Mental health interventions for university students: A critical review of literature

Folashade Alloh[1], Tadej Citi[2], Paul Maurer[2], Sylvia Nalubega[3], & Josephine NwaAmaka Bardi[4]

[1] University of Wolverhampton (United Kingdom)
[2] University of East London (United Kingdom)
[3] Fatima College of Health and Sciences (United Arab Emirates)
[4] London South Bank University (United Kingdom)

bardij3@lsbu.ac.uk

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Being a student, the high intensity of events within a university setting creates significant levels of stress, which may also be associated with mental health conditions such as depression and anxiety. This review aims to examine the impact of mental health interventions on mental health challenges among university students. A comprehensive literature search in Google Scholar, Academic Search Complete, PsycINFO, and APA. Thirty-two articles were included in the review from the database searched according to the PRISMA criteria. Eligible articles were appraised using Critical Appraisal Skills Programme (CASP) tools. In total, 14 randomised controlled trials and 19 cross-sectional studies with the intervention were included. Only eleven studies reported racial/ethnic characteristics of participants, and most of the studies (60%) involved female participants. Evidence indicates that cognitive-behavioural therapy applied in different modalities is a major effective therapy to reduce depression, anxiety, and suicidal symptoms and increase well-being. This review identified the effectiveness of mental health interventions on depression and anxiety among university students. The review highlighted the disparity of ethnic minority representation in mental health intervention studies; hence it is suggested that future research should incorporate elements of ethnic minorities in mental health interventions.

Keywords: anxiety; depression; interventions; mental health; university students; well-being

INTRODUCTION

The World Health Organization (WHO) defines mental health (MH) as "a state of well-being in which the individual realises his or her abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to his or her community" (World Health Organization, 2004). Specifically, MH is defined as the state of achieving internal equilibrium, which allows individuals to harness their abilities in accordance with agreed societal values (Galderisi et al., 2015). However, this internal equilibrium can be easily challenged when starting university. Students face major life transformations that can be both exciting and overwhelming. They are required to handle multiple new academic and social pressures as they transition to adulthood (Topham & Moller, 2011). Consequently, studies have reported that stress levels among university students are significantly higher than in the general population (Adlaf et al., 2001). Challenges such as financial difficulties, the volume of assessments and exams, life outside the family, and competition in class all negatively impact MH. Additionally, studies indicate that students associate stress with mental health conditions like depression and anxiety, which are also highlighted as the most common MH concerns among undergraduate students (Dyrbye et al., 2006; Relojo, 2018).

Nearly 50% of secondary school students have been associated with one or more MH problems (Blanco et al., 2008), while approximately 30 % of students suffer from depression and anxiety (American College Health Association, 2009). As a result of MH issues, students' capacity for effectively coping with daily tasks and routines can be disrupted (Hunt & Eisenberg, 2010). For example, authors have reported that undergraduate students suffering from high-stress levels and MH difficulties experience decreased quality and satisfaction of life (Hunt & Eisenberg, 2010; Lustyk et al., 2004). In a study by Hysenbegasi et al., (2005) that assessed the impact of depression on the academic productivity of university students, a significant number of students with depression reported missing their classes, dropping courses, and missing social activities. In addition, lowered grades and GPA negatively affected students' productivity levels (Hysenbegasi et al., 2005).

Due to the prevalence of MH conditions among undergraduate students, MH services have been challenged to establish support facilities to help students cope with emotional distress and maintain their well-being. Various therapies, treatments and interventions have been innovated to address the MH challenges of the students. These innovations include a wide range of easily accessible and cost-effective interventions such as; (a) face-to-face therapies, (b) internet-based self-guided therapies, (c) mindfulness-based therapies, and (d) therapist-guided services (Davies et al., 2014; Harrer et al., 2019). These services aim to decrease the trajectory of psychological problems before the situation becomes chronic (Zivin et al., 2009).

However, there has not been evidence to support the conclusive effectiveness of the available MH interventions, as access to these interventions has not been harnessed. This lack is, as research shows, due to the fact that nearly half of the students experiencing MH challenges do not seek professional help to address those challenges (Cooke et al., 2006). Various reasons have been identified for why students are prevented or discouraged from accessing these services, including; (i) a lack of time, (ii) fear of stigma, (iii) lack of knowledge about available services, and (iv) students' tendency of choosing familiar support such as internet websites, family or friends (Ryan et al., 2010). These factors should be carefully considered when providing MH services for university students. Additionally, the poor health-seeking behaviour among university students and the limited awareness/availability of effective treatments create a substantial treatment gap among university students suffering from mental illness, with only one in five receiving minimally adequate treatment (Auerbach et al., 2016). Beyond the interventions on MH, there is a need to consider the accessibility of university students between 18 and 29 years to MH interventions, as well as those interventions' effectiveness. Therefore, this review sought to examine the effectiveness of MH interventions available in university settings, focusing on students aged 18-29 years.

This review set out to answer the following questions: (1) What mental health (MH) interventions are available for university students between the ages of 18 and 29? (2) What approaches are used to deliver

specific MH interventions to university students? (3) What is the impact of these specific interventions on promoting mental well-being among university students?

