THE IMPACT OF DEPRESSION AND ANXIETY ON ACADEMIC PERFORMANCE AMONG UNIVERSITY STUDENTS IN UAE: EVALUATING A CBT-BASED ONLINE INTERVENTION IN ACADEMICALLLY STRUGGLING STUDENTS WITH LOW MOOD

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#### Abstract

Rising rates of university students experiencing symptoms of depression and anxiety have been observed, both of which affect cognitive function. While some studies suggest that depression can significantly impact and impair students' academic performance, study satisfaction, and general well-being, the relationship between anxiety and academic outcomes is perhaps more complex.

Academic success is a crucial concern for university students; therefore, understanding how depression and anxiety and university academic experiences affect each other is critical. While options for effective treatments are widely available, these disorders are often under-diagnosed and under-treated. Recent literature suggests an increasing need for accessible and confidential mental health services to support university students suffering from psychological and/or academic difficulties. Student populations use technology at a high rate. Though online interventions can effectively improve university students' mental health, their impact on educational attainment has not been fully explored.

This PhD study aims to systematically review evidence for a relationship between anxiety and depression and academic performance in university students, to examine the hypothesis that higher levels of depressive or anxiety symptoms will be associated with poorer academic performance among university students, and

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investigate the potential effectiveness of a self-directed, internetdelivered cognitive-behavioural skills training tool (MoodGYM) in improving academic performance (GPA) and mood of university students in the UAE.

Chapter one provides an overview of depression and anxiety in university students, a literature review of the prevalence of emotional disorders in this group, the impact of anxiety and depression on on academic outcomes, and the role of online interventions in supporting students' mental health literacy in improving management and help-seeking for depression or anxiety. Through a systematic review, study One (Chapter Two) explores the evidence for the impact of emotional disorders (anxiety or depression) on university students' academic performance. Of 2,746 citations, 10 met the eligibility criteria, of which six cross-sectional analyses and three of four longitudinal studies reported a negative relationship between depression and academic performance. Three cross-sectional analyses and one longitudinal study reported a negative relationship between anxiety and academic performance. This review supports a consistent relationship between depression and academic performance, but less support for anxiety. Study Two (Chapter Three) describes a longitudinal representative survey of depression, anxiety and

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academic achievement in 404 students from a public university in the UAE with a six-month follow-up. The survey also investigated whether the relationship between emotional disorders and academic performance is moderated by gender or socioeconomic status. The findings highlight that over a third of students (34.2%; CIs 29.7%-38.9%) screened for a possible major depressive disorder, but less than a quarter (22.3%; CIs 18.2%-26.3%) screened for possible generalised anxiety disorder. The cross-sectional analysis found that higher levels of depression and anxiety were significantly but weakly associated with poor academic performance. The longitudinal analysis found that depression, but not anxiety, predicted a poorer GPA at the six-month followup. Findings from these two studies were inputted into the development of the third study. It was predominantly based on exploring the potential effectiveness of a selfdirected, internet-delivered, cognitive-behavioural skills training program (MoodGYM) in improving academic outcomes average and low mood in university students in the UAE with poor academic performance. Study Three (Chapter four) describes an exploratory pre-post intervention study with a historical control group of 50 students with less than 2 GPA (academically failing) and depressive symptoms from one UAE university. The findings of study three indicated a significant decrease in

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depression scores at post intervention (P=0.004) and the proportion of participants scoring above the cut-off for depression (HADS-D  $\geq$ 8) fell from 77.2% to 27.3% (p<0.001). There was also a substantial fall in anxiety scores (p<0.001) and the proportion of participants above the cut-off for anxiety (HADS-A  $\geq$ 8) fell from 50% to 11.4 % (p=0.001). GPA scores improved substantially over time (p<0.001, d=1.3) and attendance warnings reduced (p = 0.008, d = 0.6). Compared to historic control, the intervention group had higher GPA at followup (p < 0.030 d = 0.6) fewer attendance warnings (p =0.036 d = 0.7). Most students (79.6%) evaluated MoodGYM as useful. More modules completed (p=0.005) and greater reduction in attendance warnings (p=0.007) were independently associated with greater improvement in GPA scores at follow-up. **Chapter five** considers all the evidence of the impact of emotional disorders on academic outcomes of university students, the evaluation of the online intervention, and plans for future longitudinal research for further feasibility studies.

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#### Publications and presentations arising from this thesis

The following publications and presentation have been produced from work within this thesis:

**Chapter Three (study two):** Awadalla, S., Davies, E., & Glazebrook, C. (2020). A longitudinal cohort study to explore the relationship between depression, anxiety and academic performance among Emirati university students. BMC Psychiatry, 20(1). doi: 10.1186/s12888-020-02854-z (Appendix 1).

**Chapter Four (study three)**: Awadalla, S., Davies, E., & Glazebrook, C. (December 2020). Using an online CBT-based intervention to improve academic performance in students with low mood: A pre-post study with historical control. BMC Psychiatry, <u>https://doi.org/10.21203/rs.3.rs-228617/v1</u> Under review (Appendix 2).

**Chapter Two (study one)**: Awadalla, S., Davies, E., & Glazebrook, C. (2021) The impact of depressive and anxiety symptoms on academic achievement among undergraduate university students: A systematic review. Journal of American College Health. Under review (April 2021) (Appendix 3).

#### Presentation

May 2019 Suheir Awadalla, Professor Cris Glazebrook & Dr Bethan

Davies Longitudinal Cohort Study to Explore the Relationship Between Anxiety, Depression and Academic Performance Among Emirati University Students. Poster presented at Institute of Mental Health 21/5/2019 Research Day, The University of Nottingham.

### Abbreviations

GPA	Grade Point Average
MDD	Major Depressive Disorder
GAD	General Anxiety Disorder
UAE	United Arab Emirates
OR	Odds ratio
PHQ-9	Patient Health Questionnaire (9-item version)
GAD-7	General Anxiety Disorder scale (7-item version)
SDs	Standard Deviation
FAS	Family Affluence Scale
СІ	Confidence Interval
АСТ	Acceptance and Commitment Therapy
СВТ	Cognitive Behavioural Therapy
HADS	Hospital Anxiety and Depression Scale
ANOVA	Analysis of Variance
BOS	Bristol Online Surveys

## **CCBT** Computerized/internet-based Cognitive Behavioural

Therapy

MHL	Mental health literacy
MHFA	Mental health first aid
%	Percentage
a	Cronbach's alpha
Yr	Year

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Chapter One: An overview of the prevalence of depression and anxiety among university students and its impact on their academic performance: An overview of exploring the evidence for the feasibility and effectiveness of online interventions including computer-based Cognitive Behavioral Therapy

#### 1.1. Introductory section

Depression and anxiety are common emotional disorders that are associated with significant levels of impairment. Studying at university represents a period of transition to independence associated with economic, social, and academic pressures that can make students vulnerable to emotional difficulties. During this period, various psychosocial, physiological, and cognitive developmental changes occur, including rapid changes in mood and behaviour. Indeed, around a third of students are likely to be experiencing depression at any given time (Sarokhani et al., 2013), along with anxiety (Paula et al., 2020). Although less is known about rates of problems in students in the UAE, they appear to be equally vulnerable. Anxiety and depression can impact students' performance on their courses, and thus effective treatment is important. Psychotherapies like Cognitive Behavioral Therapy (CBT) are effective, but students can struggle to access them. Online therapies can increase access to effective interventions, but little research has evaluated the impact of treatment for anxiety and depression on academic performance.

Therefore, this introductory chapter will provide an overview of the prevalence of anxiety and depression among university students, focusing on Major Depressive Disorder (MDD) and Generalised

Anxiety Disorder (GAD). The relationship between MDD and GAD and sociodemographic factors, such as gender and age, will be explored, followed by an evaluation of the impact of those emotional disorders on students' academic performance. After establishing the effectiveness of psychotherapies therapies such as CBT, this review will consider barriers to accessing treatment, with particular reference to the situation in UAE. Finally, the review will explore evidence for the feasibility and effectiveness of online therapy, including Computer-based Cognitive Behavioral Therapy (cCBT).

#### **1.2.** Prevalence of depression and anxiety

Depression and anxiety are two of the most common types of emotional distress in both community and student populations (Anxiety and Depression Association of America, 2014). While effective treatment options are widely available, these disorders are often under-diagnosed and under-treated. Although students have been reported to experience poorer physical and mental health than their non-student peers (Stewart-Brown et al., 2000), depression and anxiety prevalence is not solely a studentbased concern. Their prevalence and social effects within the general population are public health issues. According to the 2014 Adult Psychiatric Morbidity Survey for England, 39% of adults aged 16-74 were screened for at least one common mental health disorder, such as anxiety or depression. This figure has increased by 24% since 2007. Overall, in England, approximately one in every six adults (17%) met the criteria for a common

mental disorder (CMD, conditions relating to depressive and anxiety disorders) in 2014.

A similar trend was noted in other countries. For instance, the lifetime prevalence of anxiety disorders and major depression in adults in the United States (N=9282) were determined as 28.8% and 16.6%, respectively (Kessler et al., 2005). In a Swedish national survey (N=3001), 10.8% and 14.7% of patients were screened for clinically significant depression and anxiety, respectively (Johansson et al., 2013). Similarly, a recent systematic review reported the prevalence of CMD in South Asia as 14.2% (12.9% to 15.7%) (Naveed et al., 2020).

More importantly, recent studies in this area indicate that prevalence rates of depression and anxiety among students continue to increase (Herrmann et al., 2019; Islam et al., 2020). For example, according to a cross-sectional survey conducted on Malaysian university students, the prevalence of depression and anxiety symptoms of moderate severity and above was 37.2% and 63.0%, respectively (Shamsuddin et al., 2013). This study indicates that the prevalence of depression and anxiety is higher than that reported by Bayram and Bilgel (2008), where the prevalence of depression was reported as 27.1% and that of anxiety as 47.1%. Another recent study conducted in Pakistan reported the prevalence of depression and anxiety among university students as 75% and 88.4%, respectively (overall frequencies were calculated by adding the severity categories: mild, moderate, and severe) (Asif et al., 2020).

University students are usually between 17 and 24 years old, indicating a transition out of adolescence. During puberty, various psychosocial, physiological, and cognitive developmental changes occur, including rapid changes in mood and behaviour (Zuckerbrot et al., 2018). These natural changes and mood swings might impair the ability to recognise depressive or anxiety symptoms accurately. Coping with various demands and life events can impact adolescents' moods and thinking styles, lowering their quality of life and functioning (Zuckerbrot et al., 2018).

Since early diagnosis and management of psychological distress results in better management and patient outcomes (Dixon & Kurpius, 2008), it is critical to identify university students at a higher risk of developing mental health problems. Therefore, health care centres must consider outreach programs and implement different strategies to establish treatment retention.

#### **1.3.** Major Depressive Disorder (MDD)

MDD, also known as clinical depression, causes significant distress or impairment that can affect many areas of an individual's life. It affects mood, behaviour, and various physical functions, such as appetite and sleep. The main symptoms are depressed mood most of the day, almost every day, and significant loss of interest in all activities, accompanied by continuous feelings of fatigue and loss of energy for at least two weeks. Furthermore, individuals with MDD may feel that life is not worth living. Evaluation of MDD symptoms becomes difficult if the patient has other medical conditions, as some of the symptoms may overlap. (Diagnostic and Statistical Manual of Mental Disorders, 5th Edition, DSM-5) (American Psychiatric Association, 2013).

According to the World Health Organization, WHO (2018), more than 300 million people across all age groups experience depression making depression a global health issue and a particularly persistent problem for university students. Depression is involved in more than half of all suicide attempts, and patients with untreated MDD have a lifetime risk of nearly 20% (Harris & Barraclough, 1997).

Previous studies worldwide have frequently shown that MDD is among the most common psychiatric disorders, with an estimated lifetime prevalence ranging from 12% to 16% in Western communities (Alonso et al., 2004; Kessler et al., 2003). Such prevalence is much lower in Asia, ranging between 3% and 6% (Gu et al., 2013; Orui et al., 2011), and 4.1% in Iran (Sadeghirad et al., 2010). MDD can be chronic or recurrent, affecting individuals for many months or even years (Burcusa & Iacono, 2007). According to the WHO (2018), the total number of people living with depression in the world is 322 million, with the Middle East has 16% prevalence in total.

# **1.3.1. MDD** and sociodemographic factors (gender and age)

Some sociodemographic factors, including age and gender, have been correlated with MDD. The prevalence of MDD is higher among females and can be 1.5–3 times higher among females than males (Seedat et al., 2009). Research has also shown that depression is the leading cause of disease-related disability among women (Kessler, 2003). According to the WHO (2018), depressive disorders account for approximately 41.9% of the disability from neuropsychiatric disorders among women compared to 29.3% among men.

These findings have been reported in clinical and general populations and remain evident, irrespective of where the research is conducted and assessed. For example, a study carried out by Picco et al. (2017) in Singapore among permanent residents aged 18 and above reported that the prevalence of MDD is higher among women (7.2%) than among men (4.3). Furthermore, a systematic review of 17 studies on the epidemiology of MDD in China reported that women (2.1%) are at greater risk of MDD compared to men (1.3%), with a higher prevalence among rural residents than urban residents (Gu et al., 2013). Another review conducted in Iran reported that MDD is twice more prevalent in females than males and that females are 1.95 (95% CI: 1.55-2.45) times more likely to have MDD than males (Sadeghirad et al., 2010).

According to the National Institute of Mental Health (NIMH), in 2017, an estimated 3.2 million adolescents aged 12-17 in the

United States had at least one major depressive symptom. This number represented 13.3% of the U.S. population aged 12-17, and the symptoms were found to be more common among adolescent females (20.0%) than among males (6.8%). Picco et al. (2017) reported that among the overall sample, women with MDD were less likely to be older and more likely to belong to the younger age group (aged 18–34).

This gender gap may be a result of different factors, including differences in sex hormones, social and family roles, genetic factors, and psychological characteristics (Kuehner, 2017); as well as differences in the expression of symptoms, course of illness, help-seeking behaviour, and response to treatment (Picco et al., 2017).

Although males and females with depressed mood report similar degrees of subjective, social, and occupational impairment, females are more inclined to report more depressive symptoms than males, which could be responsible for their more significant risk of fulfilling criteria for a depressive illness. Several studies have found that at low symptom thresholds, there is a female majority in depression rates (Angst & Dobler-Mikalo, 1984). It is argued that females tend to be more socially able to express those feelings than males. In contrast, men may express those feelings via other mechanisms such as blaming others, picking fights, or engaging in destructive behaviours such as drinking (Piccinelli & Wilkinson, 2000).

The existing literature suggests that most adults experience symptoms of MDD by early adulthood (Kessler et al., 2005). MDD is predicted to have a point prevalence of slightly less than 3% in

children and 4-8% in adolescents (Roberts et al., 1995). In retrospective studies, the most probable period for the onset of the first symptoms of major depression extends from mid-adolescence to mid-40s; however, almost 40% experience their first symptoms of depression before they are 20 years old (Heim & Binder, 2012), which is the age adults begin their higher education. Before attending higher education institutions, students are usually raised in a stable family setting where social support is more readily available. A positive transition to university life can have an important and long-lasting impact on student's mental health and well-being (Denovan & Macaskill, 2013). These findings highlight the importance of expanding health service capacity to meet the mental health care needs of this age group of adults entering higher education institutions.

#### **1.4.** Prevalence of depression among university students

In recent years, there has been a spike in the recorded symptoms of mental disorders among university student populations (Lattie et al., 2019). A large epidemiological study has recently shown that mental health diagnoses among university student respondents have risen from 22% to 36% over the last ten years (Lipson, Lattie & Eisenberg, 2019). As noted in the latest annual report of the Centre for Collegiate Mental Health records, depression is one of the top reasons why university students seek counselling in the United States. A systematic review of 24 articles reported that the weighted mean prevalence of depression in university students was 30.5% (CI: 30.2 to 31.1), with rates ranging between 10% and 85% (Ibrahim et al., 2013). Similarly, another systematic review reviewed 35 studies and indicated that the weighted mean prevalence of depression among university students is 33% (CI: 32 to 34) (Sarokhani et al., 2013).

More recent studies have confirmed a high incidence among university students. Bukhari and Khanam (2015) conducted a study in Pakistan to investigate the prevalence of depression among university students in Karachi, who belong to the middle, upper-middle, and upper socioeconomic backgrounds. The study revealed that the prevalence of depression is 27%, with a higher prevalence among students with upper-middle socioeconomic status compared to their counterparts belonging to the upper socioeconomic categories. A recent study measured the prevalence of depression among university students in Macau, Hong Kong, and mainland China and reported that the overall prevalence of depression was 28.9% (95% CI:27.08–30.77%) with 35.2% in Macau, 41.0% in Hong Kong, and 16.8% in mainland China (Li et al., 2020).

The rates of prevalence of the general population are considered lower than those among university students. These rates are higher than those observed in the community samples. For example, a systematic review conducted by Lim et al. (2018) to measure the community prevalence of depression in 30 countries

from a total of 90 studies (single point prevalence = 68 studies, one-year prevalence = 9 studies, lifetime prevalence = 13 studies) indicated that the single point, one-year, and lifetime prevalence rates of depression were 12.9%, 7.2%, and 10.8%, respectively. Another recent systematic review of 14 studies conducted to determine the prevalence of depression in individuals living in the United Arab Emirates (UAE) suggested that depression varies from 12.5% for non-students to 28.6% for university students (Razzak, Harbi & Ahli, 2019). Similarly, Melall et al. (2014) carried out a study among students in the UAE University (in Al-Ain) reported that the prevalence of depression is 22.2%.

During their academic lives, most young people face various challenges and obligations to achieve success within the extreme socioeconomic diversity and academic requirements faced at the university level (Arslan et al., 2009). Furthermore, uncertainty in the job market can put students under much pressure to perform well to stand out, and rising tuition costs and the availability of student loans have contributed to financial strains (Bewick et al., 2010). Students' adjustment to university, academic performance and progression, and decision to stay at university are influenced by these stressors (Goff, 2011).

# **1.4.1.** Gender differences in the prevalence of depression among undergraduate students

Due to the interactions between biological factors and social determinants, including gender norms and roles, social stigma and discrimination, and social autonomy, women are at greater risk for emotional disorders than males (Riecher-Rössler, 2010; Riecher-Rössler, 2017). Depression is more than twice as common in young females than males (aged 14-25); however, this ratio decreases with age (Patten et al., 2006). Indeed, young females are at the highest risk of severe depression and mental illnesses globally, from puberty onwards (Whiteford et al., 2013). Notably, before puberty, female and male students have comparable rates of depression; for males, the prevalence may be even higher (Cyranowski et al., 2000).

Community studies have consistently shown that females have higher rates of depression, which is less clear in studies conducted with university students, where males and females share many of the same financial and social challenges. For example, a systematic review conducted by Ibrahim et al. (2013) pointed out that 16 of the 24 articles reviewed report gender differences; the majority of these articles (n ¼ 9) (Dahlin et al., 2005; Dion & Giordano, 1990; Goebert et al., 2009; Roberts et al., 2010; Roh et al., 2010; Rosal et al., 1997; Schwenk et al., 2010; Song et al., 2008; Steptoe et al., 2007) report higher prevalence among female students compared to male students: a weighted mean average of 29.6% (95% CI, 29.2 to 30.1) in females compared to 24.9% (95% CI, 24.4 to 25.4) in males, while six articles report no statistically significant gender

differences (Arslan et al., 2009; Eisenberg et al., 2007; El-Gendawy et al., 2005; Kaya et al., 2007; Tjia et al., 2005; Zong et al., 2010), and one reports that males have a higher rate of depression than females (Wong et al., 2006).

On the other hand, some studies found no gender differences in the prevalence of depression among university students. For example, in a study conducted by Bayram and Bilgel (2008) in Turkey, the prevalence of depression among Turkish university students was reported as 27.1%, with no significant difference in the average depression scores between male and female students. Similarly, a study conducted by Lei et al. (2016) to investigate the prevalence of depression among Chinese university students concluded that the overall rate of prevalence of depression is 23.8%, with no significant difference in the prevalence of depression between women and men. Similarly, in a systematic review of 35 studies among Iranian students, Sarokhani et al. (2013) reported no gender differences in the prevalence of depression. Gender differences are less pronounced in student samples, possibly because the stresses and strains experienced by university students are similar for male and female students.

# **1.5.** Risk factors of depression among university students

Various psychosocial and economic factors influence students' mental health (Royal College of Psychiatrists, 2011). It has been

suggested that students with less objective socioeconomic status are more vulnerable to depression (Hoebel et al., 2017). Many cross-sectional studies have been conducted to provide extensive evidence for this association.

