesser Developed Country" OR "Lesser Developed Countries" OR "Lesser Developed Nation" OR "Lesser Developed Nations" OR "Lesser Developed Population" OR "Lesser Developed Populations" OR "Lesser Developed World" OR "Under Developed Country" OR "Under Developed Countries" OR "Under Developed Nation" OR "Under Developed Nations" OR "Under Developed Population" OR "Under Developed Populations" OR "Under Developed World" OR "Underdeveloped Country" OR "Underdeveloped Countries" OR "Underdeveloped Nation" OR "Underdeveloped Nations" OR "Underdeveloped Population" OR "Underdeveloped Populations" OR "Underdeveloped World" OR "Middle Income Country" OR "Middle Income Countries" OR "Middle Income Nation" OR "Middle Income Nations" OR "Middle Income Population" OR "Middle Income Populations" OR "Low Income Country" OR "Low Income Countries" OR "Low Income Nation" OR "Low Income Nations" OR "Low Income Population" OR "Low Income Populations" OR "Lower Income Country" OR "Lower Income Countries" OR "Lower Income Nation" OR "Lower Income Nations" OR "Lower Income Population" OR "Lower Income Populations" OR "Underserved Country" OR "Underserved Countries" OR "Underserved Nation" OR "Underserved Nations" OR "Underserved Population" OR "Underserved Populations" OR "Underserved World" OR "Under Served Country" OR "Under Served Countries" OR "Under Served Nation" OR "Under Served Nations" OR "Under Served Population" OR "Under Served Populations" OR "Under Served World" OR "Deprived Country" OR "Deprived Countries" OR "Deprived Nation" OR "Deprived Nations" OR "Deprived Population" OR "Deprived Populations" OR "Deprived World" OR "Poor Country" OR "Poor Countries" OR "Poor Nation" OR "Poor Nations" OR "Poor Population" OR "Poor Populations" OR "Poor World" OR "Poorer Country" OR "Poorer Countries" OR "Poorer Nation" OR "Poorer Nations" OR "Poorer Population" OR "Poorer Populations" OR "Poorer World" OR "Developing Economy" OR "Developing Economies" OR "Less Developed Economy" OR "Less Developed Economies" OR "Lesser Developed Economy" OR "Lesser Developed Economies" OR "Under Developed Economy" OR "Under Developed Economies" OR "Underdeveloped Economy" OR "Underdeveloped Economies" OR "Middle Income Economy" OR "Middle Income Economies" OR "Low Income Economy" OR "Low Income Economies" OR "Lower Income Economy" OR "Lower Income Economies" OR "Low Gdp" OR "Low Gnp" OR "Low Gross Domestic" OR "Low Gross National" OR "Lower Gdp" OR "Lower Gnp" OR "Lower Gross Domestic" OR "Lower Gross National" OR Lmic OR Lmics OR "Third World" OR "Lami Country" OR "Lami Countries" OR "Transitional Country" OR "Transitional Countries" OR "Emerging Economies" OR "Emerging Nation" OR "Emerging Nations"):Ti,Ab,Kw	
#12	(Afghan OR Afghans OR Afghani OR Albanian OR Albanians OR Algerian OR Algerians OR "American Samoan" OR "American Samoans" OR Angolan OR Angolans OR Antiguan OR Antiguans OR Barbudan OR Berbudans OR Argentine OR Argentines OR Argentinian OR Argentinians OR Argentinean OR Argentineans OR Armenian OR Armenians OR Aruban OR Arubans OR Azerbaijani OR Azerbaijanis OR Bahraini OR Bahrainis OR Bangladeshi OR Bangladeshis OR Bangalees OR Bajan OR Bajans OR Belarusian OR Belarusians OR Byelorussian OR Byelorussians OR Belizean OR Belizeans OR Beninese OR Beninese's OR Bhutanese OR Bolivian OR Bolivians OR Bosnian OR Bosnians OR Botswana OR Batswana OR Brazilian OR Brazilians OR Brasilian OR Brasilians OR Bulgarian OR Bulgarians OR Burkinabe OR Burkinese OR Burundian OR Burundians OR "Cape Verdean" OR "Cape Verdeans" OR "Cabo Verdean" OR "Cabo Verdeans" OR Cambodian OR Cambodians OR Khmer OR Cameroonian OR Cameroonians OR "Central African" OR "Central Africans" OR Chadian OR Chadians OR Chilean OR Chileans OR Chinese OR Colombian OR Colombians OR Comorian OR Comorians OR Congolese OR "Costa Rican" OR "Costa Ricans" OR Ivorian OR Ivorians OR Croatian OR Croatians OR Cuban OR Cubans OR Cypriot OR Cypriots OR Czech OR Czechs OR Djiboutian OR Djiboutians OR Dominican OR Dominicans OR Ecuadorian OR Ecuadorians OR Egyptian OR Egyptians OR Salvadoran OR Salvadorans OR "Equatorial Guinean" OR "Equatorial Guineans" OR Equatoguinean OR Equatoguineans OR Eritrean OR Eritreans OR Estonian OR Estonians OR Swazi OR Swazis OR Swati OR Swatis OR Ethiopian OR Ethiopians OR Fijian OR Fijians OR Gabonese OR Gabonaise OR Gambian OR Gambians OR Georgian OR Georgians OR Ghanaian OR Ghanaians OR Gibraltarian OR Gibraltarians OR Greek OR Greeks OR Grenadian OR Grenadians OR Guamanian OR Guamanians OR Guatemalan OR Guatemalans OR Guinean OR Guineans OR "Bissau Guinean" OR "Bissau Guineans" OR Guyanese OR Haitian OR Haitians OR Honduran OR Hondurans OR Hungarian OR Hungarians OR Indian OR Indians OR Indonesian OR Indonesians OR Iranian OR Iranians OR Iraqian OR Iraqians OR Iraqi OR Iraqis OR Manx OR Jamaican OR Jamaicans OR Jordanian OR Jordanians OR Kazakhstani OR Kazakhstanis OR Kenyan OR Kenyans OR Kirabati OR Kirabatian OR Kirabatians OR "North Korean" OR "North Koreans" OR Korean OR Koreans OR Kosovar OR Kosovars OR Kosovan OR Kosovans OR Kyrgyzstani OR Kyrgyzstanis OR Kyrgyz OR Lao OR Laotian OR Laotians OR Latvian OR Latvians OR Lebanese OR Lesothan OR Lesothans OR Lesothonian OR Lesothonians OR Mosotho OR Basotho OR Liberian OR Liberians OR Libyan OR Libyans OR Lithuanian OR Lithuanians OR Macanese OR Macedonian OR Macedonians OR Malagasy OR Madagascan OR Madagascans OR Malawian OR Malawians OR Malaysian OR Malaysians OR Maldivian OR Maldivians OR Malian OR Malians OR Maltese OR Marshallese OR Marshalleses OR Mauritanian OR Mauritanians OR Mauritian OR Mauritians OR Mexican OR Mexicans OR Micronesian OR Micronesians OR Moldovan OR Moldovans OR Mongolian OR Mongolians OR Mongol OR Montenegrin OR Montenegrins OR Moroccan OR Moroccans OR Mozambican OR Mozambicans OR Burmese OR Myanma OR Namibian OR Namibians OR Nauruan OR Nauruans OR Nepali OR Nepalese OR "Netherlands Antillean" OR "Netherlands Antilleans" OR Nicaraguan OR Nicaraguans OR Nigerien OR Nigeriens OR Nigerian OR Nigerians OR "Northern Mariana Islander" OR "Northern Mariana Islanders" OR Mariana OR Marianas OR Omani OR Omanis OR Pakistani OR Pakistanis OR Palauan OR Palauans OR	69775