METHODS

Search strategy

Articles were identified by searching major databases and other sites for grey literature. The five databases searched include Google Scholar, Academic Search Complete, CYNAHL PLUS, PsycArticles and PsycINFO via EBSCO. Keywords of the four concepts searched in the databases were (i) mental health ("mental illness" OR "mental disorder" OR Depression OR Anxiety); AND (ii) university (Higher educat*OR College OR Educational instit*); AND (iii) student (ungraduat*OR postgraduat*) AND (iv) intervention (strateg* OR treat* OR therapy OR campaign). The synonyms for these terms were searched together using the Boolean operators.

The population, intervention, comparator and outcomes, study design and setting (PICO) criteria were used to screen for the eligibility of potential papers for inclusion in this review. Papers that employed the use of an intervention to address a MH challenge for university students between the ages of 18 and 29 years were included. Additional references were identified through bibliographic screening. Only articles published in English, conducted between 2010 and 2020, were included in this review. All geographical settings were considered. All studies were screened against the inclusion and exclusion criteria that were set based on the review question for this study (Table 1).

Table 1
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Primary research	Review papers
Peer-reviewed	Not peer-reviewed
Published between 2010–2020	Published before 2010
Written in English	Other languages outside of English
Intervention in mental health of university students	Intervention on other health conditions among university students
Intervention within University setting	Intervention outside university setting
University students as participants	Any student outside university students
18–29 years old	Above 29 years old; below 18 years old
Primary research; qualitative, quantitative, and mixed method studies	Reports, letters, editorials, conference papers, abstracts, systematic reviews, and perspectives

Experimental studies included randomised controlled, non-controlled, randomised, and non-randomised trials of MH interventions. MH studies consisting of intervention sessions were included. Studies including student participants that aimed at promoting MH, such as observational studies, were also included in the review.

Inclusion and exclusion criteria

Screening criteria for eligibility include population, intervention, outcomes, study design and setting.

- Population: Undergraduate university students between the ages of 18-29 years.
- Intervention: Mental health interventions to promote the mental health of university students
- Study design: All primary research study designs were included.
- Outcomes: Mental health outcomes of common conditions such as depression, anxiety and well-being challenges.
- Setting: All geographical settings were considered.

Study selection

The title and abstract of each article were screened by two authors against the inclusion and exclusion criteria (Table 1). The full-text articles selected were reviewed by three authors (TC, AS and PM), while FA reviewed each researcher's included articles. Any disagreements on selected articles were discussed and agreed upon after reaching a consensus. However, if no consensus was reached, JNB was asked to assess the article and adjudicate to ensure the credibility of the selection process.

Quality appraisal

The review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009). Quality appraisal was carried out by TJ and FA against the selected Critical Appraisal Skills Programme (CASP) tool adopted for each type of paper. After reviewing the critical appraisal, all authors discussed the disagreements in the quality appraisal results and inclusion in order to reach an agreement. Articles were appraised for quality using the CASP tools. The randomised controlled trial RCT CASP tool was used for randomised controlled studies, which evaluates studies through 10 domains (CASP, 2020). Similarly, cohort studies were assessed using an appropriate data extraction version of the CASP tool with 14 domains. The domains covered the study design, context, discussion, methods and findings. Each study was scored with a 'Yes', 'No' or 'Not available'. 'Yes' was assigned a 1 mark, 'No' was a -1 mark and not available was a 0 mark. A summation of all marks was totalled at the end of the appraisal. The score is presented as a star with one star for 1-4 scores indicating a low quality, two stars for 4-7 scores indicating medium quality, three stars for 7-10 scores, and four stars for 10-14 score. Eleven studies were rated *strong* with four stars quality appraisal (Dear et al., 2019; Warnecke et al., 2011; Cavanagh et al., 2013; Haukaas et al., 2018; Rasanen et al., 2016; Rohde et al., 2014; Pistorello et al., 2012; Hazlett-Stevens & Oren, 2017; Friedrich et al., 2018; Yamamoto et al., 2018).

Fourteen studies were rated *moderate* with three scores (Richards et al., 2013; Falsafi 2016; Gu et al., 2017; Tahsini et al., 2017; Zaboski et al., 2018; Nguyen-Feng et al., 2017; Yang et al., 2017; Renshaw and Rock 2018; Houston et al., 2017; Han & Chen, 2014; Dai et al., 2019; Hintz et al., 2015; McFadden et al., 2017). Finally, seven studies were rated *low* (Haddock et al., 2016; Mokrue et al., 2013; Levin et al., 2014; Kim et al., 2011; Rohde et al., 2016; Carpena et al., 2019; House & Walton, 2017) for not reporting bias, or levels of post-intervention drop out (Table 2 and 3). No study was excluded due to its poor quality.