A recent systematic review of 37 studies from 20 different countries reported that about 24.4% of university students from low- and middle-income countries experience symptoms of depression (Akhtar et al., 2020). Another cross-cultural study, including university students from 23 countries, reported that low family income is associated with an increased possibility of screening for elevated symptoms of depression (Steptoe et al., 2007). In this study, seven articles indicated that lower levels of parental education are related to high levels of depression. This association was also found in China in a random sample from six universities: lower levels of parental education and lower family affluence were found to be associated with elevated depressive symptoms (Yu et al., 2015), perhaps because parents with higher socioeconomic status are better able to support their children financially and practically as they attend university.

Attending university and adapting to new transitions and changes is likely to have a detrimental effect on students' physical and mental health. Adapting to higher education, academic demands and evaluations, changes in lifestyle, relocation and independent living, handling finances and jobs, the loss of existing social networks, the creation of new ones, and more independent life are examples of these changes and challenges (Denovan &

Macaskill, 2013). Being in a higher education environment also means several academic stressors; for example, a new level of education and high workloads coupled with high expectations of top achievement may stress those students more (Pitt et al., 2018).

Certain personality traits may also be linked to an increased risk of developing high levels of depression and poor mental health; for example, university students with pronounced levels of neuroticism are at increased risk of depression (Kotov et al., 2010). Some personality traits linked to high academic achievement and performance are also linked to a higher risk of depression. For example, perfectionism can positively (maladaptive) or negatively (adaptive) predict depression (Pirbaglou et al., 2013). Adaptive perfectionism can help students achieve their goals and stay motivated to achieve positive results (Chai et al., 2020). Maladaptive perfectionism is defined as the personal expectations to achieve unrealistic goals and severe self-criticism for falling short of other people's expectations, which is significantly and positively associated with high levels of depression (Chai et al., 2020).

Perfectionism may affect students' academic performance and emotional well-being by affecting their perceptions, cognitions, motivation, and behaviours. Accordingly, more studies have investigated the relationship between university students' perfectionism and mental health, focusing on medical students (Bußenius & Harendza, 2019).

#### **1.6.** Impact of depression on academic performance

While there is growing literature on the prevalence of emotional disorder symptoms among university students, to date, few studies have been conducted to systematically examine the relationship between depression and academic performance in higher education, particularly in countries lacking an efficient mental health system and referral services. There are several areas in which the reduced cognitive and physiological capacities of depressed students may negatively affect their academic performance (Mellal et al., 2014).

Apart from being a deterrent to help-seeking, depression may negatively affect students' engagement with their courses or research. Students who are depressed are more likely to skip classes, exams, and assignments, fail courses and drop out of university altogether (Abu Ruz et al., 2018).

A study carried out by Heiligenstein et al. (1996) investigated the correlation between depression and reduced academic performance among university students using the Beck Depression Inventory (Beck et al., 1988) to measure symptoms of depression. Academic impairment was measured as a high number of missed classes and decreased academic productivity. According to the results, more severe depression is associated with higher academic impairment levels, and all levels of depression are related to high absence and disinterest in school. Similarly, a recent study among university students in Jordan reported that high levels of depression are associated with poor academic achievement and a high rate of absence (Abu Ruz et al., 2018).

A growing body of literature exploring depressive symptomology within the academic environment has suggested the need for the development of effective counselling and other mental health interventions that focus mainly on enhancing emotional wellbeing to improve educational attainment (Abu Ruz et al., 2018; Al-Qaisy,2011; DeRoma et al., 2009).

Turner et al. (2012) investigated the impact of symptoms of depression on academic performance among 1,280 students at the North Carolina University. This study showed that students with mild symptoms of depression are at risk of low academic performance. The study also highlighted the higher prevalence of milder depressive symptoms among the students and their risk of remaining undiagnosed, resulting in academic problems lasting on their lives. Moreover, in another study, Hysenbegasi, Hass, and Rowland (2005) concluded that depression is directly linked to decreased college grade point average (GPA) performance.

At the beginning of university life, university students are suddenly subjected to a slew of new academic stressors, such as time pressure, increased writing demands, and managing multiple deadlines. They are required to complete challenging academic assignments while adapting to the realities of college life. Unsurprisingly, a circle develops where academic pressures
and depression can exacerbate each other (Heiligenstein et al., 1996).

#### **1.7.** Generalised Anxiety Disorder (GAD)

Anxiety disorders, including GAD, are the most prevalent mental disorders, whereby approximately 11.9% of college students suffer from anxiety disorders (Bandelow & Michaelis, 2015; Blanco et al., 2008). Anxiety disorders affect up to 20% of adults per year, and they are associated with enormous health care costs and a high disease burden (Munir & Takov, 2020). Around 50% of those who experience anxiety disorders claim that their symptoms started during childhood (Bandelow & Michaelis, 2015). According to previous studies, one-third of the population suffers from anxiety disorders at some point in their lives, and the median age of onset of anxiety disorders is 11 (Kessler et al., 2005).

GAD, also known as clinical anxiety, is characterised by difficulty in controlling worry most of the time, which may cause impairment in social, occupational, or other areas of life (DSM-5). GAD involves excessive and uncontrollable worry, occurring most days during the week, interfering with daily activities. This ongoing worry and tension may be accompanied by physical symptoms such as restlessness, feeling on edge or fatigued, difficulty concentrating, muscle tensions, and sleeping problems. The worries are often focused on everyday aspects such as work

responsibilities, family members' health, or minor matters such as household chores or being late for appointments (American Psychiatric Association, 2013).

Furthermore, according to the Anxiety and Depression Association of America (ADAA), GAD can often co-occur with MDD and affects 6.8 million adults or 3.1% of the United States population; and females are twice as likely to be affected as males. While GAD gradually progresses and can arise at any point in one's life, the risk is greatest between childhood and middle ages (Kessler et al., 2005). Although the exact cause of GAD is unknown, evidence suggests that biological factors, family history, and life experiences, especially stress, all play a role (Newman, Shin & Zuellig, 2016).

# **1.7.1. GAD** and sociodemographic factors (age and gender)

Age and gender are some of the sociodemographic factors that have frequently been correlated with GAD. The median age of onset of GAD has been estimated as 31, and the highest 12month prevalence rates are observed in adults aged 18-34 (Mack et al., 2014). According to the DSM-5, the lifetime prevalence of GAD according to age is explained as the following: age 18-29 (4.1%), 30-44 (6.8%), 45-59 (7.7%) (Kessler et al., 2005). GAD is one of the most common anxiety disorders among college students worldwide and more common among females than males (Auerbach et al., 2016).

It has been estimated that anxiety levels have increased among young adults aged 16-23 (Calling et al., 2017). In addition, the initial transition to college is considered one of the stages when college students experience the greatest rise in anxiety. Sleep deprivation, whether caused by excessive caffeine or time spent on electronic communication (smartphones and social media), has been linked to increased anxiety (Conley et al., 2020).

Existing literature from epidemiological studies has reported that females have two to three times higher lifetime risk for GAD than males (Hunt, Issakidis & Andrews, 2002; Wilkinson, 2009). Data from clinical studies have shown that females with GAD have an earlier onset age, experience more somatic symptoms, and appear to have lower recovery rates, higher rates of psychiatric comorbidity, and poorer response to antidepressant therapy than males with GAD (Vesga-López et al., 2008).

However, these studies are limited by their small sample size and derived from a clinical and treatment-seeking sample group; therefore, the results may not be generalisable to people who experience GAD symptoms in the community.

A study on gender differences in GAD with a representative sample from the United States reported that females have a higher lifetime risk of developing GAD than males, have other anxiety disorders and a higher number of related physical symptoms, and are more likely to seek treatment. These findings indicate that males might express their anxiety more often than females through externalising behaviours, such as consuming

higher rates of alcohol and non-prescribed medication (Vesga-López et al., 2008). Furthermore, Lee et al. (2016) reported a significant gender effect, with females having a higher prevalence of GAD at any age than males in Singapore. In addition, Luo et al. (2019) suggested a higher prevalence of GAD among females than males; females are 1.30-and 1.54 times more likely to be at risk of GAD than males.

Females and males are socialised to develop gender-specific attitudes, characteristics, and abilities (Muris, Meesters & Knoops, 2005). In females, the expression of fear and anxiety may be more socially acceptable than in males, contributing to the acceptance of more requirements and related physical symptoms (Silverstein & Lynch, 1998). Although these cultural influences promote less stoicism and more expressiveness in women, externalising behaviours may be more acceptable in men, explaining a higher prevalence of self-medication symptoms and sharing more frequent disputes with family and friends (Vesga-López et al., 2008).

# **1.8.** Prevalence and risk factors of anxiety among university students

A growing body of literature suggests that the prevalence of anxiety among students in higher education institutions, attended by many young people, has sharply increased (US Department of Education and National Center for Education Statistics, 2005a). According to the 2012 Association for

University and College Counseling Center Directors, anxiety is the most common concern among college students (41.6%), followed by depression (36.4%) and relationship problems (35.8%). A recent study carried out by Kamberi et al. (2019) in Kosovo pointed out that the prevalence of anxiety among university students is 33.6%. According to previous literature, the reported anxiety prevalence rate ranges from 15% (Beiter et al., 2015) to 64.3% (Abdel Wahed & Hassan, 2017). It is worth mentioning that anxiety has been linked to self-esteem, self-confidence, personality types, and loneliness among university students. Students who have poor self-esteem are more likely to experience anxiety and be more stressed, particularly at the beginning of the first semester at the university (Ratanasiripong et al., 2018).

In a cross-sectional survey of 130 Chinese international students at Yale University, 29% of students had anxiety symptoms (Han et al., 2013). Further, according to Choueiry et al. (2016), 62.4% of the students who participated in their study showed a potential risk of anxiety, with 28.7% having clinically significant anxiety. Likewise, a study conducted among Portuguese college students showed a higher prevalence of anxiety (32.8%) (Bártolo, Monteiro & Pereira, 2017).

Although normal levels of stress and worry can motivate students to perform well in exams, intense feelings can cause anxiety and distraction. Unlike high school, university students need to focus on academics and social contact, homesickness, tuition fees,

doubts regarding future and living costs. Coping with all these demands, especially in the first or even the second year, can be challenging and significantly associated with the risk of anxiety (Vitasari et al., 2010). Furthermore, the risk of anxiety was higher in students who did not receive financial support than those who did and did not live alone without parental support (Mohamad et al., 2021). In addition, poor sleep quality is considered a risk factor for anxiety among university students; students who are deprived of sleep tend to be more anxious, and those with anxiety have trouble falling asleep (Samaranayake, Arroll & Fernando, 2014).

It has been suggested that the academic year might be significantly associated with the risk of anxiety among university students (Sakin Ozen et al., 2009). Bayram and Bilgel (2008) demonstrated higher anxiety scores among the first- and second-year students, and Bouteyre, Maurel, and Bernaud (2007) found that first-year students tend to experience higher anxiety levels. Asif et al. (2020) found that the prevalence of anxiety among first-year university students is 61%. This can be attributed to various factors, including different approaches, discrepancies in each course's evaluation and grading structures, and teaching methods in different academic years (Mohamad et al., 2021). Overall, it was found that first-year students have a hard time adapting to university life and face challenges by taking more responsibility for their lives and make key decisions about their future (Islam et al., 2020).

## **1.9.** Gender differences in the prevalence of anxiety among undergraduate students

Anxiety is higher among university students than among the general population, with females having consistently higher prevalence rates than males (Bahrami & Yousefi, 2011). Existing literature suggests that female students are more vulnerable to anxiety and stress and are more at risk of experiencing sadness and emotional pain (Bayram & Bilgel, 2008; Eisenberg et al., 2007; Mahmoud et al., 2012). A recent longitudinal study carried out in China reported that female students experienced significantly higher levels of anxiety than their male counterparts, especially in the first and second years, and a higher percentage of female students had symptoms of anxiety above normal levels (Gao, Ping & Liu, 2020).

A study carried out by Hosseini and Khazali (2013) among Iranian students suggested a significant relationship between anxiety and gender. Females scored higher than males on the common set of anxiety items and self-reported measures of anxiety. Similarly, various studies (Bayram & Bilgel, 2008; Kamberi et al., 2019; Abdel Wahed & Hassan, 2017) conducted among university students in Egypt, Turkey, and Kosovo have highlighted higher anxiety levels among female students.

Some studies have attributed this to differences between males and females regarding brain chemistry and hormonal fluctuations in females, linked to anxiety (Kajantie & Phillips, 2006; McLean & Anderson, 2009). Other studies have suggested that

psychological differences might explain why females are more likely to develop anxiety disorders than males. For example, males are more likely to be raised to believe that they have control over situations; therefore, because of societal expectations, whereas males are not expected to admit their weaknesses, they are also less likely to be sincere in reporting anxiety (McLean et al., 2011).

Moreover, females and males seem to experience and react to life events differently. Females tend to be more inclined to experience stress and view life events and changes as negative and less manageable, increasing their levels of anxiety (Matud, 2004). These can be attributed to the differences in social norms between males and females. For example, fear is not consistent with males; thus, they are encouraged to suppress their fears and manage stress on their own (Block, 1983). By contrast, females are encouraged not to mute their fears but rather to express their distress, seek social support, and avoid feared (Chambless objects & Mason, 1986). This differential among reinforcement of instrumentality males versus expressivity among females explains higher rates of anxiety and phobias among women (Zalta & Chambless, 2012).

#### 1.10. Impact of anxiety on academic performance

High levels of anxiety affect a person's concentration and memory, leading to hyper-vigilance and deterioration of thought and judgement, resulting in impaired cognitive functioning and

academic performance (Robinson et al., 2013). Some crosssectional studies have found that more anxious students have poorer performance (Wilson, Warton & Louw, 1998). Another study carried out by Vitasari et al. (2010) among engineering students found that students with high anxiety levels have low academic performance. Bostani, Nadri, and Nasab (2014) and Eisenberg, Golberstein, and Hunt (2009) reported a negative relationship between academic performance and anxiety. A recent Saudi Arabian study among medical students indicated that high anxiety levels are associated with low academic performance and last years of study (Junaid et al., 2020).

The potential connection between high levels of anxiety and poor academic performance among students requires further exploration. According to researchers, high levels of anxiety can interfere with performance by affecting students' attention and memory, resulting in impairments in reasoning and judgment, leading to the deterioration of cognitive functioning (Aronen et al., 2005). When students are under pressure due to their assignments and experience much tension during their studies, they are more likely to perform poorly.

The relationship between anxiety and academic performance is more complicated than the relationship between depression. It has been suggested that anxiety is a primary predictor of academic achievement (Vitasari et al., 2010). However, longitudinal studies have not shown a predictive link between high anxiety and poor academic performance (Andrews &

Wilding, 2004). On the other hand, some studies found that students with moderate levels of anxiety have a better academic achievement (Al-Qaisy, 2011; Andrews & Wilding, 2004; Eysenck et al., 2007), reflecting that adequate levels of anxiety over fear of failure could increase students' self-motivation to perform better in various academic tasks. This may indicate a different direction in which anxiety level and academic achievement are associated.

#### 1.11. Treatment of depression

#### (Psychopharmacology and psychotherapy)

Depression, a prevalent serious disorder that affects many people, has increased chances for treatment with an early and accurate diagnosis. It can be treated and managed with a variety of evidencebased pharmaceutical and therapeutic approaches. Antidepressants and psychotherapies, including cognitive behavioural therapy (CBT) (Beck, 1967), are well-known treatments. Several treatment strategies have been developed to guide the most effective interventions while considering the severity and presentation of depression among individuals (NICE, 2009). Despite the approval of many drugs by the FDA for the treatment of major depression, there is growing evidence of the efficacy of psychotherapies that can be administered in primary care or specialised mental healthcare settings (Mynors-Wallis, 2000; Cuijpers et al., 2007).

Several measures are needed for effective depression treatment in primary care centres, such as detection and evaluation, patient

education and involvement in recovery, initiation of evidence-based pharmacotherapy or psychotherapy, treatment effectiveness and side effects and close follow-up focusing on treatment adherence (Unützer & Park, 2012). Individual responses to depression treatments vary and result from broad treatment studies in primary care and speciality care settings show that initial treatments are successful in approximately 30%–50% of patients, regardless of whether pharmacotherapy or psychotherapy is used (Trivedi et al., 2006). Although antidepressants may be used for moderate to severe depression, the current NICE recommendations suggest they should be combined with a psychotherapy therapy like CBT (NICE, 2009).

The primary goal of antidepressant treatment is to alleviate the symptoms of severe depression (feeling down and exhausted) and prevent their recurrence (Moncrieff & Kirsch, 2005). They are intended to restore an individual's emotional stability and assist them in returning to a regular daily routine and, in some cases, also treat symptoms such as restlessness, anxiety, sleep problems and help prevent suicidal ideation (Wells et al., 2014).

Despite the availability of various pharmacotherapies, a full symptomatic and functional recovery remains challenging. Remission rates are low for most drugs (approximately 50%) across groups of patients studied in antidepressant clinical trials (Thase et al., 2005) and could be lower among patients treated in clinical practice (Moller, 2008). Therefore, effective management of depression might necessitate developing a customised treatment plan that helps each patient achieve full functional recovery most effectively and

efficiently. This is augmented by the use of medication and psychotherapy (Kornstein, 2008).

Psychotherapy (also called talk therapy), a type of mental health treatment, involves the process of identifying and dealing with an illness (e.g., depression) by chatting with trained mental health professionals (Muran et al., 2010). It is the first recommended treatment for depression in adolescents and young adults and involves many strategies that work for different people (McCarty & Weisz, 2007).

Types of psychotherapies include group, individual and family settings. There are three main approaches (therapies) that the therapist can adopt. **Psychodynamic therapy** aims to help the patient understand and cope with unconscious and unresolved childhood conflicts that manifest in their present behaviour by talking about their past experiences (Matthews & Chu, 1997). Interpersonal therapy (IPT) focuses on a patient's behaviour and experiences with family and friends rather than childhood or developmental issues and discusses current concerns and relationships (Markowitz & Weissman, 2012). CBT aims to modify how a person feels and acts about a situation by changing their thinking process. It helps patients identify and change negative and destructive thoughts that impact behaviour, attitude and emotions (Hofmann et al., 2012).

Previous literature has shown that CBT is as effective as antidepressant drugs in treating depression and can assist the individual long after the symptoms have subsided and therapy

sessions are completed (Gaffan et al., 1995; Oei & Dingle, 2008; Samad et al., 2011). Unlike antidepressant medications, CBT has no known adverse side effects and can reduce the risk of relapse even after the therapy has been discontinued (Jayasekara et al., 2014). CBT has the highest weight of evidence and is also the most studied psychotherapy for depression. For example, a meta-analysis compared the effectiveness of CBT with pharmacotherapy and other psychotherapies in treating depression among adults and reported that CBT compared with 20 pharmacotherapy studies indicated no significant difference in CBT outcomes and antidepressant treatments. Likewise, when CBT compared with other psychotherapies in 46 studies provided little indication that CBT was more effective than other psychotherapies (Cuijpers et al., 2013). Although face-to-face CBT is not commonly offered to university students, evidence supports its effectiveness in higher education insinuations. For example, research among university students in the United Kingdom looked at the efficacy of CBT among individuals who had symptoms of sadness and anxiety. The results indicated the effectiveness of CBT in treating mild to moderate symptoms of depression and anxiety, and the effectiveness and efficacy were maintained even after controlling for differences in therapists' qualifications and experience, primary problem, and total time in treatment (Dickson & Gullo, 2015).

Despite the strong evidence for the effectiveness of CBT in treating symptoms of depression and anxiety, it might not be successful and suitable for everyone. For example, people with more complicated

mental health problems or learning disabilities may not benefit from the CBT structured sessions. Also, CBT depends highly on required homework and assignments; unfortunately, some patients are simply not motivated enough or see the assignments as unnecessary obligations that they choose not to complete, jeopardizing their therapy success (Gaudiano, 2008).

# **1.12.** Treatment of Anxiety (psychopharmacology and psychotherapy)

There are a number of different classifications of anxiety disorders. Recent revisions in DSM-5 have distinguished between anxiety dirorders, obsessive compulsive disorders and trauma and stress related disoers. Anxiety disorders including generalised anxiety disorder, obsessive-compulsive disorder, panic disorder, specific phobias, post-traumatic stress disorder, social phobia, or social anxiety disorder (Bystritsky et al.,2013). Nevertheless, the focusses on this treatment review will be on generalised anxiety disorder.