	Panamanian OR Panamanians OR "Papua New Guinean" OR "Papua New Guineans" OR Paraguayan OR Paraguayans OR Peruvian OR Peruvians OR Philippine OR Philippines OR Philipine OR Philipines OR Phillipine OR Phillipines OR Phillippine OR Phillippines OR Filipino OR Filipinos OR Filipina OR Filipinas OR Polish OR Pole OR Poles OR Portuguese OR "Puerto Rican" OR "Puerto Ricans" OR Romanian OR Romanians OR Russian OR Russians OR "Soviet People" OR "Soviet Population" OR Rwandan OR Rwandans OR Rwandese OR Ruandan OR Ruandans OR Ruandese OR Samoan OR Samoans OR "Sao Tomean" OR "Sao Tomeans" OR Santomean OR Santomeans OR "Saudi Arabian" OR "Saudi Arabians" OR Saudi OR Saudis OR Senegalese OR Serbian OR Serbians OR Montenegrin OR Montenegrins OR Seychellois OR Seychelloise OR Seychelloises OR "Sierra Leonean" OR "Sierra Leoneans" OR Slovak OR Slovaks OR Slovene OR Slovenes OR "Solomon Islander" OR "Solomon Islanders" OR Somali OR Somalis OR "South African" OR "South Africans" OR "South Sudanese" OR "Sri Lankan" OR "Sri Lankans" OR Ceylonese OR Kittitian OR Kittitians OR Nevisian OR Nevisians OR "Saint Lucian" OR "Saint Lucians" OR Vincentian OR Vincentians OR Sudanese OR Surinamese OR Surinameses OR Syrian OR Syrians OR Tajik OR Tajiks OR Tajikistani OR Tajikistanis OR Tanzanian OR Tanzanians OR Tanganyikan OR Tanganyikans OR Thai OR Timorese OR Timoreses OR Togolese OR Tongan OR Tongans OR Trinidadian OR Trinidadians OR Tobagonian OR Tobagonians OR Tunisian OR Tunisians OR Turk OR Turks OR Turkish OR Turkmen OR Turkmens OR Tuvaluan OR Tuvaluans OR Ugandan OR Ugandans OR Ukrainian OR Ukrainians Uruguayan OR Uruguayans OR Uzbek OR Uzbeks OR Vanuatu OR Vanuatuan OR Vanuatuans OR Venezuelan OR Venezuelans OR Vietnamese OR Yemeni OR Yemenis OR Yemenite OR Yemenites OR Yemenese OR Yugoslav OR Yugoslavs OR Yugoslavian OR Yugoslavians OR Zambian OR Zambians OR Zimbabwean OR Zimbabweans):Ti,Ab,Kw	
#13	MeSH descriptor: [Developing Countries] explode all trees	909
#14	#11 OR #12 OR #13	148344
#15	"stress reduction" OR reduc* stress OR manag* stress OR "stress management" OR stress relie* OR relie* stress OR coping	42199
#16	#10 AND #14 AND #15 Filters: 2010 - 2021	74

Appendix 3

PubMed Search Strategy 22-02-2022

#	Query	Results
#15	Filters: **Full text, Case Reports, Classical Article, Clinical Conference, Clinical Study, Clinical Trial, Comparative Study, Controlled Clinical Trial, Multicentre Study, Observational Study, Pragmatic Clinical Trial, Randomized Controlled Trial, Twin Study, Adult: 19+ years, from 2010 - 2021**	192
#14	Search: **#12 AND #13**	2,749
#13	Search: **"stress reduction" OR reduc* stress OR manag* stress OR "stress management" OR stress relie* OR relie* stress OR coping**	501,231
#12	Search: **#7 AND #8 AND #11**	9,477
#11	Search: **#9 OR #10**	2,337,611
#10	Search: **Afghanistan[Text Word] OR Albania[Text Word] OR Algeria[Text Word] OR American Samoa[Text Word] OR Angola[Text Word] OR Antigua[Text Word] OR Barbuda[Text Word] OR Argentina[Text Word] OR Armenia[Text Word] OR Armenian[Text Word] OR Aruba[Text Word] OR Azerbaijan[Text Word] OR Bahrain[Text Word] OR Bangladesh[Text Word] OR Barbados[Text Word] OR Belarus[Text Word] OR Byelarus[Text Word] OR Belorussia[Text Word] OR Byelorussian[Text Word] OR Belize[Text Word] OR British Honduras[Text Word] OR Benin[Text Word] OR Dahomey[Text Word] OR Bhutan[Text Word] OR Bolivia[Text Word] OR Bosnia[Text Word] OR Herzegovina[Text Word] OR Botswana[Text Word] OR Bechuanaland[Text Word] OR Brazil[Text Word] OR Brasil[Text Word] OR Bulgaria[Text Word] OR Burkina Faso[Text Word] OR Burkina Fasso[Text Word] OR Upper Volta[Text Word] OR Burundi[Text Word] OR Urundi[Text Word] OR Cabo Verde[Text Word] OR Cape Verde[Text Word] OR Cambodia[Text Word] OR Kampuchea[Text Word] OR Khmer Republic[Text Word] OR Cameroon[Text Word] OR Cameron[Text Word] OR Cameroun[Text Word] OR Central African Republic[Text Word] OR Ubangi Shari[Text Word] OR Chad[Text Word] OR Chile[Text Word] OR China[Text Word] OR Colombia[Text Word] OR Comoros[Text Word] OR Comoro Islands[Text Word] OR Mayotte[Text Word] OR Congo[Text Word] OR Zaire[Text Word] OR Costa Rica[Text Word] OR Cote D'ivoire[Text Word] OR Cote D' Ivoire[Text Word] OR Cote Divoire[Text Word] OR Cote D Ivoire[Text Word] OR Ivory Coast[Text Word] OR Croatia[Text Word] OR Cuba[Text Word] OR Cyprus[Text Word] OR Czech Republic[Text Word] OR Czechoslovakia[Text Word] OR Djibouti[Text Word] OR French Somaliland[Text Word] OR Dominica[Text Word] OR Dominican Republic[Text Word] OR Ecuador[Text Word] OR Egypt[Text Word] OR United Arab Republic[Text Word] OR El Salvador[Text Word] OR Equatorial Guinea[Text Word] OR Spanish Guinea[Text Word] OR Eritrea[Text Word] OR Estonia[Text Word] OR Eswatini[Text Word] OR Swaziland[Text Word] OR Ethiopia[Text Word] OR Fiji[Text Word] OR Gabon[Text Word] OR Gabonese Republic[Text Word] OR Gambia[Text Word] OR Georgia[Text Word] OR Georgian[Text Word] OR Ghana[Text Word] OR Gold Coast[Text Word] OR Gibraltar[Text Word] OR Greece[Text Word] OR Grenada[Text Word] OR Guam[Text Word] OR Guatemala[Text Word] OR Guinea[Text Word] OR Guyana[Text Word] OR Guiana[Text Word] OR Haiti[Text Word] OR Hispaniola[Text Word] OR Honduras[Text Word] OR Hungary[Text Word] OR India[Text Word] OR Indonesia[Text Word] OR Timor[Text Word] OR Iran[Text Word] OR Iraq[Text Word] OR Isle Of Man[Text Word] OR Jamaica[Text Word] OR Jordan[Text Word] OR Kazakhstan[Text Word] OR Kazakh[Text Word] OR Kenya[Text Word] OR Korea[Text Word] OR Kosovo[Text Word] OR Kyrgyzstan[Text Word] OR Kirghizia[Text Word] OR Kirgizstan[Text Word] OR Kyrgyz Republic[Text Word] OR Kirghiz[Text Word] OR Laos[Text Word] OR Lao Pdr[Text Word] OR Lao People's Democratic Republic[Text Word] OR Latvia[Text Word] OR Lebanon[Text Word] OR Lesotho[Text Word] OR Basutoland[Text Word] OR Liberia[Text Word] OR Libya[Text Word] OR Libyan Arab Jamahiriya[Text Word] OR Lithuania[Text Word] OR Macau[Text Word] OR Macao[Text Word] OR Macedonia[Text Word] OR Madagascar[Text Word] OR Malagasy Republic[Text Word] OR Malawi[Text Word] OR Nyasaland[Text Word] OR Malaysia[Text Word] OR Maldives[Text Word] OR Indian Ocean[Text Word] OR Mali[Text Word] OR Malta[Text Word] OR Micronesia[Text Word] OR Kiribati[Text Word] OR Marshall Islands[Text Word] OR Nauru[Text Word] OR Northern Mariana Islands[Text Word] OR Palau[Text Word] OR Tuvalu[Text Word] OR Mauritania[Text Word] OR Mauritius[Text Word] OR Mexico[Text Word] OR Moldova[Text Word] OR Moldovian[Text Word] OR Mongolia[Text Word] OR Montenegro[Text Word] OR Morocco[Text Word] OR Ifni[Text Word] OR Mozambique[Text Word] OR Portuguese East Africa[Text Word] OR Myanmar[Text Word] OR Burma[Text Word] OR Namibia[Text Word] OR Nepal[Text Word] OR Netherlands Antilles[Text Word] OR 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Slovenia[Text Word] OR Melanesia[Text Word] OR Solomon Island[Text Word] OR Solomon Islands[Text Word] OR Norfolk Island[Text Word] OR Somalia[Text Word] OR South**	2,253,838