Data extraction

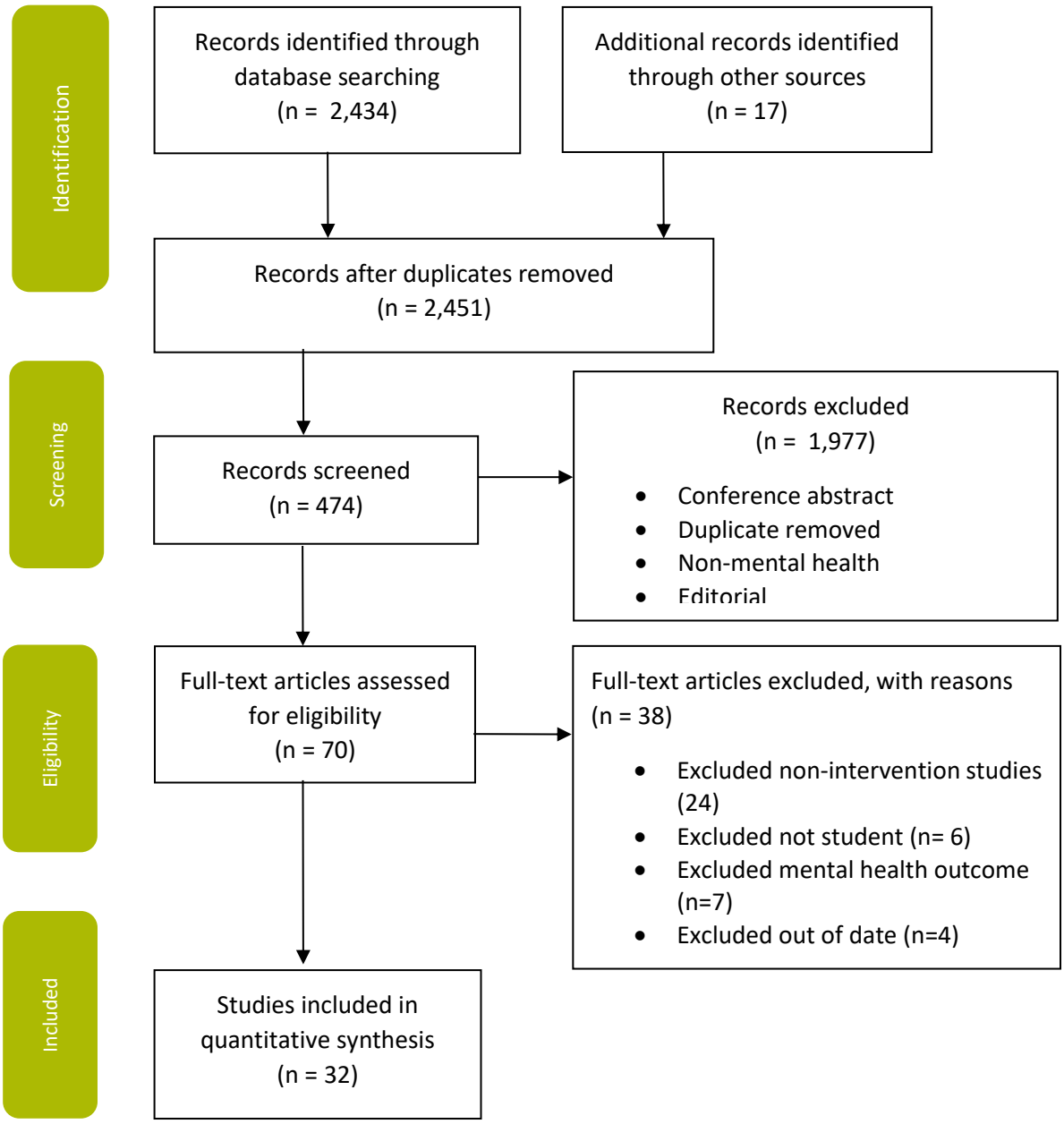
Data extraction was carried out by TJ using a customised Excel data extraction tool, while FA assessed the data extraction process (See Table 4 and 5). Study information including the publications' authors, year of publication, intervention type, gender, method of recruitment, outcomes reported, key findings and other important aspects of the study were extracted and presented. Studies were categorised based

on their design, such as; (a) cohort studies, (b) randomised controlled trials and (c) non-randomised controlled trials.

Data analysis

Only descriptive data analysis was conducted due to the heterogeneity of the studies included in the review, which made meta-analysis impossible. The review findings are presented under three main categories.

Figure 1. The PRISMA Flow chart for the study selection process



RESULTS

Search results

A total of 2,434 articles published between 2010 and 2021 were identified from the electronic database search. A further 17 articles were included from other data sources, comprising 2,451 articles. 1,977 articles were removed as duplicates and from title screening. Abstracts of the 474 papers left were screened further for eligibility. Full text of 70 papers was assessed, 38 papers of which were excluded for various reasons (Fig 1). Finally, a total of 32 papers were included in the review (Box 1).

Study characteristics

Fourteen papers were randomised controlled trials, while eighteen papers were cross-sectional studies with an intervention. In total the included studies involved 3,413 participants. Studies were conducted in 14 different countries (USA, UK, Ireland, Norway, Finland, Iran, Canada, South Korea, China, Spain, Brazil, Japan, Taiwan and Australia). The origin distributions are 46% from North America, 22% from Europe, 20% from Asia, 6% from Eastern Mediterranean, 3% from South America and 3% from Australia. The majority of the studies were published between 2016 and 2019, representing 53% of the included studies. All thirty-two articles described interventions carried out within university settings. Sample sizes ranged from 1 to 309 participants. However, the RCT studies tended to have smaller sample sizes, ranging from 15 to 64 participants in the intervention arm, except for one study that recruited 121 participants in the intervention arm (Nguyen-Feng et al., 2017).