Anxiety disorders can affect an individual's ability to work, study and function in other activities. However, recovery is possible with the appropriate treatment. Treatment options are determined by how anxiety interferes with a person's ability to function in everyday life. Psychotherapy and medication are the two most common therapies for generalised anxiety disorder (GAD). As with depression, a combination of the two was shown to be the clinically preferred treatment strategy for anxiety (Bandelow et al., 2012).

The treatment plan is determined by the patient's preferences, the seriousness of the disease, existing comorbidities, concurrent medical illnesses, complications such as drug abuse or suicide risk, prior treatment history, cost concerns and the availability of different forms of treatment in each area (Kavan et al., 2009). It is particularly challenging to predict which patients respond well to anxiety treatment and have a minimal response. According to studies, some drugs have shown good efficacy in treating anxiety (Nitschke et al., 2009; Mathew et al., 2008). However, overall outcomes can be poor in many patients (Baldwin et al., 2011). Despite the effectiveness of some drugs in managing anxiety symptoms in general, the ideal treatment for GAD does not yet exist as the existing drugs have insufficient efficacy in the short term, and some can have problematic side effects when prescribed for longer periods (Baldwin et al., 2011).

Most patients benefit from psychotherapy in terms of reducing symptoms of anxiety. In particular, cognitive behaviour therapy (CBT) has reduced GAD symptoms (Covin et al., 2008). CBT is also considered as effective as drugs, but with less attrition and longerlasting effects (Carl et al., 2019). CBT focuses on the role of irrational thinking in how individuals with symptoms of GAD feel and behave. CBT for GAD typically consists of individual self-monitoring of worrying or related symptoms, cognitive restructuring including evaluating and reconsidering interpretive and predictive thoughts/worries, relaxation training and coping skill rehearsal (Borkovec et al., 2001). Significant evidence suggests that CBT helps approximately 50% of patients with GAD achieve significant symptom

reduction and high end-state functioning (Huppert & Sanderson, 2010). CBT as a treatment for GAD has shown an excellent way to change pathological worries into normal worries (Borkovec et al., 2001). The effects of CBT treatment tend to be sustained over time. For example, Dugas et al. (2003) reported increased treatment effect at two years follow-up for individuals with GAD. Furthermore, several meta-analyses of randomised controlled trials (RCTs) of CBT for anxiety disorders have shown CBT's long-term effectiveness in research (Norton & Price, 2007; Chambless & Ollendick, 2001). As a result, the effectiveness of CBT tends to persist well after treatment discontinuation.

Overall, previous studies have shown that both types of interventions, psychotherapy and pharmacological, significantly improved primary GAD outcomes with age moderating the primary GAD outcomes in psychotherapy (e.g., CBT) with a younger age predicting better treatment response (Carl et al., 2019).

#### 1.13. Cognitive Behavioural Therapy (CBT)

CBT is a form of psychotherapeutic treatment that teaches people to recognise and alter unhealthy or problematic thinking patterns that affect their actions and emotions (Hofmann et al., 2012). The central concept of this therapeutic method is that maladaptive cognition leads to the persistence of mental distress and behavioural issues, as pioneered by Beck (1970) and Ellis (1962). CBT focuses on changing automatic negative feelings that exacerbate emotional problems, depression, anxiety, and distress.

According to Beck (1970), CBT is based on several core principles. It argues that the cause of psychological disorders is partly due to wrong or unhelpful ways of thinking and that learned patterns of unhelpful behaviour contribute to psychological issues. People with psychological disorders such as depression and anxiety will learn new ways to cope with these disorders and alleviate their symptoms, which allow them to be more successful in their daily lives.

CBT usually involves efforts to change thinking patterns. These strategies include the following: Recognising and re-evaluating one's negative thoughts that are causing issues, gaining a greater understanding of others' motivations and behaviours, and dealing with tough problems by using problem-solving skills. CBT focuses on assisting people to be their therapists. Patients/clients are aided in learning coping strategies by activities in the session and 'homework' exercises outside of meetings to help them learn to improve their thinking, difficult feelings, and actions (Ryan et al., 2011).

CBT has been proven successful for several issues, including depression, anxiety disorders, alcohol and substance dependency issues, marriage issues, eating disorders, and serious mental illness. According to several research reports, CBT significantly improves one's functioning and quality of life (Murphy et al.,

2010). CBT is the most well-studied form of psychotherapy and has effectively treated depression and anxiety disorders in most trials and meta-analyses (Cuijpers et al., 2013).

A meta-analysis of CBT-focused for symptoms of anxiety or depression consisting of 29 RCTs in three separate meta-analyses provided solid preliminary support for the efficacy of multi-modal CBT in primary care for anxiety (in particular) and depression symptoms. With respect to various distribution formats, there is preliminary evidence for face-to-face CBT, computerised/online CBT, and directed self-help CBT (Twomey, O'Reilly & Byrne, 2015).

CBT is also considered an effective method for improving the mental health of university students. It includes numerous therapeutic components and outcome measures. According to Harvey et al. (2004), five cognitive-behavioural variables can be used in CBT: attention, memory, reasoning, thought, and behaviour. Irie et al. (2019) pointed out that these are correlated with the mental health status of university students. As a result, psychological treatment based on CBT effectively resolves mental health issues among university students. Overall, CBT results differ and are influenced by several variables. Therefore, various outcomes should be considered when investigating the effects of psychological treatment on university students (Irie et al., 2019). Consideration should be given to barriers to accessing CBT, particularly in economically disadvantaged or traditional cultures where there may be a stigma

associated with help-seeking and a lack of trained health professionals.

# **1.14.** A brief outline of mental health in the UAE and barriers accessing treatment

Mental health facilities were developed in the UAE in the mid-1970s in the form of psychiatric services in certain emirates (i.e., Abu Dhabi, Dubai). Psychological care was used as a supporting service in treating patients seeking psychological assistance in hospitals in the 1980s (Al-Darmaki, 2004). As a result of the rapid social and economic changes that have taken place over the last 30 years, in addition to the external pressures from other societies, the need for the provision of psychological services in UAE society has become essential.

Despite the Government's efforts to develop a competent mental health service in the UAE, the lack of medically and culturally competent practitioners impedes these efforts (Sayed, 2015). In addition, while modern medical methods are generally accepted, people in the UAE would consider the traditional methods (e.g., religious healers) due to strong beliefs about their effectiveness and acceptability in society (Al-Darmaki, 2004, 2011).

Depression and anxiety appear to be common mental health problems in the UAE, although there is a lack of high-quality prevalence studies. A study conducted among university students in the Dubai Medical College reported a 28.7% prevalence of anxiety and 28.6% depression. The study indicated that secondyear medical students have the highest percentage of depression (8.7%) and anxiety (7.3%) (Ahmed et al., 2009).

Similarly, a study carried out by Mellall et al. (2014) among university students in the UAE University indicated that the prevalence of depression was 22.2% and response rate of 86% with higher rates of depression was among second-year students. However, many elements of the epidemiology of mental illness and help-seeking approaches are still poorly understood in the UAE (Sayed, 2015).

Stigma refers to negative attitudes or discrimination directed at someone because of a distinguishing feature, such as a psychological illness, health condition, or disability (Ross & Goldner, 2009). In most Arab countries, stigma is one of the most discussed barriers to actively seeking mental health services, and it has been shown to harm attitudes toward seeking psychological support (Ciftci et al., 2013; Youssef & Deane, 2006). Help-seeking stigma is public support of stereotypes, prejudice, and discrimination against those seeking mental health assistance (Vogel et al., 2006). Men and women in the UAE have stated that they do not seek psychological support because of the stigma of seeing a mental health therapist (Al-Darmaki, 2011). In addition, one study found that only 38% of parents indicated they would take their children to mental health specialists. The main reason for not seeking help given by other parents was refusing to acknowledge that a family member has a mental illness and the stigma present in UAE culture (Eapen & Ghubash, 2004).

Few studies have examined the provision of and attitudes toward mental health services among individuals, particularly among students in the UAE (AI-Darmaki 2003; AI-Krenawi et al. 2004). Researchers have found that among students in the UAE, approaching counselling centres is viewed as a last resort or is only approached when issues become overly serious (AI-Darmaki, 2011; AI-Darmaki & Sayed, 2009). Heath et al. (2016) reported that help-seeking attitudes of Emirati university students are indirectly related to feared loss of face and stigma through risks of self-disclosure to the counsellor; more importantly, students worry about losing face, as it breaks the Emirati social expectation of non-disclosure to others.

Despite the growing recognition in the UAE society of such a need for mental health services, university students' mental health is a neglected area of research. However, the lack of attention to the mental health of higher education students is a regional phenomenon affecting all countries within the Gulf Cooperation Council (GCC) (Haque, 2016).

Recently, efforts have been made to raise public understanding of mental health issues and reduce the stigma of mental health problems through media campaigns that span the whole country. Another move toward this will be to establish hospital mental illness registries to gather comprehensive data over time to improve services and provide quality healthcare for everyone.

#### 1.15. Background to internet interventions

Internet interventions have been described by several interchangeable terms (Barak et al., 2009), such as e-health, e-therapy, web-based treatment, online therapy, and digital interventions. Over the last twenty years, computer-delivered and Internet-based interventions have been increasingly established and tested because of digital technologies' growth in popularity and accessibility (Andersson, 2018). Online interventions, which most commonly employ cognitive-behavioural therapy (CBT), are typically carried out over weeks or months. Users typically complete modules or exercises while receiving feedback on their progress (Cowpertwait & Clarke, 2013).

Digital interventions are less costly than their face-to-face counterparts, reach a broader audience that may not otherwise have access to traditional mental health services, and improve flexibility due to fewer regional restrictions (Christensen et al., 2002). Internet interventions have successfully enhanced many studies' cognitive, social, and behavioural outcomes (Andersson, 2018).

Counselling centres in universities are well-positioned to offer mental health services. Nevertheless, most are under-resourced, have trouble reaching students in need, and does not operate at full capacity most of the time (Xiao et al., 2017). Online interventions, such as those provided via mobile and web-based platforms, provide emotional support for university students with common mental health issues while avoiding many barriers to

traditional mental health care, such as stigma and time factors (Kass et al., 2017).

Digital interventions have different delivery systems. Users may engage with interventions once or several times; interventions may be available to everyone or within study trials, and their level of interactivity and navigational functionality may differ. Because of these various factors, materials may be viewed in various ways to suit the users' needs and can be more user-friendly than usual methods (Lattie et al., 2019).

In addition, internet programs may be designed using behaviour modification, help-seeking, psychoeducation, or psychotherapeutic theory to focus on the most important variables for positive change. This reflects the significant indicators of change (e.g., attitudes and behaviours) and implements positive change mechanisms (e.g., modelling, increasing perceived control, and coping skills) (Webb et al., 2010). In the case of mental well-being, web-based programs typically use such theory to either alter essential behaviours (e.g., seeking support, using self-help) or improve symptoms of emotional distress (e.g., decreasing levels of anxiety or depression) (Pantic, 2014).

Existing literature indicates that digital mental health interventions are either effective or partially effective in producing significant changes in the main psychological outcome variables in the university student population (Davies et al., 2014; Harrer et al., 2019). For example, a recent meta-analysis

of 89 studies that reviewed the literature on digital mental health interventions focusing on depression, anxiety, and psychological well-being among different samples of university students reported that digital interventions could improve the mental health of university students worldwide. However, further research is needed to design and test usable and accessible programs to ensure higher adherence rates among students (Lattie et al., 2019).

### **1.16.** Computer-based interventions for university students' depression and anxiety

The increase in students with mental illness has not been properly addressed due to limited psychological services and a lack of qualified therapists (Storrie, Ahern & Tuckett, 2010). Furthermore, research indicates that many students may experience barriers that prevent them from approaching these services, resulting in avoidance or delayed access (Raunic & Xenos, 2008).

Most university students face various obstacles while seeking mental health support, such as stigma, long waiting lists, an inclination to seek help from family or friends, and limited knowledge of available services (Lu et al., 2014). Recently, there has been a growing interest in the potential of computer-based delivery of intervention as an alternative to increase students' access to professional psychological support (Andersson & Titov,

2014). Despite the increasing number of studies evaluating the efficiency of web-based interventions, there is an increasing interest in randomised trials investigating its effectiveness for depression and anxiety disorders among university students. For example, a study conducted by Kenardy, McCafferty, and Rosa (2003) investigated a six-week self-guided anxiety program for students scoring above a cut-off for high-level anxiety and found a reduction in anxiety-related cognition and symptoms of depression no improvement in anxiety sensitivity compared to the control group.

Two other studies by Mitchell and Dunn (2007) and Santucci et al. (2014) investigated the feasibility of computerized cognitive behaviour therapy (cCBT) program called 'Beating the Blues'. Both studies indicated improvement in symptoms of depression; the first study reported no significant improvement in anxiety scores (Mitchell & Dunn, 2007), and the second reported very low treatment completion rates (Santucci et al., 2014).

A recent meta-analysis of 48 studies on Internet interventions for mental health and well-being for university students suggested small effects on depression (g = 0.18, 95% CI) and anxiety (g = 0.27, 95% CI). The study reported that the effect is higher in samples preselected through symptom cut-offs or risk factors and interventions of medium length (4–8 weeks), based on CBT principles. The study concluded that Internet-based mental health interventions can be a potentially useful means for several psychological problems for university students and can positively impact university students' mental health (Harrer et al., 2019). Digital self-help interventions (including online or computerised programs or applications) are effective for depression and anxiety and provide an opportunity to extend psychotherapy to people who might not otherwise receive it. However, implementing and integrating online intervention health tools into routine healthcare settings has been a challenge across the board. Many have advocated testing digital health tools under more pragmatic conditions to maximise knowledge transfer from research studies to real-world implementation (Glasgow, Phillips & Sanchez, 2014).

Studies examining the uptake and engagement of digital mental health interventions in the real world have generally found low levels of engagement and completion (Staples et al., 2016). This could be attributed to their application in the real world, that is, as implemented (disseminated) outside of study settings (mainly randomised trials), the real-world data can vary from what is recorded in trials; and implementation data are rarely reported (Fleming et al., 2018). For example, trial participants may have additional reasons to complete interventions, such as pleasing researchers or helping others; trials may exclude participants with complicated issues. Participants in clinical trials can also benefit from appraisal outcomes or face-to-face interactions unrelated to the intervention (Fleming et al., 2018).

Davies, Morriss, and Glazebrook (2014) conducted a metaanalysis to analyse the trials of web-based and computerdelivered interventions to improve symptoms of depression, anxiety, and stress among university students. The study analysed 17 randomised control trials in which the mean age of the participants was approximately 22. Nine studies applied cCBT interventions. In this study, trials were analysed using three group comparisons: comparing intervention to an inactive control, comparing intervention to active control, and comparing intervention to comparison intervention. The results were mixed, and the best results were obtained for inactive controls. Depressive and anxiety symptoms generally improved in these trials: anxiety (standardised mean difference = -0.56; 95% CI, -0.77, -0.35), depression (standardised mean difference = -0.43; 95% CI, -0.63, -0.22), and stress (standardised mean difference = -0.73; 95% CI, -1.27, -0.19). The researchers concluded that web-based and computerised interventions could improve symptoms of depression and anxiety under some conditions, indicating that this kind of treatment is promising for university students.

On the other hand, some studies found that using digital self-help programs result in very limited or no improvement in symptoms of depression and anxiety. For instance, a pragmatic randomised control trial (RCT) was carried out by Mullin et al. (2015) to examine the efficiency and acceptability of an Internet-delivered CBT programme called 'UniWellbeing Course' for university

students with subclinical and clinical symptoms of depression and anxiety. Participants in this study were randomly allocated to two groups: a treatment group (n=30) and a waitlist control group (n=23). The treatment group received weekly follow-ups with therapists during the course, and follow-up questionnaires were completed three months after completing the course. The results indicated a significant reduction in anxiety symptoms (95% CI, 0.13 to 1.17) and depression (95% CI, 0.27 to 1.32) among the treatment group; however, there was a significant difference between the treatment and control groups at the post-treatment three-month follow-up. The study concluded that internetdelivered CBT programs could be an innovative tool to encourage university students to seek mental health services at the university; however, they must be supported by therapist guidance and support for each participant.

A recent systemic review conducted by Lattie et al. (2019) examined the effectiveness, usability, and adoption of digital mental health interventions focused on depression, anxiety, and the improvement of psychological well-being among university students. The review employed 89 studies (71 applying webbased interventions and eight studies applying mobile application-based programmes). According to the review results, 42 studies were effective, and 30 were partially effective in reducing symptoms of psychological illness, while a minority (n=10) reported that interventions were not effective. Regarding acceptability and usability, the review stated that half of the

studies (51%) do not indicate any acceptability or usability effects. Many studies in the review had notable rates of early programme discontinuation by participants, which could be attributed mainly to an unsatisfactory user experience. The study concluded that digital mental health interventions have a promising future in improving the mental health of university students and could be more effective if such programs are permanently implemented in the university system as part of mental health services.

Papadatou-Pastou et al. (2017) suggested that online interventions could help improve academic skills, provide psychoeducation, and decrease course dropout rates. Reducing mental health illness symptoms such as depression or anxiety will improve academic outcomes among university students. Moreover, online interventions could be offered to students with mild to moderate levels of depressive symptoms, while face to face therapy with evidence-based CBT could focus on students with more severe problems that require more intensive psychological support.

In general, there is growing evidence that web-based interventions are useful; however, ensuring user engagement and adherence is a particular challenge (Ludden et al., 2015). Although web intervention effectiveness trials show good-toexcellent levels of adherence, open access websites have been correlated with weak adherence and dropout, with large numbers

of users failing to complete all web pages and leaving websites before fully completing the programme (Glasgow, 2007). For instance, Farvolden et al. (2005) reported that a 12-week openaccess panic programme was completed by only one per cent of participants, and Christensen et al. (2004) found that less than one per cent of registered users completed all modules for depression on an open-access website. A systematic review of RCT trials using web-based interventions for anxiety and depression found that dropout rates from RCT trials of web interventions are lower than that from open-access websites, ranging from 1 to 50% (Christensen, Griffiths & Farrer, 2009). It is noteworthy to mention that several studies have examined the motivators and barriers to web-based programs among university students and found that flexibility and ability to track one's progress help keep a user motivated to persist through all the program modules (Viskovich & Pakenham, 2019).

# **1.16.1.** Computer-based CBT (cCBT) intervention for psychological distress

In recent years, the use of computers and the Internet as an addition to face-to-face CBT has been growing and used as an alternative to individual contact with clinicians. Even though CBT is an effective treatment for depression and anxiety, it is difficult to approach, considering the limited mental health care resources and the lack of qualified therapists (Bower & Gilbody, 2005). In the Middle East and many Arab countries, established mental

health resources are limited, and negative beliefs about mental health care can act as a barrier to engaging in help-seeking behaviour (Dardas & Simmons, 2015).

To fill the noticeable gap between the need for professional psychotherapy and access to the required therapy, a group of researchers suggested increasing the use of web-based programmes to access CBT (often referred to as 'cCBT'or 'iCBT') for treatment (Christensen, Reynolds & Griffiths, 2011; Griffiths & Christensen, 2007). Introducing computerised CBT is one way to increase the access and delivery of CBT programs to a large group of people with less therapist involvement. However, challenges to their uptake among adolescents in general and university students in particular, must be investigated.

Most online CBT programs for depression and anxiety include psychoeducation, behavioural activation, problem-solving therapy, cognitive restructuring, and preventing relapse, which can help patients to improve their knowledge and awareness about their psychological condition and to learn new techniques to cope with negative thoughts (Warmerdam et al., 2012). Webbased interventions in treating depression and anxiety seem effective, even though the outcomes are more positive for guided and assisted programs (Montero-Marín et al., 2016). Further, the literature shows more evidence for treating depression and anxiety using web-based CBT programs among adults than children. A meta-analysis (with twelve systematic reviews from ten studies) conducted by Foroushani, Schneider, and Assareh

(2011) indicated strong support for web-based CBT for depression, especially for certain programmes, including MoodGYM. The study concluded that web-based CBT is as effective as face-to-face therapy. Another meta-analysis conducted by Andrews et al. (2010) reported positive findings for web-based CBT in treating anxiety and depression.