	Africa[Text Word] OR South Sudan[Text Word] OR Sri Lanka[Text Word] OR Ceylon[Text Word] OR Saint Kitts And Nevis[Text Word] OR St Kitts And Nevis[Text Word] OR Saint Lucia[Text Word] OR St Lucia[Text Word] OR Saint Vincent[Text Word] OR St Vincent[Text Word] OR Grenadines[Text Word] OR Sudan[Text Word] OR Suriname[Text Word] OR Surinam[Text Word] OR Syria[Text Word] OR Syrian Arab Republic[Text Word] OR Tajikistan[Text Word] OR Tadjikistan[Text Word] OR Tadzhikistan[Text Word] OR Tadzhik[Text Word] OR Tanzania[Text Word] OR Tanganyika[Text Word] OR Thailand[Text Word] OR Siam[Text Word] OR Timor Leste[Text Word] OR East Timor[Text Word] OR Togo[Text Word] OR Togolese Republic[Text Word] OR Tonga[Text Word] OR Trinidad[Text Word] OR Tobago[Text Word] OR Tunisia[Text Word] OR Turkey[Text Word] OR Turkmenistan[Text Word] OR Turkmen[Text Word] OR Uganda[Text Word] OR Ukraine[Text Word] OR Uruguay[Text Word] OR Uzbekistan[Text Word] OR Uzbek[Text Word] OR Vanuatu[Text Word] OR New 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OR Lami Countries[Text Word] OR Transitional Country[Text Word] OR Transitional Countries[Text Word] OR Emerging Economies[Text Word] OR Emerging Nation[Text Word] OR Emerging Nations[Text Word]	
#9	Search: **Afghanistan[Mesh] OR Albania[Mesh] OR Algeria[Mesh] OR American Samoa[Mesh] OR Angola[Mesh] OR Antigua And Barbuda[Mesh] OR Argentina[Mesh] OR Armenia[Mesh] OR Aruba[Mesh] OR Azerbaijan[Mesh] OR Bahrain[Mesh] OR Bangladesh[Mesh] OR Barbados[Mesh] OR Republic Of Belarus[Mesh] OR Belize[Mesh] OR Benin[Mesh] OR Bhutan[Mesh] OR Bolivia[Mesh] OR Bosnia And Herzegovina[Mesh] OR Botswana[Mesh] OR Brazil[Mesh] OR Bulgaria[Mesh] OR Burkina Faso[Mesh] OR Burundi[Mesh] OR Cabo Verde[Mesh] OR Cambodia[Mesh] OR Cameroon[Mesh] OR Central African Republic[Mesh] OR Chad[Mesh] OR Chile[Mesh] OR China[Mesh] OR Colombia[Mesh] OR Comoros[Mesh] OR Democratic Republic Of The Congo[Mesh] OR Congo[Mesh] OR Costa Rica[Mesh] OR Cote D'ivoire[Mesh] OR Croatia[Mesh] OR Cuba[Mesh] OR Cyprus[Mesh] OR Czech Republic[Mesh] OR Djibouti[Mesh] OR Dominica[Mesh] OR Dominican Republic[Mesh] OR Ecuador[Mesh] OR Egypt[Mesh] OR El Salvador[Mesh] OR Equatorial Guinea[Mesh] OR Eritrea[Mesh] OR Estonia[Mesh] OR Swaziland[Mesh] OR Ethiopia[Mesh] OR Fiji[Mesh] OR Gabon[Mesh] OR Gambia[Mesh] OR "Georgia (Republic)"[Mesh] OR Ghana[Mesh] OR Gibraltar[Mesh] OR Greece[Mesh] OR Grenada[Mesh] OR Guam[Mesh] OR Guatemala[Mesh] OR Guinea[Mesh] OR Guinea Bissau[Mesh] OR Guyana[Mesh] OR Haiti[Mesh] OR Honduras[Mesh] OR Hungary[Mesh] OR India[Mesh] OR Indonesia[Mesh] OR Iran[Mesh] OR Iraq[Mesh] OR Jamaica[Mesh] OR Jordan[Mesh] OR Kazakhstan[Mesh] OR Kenya[Mesh] OR Democratic People's Republic Of Korea[Mesh] OR Republic Of Korea[Mesh] OR Kosovo[Mesh]**	1,515,251