Only eleven studies reported racial/ethnic characteristics of participants (Hintz et al., 2015; House & Walton, 2017; Houston et al., 2017; Mokrue & Acri, 2013; Levin et al., 2014; Nguyen-Feng et al., 2017; Pistorello et al., 2012; Renshaw & Rock, 2018; Rohde et al., 2014; Rohde et al., 2016; Zaboski et al., 2019;). Hintz et al., (2015) recruited 71% European, House & Walton, (2017) recruited 99% Caucasian, Houston et al., (2017) recruited 68% white, Levin et al., (2014) 71% white, Nguyen-Feng et al., (2017) recruited 73% white, Pistorello et al., (2012) recruited 69% white, Renshaw & Rock, (2018) recruited 81% white, Rohde et al., (2014) recruited 81% white, Rohde et al., (2016) recruited 70% white. Among these studies, Black American students were the least recruited, followed by Hispaninc and Asian students. Only three studies recruited more non-white participants, McIndoo & Hopko, (2013) recruited a non-white participant, Mokrue & Acri, 2013 recruited 97% non-white and Zaboski et al., (2019) recruited 52% non-Whites.

Most of the studies (65%) recruited female participants for the interventions (Cavanagh et al., 2013; Friedrich et al., 2018; Han & Chen, 2014; Haukass et al., 2018; Hintz et al., 2015; House & Walton, 2017; Houston et al., 2018; Kim et al., 2011; Levin et al., 2014; Lopez-Rodriguez et al., 2017; McFadden et al., 2017; Mokrue & Acri, 2013; Nguyen-Feng et al., 2017; Pistorello et al., 2012; Rasanen et al., 2016; Renshaw & Rock, 2018; Rohde et al., 2014; Rohde et al., 2016; Warnecke et al., 2011; Yamamoto et al., 2018; Yang et al., 2018; Zaboski et al., 2019). Only two studies recruited more males or only male participants (Gu et al., 2017; McIndoo & Hopko, 2013). No gender was mentioned in five studies (Dai et al., 2019; Dear et al., 2019; Falsafi 2016; Hazlett-Stevens & Oren, 2017; Tahsini et al., 2017).

The average length of interventions reported in the included studies was 6 to 8 weeks, with 8 weeks as the most common length. The shortest intervention length was 2 weeks, with 18 months being the longest. More than 77% of the studies used passive control, 22% used active controls, and 18% used more than one active control group. The most common intervention type was cognitive behaviour therapy (CBT), which was included in 40% of the studies, while 30% used mindfulness and others (30%) used different intervention approaches.

School-based programmes/interventions

All interventions were MH programmes for improving MH challenges among university students (see Appendix 1). Interventions varied in focus from the CBT approach (Dear et al., 2019; Han & Chen, 2014; McIndoo & Hopko, 2014; Mokrue & Acri, 2013; Rohde et al., 2014; Rohde et al., 2016; Richard et al., 2013).

Mindfulness (Carpena et al., 2019; Cavanagh et al., 2013; Falsafi, 2016; Hazlett-Stevens & Oren, 2017; Warnecke et al., 2011; Yamamoto et al., 2018), Dot-probe training (Dai et al., 2019), yoga (Falsafi 2016; Zaboski et al., 2019), Studieren wie im Schlaf (SWIS) training (Friedrich et al., 2018), mindfulness and CBT (Gu et al., 2017), Internal Family Systems (IFS) intervention (Haddock et al., 2017), physical activity counselling (McFadden et al., 2017), attention training technique and mindfulness self-compassion (Haukaas, 2018), light box therapy (House & Walton 2017), resilience and coping intervention (Houston et al., 2017), CBT and interpersonal therapy (Kim et al., 2011), Web-based acceptance and commitment therapy (Levin et al., 2014), psychoeducation, mindfulness and stress management (Nguyen-Feng et al., 2017), Dialectical behaviour therapy (Pistorello et al., 2012), acceptance and commitment therapy (Rasanen et al., 2016), gratitude thinking only exercise (Renshaw & Rock, 2018), Biofeedback-Aided Relaxation Training (Tahsini et al., 2017), Biodanza (Lopez-Rodriquez et al., 2017) and comprehensive self-control training (Yang et al., 2018).

Measurement instruments

In measuring outcomes among students, studies employed different measurement tools (see Appendix 2). In terms of depression measurement, Beck-depression was used by most studies (Dai et al., 2019; Falsafi, 2016; Gu et al., 2017; Haddock et al., 2017; House & Walton, 2017; McIndoo & Hopko, 2014; Mokrue & Acri, 2013; Pistorello et al., 2012; Rasanen et al., 2016; Rohde et al., 2016; Yang et al., 2018; Zaboski et al., 2019). Four studies used a patient health questionnaire for depression and anxiety (Cavanagh et al., 2013; Dear et al., 2019; Haukaas, 2018: McFadden et al., 2017). One study used the German general depression scale (Friedrich et al., 2018). One study used a psychological blame scale to measure depression (Han & Chen, 2014). Four studies used the Centre for Epidemiological Studies' depression scale (Houston et al., 2017; Kim et al., 2011; Lopez-Rodriquez et al., 2017; Rohde et al., 2014). Four studies used a Depression, Anxiety and Stress Scale (DASS) to assess depression and anxiety (Hazlett-Stevens & Oren, 2017; Levin et al., 2014; Nguyen-Feng et al., 2017; Renshaw & Rock, 2018), while one study used Zung self-rating depression scale (Yamamoto et al., 2018). For anxiety, five studies reported using Beck anxiety Inventory (BAI) (Dai et al., 2019; Gu et al., 2017; Haddock et al., 2017; Makrue & Acri, 2013; McIndoo & Hopko, 2014).