The analysis identified 22 studies that used control groups, and the effect size was found to be g = 0.88 for web-based CBT, with positive results in both the short and long-term. The same study confirmed adherence rates of 80% for the different programs. Ten studies reviewed in the meta-analysis measured satisfaction rates, with a median of 86% reporting that participants were satisfied or very satisfied with the interventions. The authors concluded that web-based CBT could offer effective, acceptable, and practical treatment for many untreated patients. The participants' acceptability included the convenience of the programmes, the privacy of the treatment, being able to work at their own pace, and cost-effectiveness.

Foroushani et al. (2011) conducted a meta-analysis to evaluate the characteristics of studies that used different cCBT programs to treat mild to moderate depression with or without anxiety. This study evaluated 12 systematic reviews, 10 of which covered depression. The study evaluated four cCBT programs (MoodGYM, ODIN, Beating the Blues, and Colour Your Life) designed to treat depression. The results indicated that MoodGYM, Beating the

Blues, and Colour Your Life had positive outcomes in reducing symptoms of depression, while ODIN had moderate to no significant effect. Although the reviews in this study included limited information to permit a comprehensive comparison between the different cCBT programs, the results indicated that cCBT had been found to have an effect similar to face-to-face therapy and reduce therapist time during the treatment sessions.

Griffiths et al. (2010) examined all internet preventive and treatment interventions for depression and anxiety and identified 26 trials, of which 23 showed some evidence of effectiveness compared to controls. The effect size differences ranged from 0.42 to 0.65 for depression interventions, including eight trials for depression involving participants with major depressive disorder, and from 0.29 to 1.74 for anxiety interventions, including participants diagnosed with anxiety disorder. The effect size shows an improvement in anxiety and depression with more improvement for anxiety. The study concluded that internet-based intervention and cCBT for depression and anxiety could be used as self-help applications for different categories of individuals or as additional support for traditional mental health care.

Computerised CBT interventions provide the same content and teach the same skills as traditional face-to-face CBT; however, they do so with standardised materials that can be accessed via computers and the Internet. Treatments administered over the

Internet may be clinician-guided, coach-guided, or completely self-guided, with most approaches taking a fraction of the time that traditional face-to-face psychological counselling takes (Andersson & Titov, 2014; Hedman et al., 2012).

In comparison to control conditions, there is now good metaanalysis evidence for the efficacy of cCBT for anxiety and depression (Andersson & Cuijpers, 2009; Cuijpers et al., 2009). There is also evidence of clinical results being comparable between face-to-face and internet-delivered CBT (Cuijpers et al., 2009), as well as the cost-effectiveness of cCBT (Cuijpers et al., 2009; Hedman et al., 2012). However, only a few randomised controlled trials on using cCBT for university students have been conducted.

Although the results of existing studies are promising, empirical evidence on the effectiveness and acceptability of cCBT for university students is still limited, and further research is needed (Mullin et al., 2015).

### 1.16.2. MoodGYM

In the past decade, different meta-analyses reported that cCBT is an effective low-intensity treatment for most common emotional disorders, such as depression and anxiety (Andersson & Cuijpers, 2009; Andrews et al., 2010; Spek et al., 2007). However, relatively little evidence has been provided for their long-term effectiveness and acceptability by patients (Andrews et al., 2010). MoodGYM is an Internet-based cCBT program

developed by researchers at the Australian National University, and it can be used without therapist guidance (Christensen et al., 2004). It consists of five modules: written information, animations, interactive exercises, and quizzes (Christensen et al., 2006; Farrer et al., 2011). In the introduction, MoodGYM users must complete the Goldberg Depression and Anxiety quizzes and are introduced to six cartoon characters. During the entire programme, scenarios including these characters explain CBT principles relating to mood and thoughts. MoodGYM provides an emergency page with resources for people who are suicidal or know someone who is.

The program comprises five modules. The first module is called Feeling. It mainly introduces the users to different negative thought patterns and how negative views are related to the self. The second module is called Thoughts and provides further information about identifying and overcoming unhelpful patterns of thinking. In this module, users are introduced to cognitive distortions and areas of vulnerability (e.g., the need to be loved) and learn more about self-esteem. 'The third module is called Unwrapping, which extends the materials covered previously by using different techniques for responding to dysfunctional thoughts. The fourth module is called De-stressing, and it is all about stress and identifying stressors and how they interact with cognitive patterns. The fifth and final module is called Relationships, and it provides interventions for coping with relationship breakdown, which involves cognitive and behavioural techniques (https://moodgym.com.au). At the end of the programme, the users completed the Goldberg Anxiety and Depression Quiz and could compare their scores with the earlier results and review their progress (Christensen et al., 2006; Farrer et al., 2011).

MoodGYM is one of the most commonly used cCBT programs worldwide, with over one million users, and it is also a costeffective treatment option for people across socio-demographic divides (www.ehubhealth.com). Many studies have provided scientific support for MoodGYM's effectiveness (Twomey et al., 2014). However, some studies suggested that in comparison between research trials and implementation usage MoodGYM had a low adherence level in real-world settings (Fleming et al., 2018).

For instance, only 0.5% of community MoodGYM users completed a noncompulsory final assessment, compared with 22.5% of participants in a trial evaluating the same program (Christensen et al., 2004). Likewise, in the community, adolescent users of MoodGYM completed an average of 3.1 exercises, compared with an average of 9.4 exercises among adolescents in a school-based trial (Neil et al., 2009). These results reflect that, for MoodGYM or any intervention programs to achieve meaningful impact, they need adequate uptake and adherence in real-world settings. A meta-analysis conducted by Foroushani et al. (2011) suggested that MoodGYM and other cCBT programs can improve symptoms of depression and can contribute to reducing therapist time.
However, high-quality comparative studies that support the costeffectiveness of these programs are scarce. Another metaanalysis conducted to examine MoodGYM's effectiveness in improving depression and general psychological distress symptoms among adults highlighted that MoodGYM could improve symptoms of depression and general psychological distress; however, it should be noted that the adherence rate can create a big challenge, and, at extreme, can fall below 10%. Despite this, the study concluded that MoodGYM could be considered a population-level intervention that can benefit many users (Twomey & O'Reilly, 2016).

Høifødt et al. (2013) indicated that a combination of the MoodGYM program and face-to-face therapy support could effectively improve mild to moderate depression among individuals recruited from primary care. In addition, the study also suggested a positive effect on symptoms of anxiety and emotional well-being in general, which was maintained at a 6month follow-up assessment. In the same context, another study was conducted by Powell et al. (2012) to evaluate the effectiveness of MoodGYM among a large sample of the general population using the Internet. The study revealed that those who received the intervention exhibited improvements in their mental well-being over 12 weeks, while the scores of those in the control group who received no intervention showed that their symptoms remained unchanged.

The issue of how to measure adherence in MoodGYM is critical. Christensen et al. (2006) recorded the amount of time each user spent on MoodGYM; however, they could not calculate how much time each user spent on the modules. Furthermore, some studies used the percentage of exercises completed to measure adherence, while others used the total number of exercises completed. However, the module definitions were unclear, such as whether all exercises had to be completed or if a user had to click through the pages. Furthermore, it is unclear how many characters or words must be typed into blank fields before an exercise is considered complete. According to Neil et al. (2009), computerised interventions should accurately record user activity to improve adherence. It is important to track how much time users spend on modules because they can read them but may not complete the exercises and still get something out of the program.

While the evidence so far suggests that cCBT could be useful and cost-effective, it remains to be seen whether it will provide a viable alternative to human, face-to-face support. The results of such studies could support the use of web-based alternatives in education institutions independent higher as an or complementary solution to campus mental health services to improve student mental health and well-being and relieve the burden on overstretched student support services. However, the impact of those interventions on educational attainment has yet to be fully explored. A recent meta-analysis of six RCT

evaluating the impact of online mental health interventions on academic performance reported beneficial effects for depression but revealed only a small non-significant effect for academic achievement (Bolinski et al., 2020).

#### 1.17. Summary

It has been estimated that around one-third of university students are likely to experience clinically significant levels of depression and anxiety at any one time. Despite the availability of effective treatment options, these disorders are often underdiagnosed and under-treated. Emotional disorders among university students result in the deterioration of abilities in daily activities, especially those related to academic achievement. There have been several studies on the prevalence of depression and anxiety among university students worldwide. However, a minority of studies have explored the impact of depressive symptoms and anxiety on university students' academic performance.

Several factors such as cognitive function, motivation, and previous educational experience influence students' academic performance. In addition, motivation and cognition are both affected by symptoms of depression and anxiety. Given that less is known about emotional disorders and academic performance, the effects of depression and anxiety are of particular interest in this thesis. An in-depth exploration of the correlation between depression/anxiety and academic achievement could be

beneficial in understanding how to support university students' success.

A better understanding of the prevalence of emotional disorders in Emirati student populations and their implications for academic outcomes could help to address this gap. Therefore, further research, specifically longitudinal studies, is needed in this area. Moreover, additional efforts to validate the causal association between depressive and anxiety symptomatology and academic challenges are essential.

There is a growing need to create supportive environments for students who may experience emotional disorders during their university life. Therefore, web-based intervention programs offer an acceptable and effective method for providing psychological treatment within the university system. University students can benefit from the opportunities offered by web-based interventions for anonymous and non-stigmatizing access to tools that support emotional well-being. Furthermore, such systems can support improvements in academic skills and promote academic success.

It is known that online interventions (particularly cCBT) can effectively improve university students' mental health; however, their impact on educational attainment has yet to be fully explored. To promote already available psychotherapeutic internet-based interventions for students, it is important to explore their potential to improve university students' mental health and their impact on academic performance. Pre-and post-

research with a control group is needed to evaluate the feasibility, acceptability, and effectiveness of cCBT programs with academically failing students who may have emotional disorder symptoms.

This research represents the initial stage of understanding depression, anxiety, and their relationship with academic outcomes. This is an essential step for early and appropriate interventions for university students in the UAE. The results of this research would be crucial in promoting a web-based program that can support mental health treatment facilities among university students and contribute to educating this population on the availability of those resources.

# **1.18.** Aims of the thesis

## 1.18.1. Specific objectives:

 To systematically review evidence on the relationship between anxiety/depression and academic performance among undergraduate students.

• To establish the prevalence of anxiety and depression in a representative sample of undergraduate students in the UAE.

• To determine the relationship between anxiety/depression and academic performance in UAE undergraduate students and explore gender differences in that relationship.

• To explore the acceptability and effectiveness of an online CBT-based intervention (MoodGYM) in improving academic performance and reducing anxiety and depression in UAE students with emotional difficulties.

#### 1.18.2. Overarching objectives:

This thesis aims to explore the correlation between depression/anxiety and academic achievement among UAE university students and the impact these symptoms have on their academic performance. Considering that little research has been conducted in this area, this research will help open lines of communication among students, faculty, and university counselling centres; thus, essential referrals can be given to those in need. Identifying students with symptoms of emotional disorders at early stages is essential for planning appropriate early interventions for this population.

Another aim of this thesis is to investigate the potential effectiveness of a self-directed, internet-delivered cognitivebehavioural skills training tool in improving academic performance (GPA) and mood in UAE university students with poor academic performance. Despite evidence confirming the effectiveness of cCBT for reducing symptoms of depression and anxiety, very little research has evaluated a CBT-based online intervention targeting students with depressive symptoms who are also struggling academically.

As we aim to investigate the impact of depression and anxiety on academic performance, the first study (Chapter two) will systematically review the relationship between

anxiety/depression among university students and their academic performance. Through this systematic review, we will examine the hypothesis that higher levels of depression and anxiety are associated with poorer academic performance among university students.

To explore the prevalence of depression and anxiety in Emirati student populations and their implications for academic outcomes, the second study (Chapter three) will use a longitudinal survey conducted at baseline and six months followup, with a representative cohort of students attending one university in the UAE. The study will also examine the hypothesis that students with a possible depressive disorder will have lower grade point averages (GPA) and that higher levels of depressive symptoms at baseline will predict lower GPAs at follow-up.

The third study (Chapter four) will use an exploratory pre-post intervention survey with a historical control group to investigate the potential effectiveness of a self-directed, internet-delivered cognitive-behavioural skills training tool (MoodGYM) in improving academic performance (GPA) and mood in UAE university students with poor academic performance. The study will also investigate factors influencing GPA improvement, including changes in depression scores and MoodGYM use.

Chapter Two: The impact of depressive and anxiety symptoms on academic achievement among undergraduate university students: A systematic review

#### 2.1 Introduction

# 2.1.1. Prevalence of depression and anxiety among university students

Depression and anxiety disorders are two of the most prevalent mental health disorders among university students (Lun et al., 2018). A previous study suggested that university students have higher prevalence rates of mental health problems, including depression and anxiety, than the general population (Yusoff et al., 2013). In recent years, depression and anxiety have been reported in university students at alarming levels. For example, a recent, representative, cross-sectional survey of first-year students residing in dormitories at a Bangladesh University reported that more than two-thirds of students experienced moderate to severe depression (69.5%) and anxiety (61.0%) (Islam et al., 2020).

As noted in the latest annual report of the Center for Collegiate Mental Health records, anxiety and depression are the top reasons college students seek counselling in the USA. The report suggests that anxiety and depression continue to be the most common problems presenting in mental healthcare<sup>,</sup> with a reported prevalence rate of 62.7% for anxiety, followed by

depression at 49.3% of 82,685 students who completed the Counseling Center Assessment of Psychological Symptoms (Center for Collegiate Mental Health, 2019). Similarly, in the UK, it was estimated that one in six university students experience a common mental health condition, such as depression or anxiety (McManus et al., 2016). Both are associated with a decreased quality of life, cognitive and social skills impairment, and a dominant cause of disability (Lun et al., 2018).

The cost of affective mood disorders can be particularly high in young people. They are transitional between adolescence and early adulthood when they need to make key decisions about their future and take more responsibility for their lives and achievements. Hence, this can be perceived as one of the most stressful times in a person's life (Keller et al., 2007). Additionally, university students face many new experiences (e.g., changes in the learning environment, living arrangements, geographical changes and making new friendships) and associated behavioural, emotional, academic, and socioeconomic changes (Ginwright & James, 2002). For example, university academic courses require greater self-directed learning, demanding highclass grades that put the students under great pressure to adapt to new environments and learning modes. Therefore, failing to make this transition effectively can affect the mental health and social wellbeing of this group (Quince et al., 2012).

### 2.1.2. Depression, anxiety, and academic performance

Depression is a mood disorder characterized by a composite of physical, emotional, psychomotor, and cognitive impairments and typical symptoms including sleep disturbance, poor concentration, negative thoughts, and feelings of guilt. Students with high levels of depression might struggle to perform well academically because they do not have interest and motivation (Modabernia et al., 2008). They may lack confidence, not reach the required performance standard, negatively discern things, and consider themselves inefficient. Thus, their academic and social life is bound to be affected, resulting in poor grades, low achievement, and absence from college or university (January et al., 2018). A recent study among graduate and undergraduate students in Jordan reported that students with persistently high anxiety and depressive symptoms are more likely to exhibit lower academic achievement and a higher absenteeism rate than those experiencing normal and moderate levels of anxiety and depression (Abu Ruz et al., 2018). The same study's findings reflect that depression is highly correlated with students' academic success and class attendance. Furthermore, a study by Deroma et al. (2009) reported that university students experiencing a moderate level of depressive symptomology perform worse academically than those with mild or normal symptoms.

Anxiety symptoms reflect an emotional and physical condition distinguished by intellectual, somatic, emotional, and behavioural elements that create an unpleasant feeling associated with

uneasiness, fear, and worries (Hoyt, 2008). High levels of anxiety impact an individual's attention and memory, resulting in hyper-vigilance and impairments in reasoning and judgment, leading to the impairment of cognitive functioning and academic performance (Robinson et al., 2013).

A survey from the American College Health Association (ACHA 2018/19) suggested that about 60% of the students in the USA felt "overwhelming" anxiety. However, little is known about any association between high levels of anxiety symptoms and university academic achievement. A cross-sectional study among high school students found a negative relationship between anxiety symptoms and poor academic performance (Mazzone et al., 2007). Furthermore, a study conducted by Vitasari et al. (2010) among engineering university students found that high anxiety levels display low academic performance. Some studies revealed a positive correlation between low anxiety levels and better academic performance (Al-Qaisy, 2011). Conversely, appropriate degrees of anxiety about the fear of failure could enhance students' self-motivation to perform better academically (Eysenck et al., 2007).

There have been several studies on the prevalence of depression among university students worldwide (Ibrahim et al., 2013). However, a minority of studies have explored the impact of depressive symptoms and anxiety on university students' academic performance. Academic performance is affected by various factors such as cognitive function and motivation and

prior educational experience. Furthermore, motivation and cognition are both affected by symptoms of depression and anxiety (Jones et al., 2015).

Given that less is known about emotional difficulties and academic performance, the effect of depression and anxiety is of particular interest in the present undertaking. An in-depth exploration of the correlation between depression/anxiety and academic achievement could be very beneficial in supporting university students' success. Therefore, further research, specifically longitudinal studies, is needed in this area. Moreover, additional efforts to validate the causal association between depressive and anxiety symptomatology and academic challenges are essential.

## 2.1.3. Rationale and objectives

To the best of our knowledge, no published systematic review has examined the impact of depressive and anxiety symptoms on academic performance in undergraduate university students. Considering this research gap, this review has two main objectives:

1. To identify studies reporting the relationship between depression and anxiety and academic performance among university students.

2. To examine the hypothesis that higher depression and higher anxiety levels are associated with poorer academic performance among university students.

# 2.2. Methodology

# 2.2.1. Search methods for identification of studies

## Electronic searches

A systematic literature review of the PsychINFO, PubMed, Embase, Google Scholar, and Medline databases was conducted in June 2020 to identify peer-reviewed studies published between January 1997 and June 2020 on the impact of depression and anxiety symptoms on the academic performance of university students. Searching other resources.

The 27-item PRISMA checklist was completed for this systematic review and can be found in Appendix 22.

### 2.2.2. Eligibility criteria

Studies published in peer-reviewed journals were included in the review if they met the following inclusion criteria:

 The sample consisted solely of undergraduate university students in any year of study at higher education institutions (i.e., universities and colleges) in any country. If studies included a mix of university students and another sample (e.g., adolescents, non-student age-matched peers, postgraduates), they were included if undergraduates had been analyzed and reported separately. 2. The study assessed depression and anxiety through standardized, validated outcome measures or clinical diagnosis (e.g., PHQ-9 and GAD-7).

3. The study reported an objective outcome measure of academic performance, such as GPA, degree classification, or examination results.

4. The study reported a statistical estimate of the association between depression and anxiety and academic performance.

5. The study was a cross-sectional, longitudinal, or randomized controlled trial of an intervention to reduce depression and anxiety that measured academic outcomes. If the study was a randomized control trial, baseline data were considered to explore the effect of depression and anxiety on academic performance.

6. The study was published in English and a peer-reviewed journal.

The following studies were excluded:

1) A study involving a mixed sample (e.g., undergraduate and postgraduate students) did not separately report outcomes for undergraduate university students.

2) The study assessed depression and anxiety through nonstandardized validated outcome measures (e.g., GHQ-12).

3) The study design was a systematic review, case study, meta-analysis, grey literature, unpublished research, or thesis.

# 2.2.3. Database search strategy

Boolean terms and combinations of the following keywords were used to search for relevant literature: depression, depressive symptoms, major depression, depressive disorder, academic performance, university students, college students, anxiety symptoms, anxiety disorders, and academic achievements (Table 1).

# Table 1. Search terms used in online databases (exceptpublisher websites and Google Scholar)

Database	Search strategy				
Psych INFO	Exp Major Depression/ Exp Anxiety Disorders/ OR Exp Anxiety/ Depress* OR Anxiety /.ti,ab. Exp Colleges Students/ OR Exp Students/ Undergraduate*.ti,ab/ College OR University) Adj2 Student*.ti,ab. Exp Academic Achievement/ Academic OR Education*) Adj2 (Perform* OR Achiev* OR Function* OR Succes*ti,Ab. Limit TO (English Language AND yr="1997 - 2020")				
PubMed	Undergraduate*.ti,ab/ College OR University) Adj2 Student*.ti,ab. Exp Academic Achievement/ Academic OR Education*) Adj2 (Perform* OR Achiev* OR Function* Educational Status/ OR((academic or education*) adj2 (perform* or achiev* OR function* or succes*)).ti,ab. Limit TO (English Language AND yr="1997 - 2020")				

Embase	exp MAJOR DEPRESSION/ OR exp ANXIETY DISORDERS/ OR exp ANXIETY/ depress* OR anxiety).ti,ab. OR exp COLLEGE STUDENTS/ or exp STUDENTS OR undergraduate*.ti,ab
	((college or university) adj2 student*).ti,ab. OR exp ACADEMIC ACHIEVEMENT/ ((academic or education*) adj2 (perform* OR achiev* OR function* OR succes*)).ti,ab.
	limit 13 to (english language and yr="1997 - 2020")
Medline	exp Depression/ OR exp Anxiety/ exp Anxiety Disorders/ (depress* or anxiety).ti,ab. exp Students/ undergraduate*.ti,ab. ((college or university) adj2 student*).ti,ab.OR exp Achievement/ OR exp Educational Status/ OR((academic or education*) adj2 (perform* or achiev* OR function* or succes*)).ti,ab. limit 15 to (english language and yr="1997 - 2020")

Google Scholar (reduced search terms were used).