	OR Kyrgyzstan[Mesh] OR Laos[Mesh] OR Latvia[Mesh] OR Lebanon[Mesh] OR Lesotho[Mesh] OR Liberia[Mesh] OR Libya[Mesh] OR Lithuania[Mesh] OR Macau[Mesh] OR Republic Of North Macedonia[Mesh] OR Madagascar[Mesh] OR Malawi[Mesh] OR Malaysia[Mesh] OR Indian Ocean Islands[Mesh] OR Mali[Mesh] OR Malta[Mesh] OR Micronesia[Mesh] OR Palau[Mesh] OR Mauritania[Mesh] OR Mauritius[Mesh] OR Mexico[Mesh] OR Moldova[Mesh] OR Mongolia[Mesh] OR Montenegro[Mesh] OR Morocco[Mesh] OR Mozambique[Mesh] OR Myanmar[Mesh] OR Namibia[Mesh] OR Nepal[Mesh] OR Netherlands Antilles[Mesh] OR Nicaragua[Mesh] OR Niger[Mesh] OR Nigeria[Mesh] OR Oman[Mesh] OR Pakistan[Mesh] OR Panama[Mesh] OR Papua New Guinea[Mesh] OR Paraguay[Mesh] OR Peru[Mesh] OR Philippines[Mesh] OR Poland[Mesh] OR Portugal[Mesh] OR Puerto Rico[Mesh] OR Romania[Mesh] OR Russia[Mesh] OR Rwanda[Mesh] OR Samoa[Mesh] OR Sao Tome And Principe[Mesh] OR Saudi Arabia[Mesh] OR Senegal[Mesh] OR Serbia[Mesh] OR Seychelles[Mesh] OR Sierra Leone[Mesh] OR Slovakia[Mesh] OR Slovenia[Mesh] OR Melanesia[Mesh] OR Somalia[Mesh] OR South Africa[Mesh] OR South Sudan[Mesh] OR Sri Lanka[Mesh] OR Saint Kitts And Nevis[Mesh] OR Saint Lucia[Mesh] OR Saint Vincent And The Grenadines[Mesh] OR Sudan[Mesh] OR Suriname[Mesh] OR Syria[Mesh] OR Tajikistan[Mesh] OR Tanzania[Mesh] OR Thailand[Mesh] OR Timor Leste[Mesh] OR Togo[Mesh] OR Tonga[Mesh] OR Trinidad And Tobago[Mesh] OR Tunisia[Mesh] OR Turkey[Mesh] OR Turkmenistan[Mesh] OR Uganda[Mesh] OR Ukraine[Mesh] OR Uruguay[Mesh] OR Uzbekistan[Mesh] OR Vanuatu[Mesh] OR Venezuela[Mesh] OR Vietnam[Mesh] OR Middle East[Mesh] OR Yemen[Mesh] OR Yugoslavia[Mesh] OR Zambia[Mesh] OR Zimbabwe[Mesh] OR Africa South Of The Sahara[Mesh] OR Africa, Central[Mesh] OR Africa, Northern[Mesh] OR Africa, Southern[Mesh] OR Africa, Eastern[Mesh] OR Africa, Western[Mesh] OR West Indies[Mesh] OR Indian Ocean Islands[Mesh] OR Caribbean Region[Mesh] OR Central America[Mesh] OR Latin America[Mesh] OR South America[Mesh] OR Asia, Central[Mesh] OR Asia, Northern[Mesh] OR Asia, Southeastern[Mesh] OR Asia, Western[Mesh] OR Europe, Eastern[Mesh] OR Developing Countries[Mesh]	
#8	Search: **University Student OR University Students OR College Student OR College Students OR Undergraduate Student OR Undergraduate Students OR Postgraduate Student OR Postgraduate Students OR Higher Education OR Tertiary Student OR Tertiary Students**	505,200
#7	Search: **#3 OR #6**	1,413,078
#6	Search: **#4 OR #5**	320,720
#5	Search: **Anxiety OR Neuroses Anxiety OR Anxiety Neuroses OR Anxiety States OR Neurotic Anxiety State OR Neurotic OR Neurotic Anxiety State OR Neurotic Anxiety States OR State Neurotic Anxiety OR States Neurotic Anxiety**	320,720
#4	Search: **(("anxiety"[MeSH Terms]) OR (anxiety disorders[MeSH Terms])) OR (anxiety disorder[MeSH Terms])**	174,360
#3	Search: **#1 OR #2**	1,160,429
#2	Search: **Stress, psychological OR Stress OR Stressors OR Psychological Stresses OR Stresses Psychological OR Life Stress OR Life Stresses OR Stress Life OR Stresses Life OR Stress Psychologic OR Psychologic Stress OR Stressor Psychological OR Psychological Stressor OR Psychological Stressors OR Stressors Psychological OR Psychological Stress**	1,160,429
#1	Search: **(stress, psychological[MeSH Terms]) OR (stress, psychologic[MeSH Terms])**	145,170

Appendix 4

EBSCO Host Search Strategy 22-02-2022

#	Query	Results
S28	S22 AND S27 Limiters - Full Text; Peer Reviewed; Published Date: 20100101-20211231 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	374
S27	S23 OR S24 OR S25 OR S26	338,777
S26	"stress reduction" OR "reduc* stress" OR "manag* stress" OR "stress management" OR "stress relie*" OR "relie* stress" OR coping	338,777
S25	(MH "Stress Management")	19,496
S24	DE "Stress Management"	29,951
S23	DE "STRESS management"	29,951
S22	S20 AND S21	10,968
S21	S15 AND S19	148,532
S20	S5 OR S10	2,451,856
S19	S16 OR S17 OR S18	15,246,729
S18	Afghanistan OR Albania OR Algeria OR American Samoa OR Angola OR "Antigua And Barbuda" OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Republic Of Belarus OR Belarus OR Byelarus OR Belorussia OR Byelorussian OR Belize OR British Honduras OR Benin OR Dahomey OR Bhutan OR Bolivia OR "Bosnia And Herzegovina" OR Bosnia OR Herzegovina OR Botswana OR Bechuanaland OR Brazil OR Brasil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cabo Verde OR Cape Verde OR Cambodia OR Kampuchea OR Khmer Republic OR Cameroon OR Cameron OR Cameroun OR Central African Republic OR Ubangi Shari OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Iles Comores OR Mayotte OR Democratic Republic Of The Congo OR Democratic Republic Congo OR Congo OR Zaire OR Costa Rica OR "Cote D'ivoire" OR "Cote D' Ivoire" OR Cote Divoire OR Cote D Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czech Republic OR Czechoslovakia OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Equatorial Guinea OR Spanish Guinea OR Eritrea OR Estonia OR Eswatini OR Swaziland OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR "Georgia (Republic)" OR Georgian OR Ghana OR Gold Coast OR Gibraltar OR Greece OR Grenada OR Guam OR Guatemala OR Guinea OR Guinea Bissau OR Guyana OR British Guiana OR Haiti OR Hispaniola OR Honduras OR Hungary OR India OR Indonesia OR Timor OR Iran OR Iraq OR Isle Of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR "Democratic People's Republic Of Korea" OR Republic Of Korea OR North Korea OR South Korea OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kirgizstan OR Kyrgyz Republic OR Kirghiz OR Laos OR Lao Pdr OR "Lao People's Democratic Republic" OR Latvia OR Lebanon OR Lebanese Republic OR Lesotho OR Basutoland OR Liberia OR Libya OR Libyan Arab Jamahiriya OR Lithuania OR Macau OR Macao OR Republic Of North Macedonia OR Macedonia OR Madagascar OR Malagasy Republic OR Malawi OR Nyasaland OR Malaysia OR Malay Federation OR Malaya Federation OR Maldives OR Indian Ocean Islands OR Indian Ocean OR Mali OR Malta OR Micronesia OR Federated States Of Micronesia OR Kiribati OR Marshall Islands OR Nauru OR Northern Mariana Islands OR Palau OR Tuvalu OR Mauritania OR Mauritius OR Mexico OR Moldova OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Portuguese East Africa OR Myanmar OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR Nicaragua OR Niger OR Nigeria OR Oman OR Muscat OR Pakistan OR Panama OR Papua New Guinea OR New Guinea OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR "Polish	15,246,729