Three studies used generalised anxiety disorder-7 (Dear et al., 2019; Haukaas, 2018; Houston et al., 2017). One study used Hamilton Anxiety scale to assess anxiety (Falsafi, 2016), one study used a patient health questionnaire for anxiety (Friedrich et al., 2018), one study used DASS scales for anxiety (Rasanen et al., 2016), and one study used the Liebowitz social anxiety scale self-reported measure and the social anxiety questionnaire for adults (Zaboski et al., 2019) (see Appendix 3).

Review outcomes

The primary outcome for this review was a focus on the reduction in university students' depression and anxiety. Data was included if the study involved at least one participant who reported reduction in feelings of depression and/or anxiety. Studies that reported well-being outcomes were also included in the review. Well-being outcomes were included as many studies reported them (Hope & Henderson 2014; Ibrahim et al. 2013) and they provided a holistic understanding of the interventions employed among university students.

1. Depression outcomes

Several papers highlighted a significant decrease of depressive symptoms after the intervention sessions. The results of supported and unsupported online CBT therapies indicated a difference of MH condition improvement by 52% and 42%, respectively (Richards et al., 2013), which leads to the conclusion that the coach-supportive session is a superior approach. The majority of students were found to engage better with internet-delivered interventions (Dear et al, 2019). Dialectical behaviour therapy was highlighted as an effective and/or successful intervention to treat severely distressed clients with complex, multi-problems and/or suicidal profiles (Pistorello et al., 2012). This finding was strengthened by that of Dai et al., (2019) who suggested that different interventions need to be applied

for different types of depression. In this study that explored Attentional Bias Modification (ABM) therapy, Dai et al., (2019) found this intervention to be more effective for non-clinical depression situations and also similar to comprehensive self-control training (CSCT) (Yang et al., 2018).

Richard et al., (2013) reported significant improvement (p<.001) using email-CBT. Similarly, mindfulness was reported to be effective in reducing depression among intervention groups. Friedrich et al., (2018) used CBT and reported that, as a result, students experienced less anxiety. Only one-fifth showed clinically reduced depression, while 5% showed deteriorated depression scores in long-term. Similarly, Kim et al., (2011) using CBT reported a reduction in depression scores from 20.26 to 15.56 in intervention compared 19.32 to 20.26 in the control group (p= .005). McIndoo & Hopko, (2014) reported significant reduction symptoms over the course of treatment using CBT. However, Gu et al., (2017) who employed Mindfulness Based Cognitive Therapy (MBCT), reported no significant reduction in depression (p =.125) at the end of the intervention, although significant improvement was reported among the intervention group at post-intervention and follow-up phases.

Warnecke et al., (2011) reported significant reduction in DASS (p< .05) with the positive effect maintained after 8 weeks follow-up. Carpena et al., (2019) found that mediation brought about a significant reduction in depressive symptoms (p< .001), although there was a reduction of the effect after 12 months follow-up. Dai et al., (2019) used the Dot-probe task in intervention for depression among university students, with a significant reduction being reported (p<.001) after one month of intervention implementation. Similarly, the use of psychological education showed significant improvement in depression outcome (p < 0.001) with further improvement after a 3 month follow-up (p< 0.01) for participants with mild and severe depressive symptoms.

Mindfulness was reported to improve depressive symptoms (Haukaas, 2018). Falsafi et al., (2016) reported depression levels reduced significantly among a mindfulness group (p<.01) from pre to follow-up measurements. Similarly, the study reported improvement among participants in the yoga group (p< .01) However, the depression assessment scores stayed the same from post-intervention to follow-up measurements in the yoga group (Falsafi, 2016). Haddock et al., (2017) reported that depression reduction was noticed; however, there was no significant difference in depressive symptoms between the intervention and control groups. Han & Chen, (2014) used psychological education and reported no significant difference in depressive symptoms.

Levin et al. (2014), using web-based acceptance and commitment therapy did not realise any significant results in depression among students. Pistorello et al., (2012) reported significant reduction of depression at the 12 month follow-up (p<.04). Rasanen et al., (2016) found improvement of depression symptoms in the Acceptance and Commitment therapy group. Tahsini et al., (2017) used Biofeedback-Aided Relaxation Training (BFRT) and reported significant reduction in depression when compared with the control group. Similarly, Zaboski et al., (2019), using group behaviour therapy with depressive symptoms showed significant improvement. The study by Renshaw & Rock (2018) found that gratitude favours depression symptoms among the intervention group. However, Rohde et al., (2014) and Rohde et al., (2016) reported that cognitive therapy did not show significant change in depressive measures after a 12-month follow-up. Nguyen-Feng et al., (2017) reported no significant change in depression among the mindfulness intervention group. Similarly, Gu et al., (2017) reported no significant change in depressive symptoms among the intervention group at the post-study and follow-up phases.

Haddock et al., (2017) found no significant decrease in depressive symptom following internal family systems intervention when compared to the control group. Web-based acceptance and commitment therapy did not show significant differences among students with depression, anxiety and stress (Levin et al., 2014). Hintz et al., (2015) reported fewer depressive symptoms among the PCI intervention group than the control group. Using light box therapy, House & Walton, (2017) reported significant reduction in depression score from 30.6 (severe) to 11.8 (minimal). Physical activity counselling used by McFadden et al., (2017) showed reduction in depressive symptoms but not significant among participants.