# 2.2.4. Data collection and analysis

# Selection of studies

Search results were imported into EndNote X8, and duplicates were removed. The first researcher screened titles and abstracts for assessment according to the review's inclusion criteria, and the second researcher double-checked her work. Disagreement between these two researchers and a random selection of excluded papers was reviewed by a third reviewer (team leader). Full texts of the remaining articles were obtained and reviewed against the inclusion criteria by the first and second researchers, and their work was verified by the team leader (CG). The review was conducted in October 2017 to identify peer-reviewed studies published between January 1997 to 2017 and updated in June 2020. Findings and recommendations from studies published in the past two decades are relevant and applicable to current university students. The higher education sector has experienced unparalleled growth over the past 20 years globally concerning students' expectations and perceptions of the quality of their learning experience and academic standards (Money et al., Nevertheless, consideration should be given to the 2017). significant changes in university life for the new generation of undergraduates over the past two decades in terms of technology, economics, and social aspects (Serdyukov, 2017).

# 2.2.5. Data extraction and management

#### Extraction

Microsoft Excel created a data extraction form to produce a tabulated summary of study characteristics such as population, psychological and academic performance scales, outcomes, study design, and other considered important characteristics for inclusion.

#### Management

A Microsoft Excel sheet was used as a data entry and management tool to create the relevant tables included in the review.

### 2.2.6. Analyzing/synthesizing the data

Meta-analysis was not considered in this review as the data and the review's objectives did not meet the criteria for a metaanalysis design.

# 2.2.7. Quality evaluation

We adapted the quality assessment tool for surveys developed by Parker et al. (2008) to assess the risk of bias in the studies included in this systematic review. Articles scored one point for each of the following quality markers:

1. The target population was defined clearly by describing the inclusion and exclusion criteria (i.e., undergraduate university students).

2. Complete, random, or consecutive recruitment was conducted.

3. The targeted sample is representative, or the report presents evidence that the results can be generalized to the undergraduate population and has a minimum 50% response rate.

4. The scale used is a validated measure of depression or anxiety with valid cut-off values for the classification of depression and anxiety.

5. The sample size was adequate, with a minimum sample size of 300 (Loney et al., 1998). The last quality criterion was added because the larger the sample, the more precise the results (Starchan, 1997).

6. Missing data are accounted for. For example, reasons for dropout are explained, the impact of missing data on results is discussed, and people lost in the follow-up compared to initial responders is explained.

7. The study accounted for potential confounding variables either by design or statistical analysis.

# A full description of the quality assessments for the examined studies is provided in Table 2.

SN	Source	Sample	Recruitment	Representative	Scale	Sample	Accounts for	Controls for	Quality
		definition		sample		size	missing values	confounding	Score
								variables	
1	Andrews &	1	0	1	1	1	1	1	6
	Wilding								
	2004								
3	Cheung et	1	1	1	1	1	0	0	5
	al. 2020								
4	Deb et al.	0	0	0	1	1	0	0	2
	2016								
5	Hysenbegasi	1	0	0	1	1	1	1	5
	et al. 2005								
6	Junaid et al.	1	1	1	1	0	0	1	5
	2018								
7	Mihailescu	1	1	1	1	0	0	1	5
	et al.2016								

# Table 2: Quality assessment of the ten included studies

8	Newcomb-	1	0	1	1	1	1	1	6
	Anjo et al.								
	2016								
	Sadeghi	1	1	1	1	1	0	1	6
	Bahmani et								
	al. 2018								
9	Sindhu &	0	1	0	1	0	0	0	2
	Basha, 2017								
10	Yeh et al.	1	0	1	1	0	0	0	3
	2007								

#### 2.2.2. Study search and screening

The search yielded 2,746 citations. After examining the titles and abstracts, 112 full-text articles were retrieved and thoroughly examined. Subsequently, 102 articles were excluded as a result of the following justifications: studies examining test anxiety and motivation (n=14); the study population was non-university students or young adults (n=21); studies that reported only the prevalence of depression and anxiety and not academic performance, (n=19), studies that did not report any measure of academic performance (n=18); studies examining the relationship between academic performance and other psychological disorders (n=24); and studies that did not assess depression or anxiety with standardized measures (n=6). The remaining articles (n=10) were included and evaluated for quality (Appendix 22).

Figure 1 outlines the search process.



Figure 1. PRISMA Flow Diagram

### 2.3. Results

The search yielded 2,746 citations. After examining the titles and abstracts, 112 full-text articles were retrieved and thoroughly examined. Ten studies met all inclusion criteria (Figure 1). Nearly half (n=4) was carried out in Western countries: one in the USA (Hysenbegasi et al., 2005), one in Canada (Newcomb-Anjo et al., 2016), one in Romania (Mihailescu et al., 2016), and one in the United Kingdom (Andrews & Wilding, 2004). Four studies were conducted in East and South Asia: two in India (Deb et al., 2016; Sindhu & Basha, 2017), one in China (Yeh et al., 2007), and one in Hong Kong (Cheung et al., 2020). Finally, two were in the Middle East: one in Iran (Sadeghi Bahmani et al., 2018) and one in Saudi Arabia (Junaid et al., 2020) (Table 3).

Study	Year	Country	Period of	Sample size	Scale to measure	Academic
			study		depression/anxiety	performance
						measure
Andrews &	2004	UK	2000-	University	14-HADS	2 <sup>nd</sup> year-exam
Wilding			2002	students		averages
Cheung et al.	2020	Hong	2019-	University	DASS-21	sGPA, cGPA,
		Kong	2020	students		aGPA
Deb et al.	2016	India	NR	University	30-USDI	Choice Based
				students		Credit System
						(CBCS)(cGPA)
Hysenbegasi et	2005	USA	NR	University	Clinical diagnosis	GPA
al.				students		
Junaid et al.	2020	KSA	March	Medical	21 -BAI-II	cGPA
			2018 to	students		
			August			
			2018			
Mihailescu et	2016	Romania	NR	Medical	ZAS	GPA
al.				students	ZDS	Academic
						Achievements
						Records
Sadeghi	2018	Iran	NR	Medical	21-BDI=II	Exam scores
Bahmani et al.				students		
Sindhu &	2017	India	ND	University	BAT-	Course marks
Bacha	2017	India	INIX	students		
Vah at al	2007	China	2006-	Medical	20-705	Achievement
	2007	China	2000-	studente	20 203	Scale marks
			2007	Stutents	20 283	

# Table 3: Description of the included studies (N=10)

ZDS: Zung Self-Rating Depression Scale, ZAS: Zung Self-Rating Anxiety Scale, BAI: Beck Anxiety Inventory Scale, BDI: Beck Depression Inventory Scale, GHO-12: General Health Questionnaire, HADS: Hospital Anxiety and Depression Scale, USDI: University Students Depression Inventory, DASS: The Depression, Anxiety and Stress Scale, GPA: Grade Point Average, cGPA: Cumulative Grade Point Average, sGPA: Semester Grade Point Average and Choice Based Credit System (CBCS). Medical students were the sole sample in four studies (Mihailescu et al., 2016; Yeh et al., 2007; Sadeghi Bahmani et al., 2018; Junaid et al., 2020). Six studies recruited and collected data from students across different faculties (Andrews & Wilding, 2004; Deb et al., 2016; Sindhu & Basha, 2017; Hysenbegasi et al., 2005; Sadeghi Bahmani et al., 2018; Newcomb-Anjo et al., 2016). The majority of studies (n=6) used a random sample (Sindhu & Basha, 2017; Sadeghi Bahmani et al., 2018; Mihailescu et al., 2016; Newcomb-Anjo et al., 2016; Cheung et al., 2020; Deb et al., 2016) with three studies using convenience sampling (Yeh et al., 2007; Hysenbegasi et al., 2005; Andrews & Wilding, 2004) and one study employing the systematic method for selecting the sample (Junaid et al., 2020).

The majority adopted a cross-sectional design (n=6) (Newcomb-Anjo et al., 2016; Sindhu & Basha, 2017; Sadeghi Bahmani et al., 2018; Deb et al., 2016; Cheung et al., 2020; Junaid et al., 2020) with four studies applying a longitudinal design (Hysenbegasi et al., 2005; Andrews & Wilding, 2004; Yeh et al., 2007; Mihailescu et al., 2016).

A range of measures was used to assess depressive and anxiety symptoms in the articles included in this review. The ten studies used rating scales to identify depression or anxiety and academic scales to measure academic performance (Table 2). Seven different scales were used to measure depression and anxiety in the ten articles included in the review: The Beck Depression Inventory (BDI) was used in two studies (n=2) (Sindhu & Basha,

2017; Sadeghi Bahmani et al., 2018) Zung's Anxiety and Depression Scale (ZDS-ZAS) was used in two studies (n=2) (Yeh et al., 2007; Mihailescu et al., 2016). Center for Epidemiological Studies Depression Scale (CES-D) was used in one study (n=1) (Newcomb-Anjo et al., 2016), the Depression Anxiety and Stress Scale (DASS-21) was used in one study (n=1) (Cheung et al., 2020). Hospital Anxiety and Depression Scale (HADS) was used in one study (n=1) (Andrews & Wilding, 2004). University Students Depression Inventory (USDI) was used in one study (n=1) (Deb et al., 2016). The Beck Anxiety Inventory (BAI (Annexure) was used in one study (n=1) (Junaid et al., 2020), and one study had a clinically diagnosed sample (Hysenbegasi et al., 2005).

Six different measures were used to measure academic performance. Grade point averages (GPAs) were used in four studies (n=4) (Mihailescu et al., 2016; Hysenbegasi et al., 2005; Cheung et al., 2020; Junaid et al., 2020), followed by the examination marks and the year examination average, which were used in two studies (n=2) (Andrews & Wilding, 2004; Sadeghi Bahmani et al., 2018). The Academic Achievements scale was used in two studies (n=2) (Yeh et al., 2007; Sindhu & Basha, 2017). Academic records and academic project assignments were used in two studies (n=2) (Newcomb-Anjo et al., 2016; Deb et al., 2016). In terms of study quality, the actual quality scores for the ten included studies ranged from 2 to 6 (Table 2).

The overall sample size of the current review was n=14,695, ranging from n=20 to n=9,479 participants (Sindhu & Basha, 2017; Cheung et al., 2020). The mean age of the samples in the ten studies was between 18 and 26 years.

Five studies did not report participants' gender (Yeh et al., 2007; Sindhu & Basha, 2017; Hysenbegasi et al., 2005; Mihailescu et al., 2016; Cheung et al., 2020). In three studies, females comprised 54%-82% of the sample (Newcomb-Anjo et al., 2016; Andrews & Wilding, 2004; Sadeghi Bahmani et al., 2020), while males made up 56%-68% of the sample in two studies (Junaid et al., 2020; Deb et al., 2016). The majority of studies (n=8)reported no significant gender differences in rates of anxiety and depression; one study reported that anxiety rates were higher among female students (Junaid et al., 2020), and another study reported that male students screened for greater elevated depressive symptoms than females (Cheung et al. (2020). Half of the included studies (n=5) assessed both anxiety and depression (n=5) (Yeh et al., 2007; Andrews & Wilding, 2004; Mihailescu et al., 2016; Sindhu & Basha, 2017; Cheung et al., 2020). Four studies looked at depression only (n=4) (Sadeghi Bahmani et al., 2018; Hysenbegasi et al., 2005; Newcomb-Anjo et al., 2016; Deb et al., 2016), and one study investigated anxiety only (Junaid et al., 2020).

# 2.3.1.Cross-sectional and longitudinal relationships between depression and academic performance

Among the six studies that assessed a cross-sectional relationship between depression and academic performance, all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer performance. (Sadeghi Bahmani et al., 2018; Newcomb-Anjo et al., 2016; Deb et al., 2016; Sindhu & Basha, 2017; Yeh et al., 2007; Cheung et al., 2020). In one of the longitudinal studies, depression did not correlate with academic scores, but when dividing depression scores into high, medium and low, they found a significant effect of group (p<0.05) with students in the low depression group at time one having higher academic scores in block 1 (Yeh et al., 2007).

Of the four studies (Hysenbegasi et al., 2005; Mihailescu et al., 2016; Andrews & Wilding, 2004; Yeh et al., 2007) to conduct longitudinal analyses, three (Hysenbegasi et al., 2005; Mihailescu et al., 2016; Andrews & Wilding, 2004) found that higher levels of depression predicted subsequent poorer academic performance. Hysenbegasi et al. (2005) indicated that a diagnosis of depression was associated with a decrease in student GPA of 0.49 points, and depression also mediated the negative relationship between financial difficulties and decline in academic Academic performance improved for students performance. having treatment for depression.

# 2.3.2. Cross-sectional and longitudinal relationships between anxiety and academic performance

Four studies conducted cross-sectional analyses to explore the relationship between anxiety and academic performance (Sindhu & Basha, 2017; Yeh et al., 2007; Cheung et al., 2020; Junaid et al., 2020). Of which, three found a relationship between higher anxiety levels and poorer academic performance (Sindhu & Basha, 2017; Cheung et al., 2020; Junaid et al., 2020). Of the three longitudinal studies (Mihailescu et al., 2016; Andrews & Wilding, 2004; Yeh et al., 2007), only one (Mihailescu et al., 2016) reported a significant longitudinal relationship between higher anxiety and subsequent poorer academic performance. This was significant for first-year students only (Table 4).

# 2.3.3. Factors affecting the relationship between depression/anxiety and academic performance

Five studies (*n*=5) mentioned potential (psychological, social, and financial) factors most likely to affect the association between depressive or anxiety symptoms and academic achievements. Andrews and Wilding (2004) reported that only two factors, depression, and financial difficulties, were significantly related to examination performance. Deb et al. (2016) reported that students who had poorer academic performance had higher depression scores. Sindhu and Basha (2017) stated that stress among university students could affect

both high academic achievers and low academic achievers and mediate the relationship between depression, anxiety, and academic performance.

Sadeghi Bahmani et al. (2018) reported that depression, loneliness, and scores on all dimensions of social satisfaction were independently associated with academic achievement scores. Additionally, Cheung et al. (2020) reported that higher study load and academic performance were associated with depression but did not control for study load when correlating academic performance with depression.

The remaining five studies (n=5) did not include or analyze any confounding factors that could affect the impact of depression or anxiety on academic performance (Hysenbegasi et al., 2005; Mihailescu et al., 2016; Newcomb-Anjo et al., 2016; Yeh et al., 2007; Junaid et al., 2020).

**Table 4.** Characteristics of methodologies employed in the ten studies and details of the results relating to depression and anxiety and academic performance among university students from 1997 to June 2020

Study	Sample	Response	%Female	Location	Mean/Range	Study results	Correlation coefficient
	size	rate	in the	of the	age		
			sample	study			
Andrews &	351	76%	75%	UK	NR	Depression made an	r square = 0.51
Wilding 2004						independent contribution to	p < 0.01
						the decrease in exam	
						scores between year one	
						and year 2 (controlling for	
						first-year marks and	
						demographic variables).	
						Anxiety is not related to	
						subsequent exam	
						performance.	
						In the first year, no	
						significant correlation was	
						found. In the second year,	
						depression made an	
						independent contribution to	
						exam marks (beta=11) P	
						value < 0.01	

Cheung et al.	9,479	56.5%	NR	Hong	18.9	Among the direct entry	
2020				Kong		from secondary school	Depression for all groups:
						(DEfSS) students' group,	Spearman <i>r</i>
						there was a negative	Semester GPA: $r = -0.045$
						relationship between GPA	p<0.001
						(sGPA and cGPA) and	Cumulative GPA: $r = -0.038$
						depression score.	p<0.001
						All the groups in this study	Awarded GPA: $r = -0.050$
						found a significant negative	p<0.05
						relationship between high	Anxiety for all groups:
						depression, anxiety, and	Semester GPA: $r = -0.007$
						academic performance, but	p>0.05
						the effect sizes were very	Cumulative GPA: $r = -0.003$
						small.	p>0.05
							Awarded GPA: $r = -0.040$
							p<0.05
Deb et al.	717	NR	43%	India	22.5	Students who had poorer	
2016						academic performance had	<i>F</i> = 12.56
						higher depression scores.	p < 0.001
						With means of depression	
						as following:	
						Very good (CGPA 9-10) =	
						69.92	
						Good (CGPA 7-8)	
						=74.93	
						Moderate (CGPA 5-6)	
						=80.67	

						Poor (CGPA below 5) = 86.6	
Hysenbegasi et al. 2005	330	37%	NR	USA	NR	The coefficient of the depression variable indicates that the diagnosis of a depressive disorder was associated with a 0.49- point drop in GPA. An increase in students' GPA of 0.44 was associated with treatment for depression in the depressed group.	Regression coefficient = -0.4854 p<0.0001 <i>r</i> square= 0.14
Junaid et al. 2020	247	90%	31.2%	KSA	NR	The cumulative GPA was significantly and negatively associated with higher anxiety levels.	p = 0.017 p = 0.014
Mihailescu et al. 2016	356	89%	NR	Romania	18-24	First-year students only experienced a negative association between depression, anxiety and GPA (Time 1). There was no correlation between depression, anxiety, and academic performance	Anxiety rho =290 p < 0.05 Depression rho=254 p < 0.05

						among second-year	
						students (Time 2).	
Newcomb-Anjo et	903	NR	82%	Canada	18-25	A weak negative correlation	
al. 2016						between grades and	Grades and depression
						depression was found. No	<i>r</i> = -0.14
						significant relationship once	
						controlled for demographic	
						variables.	
Sadeghi Bahmani	275	84.87%	66.2%	Iran	21.24	Depression is associated	Coefficient = -0.49
et al. 2018						with low academic	p < 0.001
						achievement.	
Sindhu & Basha	20	75%	NR	India	NR	Students in the low	Level of significance for anxiety
2017						achieving group $(n=3)$	and academic performance= $t$
						reported a higher level of	(15) = 1.74, p=0.05
						depression and anxiety	Level of significance for
						than those in the high	depression and academic
						achieving group ( $n=12$ ). P	performance= $t$ (15) =2.45,
						values 1-tailed.	p = 0.014

Yeh et al. 2007	252	90%	NR	China	NR	The first assessment	First assessment (time 1):
						(time 1):	
						There was no significant	Severe depression
						cross-sectional correlation	<i>r</i> = -0.252
						between anxiety and	p < 0.05
						academic performance.	
						Although depression did not	
						correlate with academic	
						scores, dividing depression	
						scores into high, medium	
						and low showed a	
						significant effect on the	
						group (p<0.05), with	
						students in the low	
						depression group at time 1	
						having higher academic	
						scores in block 1.	
						Second assessment	
						(time 2):	
						There was no longitudinal	
						association between anxiety	
						or depression and	
						subsequent academic	
						performance.	
#### 2.4. Discussion

The current review included studies published between 1997 and June 2020 that reported the relationship between depressive and anxiety symptoms on academic performance among university students. Of the identified studies, five addressed depression and anxiety, four examined depression only, and one investigated anxiety. In terms of study quality, the actual quality scores for the ten included studies ranged from 2 to 6.

After reviewing the ten studies, six studies revealed negative crosssectional associations between depression and academic performance (Sadeghi Bahmani et al., 2018; Newcomb-Anjo et al., 2016; Deb et al., 2016; Sindhu & Basha, 2017; Yeh et al., 2007; Cheung et al., 2020). Three studies found negative longitudinal associations between depression and poorer academic outcomes from the four longitudinal studies (Hysenbegasi et al., 2005; Mihailescu et al., 2016; Andrews & Wilding, 2004). Four studies conducted cross-sectional analyses investigating the relationship between anxiety and academic performance (Sindhu & Basha, 2017; Yeh et al., 2007; Cheung et al., 2020; Junaid et al., 2020). Of which three reported a negative cross-sectional relationship between higher anxiety levels and poorer academic performance (Sindhu & Basha, 2017; Cheung et al., 2020; Junaid et al., 2020).