	People's Republic" OR Portugal OR Portuguese Republic OR Puerto Rico OR Romania OR Russia OR Russian Federation OR Ussr OR Soviet Union OR Union Of Soviet Socialist Republics OR Rwanda OR Ruanda OR Samoa OR Pacific Islands OR Polynesia OR Samoan Islands OR Navigator Island OR Navigator Islands OR "Sao Tome And Principe" OR Saudi Arabia OR Senegal OR Serbia OR Seychelles OR Sierra Leone OR Slovakia OR Slovak Republic OR Slovenia OR Melanesia OR Solomon Island OR Solomon Islands OR Norfolk Island OR Norfolk Islands OR Somalia OR South Africa OR South Sudan OR Sri Lanka OR Ceylon OR "Saint Kitts And Nevis" OR "St. Kitts And Nevis" OR Saint Lucia OR "St. Lucia" OR "Saint Vincent And The Grenadines" OR Saint Vincent OR "St. Vincent" OR Grenadines OR Sudan OR Suriname OR Surinam OR Dutch Guiana OR Netherlands Guiana OR Syria OR Syrian Arab Republic OR Tajikistan OR Tadjikistan OR Tadzhikistan OR Tadzhik OR Tanzania OR Tanganyika OR Thailand OR Siam OR Timor Leste OR East Timor OR Togo OR Togolese Republic OR Tonga OR "Trinidad And Tobago" OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR Middle East OR West Bank OR Gaza OR Palestine OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Northern Rhodesia OR Global South OR Africa South Of The Sahara OR Sub-Saharan Africa OR Subsaharan Africa OR Africa, Central OR Central Africa OR Africa, Northern OR North Africa OR Northern Africa OR Magreb OR Maghrib OR Sahara OR Africa, Southern OR Southern Africa OR Africa, Eastern OR East Africa OR Eastern Africa OR Africa, Western OR West Africa OR Western Africa OR West Indies OR Indian Ocean Islands OR Caribbean OR Central America OR Latin America OR "South And Central America" OR South America OR Asia, Central OR Central Asia OR Asia, Northern OR North Asia OR Northern Asia OR Asia, Southeastern OR Southeastern Asia OR South Eastern Asia OR Southeast Asia OR South East Asia OR Asia, Western OR Western Asia OR Europe, Eastern OR East Europe OR Eastern Europe OR Developing Country OR Developing Countries OR Developing Nation? OR Developing Population? OR Developing World OR Less Developed Countr* OR Less Developed Nation? OR Less Developed Population? OR Less Developed World OR Lesser Developed Countr* OR Lesser Developed Nation? OR Lesser Developed Population? OR Lesser Developed World OR Under Developed Countr* OR Under Developed Nation? OR Under Developed Population? OR Under Developed World OR Underdeveloped Countr* OR Underdeveloped Nation? OR Underdeveloped Population? OR Underdeveloped World OR Middle Income Countr* OR Middle Income Nation? OR Middle Income Population? OR Low Income Countr* OR Low Income Nation? OR Low Income Population? OR Lower Income Countr* OR Lower Income Nation? OR Lower Income Population? OR Underserved Countr* OR Underserved Nation? OR Underserved Population? OR Underserved World OR Under Served Countr* OR Under Served Nation? OR Under Served Population? OR Under Served World OR Deprived Countr* OR Deprived Nation? OR Deprived Population? OR Deprived World OR Poor Countr* OR Poor Nation? OR Poor Population? OR Poor World OR Poorer Countr* OR Poorer Nation? OR Poorer Population? OR Poorer World OR Developing Econom* OR Less Developed Econom* OR Lesser Developed Econom* OR Under Developed Econom* OR Underdeveloped Econom* OR Middle Income Econom* OR Low Income Econom* OR Lower Income Econom* OR Low Gdp OR Low Gnp OR Low Gross Domestic OR Low Gross National OR Lower Gdp OR Lower Gnp OR Lower Gross Domestic OR Lower Gross National OR Lmic OR Lmics OR Third World OR Lami Countr* OR Transitional Countr* OR Emerging Economies OR Emerging Nation?	
S17	(MH "Developing Countries") OR (MH "Low and Middle Income Countries")	70,491
S16	DE "Developing Countries"	107,875
S15	S11 OR S12 OR S13 OR S14	1,025,698
S14	DE "ADULT college students" OR DE "BISEXUAL college students" OR DE "CATHOLIC college students" OR DE "CHRISTIAN college students" OR DE "CHURCH college students" OR DE "COLLEGE athletes" OR DE "COLLEGE freshmen" OR DE "COLLEGE juniors" OR DE "COLLEGE seniors" OR DE "COLLEGE sophomores" OR DE "COLLEGE students with disabilities" OR DE "COMMUTING college students" OR DE "EPISCOPALIAN college students" OR DE "FIRST-generation college students" OR DE "GAY college students" OR DE "GRADUATE students" OR DE "JEWISH college students" OR DE "JUNIOR college students" OR DE "LGBTQ college students" OR DE "LOW-income college students" OR DE "MALE college students" OR DE "MINORITY college students" OR DE "MORMON college students" OR DE "MUSLIM college students" OR DE "NONTRADITIONAL college students" OR DE "PART-time college students" OR DE "PREMEDICAL students" OR DE "RESIDENTIAL college students" OR DE "RURAL college students" OR DE "UNDERGRADUATES" OR DE "WHITE college students" OR DE "WOMEN college students"	85,065
S13	DE "Business Students" OR DE "College Graduates" OR DE "College Students" OR DE "Dental Students" OR DE "Graduate Students" OR DE "International Students" OR DE "Law Students" OR DE "Medical Students" OR DE "Postgraduate Students"	351,232
S12	(MH "Students, College") OR (MH "Students, Undergraduate") OR (MH "Students, Disabled") OR (MH "Students, Foreign") OR (MH "Students, Graduate") OR (MH "Students, Health Occupations") OR (MH "Students, Non-Traditional") OR (MH "Students, Pre-Nursing")	39,895

S11	SU ("University Student" OR "University Students" OR "College Student" OR "College Students" OR "Undergraduate Student" OR "Undergraduate Students" OR "Postgraduate Student" OR "Postgraduate Students" OR "Higher Education" OR "Tertiary Student" OR "Tertiary Students") NOT SU ("high school" OR "Secondary School" OR "primary School" OR "kindergarten" OR "creche" OR "preschool" OR "pre-school" OR "pre school")	872,294
S10	S6 OR S7 OR S8 OR S9	707,448
S9	anxiety OR "Neuroses Anxiety" OR "Anxiety Neuroses" OR "Anxiety States" OR "Neurotic Anxiety State" OR neurotic OR "Neurotic Anxiety States" OR "State Neurotic Anxiety" OR "States Neurotic Anxiety"	707,448
S8	(MH "Anxiety") OR (MH "Anxiety Disorders")	178,362
S7	DE "Anxiety" OR DE "Anxiety Disorders" OR DE "Anxiety Management" OR DE "Anxiety Sensitivity"	285,764
S6	DE "ANXIETY" OR DE "ANXIETY diagnosis" OR DE "ANXIETY disorders" OR DE "ANXIETY disorders treatment"	286,392
S5	S1 OR S2 OR S3 OR S4	1,918,464
S4	"Stress psychological" OR stress* OR "Psychological stresses" OR "Stresses Psychological" OR "Life Stress" OR "Life Stresses" OR "Stress Life" OR “Stresses Life OR “Stress Psychologic" OR "Psychologic Stress" OR "Stressor Psychological" OR "Psychological Stressor" OR "Psychological Stressors" OR "Stressors Psychological" OR "Psychological Stress"	1,918,464
S3	DE "PSYCHOLOGICAL stress"	78,840
S2	((DE "Stress") OR (DE "Stress and Coping Measures")) OR (DE "Stress Management")	148,769
S1	(MH "Stress, Psychological")	55,730

Appendix 5

Google Scholar Search Strategy 22-02-2022

Date: 22/02/2022	**Google Scholar Search Strategy**
Query:	**Keywords:**
#1	**Stress**
#2	**LMIC**
#3	**“University Students”**
#4	**“Stress Reduction”**
#5	**“Stress Management”**
Boolean Search String:	**#1 AND #2 AND #3 AND (#4 OR #5)**
Filters:	**2010 – 2021**
Final Total:	**324**

Appendix 6

CASP Appraisal Tool

CASP
Critical Appraisal Skills Programme

Study and citation: .....