Only one study was conducted mainly among participants from ethnic minority group using CBT intervention which reported a significant reduction in depression scores (Mokrue & Acri, 2013). Kim et al., (2011) used CBT and reported significant reduction in depressive symptoms among the intervention group (p=.005) compared to the control group. Additionally, mindfulness therapies were shown to be effective treatments for depressive symptoms. Mindfulness and yoga interventions were highlighted to significantly reduce depressive symptoms (Falsali, 2016). However, Carpena et al., (2019) reported meditation for depression as only being effective when practiced continuously. Dear et al., (2019), Friedrich et al., (2018) and Levin et al., (2014) recommended the use of online-based interventions as routine care for university students.

2. Findings based on intervention types

Based on the intervention types, CBT reported significant outcomes with reduction of depression, anxiety and stress (Carpena et al., 2019; Cavanagh et al., 2013; Dai et al., 2019; Dear et al., 2019; Friedrich et al., 2018; Gu et al., 2017; Haukaas et al., 2018; Hazlett-Stevens & Oren, 2017; Hintz et al., 2015; House & Walton, 2017; Houston et al., 2017; Kim et al., 2011; Levin et al., 2014; McIndoo & Hopko, 2014; Mokrue & Acri, 2013; Ngyen-Feng et al., 2017; Pistorello et al., 2012; Renshaw & Rock, 2018; Richards et al., 2013; Tahsini et al., 2017; Warnecke et al., 2011; Yamahoto et al., 2018; Yang et al., 2018; Zaboski et al., 2019). Other studies did not report significant reduction in MH symptoms among students (Haddock et al., 2017; Han & Chen, 2014; Rasanen et al., 2016; Rohde et al., 2014; Rohde et al., 2016; Yamamoto et al., 2018).

Studies that used CBT reported the greatest incidence of significant findings (Dear et al., 2019; Hintz et al., 2015; Houston et al., 2017; Kim et al., 2011; Levin et al., 2014; McIndoo & Hopko, 2014; Mokrue & Acri, 2013; Pistorello et al., 2012; Renshaw & Rock, 2018; Richards et al., 2013; Yamamoto et al., 2018; Yang et al., 2018; Zaboski et al., 2019). This was followed by mindfulness intervention (Carpena et al., 2019; Cavanagh et al., 2013; Haukaas et al., 2018; Hazlett-Stevens & Oren, 2017; Warnecke et al., 2011). Tahsini et al., (2017) used a biofeedback aided relaxation training device and reported significant reductions in levels of depression and anxiety. Lopez-Rodriquez et al., (2017) used Biodanza intervention with a significant reduction in depression as a result. Studies with more than one intervention showed mixed results. House & Walton, (2017) used light box therapy which resulted in significant reduction in depression and anxiety. Fasalfi, (2016) reported insignificant results in the yoga group but significant outcomes in mindfulness. Similarly, Gu et al., (2017) reported no reductions in levels of depression and anxiety but significance in mindfulness. However, Haddock et al., (2017) used IFS intervention but no significant results in depression and anxiety. Four studies used CBT but no significant outcome was reported among the intervention and control groups (Han & Chen, 2014; Rasanen et al., 2016; Rohde et al., 2014; Rohde et al., 2016).

Most of the studies reviewed used face to face intervention (Carpena et al., 2019; Dai et al., 2019; Dear et al., 2019; Falsafi, 2016; Friedrich et al., 2018; Gu et al., 2017; Hazlett-Stevens & Oren, 2017; Lopez-Rodriquez et al., 2017; McFadden et al., 2017; McIndoo & Hopko, 2014; Pistorello et al., 2012; Renshaw & Rock, 2018; Rhode et al., 2014; Rohde et al., 2016; Tahsini et al., 2017; Warnecke et al., 2011; Yamamoto et al., 2018; Yang et al., 2018; Zaboski et al., 2019). Others used online and email (Cavanagh et al., 2013; Hintz et al., 2015; Levin et al., 2014; Nguyen-Feng et al., 2017; Rasanen et al., 2016; Richards et al., 2013).

In terms of significance of outcomes based on intervention delivery via face to face or online; fifteen studies used face to face interventions delivery (Carpena et al., 2019; Dai et al., 2019; Friedrich et al., 2018; Haukaas et al., 2018; House & Walton, 2017; Houston et al., 2017; Kim et al., 2011; Mokrue & Acri, 2013; Pistorello et al., 2012; Renshaw & Rock, 2018; Tahsini et al., 2017; Warnecke et al., 2011; Yamamoto et al., 2018; Yang et al., 2018; Zaboski et al., 2019). However, others used online interventions (Cavanagh et al., 2013; Dear et al., 2019; Hintz et al., 2015; Levin et al., 2014).
Five studies (Gu et al., 2017; Haddock et al., 2017; Han & Chen, 2014; McFadden et al., 2017; Rhode et al., 2014; Rhode et al., 2016) reported insignificant reductions in levels of depression, anxiety and stress, while two studies (Rasanen et al., 2016; Nguyen-Feng et al., 2017) reported online delivery of interventions to be insignificant.