Of the three longitudinal (Mihailescu et al., 2016; Andrews & Wilding, 2004; Yeh et al., 2007) studies, only one reported a

significant longitudinal relationship between higher anxiety and subsequent poorer academic performance (Mihailescu et al., 2016). Overall, all the longitudinal studies highlighted that academic achievement could be adversely affected by symptoms of depression, while anxiety in the three studies had no or unclear correlation with academic achievement.

These findings were supported by a recent longitudinal study conducted by Awadalla et al. (2020) of a representative sample of university students in the UAE. The study's cross-sectional analysis reported that higher levels of depression and anxiety were significantly but weakly associated with poorer academic performance, and longitudinal analysis found that depression - but not anxiety - predicted poorer GPA at the six-month follow-up. Furthermore, Bostanci et al. (2005) conducted a previous study among university students in Turkey that supported these results. The study found that students with elevated symptoms of depression have poorer academic performance than students who do not report symptoms of depression, considering that the study used a selfadministrated questionnaire to measure academic performance. Similarly, another study of undergraduate and postgraduate students conducted by DeRoma et al. (2009) found that students with moderate depressive symptoms had significantly lower GPA than those with normal and minimal depressive symptoms. Students with severe levels of depression did not have a lower GPA than those

with mild or moderate depression. Another prospective study carried out in two cohorts of first-year medical students reported, for the first cohort, a negative relationship between mental health as measured by GHQ-12 scores assessed in the second semester and average marks for the first and second year. In the second cohort, GHQ-12 scores were assessed in the first semester, and no relationship was found with first- or second-year exam performance (James et al., 2013).

It is well known that depression and anxiety affect students' skills to complete their education, but surprisingly, there was limited evidence to support the impact of these common mental health problems on academic performance. Several studies have shown that symptoms of depression affect students' performance and achievement across different levels of education (Heiligenstein et al., 1996; DeRoma et al.,2009; Awadalla et al.,2020; Al-Qaisy, 2011). Findings in this area indicate that academic workload can be highly stressful and psychologically demanding and is a factor that increases the risk of one developing mental health problems (Smith, 2019).

In this study, only one of the three longitudinal studies found anxiety predicated subsequent academic performance, although three out of four cross-sectional analyses supported a relationship. This is in accord with our recent findings in university students in UAE that

depression but not anxiety predicted subsequent academic performance (Awadalla et al., 2020).

In consistencies in the relationship may reflect that the relationship between anxiety and performance is not linear. For example, Al-Qaisy, (2011) reported a negative relationship between depression and academic achievement and a positive relationship between anxiety and academic achievement. The results of this study and other cross-sectional studies that reported a positive relationship between anxiety and academic achievement by Bostani et al. (2014) and Eisenberg et al. (2009) reflect the complicated relationship between anxiety and academic performance.

Some studies suggested that appropriate degrees of anxiety concerning fear of failure could enhance students' self-motivation to perform better in different academic tasks (El-Anzi, 2005). This can be explained by Yerkes Dodson anxiety curve that suggests performance increases with physiological or mental arousal (stress or anxiety), but only to an extent, after which it can negatively affect the accuracy of one's judgment, working memory and coping, which can lead to poor performance (Teigen, 1994).

Some studies in this review examined the relationship between depression or anxiety at different times of the academic year. For example, Andrews and Wilding (2004) reported that depression made an independent contribution to a decrease in examination scores at the beginning of the first college year and by the end of

the second college year (controlling for first-year marks and demographic variables). Anxiety, however, was not related to subsequent examination performance. Deb et al. (2016) reported a significant difference in depression among students in the first and second years of study at the university.

Students in the first year recorded higher levels of depression and poorer academic performance than students in the more advanced years. The impact of anxiety and depression on academic performance may increase during the course. A study conducted by Wyatt et al. (2017) found first-year students experienced a less negative impact from anxiety and depression compared to second-, third-, and fifth-year students by referring to the lower workload required by the academic curriculum in the first year compared to what was required in the second and subsequent years of the university study program.

Few studies in this review investigated how the severity of depression and anxiety could affect academic performance differently. Some studies found a negative correlation between severe anxiety, severe depression and academic performance, and no correlation between low and moderate levels of anxiety and any level of depression and academic achievement at certain times in the semester (Deb et al., 2016: Junaid et al., 2020). One longitudinal study found that different levels of anxiety and depression have different directions of correlation between anxiety, depression, and

academic achievement considering the severity levels of each one (Yeh et al., 2007).

Some studies in this review examined the relationship between depression or anxiety at different times of the academic year. For example, Andrews and Wilding (2004) reported that depression made an independent contribution to a decrease in examination scores at the beginning of the first college year and by the end of the second college year (controlling for first-year marks and demographic variables). Anxiety, however, was not related to subsequent examination performance. Deb et al. (2016) reported a significant difference in depression among students in the first and second years of study at the university. Students in the first year recorded higher levels of depression and poorer academic performance than students in the more advanced years. The impact of anxiety and depression on academic performance may increase during the course. A study conducted by Wyatt et al. (2017) found first-year students experienced a less negative impact from anxiety and depression compared to second-, third-, and fifth-year students by referring to the lower workload required by the academic curriculum in the first year compared to what was required in the second and subsequent years of the university study program.

Confounding variables in these studies make it challenging to establish a clear causal link between depression or anxiety and academic performance among university students unless

appropriate statistical methods were used to measure the impact of the confounding factors (Skelly, Dettori & Brodt, 2012). The current review revealed that few studies controlled for potentially confounding factors, and there was a lack of longitudinal studies, which made it difficult to clarify the direction of the relationship. For instance, a study carried out by Turner et al. (2012) to study depressive symptoms and academic performance among North Carolina college students using National College Health Assessment (NCHA) for assessing depressive symptoms. Their study considered other factors that may play a role in the relationship between academic performance and levels of depression, such as race, substance use, and level of financial debt. After statistical adjustment and controlling for variables to measure the level of impact, the study showed a significant association between the controlled confounders, depression level, and cumulative grade average.

Some of the studies identified were conducted in Eastern and South Asia (n=4), the Middle East (n=2), and nearly half of the studies (n=4) were conducted in the West. This may reflect both publishing bias and a general lack of research in developing countries, generally and specifically in the Middle East, where higher vulnerability to depression and anxiety among people in less economically developed countries due to financial difficulties, stressful life events,

mental illness, and a lack of proper sources of health care is culturally dependent (Abdul Razzak, Harbi, & Ahli, 2019).

Overall, studies in this area reported a negative relationship between academic achievement or performance and depression. For this reason, it is assumed that poor academic success or performance is one of the main causes of depression and anxiety among students (Baker & Siryk, 1984). However, it is very difficult to identify a cause-effect relationship here because depression can affect academic performance, or the students may perform poorly as a reinforcement of low mood.

#### 2.5. Limitations

The quality scores for the ten included studies ranged from 2 to 6 out of a possible maximum score of 7. As most of the studies included in this review are cross-sectional, identifying the causal relationship among variables might be difficult. Most studies did not control for potentially confounding variables; therefore, the direct relationship could not be assessed. Moreover, the risk of bias due to the low response rate can also affect these analyses' results. For example, the small sample size of four studies in this review ( $\leq$ 300 participants) and one of the four had only 20 participants, which increases the possibility of bias in the identified studies. Research bias is the main drawback in a systematic review: studies with statistically significant findings are more likely to be published than

those with null findings (Drucker, Fleming & Chan, 2016). Furthermore, the review included studies published only in the last two decades, limiting the included studies. The review's strength was that studies used either validated measures or a clinical diagnosis of depression and anxiety and an objective measure of academic performance such as grade point average.

#### 2.6. Conclusion and recommendations

Although there is a need for in-depth research to confirm the findings of this review, evidence from the ten studies suggests that depressive and anxiety symptoms have a significant impact on university students' academic achievements. The results of this review suggest that more attention should be given to the identification and administration of depression and anxiety in university settings, where there is a high demand for success among students. Student vulnerability may increase further unless the research is conducted to establish effective interventions for treating depression and anxiety to enhance students' success in university settings and careers.

This review highlights the importance of access to counselling centres, academic advisors, faculties, and mental health treatment resources to university students and the value of educating this population on the availability of those facilities. Considering the results of this review, to date, little research has been conducted to

systematically examine the relationship between depression/anxiety and specific academic performance in a college setting. Therefore, to fully understand the relationship between depression, anxiety, and academic functioning, future research utilizing assessment techniques that would allow for data analysis that enlightens the causality and the specific nature of depression and anxiety is needed. Additionally, future studies might extend the assessment of psychopathology associated with low academic achievement to include symptoms of conditions other than depression and anxiety. Longitudinal designs and other prospective methods of assessing the effects of depressive and anxiety symptoms on academic functioning over semesters could be utilized to improve our understanding of how academic distress affects depression in college. A well-validated and reliable online therapeutic intervention tool should also be considered as they offer considerable advantages in student access and privacy (Harrer et al., 2019).

## Chapter Three: A longitudinal cohort study to explore the relationship between depression, anxiety, and academic performance among Emirati university students

#### 3.1 Introduction

University students represent a group of people who are typically experiencing a critical transition period from adolescence to adulthood: a time often considered as one of the most stressful in a person's life (Quince, Wood, Parker & Benson, 2012). This, combined with other challenges such as social changes and exam pressures, arguably puts university students at particular risk in terms of mental health. It has been estimated that around a third of students are likely to be experiencing moderate to severe depression at any one point in time (Sarokhani et al., 2013; Ibrahim et al., 2013), a rate that may exceed that found in the general population (Yusoff et al., 2013). According to Beck's cognitive theory of depression (Beck, 1991), depressed individuals in achievementoriented environments (such as higher education institutions) are likely to react to low grades with a sense of failure and low selfesteem because they tend to negative cognitions of themselves, the world, and the future. Moreover, students who have a negative view of themselves may be reluctant to engage in challenging academic

assignments, negatively affecting their academic potential (Barbara & Stuart, 1995). Students with fewer socioeconomic resources appear to be particularly vulnerable (Ibrahim et al., 2013).

Depression is characterized by a combination of physical, emotional, psychomotor and cognitive impairments that can manifest by symptoms such as sleep disturbance, poor concentration, negative thoughts and feelings of quilt (Mellal et al., 2014). However, despite the marked rates of depression in student populations and the obvious potential negative implications for academic study, surprisingly little research has explored the impact of depression on academic performance. One of the few longitudinal studies to explore the relationship between emotional difficulties and objective academic performance found that pre-university depression and financial difficulties were related to exam performance at the end of the first year of study, with depression being the only independent predictor (Andrews & Wilding, 2004). Hysenbegasi et al. (2005) found that students with a history of depression had poor academic performance, but this association disappeared if their depression had been treated. Apart from acting as a barrier to help-seeking, depression can harm engagement with their course of study.

Students experiencing depression may miss more classes, tests and assignments, are more likely to drop courses compared to their nondepressed peers (Pedrelli, Nyer, Yeung, Zulauf, & Wilens, 2014) and are more likely to drop out of university entirely (Fouilloux Morales

et al., 2013). Students experiencing depressive symptoms may be caught in a vicious cycle in which depression disrupts academic study, and poor academic performance contributes to low mood (Heiligenstein, Guenther, Hsu, & Herman, 1996).

On the other hand, a recent study carried out by Ngasa et al. (2017) among undergraduate medical students suggested that it did not affect their self-reported GPA despite the high prevalence of major depression.

The relationship between anxiety and academic performance is complex. Some cross-sectional studies have found that more anxious students have poorer performance (Wilson, Warton & Louw, 1998). However, such a connection may reflect students' worries about their academics since longitudinal studies have not shown a link between high anxiety and subsequent low academic performance (Andrews & Wilding 2004). Indeed, some research has shown that greater anxiety levels may be linked with improved performance (Al-Qaisy, 2011). As a result, this research does not hypothesise the relationship between anxiety and academic achievement.

Stigma related to depression can hinder a person's ability to engage in university life and social activities and impact academic performance. For example, a recent systematic review of 34 studies exploring stigma associated with mental illness and its treatment in Arab culture highlighted several ways a range of widely reported

negative beliefs could impact access to mental health care. This included concerns about medication use and negative attitudes toward mental health professionals and people with mental health conditions. Religion was found to strongly influence beliefs with mental illness often viewed as a curse or punishment (Zolezzi et al., 2018). Despite evidence that depression and anxiety form a significant mental health problem for university students, students' mental health in Middle Eastern countries has received little attention from researchers (Dardas et al., 2016). A better understanding of the prevalence of mood disorders in Emirati student populations and their implications for academic outcomes could help to address this gap.

#### 3.2. Objectives

1. To determine the prevalence of anxiety and depression in university students in the United Arab Emirates (UAE).

2. To explore the relationship between anxiety or depression and academic performance (GPA) in university students in UAE.

It is hypothesized that students with a possible depressive disorder will have lower grade point averages (GPA) and that higher levels of depressive symptoms at baseline will predict lower GPAs at followup.

#### 3.3. Methodology

#### 3.3.1. Participants

Participants were recruited from two campuses of one governmental university in UAE (during the 2018/19 academic year). Cluster random sampling was used to recruit participants from all six faculties of the university: Business, Education, Health and Natural Sciences, Information Technology, Art & Design, and Faculty of Communication. The number of students recruited from each faculty was determined according to its proportion of the total number of students in the university. Stratified random sampling was used to select which classes in each faculty would be asked to complete the questionnaire. Based on an estimated prevalence of depression among university students of 33.0% (Sarokhani et al., 2013), a total university population of 9585 and a conservative response rate of 65%, it was calculated that the study needed to approach 500 students in order to achieve a minimum sample size of 384 students (Lachenbruch et al., 1991). This allowed estimation of the prevalence of depression with 5% precision and 95% confidence. Participants in their first year of study were not eligible to participate as they had not yet taken end of semester exams and did not have a GPA score.

#### 3.3.2. Design

The study design consists of a longitudinal survey conducted at baseline and six months follow-up, with a representative cohort of students attending one university in UAE.

#### 3.3.3. Measures

#### 3.3.3.1. **Demographic and socio-economic factors**

Information was collected about participants' age, sex, marital status, major, year of study and parental educational level. The Family Affluence Scale (FAS) was used to assess familial material resources. The FAS comprises four items assessing parental car ownership, sharing or not sharing a bedroom in the family home, computer ownership at home, and several family holidays per year (Boyce et al., 2006). Scores range from 0-9, with higher scores indicating greater affluence. The FAS is a validated measure of socio-economic status, and lower scores have been associated with a higher risk of depression in university students (Ibrahim et al., 2013).

#### 3.3.3.2. **Depressive Symptoms**

The Patient Health Questionnaire (PHQ-9) (PHQ-9; Kroenke, Spitzer & Williams, 2001) is a short screening measure used in clinical and community settings to assess symptoms of depression. It consists of nine items that correspond to the nine DSM-V criteria for

depression (American Psychiatric Association, 2013). Each item is rated for the previous two weeks before administration: each item is scored on a scale from zero ('not at all') to three ('nearly every day'), with a total score ranging from 0 to 27. In this study, participants scoring  $\geq$ 10were allocated to the Possible major depressive disorder (MDD) group and students scoring  $\leq$  nine were allocated to the non-MDD group (Kroenke, Spitzer & Williams, 2001). However, the PHQ-9 is not a diagnostic tool. A cut-off score of 10 for PHQ-9 has been shown to have a sensitivity of 88% and a specificity of 88% for the classification of MDD (Kroenke et al., 2001).

The PHQ-9 total score for the nine items ranges from 0 to 27 and has thresholds indicating different severity of depressive symptoms: 0-4 indicate no presence of symptoms; 5-9 indicate mild symptoms; 10-14 as moderate; 15-19 as moderately severe; 20-27 is severe (Kroenke, Spitzer & Williams, 2001). The PHQ-9 has been widely used as both a screening tool and a severity measure, and it has been increasingly used in research, where it reflected superior criterion validity compared to other established depression-screening tools (Carey et al., 2014). The Arabic version of the PHQ in all six modules has been demonstrated as a valid and reliable tool to screen depression, anxiety, somatic, and panic disorders in a Saudi university student sample (AlHadi et al., 2017). A psychiatric sample of Arabic-speaking Lebanese adults suggested the PHQ-9

was a sensitive measure of depressive symptoms (Sawaya et al., 2016).

#### 3.3.3.3. Anxiety Symptoms

The General Anxiety Disorder 7-item scale (GAD-7) is a short screening tool used to measure the severity of generalized anxiety disorder (GAD). It is a self-report scale consisting of seven items based on DSM-IV criteria and has excellent internal consistency ( $\alpha$ =.89 -.92) (Rodebaugh et al., 2008). Spitzer et al. (2006) proposed a useful screening tool with strong criterion validity for identifying probable cases of GAD. In addition, the GAD-7 has been strongly associated with multiple domains of functional impairment and cognitive disability (Spitzer et al., 2006). The GAD-7 total score ranges from 0 to 21. The GAD-7 total score for the seven items ranges from 0 to 21. Scores of 5, 10, and 15 are taken as the cutoff points for mild, moderate, and severe anxiety, respectively (Spitzer et al., 2006).

In this study, participants scoring ten or above were allocated to the Possible GAD group, and students with GAD-7 scores below ten were allocated to the non-GAD group (Spitzer et al., 2006). A cut-off score of 10 for GAD-7 was classified as the optimal point for sensitivity 89% and specificity 82% for screening for possible GAD (Spitzer et al., 2006).

The GAD-7 has been increasingly used in research and has demonstrated superior criterion validity in Arabic and English (Sawaya et al., 2016).

#### 3.3.3.4. Academic Performance

Participants provided information about their most recent grade point average (GPA), several academic warnings about poor attendance in the last semester, and level of satisfaction with their course of study. Possible GPA scores range from 0 to 4, with higher scores indicating better performance. Satisfaction with studies was ranked on a 0 to 6 scale from 'extremely satisfied' to 'extremely dissatisfied', with lower scores indicating greater satisfaction.

#### 3.3.3.5. Ethical Approval

Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Sub-Committee (reference number: 250) and the Research Ethics Committee at Zayed University (ref ZU17\_0107 F). Participation was voluntary, and confidentiality was assured. Informed written consent to participate was obtained (Appendices 5 & 6).

#### **3.3.4.** Procedure

An invitation email and a participant information sheet explaining the study were sent to all students in the selected classes in each faculty by academic staff in the week before data collection (Appendices 8 & 9). An anonymous paper questionnaire comprising demographic items, PHQ-9, GAD-7 and academic performance items was distributed to students in the pre-selected classes by the researcher in March 2018 (Appendix 11). Participation was entirely voluntary, and students consented by ticking the paper consent form attached to the anonymous baseline questionnaire (Appendix 10). In order to link the questionnaire responses at baseline with academic performance at follow-up, participants generated their study number by providing their day of birth and the last three digits of their phone number. Students completed the academic performance questionnaire again at the beginning of the next semester (approximately six months later) (Appendix 12).

#### **3.3.5. Statistical Analysis**

Data were analysed using SPSS v.24 (SPSS, 2017). Non-parametric correlations were performed to explore the relationship between socioeconomic factors and anxiety and depression and to explore factors associated with poor academic performance. Chi-square was used to assess associations for nominal data, and group differences in ordinal and continuous data were assessed using Mann-Whitney U tests or t-tests as appropriate. Linear regressions (entry method)

were used to explore independent predictors of poor academic performance. Two-way ANOVAs were used to explore the possible moderating effect of gender on the relationship between MDD or GAD group and GPA. Multiple imputation was not used in missing data as it could be problematic where data are not missing at random (Nooraee et al., 2018).

#### 3.4. Results

404 of 500 undergraduate students (300 females and 200 males) were recruited to the study (80.8% response rate). The response rate for the female students was significantly higher than for male students (96.7% vs 57.5%:  $X^2 = 123.37$ , df=1, p<0.001). No student refused to participate, but 96 students (19.2%) were absent from class when the baseline questionnaires were distributed. All students recruited to the study (baseline responders) completed the baseline questionnaire. The sample's mean age was 19.6 (*SD*=2.76) years (range 17-25), and the sample was almost three-quarters female (*n*=290, 72.2%). There was a broad distribution in the educational level of participants' parents, with 56.7% (*n*=229) of paternal and 48.5% (*n*=196) of maternal being university graduates. The majority of participants were single (*n*=381, 94.3%). Table 5 shows the demographic make-up of the sample. According to the results of this study, at baseline, males are older than

females, come from more affluent families and have less educated parents than females. There were no differences in the educational outcomes at baseline between responders and non-responders.