Section A: Is the basic study design valid for a randomised controlled trial?			
1. Did the study address a clearly focused research question? *CONSIDER:* *Was the study designed to assess the outcomes of an intervention?* *Is the research question 'focused' in terms of:* • *Population studied* • *Intervention given* • *Comparator chosen* • *Outcomes measured?*	Yes ☐	No ☐	Can't tell ☐
2. Was the assignment of participants to interventions randomised? *CONSIDER:* • *How was randomisation carried out? Was the method appropriate?* • *Was randomisation sufficient to eliminate systematic bias?* • *Was the allocation sequence concealed from investigators and participants?*	Yes ☐	No ☐	Can't tell ☐
3. Were all participants who entered the study accounted for at its conclusion? *CONSIDER:* • *Were losses to follow-up and exclusions after randomisation accounted for?* • *Were participants analysed in the study groups to which they were randomised (intention-to-treat analysis)?* • *Was the study stopped early? If so, what was the reason?*	Yes ☐	No ☐	Can't tell ☐

Section B: Was the study methodologically sound?			
4. • Were the participants 'blind' to intervention they were given? • Were the investigators 'blind' to the intervention they were giving to participants? • Were the people assessing/analysing outcome/s 'blinded'?	Yes ☐ ☐ ☐	No ☐ ☐ ☐	Can't tell ☐ ☐ ☐
5. Were the study groups similar at the start of the randomised controlled trial? *CONSIDER:* • *Were the baseline characteristics of each study group (e.g. age, sex, socio-economic group) clearly set out?* • *Were there any differences between the study groups that could affect the outcome/s?*	Yes ☐	No ☐	Can't tell ☐

CASP
Critical Appraisal Skills Programme

6. Apart from the experimental intervention, did each study group receive the same level of care (that is, were they treated equally)? *CONSIDER:* • *Was there a clearly defined study protocol?* • *If any additional interventions were given (e.g. tests or treatments), were they similar between the study groups?* • *Were the follow-up intervals the same for each study group?*	Yes ☐	No ☐	Can't tell ☐

Section C: What are the results?

7. Were the effects of intervention reported comprehensively? *CONSIDER:* • *Was a power calculation undertaken?* • *What outcomes were measured, and were they clearly specified?* • *How were the results expressed? For binary outcomes, were relative and absolute effects reported?* • *Were the results reported for each outcome in each study group at each follow-up interval?* • *Was there any missing or incomplete data?* • *Was there differential drop-out between the study groups that could affect the results?* • *Were potential sources of bias identified?* • *Which statistical tests were used?* • *Were p values reported?*	Yes ☐	No ☐	Can't tell ☐
8. Was the precision of the estimate of the intervention or treatment effect reported? *CONSIDER:* • *Were confidence intervals (CIs) reported?*	Yes ☐	No ☐	Can't tell ☐
9. Do the benefits of the experimental intervention outweigh the harms and costs? *CONSIDER:* • *What was the size of the intervention or treatment effect?* • *Were harms or unintended effects reported for each study group?* • *Was a cost-effectiveness analysis undertaken? (Cost-effectiveness analysis allows a comparison to be made between different interventions used in the care of the same condition or problem.)*	Yes ☐	No ☐	Can't tell ☐

CASP
Critical Appraisal Skills Programme

Section D: Will the results help locally?		
10. Can the results be applied to your local population/in your context? *CONSIDER:* • *Are the study participants similar to the people in your care?* • *Would any differences between your population and the study participants alter the outcomes reported in the study?* • *Are the outcomes important to your population?* • *Are there any outcomes you would have wanted information on that have not been studied or reported?* • *Are there any limitations of the study that would affect your decision?*	Yes ☐	No ☐ Can't tell ☐
11. Would the experimental intervention provide greater value to the people in your care than any of the existing interventions? *CONSIDER:* • *What resources are needed to introduce this intervention taking into account time, finances, and skills development or training needs?* • *Are you able to disinvest resources in one or more existing interventions in order to be able to re-invest in the new intervention?*	Yes ☐	No ☐ Can't tell ☐

APPRAISAL SUMMARY: *Record key points from your critical appraisal in this box. What is your conclusion about the paper? Would you use it to change your practice or to recommend changes to care/interventions used by your organisation? Could you judiciously implement this intervention without delay?*

Appendix 7

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist (72):

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Click here to enter text.
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Click here to enter text.
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Click here to enter text.
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Click here to enter text.
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Click here to enter text.
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Click here to enter text.
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Click here to enter text.
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Click here to enter text.
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Click here to enter text.

Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Click here to enter text.
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Click here to enter text.
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Click here to enter text.
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Click here to enter text.
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Click here to enter text.
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Click here to enter text.
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Click here to enter text.
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Click here to enter text.
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Click here to enter text.
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Click here to enter text.
Limitations	20	Discuss the limitations of the scoping review process.	Click here to enter text.

Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Click here to enter text.
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Click here to enter text.

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

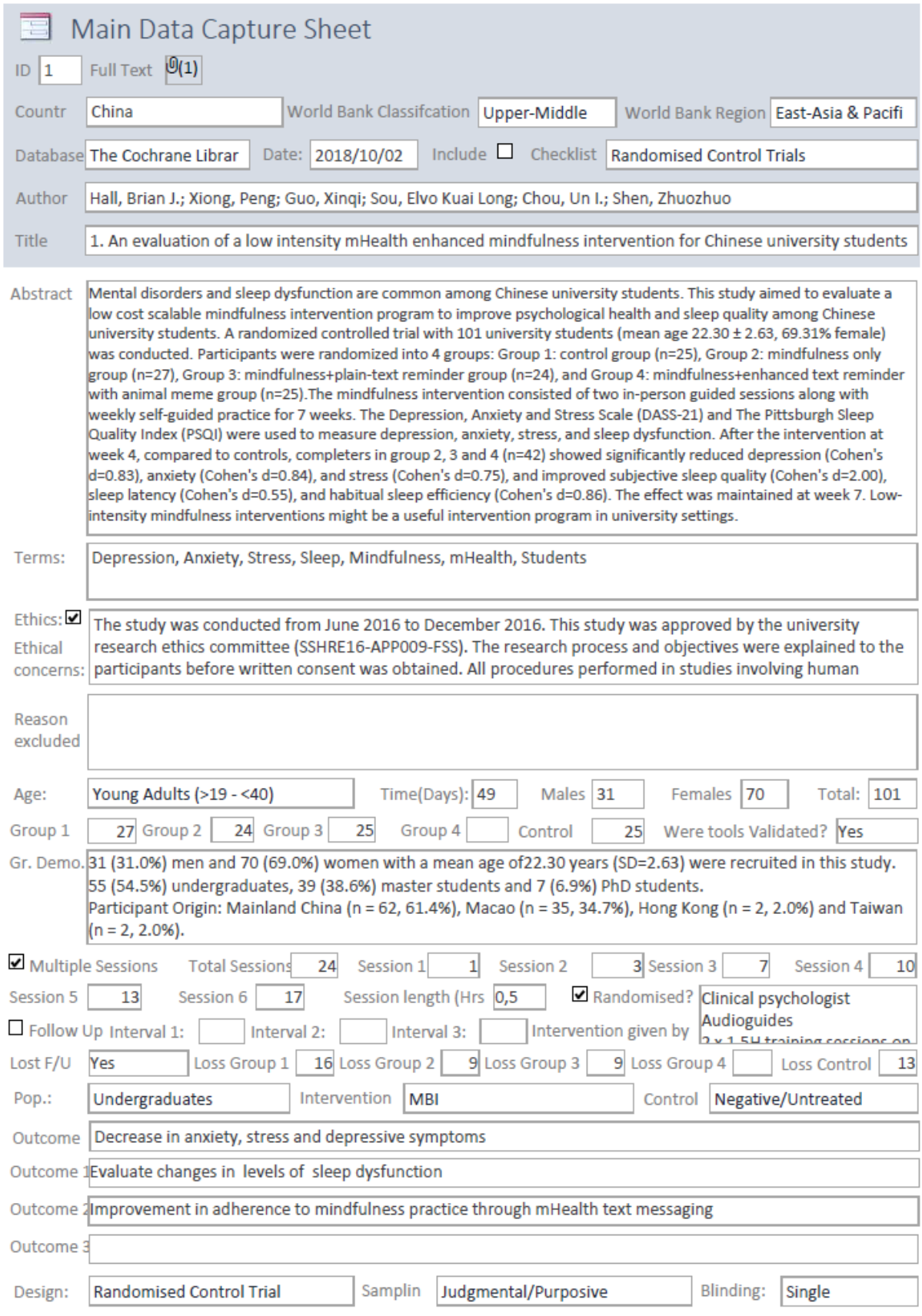
‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Appendix 8