3. Anxiety outcomes

The majority of studies reported higher anxiety outcomes than depression. Similar to previous outcomes, CBT was demonstrated as an efficacious and time-effective therapy in session for students suffering from anxiety disorders (Mokrue & Acri, 2013; McIndoo & Hopko, 2014; Zaboski et al., 2019). Carpena et al., (2019) reported that meditation training in healthy students lasting more than six weeks helped attenuate anxiety ($p<.001$). However, the intervention was only effective among those who continued meditating. Similarly, Warnecke et al., (2011) reported that audio Compact Disc (CD) of guided mindfulness, listened to daily over 8 weeks was as effective as other stress management tools for students. Additionally, Falsafi (2016), mindfulness and yoga sessions assigned together were found to be more effective if practiced together, rather than individually ($p< .001$). In addition, it was reported that sleep training involving Biofeedback-aided Relaxation Training (BFRT) was effective for significant improvements regarding reduced anxiety (Tahsini et al., 2017).

On the other hand, a reported online therapy intervention, the audio CD of guided mindfulness and a brief Mindfulness-Based Self-Help (MBSH) online programme, showed a decrease in anxiety symptoms and can be successfully employed as routine care (Cavanagh et al., 2013; Dear et al., 2019; Hintz et al., 2015; Warnecke et al., 2011). According to Hintz et al., (2015) participants of a theory-based online intervention reported some increase in well-being results and decreasing stress-related MH outcomes. Thus, there are suggestions for the provision of online mindfulness approaches in terms of acceptability, engagement and effectiveness (Cavanagh et al., 2013).

4. Well-being outcomes

Most of the studies highlighted well-being outcomes as either a primary or secondary outcome. For instance, sleep training has been reported as a significant support not only for the psychological state, but also for better quality of life (Friedrich et al., 2018). In addition, studies showed mindfulness-based sessions as being closely related to the increase in physical health outcome (Hazlett-Stevens & Oren, 2017). Renshaw & Rock, (2018) reported a brief grateful-only thinking exercise as having a positive effect on happiness and life satisfaction. In addition, light therapy was reported to significantly decreased somatic aches and pains, concentration difficulties ($p< .001$), and appetite problems (House & Walton, 2017). Lopez-Rodriquez et al., (2017) reported significant improvement in sleep quality ($p= 0.032$) and stress ($p = 0.015$) among intervention group. McFadden et al., (2017) reported increase physical activity levels among students using physical activity counselling.

DISCUSSION

This review examined the effectiveness of MH interventions available in university settings, focusing on students aged 18-29 years. The review focused at two primary outcomes of depression and anxiety, plus well-being as a secondary outcome. Overall, the review found various MH interventions that were effective for treating/relieving depression and anxiety symptoms among university students.

Several papers that were included in this review highlighted a significant decrease of depressive symptoms after the intervention sessions. Supported MH approaches (e.g., CBT) were found to be better alternatives than unsupported approaches. Dialectical Behavior Therapy was particularly reported to be an effective and successful intervention to treat severely distressed clients with complex, multi-problems and suicidal profiles. On the other hand, Attentional Bias Modification (ABM) therapy and Comprehensive Self-control Training (CSCT) were found to be more effective for non-clinical depression situations. Other interventions that were highly supported for relieving depressive symptoms included mindfulness, meditation, and yoga. Regarding anxiety outcomes, many studies reported favourable outcomes with the applied interventions. Like depression outcomes, CBT was demonstrated as an efficacious and time-effective therapy for students suffering from anxiety disorders. Most of the included studies highlighted well-being outcomes as either a primary or secondary outcome. The most effective interventions for well-being included mindfulness-based

sessions as being closely related to the increase in physical health and well-being of participants. This finding has been supported by other authors, who recommended counselling and other mind-challenging interventions as being favourable for improving the MH well-being and quality of life of university students (Cooke et al., 2006; Lustyk et al., 2004).

Internet delivered interventions were found to be highly effective in alleviating MH symptoms. This finding is consistent with previous research that highlighted that internet/web based interventions were effective in dealing with a range of students' MH symptoms such as depression, anxiety and stress (Bewick et al., 2008; Davies et al., 2014; Harrer et al., 2019). This review suggests internet-based interventions for use as routine care for university students. In their study on online universal interventions, Ryan et al., (2010) recommended that online interventions may be particularly useful for helping students with MH challenges who may not seek formal help. Considering that many university students find it difficult to seek MH support (Auerbach et al., 2016; Blanco et al., 2008; Zivin et al., 2009), online interventions should therefore be embraced as a favourable approach for supporting university students. While the online option is recommended, authors have suggested further research into this field is needed. For example, Harrer et al., (2019) recommends that it is important to ascertain the student groups for which internet based interventions could be most effective in order to increase treatment effectiveness, while Bewick et al., (2008) recommends more controlled clinical trials to ascertain their efficacy.

Of the 32 articles reviewed in this study, only 11 reported ethnic information relating to the participants, and seven of these studies were conducted in the USA. The limited minority participants in most studies highlight the limitations of the studies reviewed in understanding of MH interventions among minority students. Following global trends, MH intervention studies are not addressing the challenges of MH among ethnic minority students. Moreover, there is a reportedly high prevalence of MH conditions among ethnic minority groups (Wallace et al., 2016). It is therefore critical that more research targeting minority groups should be conducted in various settings in order to ascertain MH interventions that may be applicable for them.

Strengths and limitations

There are several strengths associated with this review. The review followed laid out review guidelines to ensure credibility of the review process (PRISMA). In addition, the descriptive approach to data analysis was helpful in highlighting aspects of the literature that might have easily been missed due to the individuality of the papers. Our review therefore contributes to the body of literature on the interventions available for managing the MH conditions of university students.