# Table 5. Demographic composition of the sample at baseline (N=404) and follow-up (N=138)

Variables	Baseline (N=404)	Follow-up (N=138)
	n (%)	n (%)
Gender		
Male	114 (28.2%)	41 (30.6%)
Female	290 (72.2%)	93 (69.4%)
Age		
17-20	292 (72.3%)	94 (71.2%)
21-25	91 (22.5%)	33 (25%)
26-30	8 (1.9%)	4 (3%)
31-41	4 (0.8%)	1 (.8%)
Mean age (SD)	19.64 (2.75)	19.8(2.91)
Marital status		
Married	20 (5.0%)	6 (4.5%)
Divorced	2 (.5%)	0
Single	381 (94.3%)	128 (95.5%)
Year of study		
2 <sup>nd</sup> year	303 (75.0%)	95 (72%)
3 <sup>rd</sup> year	65 (16.1%)	23 (17.4%)

4 <sup>th</sup> year	30(7.4%)	14 (10.6%)
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#### Faculty of study

Business	138 (34.0%)	49 (36.6%)
Humanities & Social	77 (19.1%)	21 (15.7%)
Sciences		
Technological	71 (17.6%)	23 (17.2%)
Innovation		
Communication &	57 (14.1%)	25 (18.7%)
Medical Sciences		
Natural Health	46 (11.4%)	16 (11.9%)
Sciences		

Maternal le	vel of		
education			
None/below see	condary	43 (10.6%)	12 (9%)
school educatio	on		
Completed seco	ondary	165 (40.8%)	52 (38.8%)
school educatio	on		
Completed	college	196 (48.5%)	70 (52.2%)
university educ	ation		

#### Paternal level of

#### education

None/below secondary	41 (10.0%)	14 (10.4%)
school education		
Completed secondary	131 (32.4%)	41 (30.6%)
school education		

Completed college	229 (56.7%)	79 (59%)		
university education				
Family Affluence				
Scale				
Mean ( <i>SD</i> )	7.09 (1.52)	7.01 (1.57)		
Median (range)	7.00 (2-9)	7.02(2-7)		

## 3.4.1. Prevalence of depression and anxiety in the sample and socioeconomic factors associated with poorer mental health

At baseline, 34.2% (n=138, CIs 29.7% - 38.9%) of students scored above the cut-off for possible MDD (Table 2). Females had higher PHQ-9 scores compared to males (Z= 3.63, p<0.001,) although rates of possible MDD were similar between males (31.6%) and females (35.3%). Students with higher PHQ-9 scores came from less affluent families ( $r_s$  = -.276, n=404, p< 0.001) and had less maternal education ( $r_s$  =-.118, n=403, p<0.05). PHQ-9 scores were unrelated to the year of study, participant age or paternal educational level (all p=>.05).

Eighty-nine students (22.3%, CIs 18.2%-26.3%) scored above the cutoff for possible GAD (Table 2). Female students had higher GAD-7 scores (*Z*=-4.77, P<0.001), and female students were also more likely to be in the possible GAD group compared to males ( $X^2$ =6.063, *df* =1, P=0.014). Students with higher levels of anxiety symptoms came from less affluent families ( $r_s$ = -.271, n=401, p<0.001) and had less maternal education ( $r_s$ = - .167, n=404, p<0.01). Levels of anxiety were unrelated to the year of study, participant age or paternal level of education. PHQ-9 scores were positively and strongly correlated with GAD-7 scores ( $r_s$ =.736, n=404, p<0.001).

## Table 6. Mental health and academic outcomes at baseline (n=404)

Scale	Males ( <i>n</i> =114)	Females ( <i>n</i> =290)	Total (N=404)
Mean PHQ-9 score (SD)	6.29 (5.65)	8.29 (5.03) ***	7.76 (5.29)
Possible MDD group	36 (31.6%)	102 (35.3%)	138 (34.2%)
Mean GAD-7 score (SD)	4 22 (4 57)	6.75 (5.13) ***	6.07 (5.12)
	1122 (1137)		
Possible GAD group	16(14.3%)	73 (25.2%) *	89(22.3%)
GPA	2.73 (0.60)	2.83 (0.67)	2.8 (0.65)
Attendance warning			
Median (range)	1 00(0-3)	0.00(0-6)	0.00(0-6)
	1.00(0-5)	0.00(0-0)	0.00(0-0)
Study satisfaction			
Mean (SD)	3.90(1.65)	3.54(1.74)	3.64(1.74)
. /			

Note: \*p=<0.05, \*\*p=<0.01 p=<0.001 \*\*\*

Students' GPA at baseline ranged from 0.66 to 4.00 with a mean of 2.8 (0.65): n=48 (11.9%) students had a GPA below 2.00, indicating poor academic performance and triggering academic support within the

university. Students were moderately satisfied with their studies, with a median score of 4 out of 7, with lower scores indicating greater satisfaction. Nearly half of the sample had received at least one attendance warning (n=171, 47.8%). Students with lower GPAs had had more attendance warnings ( $r_s$ =-0.24, n=376, p<0.01) and were less satisfied with their studies (r=-0.182, n=397, p<0.01) (Table 6). Poorer academic performance was also associated with older age (r=-.176 n=398 p= 0.01), higher year of study (r=-0.17, n=392, p<0.01), lower level of paternal education (r=.127, n=395, p=.011), and lower level of maternal education (r=.11, n=398, p=.028). There was no relationship between GPA and family affluence or gender.

## 3.4.2. Relationship between depressive symptoms and academic performance at baseline

At baseline, students with higher PHQ-9 scores had lower current GPAs ( $r_s = -.171$ , n=397, p<0.001). There was no relationship between PHQ-9 scores and the number of attendance warnings or satisfaction with the course. As hypothesized, students in the Possible MDD group (n=136) had lower GPA scores compared to students below the cut-off (t=2.98 p=0.003, d=0.3). They were also less satisfied with their studies (Z=2.42, p=0.015), but there was no relationship with the number of attendance warnings (Table 7).

ionow up.				
	Baseline (N=404)		Follow-up (N=13	38)
	Possible MDD	Non MDD ( <i>n</i> =261)	Possible MDD	Non MDD ( <i>n</i> =76)
	( <i>n</i> =136)	Mean (SD)	( <i>n</i> =58)	Mean (SD)
	Mean (SD)		Mean (SD)	
Semester GPA	2.67 (0.70)	2.87 (0.61) **	2.40 (0.70)	2.68 (0.76) **
Attendance warnings	0.93 (1.05)	0.77 (1.07)	1.12 (1.03)	0.92 (1.00)
Satisfaction	3.78 (1.58)	3.60 (1.85) *	3.98 (1.42)	3.71 (1.55)

Table 7. Possible MDD and academic outcomes at baseline andfollow-up.

Note: Means and SD at baseline and six-month follow-up

Note: \*p=<0.05, \*\*p=<0.01.

level

Regression analysis (entry method) with baseline GPA as the dependent variable and PHQ-9 scores, GAD-7 scores, age, gender, and maternal education as independent variables found that, although the model was significant (F=5.617, df =3,388, p<0.001), it accounted for only a small proportion of variance ( $R^2$ =0.056). Only age was significantly related to GPA, with older students having poorer GPA (B = -.034, t=-2.59, p=0.01). However, although there was no evidence of serious problems with multicollinearity, GAD-7 scores were just above the threshold for an acceptable variance inflation factor (VR=2.06). (Table 8).

Table 8. Regression analysis to explore the relationship betweendepression, anxiety and baseline GPA.

	Baseline	e GPA		
Predictors	В	SE B	β	Т
Age	034	.013	145*	-2.595**
Gender	.088	.082	.062	1.085
Maternal level of	.064	.051	.066	1.266
education				
PHQ-9 scores	011	.009	088	-1.276
GAD-7 scores	014	.009	111	-1.584

GPA at baseline as the dependent variable

Note: \*p=<0.05, \*\*p=<0.01.

A two-way ANOVA with gender and MDD group as the independent factors, GPA as the dependent variable and age as the covariant found a main effect of MDD group (F = 6.692, df = 1,389, p=0.01) with Possible MDD group having higher scores but no gender effect and no interaction between gender and MDD group.

## 3.4.3. Relationship between anxiety and academic performance at baseline

Higher GAD-7 scores (indicating more symptoms of anxiety) were associated with poorer GPA scores ( $r_s = -.176$ , n=398, p>0.001). However, there was no independent relationship between GAD-7 scores and baseline GPA once depression and sociodemographic variables had been accounted for (Table 4). There was no relationship between total GAD-7 scores and attendance warnings or satisfaction with studies rating. Students above the cut-off for possible GAD had lower GPA scores (mean 2.62, SD=0.71) in comparison to students below the cut-off (mean 2.86, SD= 0.62) (t=3.04 p=0.003d=0.4) but did not differ in terms of the number of attendance warnings or rating of satisfaction with the course (Table 9).

Table 9. GAD group and academic outcomes at baseline andfollow-up.

	Baseline (N=404)		Follow-up (N=138)	
	Possible GAD Non- ( $n=87$ ) GAD( $n=309$ )		Possible GAD (n=43)	Non-GAD ( <i>n</i> =91)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Semester GPA	2.62 (0.71)	2.86 (0.62) **	2.43 (0.70)	2.62 (0.76)
Attendance warnings	1.02 (1.16)	0.75 (1.01)	1.19 (1.12)	0.92 (0.96)
Satisfaction level	3.77 (1.59)	3.63 (1.80)	3.95 (1.45)	3.77 (1.48)

Note: Means and SD at baseline and six-month follow-up

Note: \*p=<0.05, \*\*p=<0.01.

Two-way ANOVA with GAD group and gender as independent factors, age as covariate and baseline as the dependent variable, found no main effects of group or gender, but a significant group by gender interaction (F=5.75, df=1,387, eta =0.15). The effect of GAD group on GPA was moderated by gender: females in the possible GAD group

had lower GPA (mean =2.91, SD = 0.62) than those in non-GAD group (mean =2.57, SD= 0.73) (t=3.8, df=280, p<0.001, d=0.48). In contrast, males in the possible GAD group had non-significantly higher GPA (mean =2.71, SD= 0.61) compared to males in the non-GAD group (mean=2.82, SD= 0.59).

#### 3.4.4. Factors Influencing GPA at follow-up

A total of 134 (93 females and 41 males) completed the follow-up survey (follow-up responders), with a 33.3% follow-up response rate. Follow-up responders were significantly more likely to be in the Possible MDD group (43.0% vs 29.0%; X<sup>2</sup> (1) = 11.54, p=<0.01) at baseline and to have higher PHQ-9 scores (8.84, *SD*= 5.25 vs mean 7.20 *SD*= 5.25; *Z*=-3.37 p<0.01) compared to non-responders at follow-up. Similarly, follow-up responders were more likely to be in the Possible GAD group (32% vs 17%; X<sup>2</sup> (1) =7.29, p< 0.01) at baseline and to have higher GAD-7 scores (2.62, *SD* 0.71 vs 2.43, *SD* 0.70; p<0.05). There were no significant differences in baseline GPA, satisfaction with studies, or attendance warning between responders at follow-up and non-responders at follow-up.

# 3.4.5. Relationship between levels of anxiety and depression at baseline and academic performance at follow-up

Higher PHQ-9 scores at baseline were associated with lower GPA scores at follow-up ( $r_s$ =-0.24, n= 134, p=0.006), and students in the Possible MDD group (n=58) had significantly lower GPA scores at follow-up compared to students in the non-MDD group (n=76) (mean 2.40 vs 2.68, t=2.13, p=0.035, d=0.4) (Table 7). There was no relationship between GAD-7 scores and follow-up GPA and no significant difference in GPA at follow-up between participants in the Possible GAD group and the non-GAD group. Higher GPA scores at follow-up were associated with younger age ( $r_s$ = -.0162, n= 134, p=0.05), but there was no relationship between family affluence, parental education or gender and follow-up GPA.

Regression analysis (entry method) was conducted with GPA at followup as the dependent variable and PHQ-9 scores, GAD-7 scores, age, and gender as independent variables. The overall model was significant (*F*=2.66, *df* =4,127, p=0.035) but only accounted for a small proportion of variance (adjusted  $R^2$  =0.048). Only PHQ-9 scores (*B*=-.043, p=0.014) at baseline predicted GPA at six months follow-up. (Table 10). Table 10. Regression analysis to explore the relationship between PHQ-

		Follow-up GPA		
Predictors	В	SEB	β	Т
(Constant)	2.612	.524		4.314
PHQ-9 scores	043	.017	302	-2.500**
GAD-7 scores	.011	.017	.083	.682
Age	.022	.024	.085	.914
Gender	.248	.151	.153	1.640

9 scores at baseline and GPA at follow-up.

Semester GPA at follow-up as dependent variable

Note: \*p=<0.05, \*\*p=<0.01

Including baseline GPA into the regression meant that the relationship between depressive symptoms at baseline and follow-up GPA just failed to reach significance (B=-.019, p=0.09), and the total adjusted  $r^2$ increased to 0.633, reflecting the fact that baseline GPA accounted for a high proportion of the variance in GPA at follow-up.

#### 3.5. Discussion

This representative survey found that just over a third of students (34.2%) scored over the threshold for possible major depressive disorder on the PHQ-9. Although female students had higher PHQ scores, they did not differ statistically from males in terms of rates of MDD. A smaller proportion of students (22.3%) scored above the cut-off for possible generalized anxiety disorder, with females

having higher rates of GAD-7 scores. Cross-sectional analyses found that higher levels of both depression and anxiety were significantly but weakly associated with poorer academic performance. Students scoring above the cut-offs either for possible MDD or possible GAD had lower GPA scores, although the effect sizes were small. There was evidence that gender moderated the relationship between GPA scores and anxiety as females in the Possible GAD group had substantially poorer GPA scores than females in the non-GAD group, but there was no evidence that the Possible GAD group influenced GPA in males. The longitudinal analysis found that depression, but not anxiety predicted poorer GPA at six-months follow-up. However, this just failed to reach significance (p = < 0.09) after controlling for baseline GPA. The results reported that the students who responded at follow-up seemed to have higher levels of depression than those at baseline but are similar in terms of socio-demographic and educational characteristics. However, the repeated measures design of this study decreased the possibility of biasing the findings.

In the present sample, the level of depression appears higher than other student-sampled studies in similar communities, but this probably reflects differences in the classification of depression. For example, a study carried out at Al Ain University in UAE by Mellal et al. (2014) found a prevalence rate for depression of 22.2%, but although this study used the PHQ-9, it used the higher cut-off of 11 and required students to endorse specific items in order to be

classified as having possible MDD. Another study in Oman estimated a prevalence of 27.7%, also using a cut point of 11 (Al-Busaidi et al., 2011). That study was recruited through the university health clinic, which may have impacted the reported prevalence. The prevalence in the present sample (34.2%; CIs 29.7% - 38.9%) is similar to that found in a systematic review of 24 studies of depression among university students by Ibrahim et al. (2013), which estimated a weighted mean prevalence of 30.6% (CIs 95% CI, 30.2–31.1) in student populations.

Consistent with previous studies (Deroma et al., 2009; Hysenbegasi et al., 2005; Mihailescu et al., 2016), baseline findings support an association between higher depressive symptoms and poorer levels of academic performance among university students. However, this relationship was no longer significant once other factors such as anxiety and age were controlled. The results signified that students scoring above the cut-off for possible MDD (PHQ-9 score  $\geq$ 10) have poor academic performance. This is consistent with studies carried out by Bostani et al. (2014) and Eisenberg et al. (2009). Follow-up was conducted by the end of the semester (i.e., six months from baseline). Students classified as having scores above the cut-off for possible MDD had lower GPA scores at follow-up than students below the cut-off. The relationship between PHQ-9 scores at baseline and GPA at follow-up was stronger than the cross-sectional relationship and was also independent of anxiety and sociodemographic

variables, supporting a causal relationship between higher levels of depressive symptoms and poorer academic performance. These findings align with a previous study at a UK university which found depression (but not anxiety) measured midway through the second year was negatively related to exam scores at the end of the second year (Andrews & Wilding, 2004). In a related context, Hysenbegasi and colleagues, in 2005, compared the GPA of 121 students over six months following a diagnosis of depression and found a significant negative relationship between academic performance and untreated symptoms of depression. Students who received treatment for depression during the six months had GPA scores that were statistically similar to the non-depressed group at follow-up, supporting a causal relationship between depression and academic performance.

Depression could impact academic performance in several ways. Young people with depression may find social interactions difficult and fail to engage with their courses (Steger & Kashdan, 2009). However, in this study, depression was not associated with poorer attendance in contrast to a recent study conducted in Jordan suggesting a negative relationship between depression and high absence among nursing university students (Abu Ruz et al., 2018). The relationship in this study may reflect the fact that attendance is mandatory and missing classes is penalized. While encouraging students to attend may help mitigate the impact of depression, the

low level of absenteeism may contribute to the difficulty of identifying academic struggling students.

In agreement with numerous researchers (Amr, Amin, & Saddichha, 2013; Bayram & Bilgel, 2008; Bostanci et al., 2005; Ibrahim et al., 2013; Mellal et al., 2014; Mikolajczyk et al., 2008; Steptoe et al., 2007), findings in the present study suggested that family affluence is negatively correlated with levels of depression and anxiety. This indicates that students from more affluent families may have lower levels of depression and anxiety, reinforcing the social causation and selection hypothesis for the mental disability theory suggested by Hudson (2005).

The prevalence of anxiety found in the present study (22.3%) was similar to a study carried out among the Malaysian student population, where the rate of prevalence was 27.4%, taking into consideration the study used the cut-off of 8 and the current study used the cut-off of 10 (Marthoenis et al., 2018).

Furthermore, the prevalence of anxiety in this sample was lower compared to other studies: e.g., 64.3% in Egyptian students (Abdel Wahed &Hassan, 2017) using the short-form Depression Anxiety Stress Scales and 47.1% in Turkish students (Bayram & Bilgel, 2008) using the long-form Depression Anxiety Stress Scales. Females are more likely to experience anxiety than males; this could be related to their thoughts control strategies and metacognitive beliefs, which is theorized to increase their vulnerability to higher
levels of emotional stress (Bahrami & Yousefi, 2011). Some studies suggested that hormonal fluctuations also appear to play as a possible contributor to the gender differences in anxiety McLean & Anderson, (2009) and Maeng & Milad, (2015). However, in addition to biological mechanisms, females and males seem to experience and react to events in their life differently. Females tend to be more inclined to experience stress, which can increase their level of anxiety; for females, life events and changes are seen as less manageable and extra negative (Matud, 2004). Furthermore, when faced with traumatic situations, females and males tend to use different coping strategies: womens' coping style tends to be more emotion-focused and less problem-centred than men's (Balhara, Verma & Gupta, 2012).

Consistent with previous studies Yeh et al. (2007) and Mihailescu et al. (2016), findings from baseline data supported a negative relationship between symptoms of anxiety and academic performance among university students. Moreover, students meeting the criteria for possible generalized anxiety disorder (GAD) had lower GPA scores than students in the non-GAD group. This is consistent with studies carried out by Bostani et al. (2014) and Eisenberg et al. (2009). In contrast, some studies found that students with moderate levels of anxiety had better academic achievement (Al-Qaisy, 2011; Andrews & Wilding, 2004; Eysenck et al.,2007), reflecting that appropriate degree of anxiety concerning

fear of failure could enhance self-motivation of students to perform better in different academic tasks. In this study, anxiety was no longer associated with GPA at baseline once other variables such as depression were controlled. The lack of a longitudinal relationship between anxiety and GPA has been observed in previous studies and suggests that anxiety may be reflective of academic difficulties rather than causal (Andrews & Wilding, 2004). One possible interpretation of the interaction between gender, Possible GAD group and GPA at baseline is that for female's poor performance contributes to anxiety but not for males. This is a novel finding and needs further investigation.

Furthermore, it should be considered that in the Middle East area, accessing help for mental health services is challenging (Alateeq et al.,2016). Stigma and shortage of efficient clinicians can provide intervention that respects and integrates patients' cultural values (Haque, 2016). in the health care system are the critical barriers to effective treatment (Sayed, 2015).

## Implications of the findings

Identifying low mood in students who are struggling academically and offering appropriate support may help improve mental health and academic outcomes, but the findings from this study suggest that may be difficult as students with low mood had not had poorer attendance. Increasing mental health literacy in students and

educators could reduce barriers to treatment. Academic staff are often the first to observe behaviours that indicate either the development or worsening of mental health problems among students (Whitley et al., 2013). An Australian survey found that academic staff with higher levels of depression literacy were more likely to initiate engagement with students with mental health problems and were more likely to be approached by students who wanted to discuss their mental health. Staff with higher depression literacy also felt more confident that they knew to help students with their mental health problems (Gulliver, Farrer, Bennett & Griffiths, 2017). Therefore, staff would be in a good position to signpost academically struggling students with mental health problems to sources of support and treatment.