Data Capture Tool (Designed using Microsoft Access)



Main Data Capture Sheet

ID 1 Full Text (1)

Countr China | World Bank Classifcation Upper-Middle | World Bank Region East-Asia & Pacifi

Database The Cochrane Librar | Date: 2018/10/02 | Include ☐ | Checklist Randomised Control Trials

Author Hall, Brian J.; Xiong, Peng; Guo, Xinqi; Sou, Elvo Kuai Long; Chou, Un I.; Shen, Zhuozhuo

Title 1. An evaluation of a low intensity mHealth enhanced mindfulness intervention for Chinese university students

Abstract Mental disorders and sleep dysfunction are common among Chinese university students. This study aimed to evaluate a low cost scalable mindfulness intervention program to improve psychological health and sleep quality among Chinese university students. A randomized controlled trial with 101 university students (mean age 22.30 ± 2.63, 69.31% female) was conducted. Participants were randomized into 4 groups: Group 1: control group (n=25), Group 2: mindfulness only group (n=27), Group 3: mindfulness+plain-text reminder group (n=24), and Group 4: mindfulness+enhanced text reminder with animal meme group (n=25).The mindfulness intervention consisted of two in-person guided sessions along with weekly self-guided practice for 7 weeks. The Depression, Anxiety and Stress Scale (DASS-21) and The Pittsburgh Sleep Quality Index (PSQI) were used to measure depression, anxiety, stress, and sleep dysfunction. After the intervention at week 4, compared to controls, completers in group 2, 3 and 4 (n=42) showed significantly reduced depression (Cohen's d=0.83), anxiety (Cohen's d=0.84), and stress (Cohen's d=0.75), and improved subjective sleep quality (Cohen's d=2.00), sleep latency (Cohen's d=0.55), and habitual sleep efficiency (Cohen's d=0.86). The effect was maintained at week 7. Low-intensity mindfulness interventions might be a useful intervention program in university settings.

Terms: Depression, Anxiety, Stress, Sleep, Mindfulness, mHealth, Students

Ethics: ☑ Ethical concerns: The study was conducted from June 2016 to December 2016. This study was approved by the university research ethics committee (SSHRE16-APP009-FSS). The research process and objectives were explained to the participants before written consent was obtained. All procedures performed in studies involving human

Reason excluded

Age: Young Adults (>19 - <40) | Time(Days): 49 | Males 31 | Females 70 | Total: 101

Group 1 27 | Group 2 24 | Group 3 25 | Group 4 | Control 25 | Were tools Validated? Yes

Gr. Demo. 31 (31.0%) men and 70 (69.0%) women with a mean age of22.30 years (SD=2.63) were recruited in this study. 55 (54.5%) undergraduates, 39 (38.6%) master students and 7 (6.9%) PhD students.
Participant Origin: Mainland China (n = 62, 61.4%), Macao (n = 35, 34.7%), Hong Kong (n = 2, 2.0%) and Taiwan (n = 2, 2.0%).

☑ Multiple Sessions | Total Sessions 24 | Session 1 1 | Session 2 3 | Session 3 7 | Session 4 10

Session 5 13 | Session 6 17 | Session length (Hrs 0,5 | ☑ Randomised? | Clinical psychologist Audioguides

☐ Follow Up | Interval 1: | Interval 2: | Interval 3: | Intervention given by

Lost F/U Yes | Loss Group 1 16 | Loss Group 2 9 | Loss Group 3 9 | Loss Group 4 | Loss Control 13

Pop.: Undergraduates | Intervention MBI | Control Negative/Untreated

Outcome Decrease in anxiety, stress and depressive symptoms

Outcome 1 Evaluate changes in levels of sleep dysfunction

Outcome 2 Improvement in adherence to mindfulness practice through mHealth text messaging

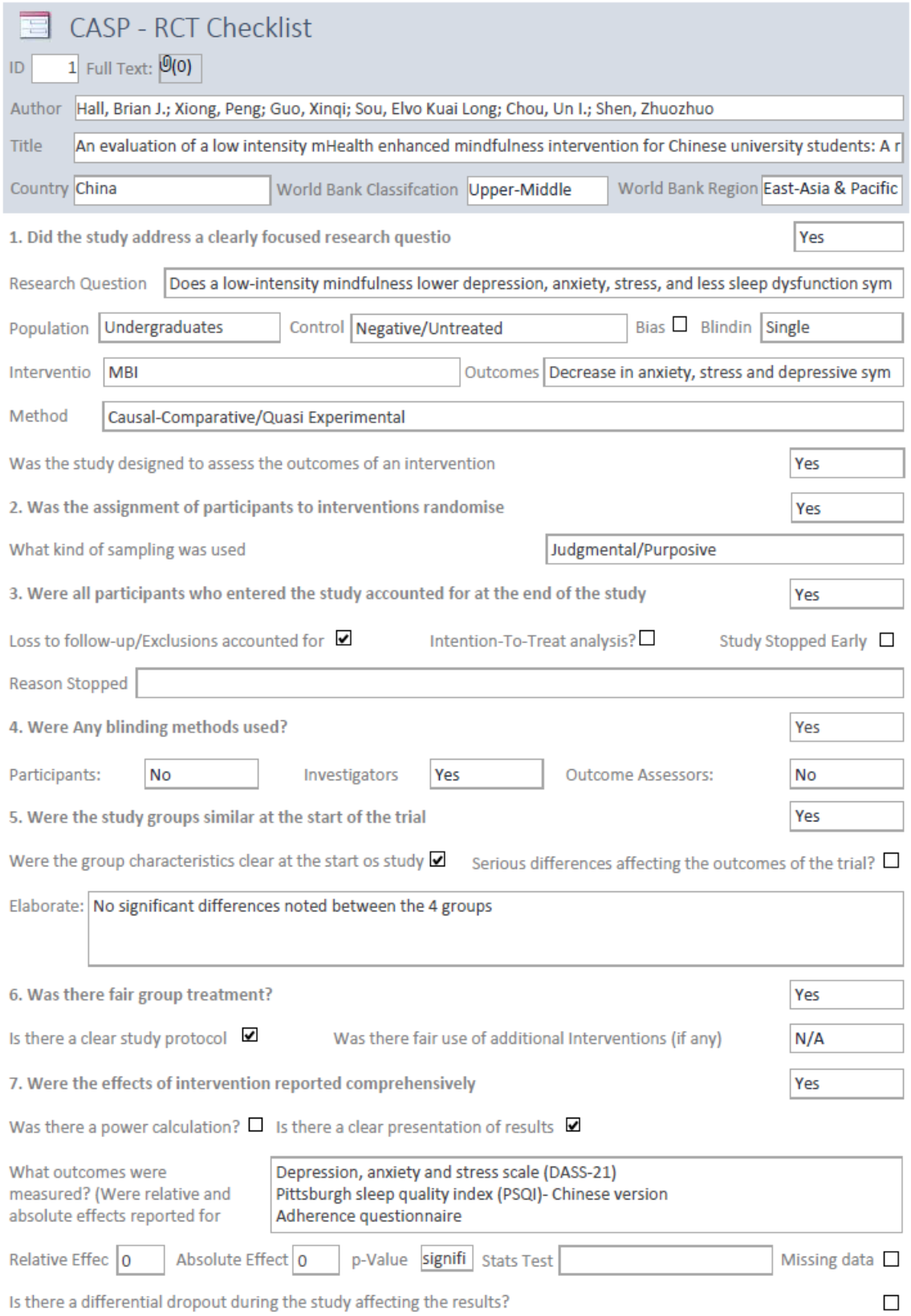
Outcome 3

Design: Randomised Control Trial | Samplin Judgmental/Purposive | Blinding: Single