One of the limitations of our review is the low quality of included RCTs. The majority of the RCTs did not use blinding (or effective blinding); an issue which could impact the studies' outcomes. Nevertheless, all included studied met the minimum inclusion quality and no study was excluded due to its low-quality appraisal results. Considering that our review included comparably more female than male students, and in the view that the majority of studies were from the USA, generalisability of the review results might be difficult to achieve; therefore, the results should be interpreted with caution.

Although CBT interventions accounted for the majority of the intervention type reported in the studies, there was a high level of methodological variability among the studies included in the review. In addition, the use of active and perceive control groups made it difficult to compare the reported findings. Furthermore, there was a sizeable number of studies with relatively small sample sizes; a fact that also has implications for the interpretation of study findings. These limitations should be considered in the interpretation of the review results.

Implications / suggestions for future research

The variability in the methodologies used in the studies reviewed makes it difficult to recommend an intervention that might be more effective in promoting the MH of university students. It will be valuable that a future review is conducted on each intervention type to evaluate their effectiveness in

this population group. Future studies can address the limitation of recruiting mainly female participants as reported in this review to address and hopefully increase the understanding of the impact of gender on MH interventions. This review highlighted the deficit of ethnic minority representation in MH intervention studies. Hence, future research can incorporate elements of ethnic minorities in MH interventions from diverse settings.

CONCLUSIONS

The outcome of this review provides a summation of findings on MH interventions among university students within the age of 18 and 29 years. Overall, this review has identified the effectiveness of MH interventions on depression and anxiety among university students between the ages of 18 and 29 years; knowledge which can be used to promote the health of these students. Given the demographic of university students which falls mainly within this age bracket, the findings from this review can be valuable for university MH policy and support for students. This review has highlighted the paucity of ethnic minority representation in MH intervention studies. Hence it is suggested future research should incorporate elements of ethnic minorities in MH interventions.

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Appendix 1: Intervention types and citations

No	Intervention type	Citation
1	Cognitive behavioural therapy	Dear et al., 2019; McIndoo & Hopko 2014; Mokrue & Acri 2013; Richard et al., 2013; 2014; Rohde et al., 2014; Rohde et al., 2016; Yamamoto et al., 2018: Han & Chen, 2014
2	Mindfulness	Carpena et al., 2019; Cavanagh et al., 2013; Falsafi, 2016; Hazlett-Stevens & Oren, 2017; Warnecke et al., 2011.
3	Dot-probe training	Dai et al., 2019
4	Yoga	Falsafi, 2016; Zaboski et al., 2019
5	Studieren wie im Schlaf (SWIS)	Friedrich et al., 2018
7	Mindfulness and CBT	Gu et al., 2017
8	Internal Family Systems (IFS)	Haddock et al., 2017
9	Attention training technique and mindfulness self-compassion	Haukaas, 2018
10	Light box therapy	House & Walton, 2017
11	Resilience and coping intervention	Houston et al., 2017
12	CBT and interpersonal therapy	Kim et al., 2011
13	Web-based acceptance and commitment therapy	Levin et al., 2014
14	Psychoeducation, mindfulness and stress management	Nguyen-Feng et al., 2017
15	Dialectical behaviour therapy	Pistorello et al., 2012
16	Acceptance and commitment therapy	Rasanen et al., 2016
17	Gratitude thinking only exercise	Renshaw & Rock, 2018
18	Biofeedback-Aided Relaxation Training	Tahsini et al., 2017
19	Biodanza	Lopez-Rodriquez et al., 2017
20	Comprehensive self-control training	Yang et al., 2018
21	Physical activity counselling	McFadden et al., 2017

Appendix 2
Depression instruments used and citation

No	Instrument used	Citations
1	Beck Depression Scale	Dai et al., 2019; Falsafi, 2016; Gu et al., 2017; Haddock et al., 2017; House & Walton, 2018; Mokrue & Acri, 2013; McIndoo & Hopko, 2014; Pistorello et al., 2012; Rasanen et al., 2016; Rohde et al., 2016; Yang et al., 2018; Zaboski et al., 2019
2	Patient Health Questionnaire	Cavanagh et al., 2013; Dear et al., 2019; Haukaas, 2018; McFadden et al., 2017
3	German General Depression Scale	Friedrich et al., 2018
4	Psychological Blame Scale	Han & Chen, 2014
5	Centre for Epidemiological Studies' Depression Scale	Houston et al., 2017; Kim et al., 2011; Lopez-Rodriquez et al., 2017; Rohde et al., 2014
6	Depression, Anxiety and Stress Scale (DASS)	Hazlett-Stevens & Oren, 2017; Levin et al., 2014; Nguyen-Feng et al., 2017; Renshaw & Rock, 2018.
7	Zung Self-Rating Depression Scale	Yamamoto et al., 2018

Appendix 3
Anxiety instruments used and citations

No	Instrument used	Citations
1	Beck Anxiety Inventory	Dai et al., 2019; Gu et al., 2017; Haddock et al., 2017; Makrue & Acri, 2013; McIndoo & Hopko, 2014.
2	Generalized Anxiety Disorder-7	Dear et al., 2019; Haukaas, 2018; Houston et al., 2017.
3	Hamilton Anxiety Scale	Falsafi, 2016
4	Patient Health Questionnaire	Friedrich et al., 2018
5	DASS Scales	Rasanen et al., 2016
6	Liebowitz Social Anxiety Scale	Zaboski et al., 2019