Question	Does a low-intensity mindfulness lower depression, anxiety, stress, and less sleep dysfunction symptoms, and does an mHealth enhanced reminder motivate participants to adhere to self-guided mindfulness practice?
Aims	1. To evaluate the impact of low-intensity mindfulness-based intervention on symptoms of depression, anxiety, and stress among university students. 2. To evaluate the outcome of sleep dysfunction.
Method:	Causal-Comparative/Quasi Experimental
Data Collection:	Standardised Test
Data Analysis	ANOVA
Measured Outcomes	Depression, anxiety and stress scale (DASS-21) Pittsburgh sleep quality index (PSQI)- Chinese version Adherence questionnaire
Results	Based on the categorical scores of DASS-21 and PSQI, a large proportion of students reported moderate or higher levels of depression (55.5%), anxiety (64.3%) and stress (47.0%) symptoms. The majority of the students (82.2%) reported sleep dysfunction based on the PSQI.
p-Value	significance set at 0.02 Depression <0.01 Stress <0.01 Subjective sleep quality <0.01
CI	A statistically significant effect for adherence across all three intervention groups during the period between week 1 and week 4 ($p<0.05$). Compared to the no text
T-Test	
ANOVA:	Week 1 – Week 4 G2: M2.60 (SD1.17), G3: M3.62 (SD1.83) G4: M2.59 (SD0.98)
Cohen's d	reduced depression 0.83 anxiety 0.84 stress 0.75
Discussion	The current study demonstrated the efficacy of a low intensity mindfulness intervention to improve Chinese university students' psychological distress (depression, anxiety, stress) and sleep dysfunction (subjective sleep quality, sleep latency, habitual sleep efficiency). Medium to large effects were shown at week 4 and these were maintained at week 7. There was no significant within-group improvement among these mental health and sleep indicators in the waitlist control group. The current study demonstrated that a group-based low-intensity mindfulness intervention enhanced by text messaging adherence reminders was useful to
Limitations	1. The study outcomes were self-reported, which may lead to reporting bias. 2. Although we measured adherence, we did not evaluate the quality of the self-guided mindfulness practice. 3. Participants were recruited through campus posters and thus might not be representative of the entire student population but may represent those students who may be in need of psychological services.
Bias ☐	
Bias - Detai	

Appendix 9

CASP Appraisal data capture sheet (Designed using Microsoft Access)



CASP - RCT Checklist

ID 1 Full Text: (0)

Author: Hall, Brian J.; Xiong, Peng; Guo, Xinqi; Sou, Elvo Kuai Long; Chou, Un I.; Shen, Zhuozhuo

Title: An evaluation of a low intensity mHealth enhanced mindfulness intervention for Chinese university students: A r

Country: China | World Bank Classifcation: Upper-Middle | World Bank Region: East-Asia & Pacific

1. Did the study address a clearly focused research questio: Yes

Research Question: Does a low-intensity mindfulness lower depression, anxiety, stress, and less sleep dysfunction sym

Population: Undergraduates | Control: Negative/Untreated | Bias ☐ | Blindin: Single

Interventio: MBI | Outcomes: Decrease in anxiety, stress and depressive sym

Method: Causal-Comparative/Quasi Experimental

Was the study designed to assess the outcomes of an intervention: Yes

2. Was the assignment of participants to interventions randomise: Yes

What kind of sampling was used: Judgmental/Purposive

3. Were all participants who entered the study accounted for at the end of the study: Yes

Loss to follow-up/Exclusions accounted for ☑ | Intention-To-Treat analysis? ☐ | Study Stopped Early ☐

Reason Stopped:

4. Were Any blinding methods used?: Yes

Participants: No | Investigators: Yes | Outcome Assessors: No

5. Were the study groups similar at the start of the trial: Yes

Were the group characteristics clear at the start os study ☑ | Serious differences affecting the outcomes of the trial? ☐

Elaborate: No significant differences noted between the 4 groups

6. Was there fair group treatment?: Yes

Is there a clear study protocol ☑ | Was there fair use of additional Interventions (if any): N/A

7. Were the effects of intervention reported comprehensively: Yes

Was there a power calculation? ☐ | Is there a clear presentation of results ☑

What outcomes were measured? (Were relative and absolute effects reported for:
Depression, anxiety and stress scale (DASS-21)
Pittsburgh sleep quality index (PSQI)- Chinese version
Adherence questionnaire

Relative Effec: 0 | Absolute Effect: 0 | p-Value: signifi | Stats Test: | Missing data ☐

Is there a differential dropout during the study affecting the results? ☐

Elaborate:

Were the results of interval follow-ups during the study recorded ☑

Elaborate: clear tables including results of follow up at week 4 and week 7

8. Was there a precision of estimate of intervention/treatment effect calculation done No

Confidence Interval (CI): A statistically significant effect for adherence across all three intervention groups during the period between week 1 and week 4 ($p<0.05$). Compared to the no text ($M=2.60$, $SD=1.17$) and animal meme ($M=2.59$, $SD=0.98$) groups, the plain text message group ($M=3.62$, $SD=1.83$) reported higher average adherence. However, post-hoc pairwise comparisons did not reveal statistically significant differences between groups. There

9. Was there a Cost-Benefit analysis done No

Treatment Effect: Moderate Any harmful/unintended effects reported ☐ Cost-effectiveness analysis? ☐

10. Can results be applied locally Can't Tell

Elaborate: Possibly, this may differ from region to region as access to a smartphone may differ depending on the demographics of the particular institution. Also, this is a non-clinical sample

11. Will this intervention present better value than already existing interventions Yes

Elaborate: shows efficacy of a brief intervention, with only 2 hours of direct contact, while reducing burden on student support service through the use of readily available telehealth technology.

☐ Include in study?

Reasons for Exculsion?

Appendix 10

Ethical Approval:

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

21 February 2022

HREC REF: 751/2021

Dr J Parker
Department of Psychiatry & Mental Health
Neuroscience Institute, OMB
Email: john.parker@uct.ac.za
Student: tinashemangozho@gmail.com

Dear Dr Parker

PROJECT TITLE: INTERVENTIONS TO REDUCE PERCEIVED STRESS AMONG UNIVERSITY STUDENTS IN LMICS: A SCOPING REVIEW-MMED CANDIDATE-DR TINASHE MANGOZHO

Thank you for your response letter, addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study, subject to Director of Student Affairs permission.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, our letter dated 02 February 2022 provides guidance found on our website:
http://www.health.uct.ac.za/fhs/research/humanethics/forms

Approval is granted for one year until the 28 February 2023.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Dr Tinashe Mangozho will also be involved in this study.

Please quote the HREC REF 751/2021 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.