Theory driven, web-based intervention programs offer an acceptable and effective method of providing psychological treatment within the university system. Online therapy may appeal to students who do not attend or cannot access established mental health clinics due to a range of different barriers, including the stigma related to mental health issues (Montero-Marín et al., 2016). Furthermore, web-based interventions could be combined with face-to-face support to achieve the best emotional well-being improvements among university students (Rickwood & Bradford, 2012).

#### 3.6. Strengths and limitations

This appears to be the first study to explore the impact of depression and anxiety on the academic performance of university students in the UAE, with a representative sample of the targeted population. In addition, the present study's longitudinal nature assessed the students' academic performance over time to enable some conclusions about the causal nature of the relationship between emotional difficulties and subsequent academic difficulties. Furthermore, the two scales that have been used in this study for anxiety and depression (GAD-7 and PHQ-9) are validated and have excellent sensitivity and specificity. Another strength of this study was that participants lost to follow-up were similar to responders at follow-up in terms of socio-demographic and educational characteristics. However, responders at follow-up did have higher rates of baseline possible MDD and possible GAD, but the repeated measures design means that this is unlikely to have biased the findings. Some limitations were encountered in the present study. For example, the response rate at follow-up was low, limiting the study's potential to conduct structural equation modelling to look for potential mediators for change. The survey was kept anonymous to maximize the baseline response rate and ensure the veracity of students' responses. However, it was impossible to target nonresponders which contributed to the low follow-up response rate. In

addition, the timing of completing the follow-up survey clashed with the end of the semester holiday, which also influenced the follow-up response rate. Another limitation was that to preserve anonymity; we had to rely on self-reported GPA to measure academic performance.

Finally, the sample of this study consists of a group of students in just one university in the UAE, limiting the generalizability of the results.

#### 3.7. Conclusion

Emotional difficulties among university students deteriorate abilities in daily activities, especially those relating to academic achievement. Findings in the current study indicated that higher levels of depressive and anxiety symptoms affected around a third of university students in the sample. Cross-sectional analyses show that students scoring above the cut-off for possible MDD, or GAD have poorer academic performance. Depressive symptoms predict GPA in the subsequent semester suggesting a causal link, but as students with possible MDD did not have reliably poorer attendance, it may be difficult to identify at-risk students. This study provides evidence regarding the negative impacts of emotional difficulties on students' academic achievements and chances of success. Accordingly, academic counsellors should consider routinely signposting academically failing students to mental health support.

Future research could distinguish the impacts of different types of anxiety disorder, particularly social anxiety common in university students and may impact non-exam-based assessments such as oral presentations (Hakami et al., 2017).

# Chapter Four: Using an online CBT-based intervention to improve academic performance in students with low mood: A pre-post study with historical control

# 4.1 Introduction

Studies indicate a high prevalence of mental health problems, such as depression, among university students compared to their nonstudent peers (Ibrahim et al., 2013). This is concerning, as depression has been shown to impact all areas of student well-being, including academic achievement. Students with depressive symptoms tend to have poor classroom engagement, peer interactions, and attendance (Abu Rus et al.,2018). Thus, depression negatively influences academic progress and encourages under-achievement among university students.

A recent representative survey (Awadalla et al.,2020) reported that over one-third of Emirati students at one university scored above the threshold for major depressive disorder. Depressive symptoms at baseline, but not anxiety symptoms, were shown to predict academic performance at follow-up, as measured by grade point average (GPA). This supports previous evidence that depression negatively impacts university students' academic performance (DeRoma et al., 2009) and suggests that an intervention to help

students manage low mood could reduce this educational disadvantage.

In many Arab countries, established mental health resources are limited, and negative beliefs about mental health care can prevent engaging in help-seeking behaviour (Dardas & Simmons, 2015). Therefore, online therapeutic interventions offer considerable advantages in terms of student access and privacy. Existing research suggests that technology-based interventions could fill the gap between university students' need for and access to mental health services (Harrer et al., 2019). There is a growing need to create supportive environments for students who may experience emotional difficulties during university life (January et al., 2018). 'Internet-delivered technology 'in counselling refers to online psychological interventions provided by utilising various multimedia formats and interactive features to engage users and promote intervention effectiveness (Grist et al., 2018). Benefits of internetdelivered interventions include customisation to student needs, anonymous access, and a more comfortable private setting to access sensitive information (Harrer et al., 2019). Recently, these advantages have led to an increased focus on using online interventions, resulting in several studies that examined such programs (Farrer et al., 2013).

It is known that online interventions can effectively improve university students' mental health (Davies et al., 2014; Barrable et

al., 2018); however, their impact on educational attainment has yet to be fully explored. In 2020, Bolinski and colleagues conducted a systematic review to evaluate the impact of online mental health interventions on academic performance. Meta-analysis of the six RCT studies to include academic performance as an outcome showed beneficial effects for depression but revealed only a small nonsignificant effect for academic achievement. None of the six studies to address mental health and academic performance targeted students who had symptoms of depression and struggled academically at baseline.

Cognitive behavioural therapy (CBT) is a collaborative therapy that focuses on how a person's thoughts, beliefs, and attitudes affect their emotions and behaviours (Gaudiano, 2008). CBT is recommended as a treatment for mild to moderate depression and is effective (Lopez & Basco, 2014); however, limited access particularly in the middle-and-low-income countries—and stigma associated with poor mental health may hinder access to physical treatment resources (Sweetland et al., 2014). Thus, cost-effective and widely accessible alternatives to in-person treatment are required. Adolescents use technology at high rates (Anderson, Howarth, Vainre, Jones & Humphrey, 2017), yet innovative online treatment methods have not fully exploited students' expertise. For example, despite evidence confirming the effectiveness of computerised CBT for reducing depressive and anxiety symptoms,

to our knowledge, no study has evaluated a CBT-based online intervention targeting students with depressive symptoms who are also struggling academically.

MoodGYM (https://moodgym.anu.edu.au/welcome/faq) is an online CBT-based program designed to prevent symptoms of emotional distress and various mental health disorders in adolescents, which has shown promise in Australian studies (Gratzer& Khalid-Khan, 2015). MoodGYM comprises five modules: written information, animations, interactive exercises, and quizzes designed to teach skills known to prevent depression and anxiety among young people (Christensen et al., 2006; Farrer et al., 2011).

Research has investigated the effects of MoodGYM across a variety of settings and using different study designs. Twomey and O'Reilly (2016) conducted a systematic review of 11 studies to evaluate the effectiveness of MoodGYM in reducing depressive symptoms and general psychological distress in adults. They found that studies with no treatment controls, face-to-face guidance, and high adherence to MoodGYM modules revealed a more positive effect on depression and other psychological stress symptoms. Furthermore, a stronger effect was found in studies conducted in Australia compared with Europe. The study concluded that MoodGYM could provide primary support to participants with mental health issues, considering that adherence rates and cross-cultural factors may affect CBT webbased programs.

In a similar context, a study conducted by Sethi, Campbell & Ellis (2010) evaluated the effectiveness of MoodGYM with 38 first-year undergraduate students at the University of Sydney in Australia. The participants in this study have mild to moderate symptoms of depression and anxiety. The study was pre and post RCT with three experimental groups; the first group received MoodGYM intervention only, the second group received a combination of MoodGYM and face-to-face therapy, and the third group received in-person CBT therapy only. The results indicated that combined face to face and MoodGYM intervention is more effective in treating symptoms of depression and anxiety than stand-alone online or face-to-face therapy. In addition, the study concluded that computerised therapy could be a very effective option for university students who were unable to access face-to-face therapy.

There is some evidence that MoodGYM may be more effective where the intervention is targeted. Christensen et al. (2002) found that in people with baseline levels of anxiety and depression who accessed MoodGYM, their symptoms significantly decreased after completing the program. Canadian university students at risk of depression randomised to MoodGYM showed a greater reduction in depressive symptoms and were significantly less likely to be diagnosed with a major depressive disorder at 4-month follow-up than attentional control (McDermott & Dozois, 2019).

A different study carried out by Christensen et al. (2002) found that people accessing MoodGYM with baseline levels of anxiety and depression their symptoms decreased significantly after completing the modules program. However, another review conducted by Fleming et al. (2018) to explore the real-world uptake and engagement with web-based interventions for depression and anxiety reported that due to the limited online intervention studies that reported uptake and ongoing usage of data, people may use web-based interventions differently in real-world settings (outside research settings) as compared with trial conditions. The review conducted 11 trials, of which five articles implemented MoodGYM and only one study of the MoodGYM trials recorded the number of website visitors and the number of registrations. The results suggested that 2.8% of MoodGYM users had completed the five modules, and 0.5% of community users completed a noncompulsory assessment in the final module compared with 22.5% of participants in a trial evaluating the same program. The study concluded that reporting implementation data in self-help digital intervention programs is essential in predicting an adequate uptake and engagement in real-world settings.

Many internet-based support programs have been developed to support mental health and well-being. However, only a few specifically target university students' academic performances. Further studies are required to evaluate the effectiveness of such

interventions in providing a cost-effective alternative to face-to-face therapy, particularly in certain settings where access to mental health services is limited or culturally stigmatized.

This study aims to evaluate the feasibility, acceptability, and effectiveness of targeting MoodGYM at academically struggling Emirati students with symptoms of depression.

### 4.2. Objectives

The objectives of the present study were as follows:

• To explore the acceptability and feasibility of using MoodGYM to improve academic achievement in university students with symptoms of depression and poor academic performance in the UAE.

• To investigate the potential effectiveness of a self-directed, internet-delivered cognitive-behavioural skills therapy (MoodGYM) in improving academic performance (GPA) and mood in university students in the UAE with poor academic performance.

• To investigate the relationship between MoodGYM uptake and improvement in GPA at post-intervention.

## 4.3. Methodology

#### 4.3.1. Design

This study used a pre-post pilot design with a historical control group to evaluate changes in GPA. All parts of this study were conducted online, and data at baseline and eight-week follow-up (after using MoodGYM) were collected via anonymous surveys hosted by JISC online survey (formerly Bristol Online Survey -BOS).

### 4.3.2. Participants and recruitment

Participants were undergraduate students at a public university in the UAE aged 18 and over. Students were selected from two campuses (Dubai and Abu-Dhabi) and recruited through their academic advisors. The target recruitment was 50 participants. The target sample size was 50 male and female undergraduate

students who met the following inclusion criteria:

• Undergraduate students in their second, third, or fourth year of study at one university in the UAE

• Scheduled to attend an academic advisory seminar to address poor academic performance (GPA less than 2.0)

• Aged 18 years or over.

• Self-identified as having at least one of two key symptoms of depression, e.g., little interest or pleasure in doing things, feeling down, depressed, or hopeless (Kroenke et al., 2009).

#### 4.3.3. Historical control group

Students from a previous longitudinal cohort study of UAE university students (Awadalla et al., 2020) were selected as the comparison group if they had a GPA < 2.0 at baseline and a GPA score reported at a two-month follow-up. The control group students (n = 19) had similar GPAs, attendance warnings, and demographic characteristics at baseline as the intervention group (n = 44). This group (no intervention) was used as a comparison group to evaluate the academic improvement in the intervention group.

# 4.3.4. Power calculation

With a historical control group of n = 19 and assuming a 70% response rate at follow-up in the intervention group (35/50), it was estimated that the study would have 90% power to detect 1 *SD* difference (*d*=1) in GPA between groups at follow-up with a probability of a type 1 error < 0.05 (Faul et al., 2007).

#### 4.3.5. Ethical approval

Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Subcommittee (reference number: 0397) and the Research Ethics Committee at Zayed University (ref ZU19\_46\_F) (Appendices 13 & 14). Participation was voluntary. Students provided informed, online consent to participate in the two anonymous online surveys linked by self-generated identifiers.

### 4.4. Measures

#### 4.4.1. Mental health (HADS)

The Hospital Anxiety and Depression Scale (HADS) is a selfassessment tool developed to detect states of depression and anxiety in non-psychiatric settings (Zigmond & Snaith, 1983). The HADS consists of 14 items, 7 assessing anxiety (HADS-A) and 7 assessing depression (HADS-D). For both subscales, scores of  $\leq 7$ indicate non-cases, while scores of 8-10, 11-14, and 15-21 indicate mild, moderate, and severe depression and anxiety, respectively (Stern, 2014). Cronbach's alpha ranged from 0.68 to 0.93 (mean = 0.83) for the HADS-A and from 0.67 to 0.90 (mean = 0.82) for the HADS-D; (Bjelland et al., 2002). The optimal cut off for anxiety caseness is HADS-A  $\geq 8$  (sensitivity 0.89, specificity 0.78), and for depression caseness, HADS-D $\geq$ 8 (sensitivity 0.83 and specificity 0.79 (Bjelland et al., 2002). The HADS has been validated in many languages, countries, and settings, including general practice and community settings (Snaith, 2003). An Arabic version of the HADS has been validated in Saudi Arabia (El-Rufaie & Absood, 1987), Kuwait (Malasi, Mirza & El-Islam, 1991), and the UAE (El-Rufaie & Absood, 1995) in primary-care settings and, recently, in

hospitalised patients (Terkawi et al., 2017). Since the students study in the English language, the English version was used in the present study.

# Help-seeking history, time spent on completing Modules of MoodGYM and evaluation of MoodGYM:

Students were asked if they have ever sought help or advice for their emotional wellbeing. Different answer options were provided, including a local health centre, health professional, university counselling service, university tutor, a friend, a family, religious leader, internet resources, books, no help thought or others. Also, several weeks they have spent completing MoodGYM modules. Content analysis was used with one open-ended question in evaluating the effectiveness of MoodGYM "In your own words, how (if at all) has MoodGYM has helped you?"

# 4.4.2. Academic performance

Participants reported their most recent GPA and the number of academic warnings about poor attendance they had received during the last semester. Possible GPA scores range from 0-4, with higher scores indicating better academic performance. In the present study, a GPA below 2.0 was considered a sign of academic difficulties.

#### 4.4.3. Intervention

MoodGYM is an internet-based CBT program to prevent depression, teach coping skills, and provide or without clinician quidance. It was developed by researchers at the Australian National University in 2013 (www.moodgym.anu.edu.au). In this study, MoodGYM was entirely self-directed. The program teaches key components of CBT for depression in five modules: Feelings, Thoughts, Unwrapping, De-stressing, and Relationships. Each module contains exercises, homework to be completed during the week, and a workbook to record progress throughout the program. The modules are designed to be completed in order, with each module estimated to take 30-45 minutes to complete, with 28 exercises and 13 quizzes in total across all modules (Christensen et al., 2004) (Table 11). Considering that all the courses at the university are taught in English, and the students are proficient in the English language, MoodGYM was provided in MoodGYM was evaluated and approved by the English. university's ethical committee, indicating that it does not include any sensitive issues that might need further consideration.

## Table 11. Modules of MoodGYM (www.ehubhealth.com)

Modules

Descriptions

Feelings	The Feelings	The Feelings module focuses on the basic tenets of CBT by				
	highlighting	connections	between	events,	thoughts,	
	feelings, and	behaviours. T	hose using	the prog	ram will be	
	introduced to	six character	rs with unio	que thoug	ht patterns	
	and feelings,	and feelings, some adaptive and some maladaptive.				

- Thoughts The second module's basis is Thoughts, teaching users how to challenge what the program identifies as their 'warped thoughts' by exploring the reasons behind their thinking.
- The third module is Unwarping. It has a total of ten Unwarping exercises, which is the most any module contains. These exercises aim to attack distorted thinking and build selfesteem. One part of this module offers techniques on addressing the areas of the vulnerability identified by the Warpy Thoughts Quiz.
- Destressing The fourth module is Destressing, which centres around recognizing the different sources of stress and learning how to deal with them. An exercise known as 'Life Whacks' consists of major stressful events, such as losing someone important or having a conflict with parents. This module also focuses on relaxation programs.

The fifth module, Relationships, focuses on emotional andRelationshipsbehavioural reactions to relationship breakups and offersmore ways to argue against distorted thoughts.

#### 4.5. Procedure

Academic advisors sent invitation emails and participant information sheets explaining the study to all students scheduled to attend a seminar to address their poor academic performance in the previous semester (GPA <2.0) (Appendix 15). Students who self-reported in the previous two weeks that they had felt that down, depressed, or hopeless, or had little interest or pleasure in doing things, were invited to participate in the study by emailing the researcher (Appendix 16). The academic advisor reminded students about the study invitation during the scheduled remedial class. All participants who contacted the researcher within the study timeframe (September 2019) were sent a link to the baseline survey. Before completing the online consent form, students could re-read the participant information page (Appendix 17). Participants were instructed to generate their own unique research ID code by giving their birthdate and the last three digits of their mobile phone number. This unique identifier was utilized to connect baseline and follow-up data. Participants then completed the baseline survey, which included demographics, GPA, attendance warnings in the previous semester, previous help-seeking for mental health problems, and the HADS (Appendix 19). At the end of the survey, students were thanked for their time and asked to click on a second survey link, which allowed them to enter their email address to receive a link and user code for MoodGYM. They were also provided with information regarding the University Counselling Centre if they felt they needed any further support. For those who provided their emails, the researcher sent them an email with instructions and a

user code for accessing MoodGYM. All participants were emailed a reminder about using MoodGYM four weeks after entering the study (Appendix 21). Eight weeks after the baseline survey, they were emailed a link to the follow-up survey, which collected data on their GPA, number of attendance warnings in the current semester and the HADS. The follow-up survey also included text boxes to allow participants to comment on the positive and negative aspects of MoodGYM (Appendix 20). A reminder email was sent to all participants two weeks after the follow-up survey email.

#### 4.6. Data analysis

Data from the baseline and follow-up surveys were imported into SPSS (version 26). After cleaning and checking the data, HADS and GPA scores were compared pre-and-post-intervention, using appropriate paired statistics. A repeated-measures ANOVA with a group (historic control/ intervention) as the independent factor, time of testing as the within-subjects factor and GPA score as the dependent variable was conducted to look for a group by time interactions in GPA score. Descriptive statistics were used to explore the acceptability and usability of MoodGYM. Content analysis was used to classify and group the participants' responses to the openended question for evaluating MoodGYM. Univariate correlations and regression analysis were also used to explore the relationship between self-reported MoodGYM use and changes in GPA.

#### 4.7. Results

Fifty consecutive respondents (36 female and 14 male) completed the baseline survey and received access to the MoodGYM program. Of the 50 students, 47 accessed the program, and 44 completed the postintervention survey and formed the study sample (88.0% follow-up). The mean participant age was 20.7 years (SD=1.55; range 18-24), and the majority were female (72%) (Table 12). At baseline, there were no detectable differences in demographic characteristics or baseline GPA, depressive symptoms, or several attendance warnings between responders at follow-up (Intervention group, n=44) and non-responders at follow-up (n=6) or between the intervention group responders at follow-up and the historical control group (n=19) (all p=>0.05). However, non-responders were substantially and significantly more anxious at baseline than responders (M=11.00, SD = 3.63, n= 6, vs. M= 7.61, SD = 2.57, n = 44, p = 0.006, d = 1.2). There was no difference in baseline anxiety between the Intervention group and the historical control.

# Table 12. Demographic characteristics of the sample andcomparison groups at baseline.

Variables	Intervention group	Non-responders	Historic control
	( <i>n</i> =44)	( <i>n</i> =6)	group
			( <i>n</i> =19)
Gender			
Male	13 (29.5%)	1 (16.7%)	6 (31.6%)
Female	31 (70.5%)	5 (83.3%)	13 (68.4%)
Age			
18-20	19 (43.2%)	4 (66.6%)	8 (42.1%)
21-24	23 (52.3%)	2 (33.3%)	11 (57.9%)
Mean age (SD)	20.7 (1.46)	20.4 (1.95)	20.00 (1.84)
Marital status			
Married	4 (9.1%)	2 (33.3%)	2 (10.5%)
Single	40 (90.9%)	4 (66.6%)	17 (89.5%)
Year of study			
2 <sup>nd</sup> year	24 (54.5%)	4 (66.6%)	12 (63.2%)
3 <sup>rd</sup> year	18 (40.9%)	2 (33.3%)	6 (31.6%)
4 <sup>th</sup> year	2 (4.5%)	0	1 (5.3%)
Department of			
study			
Business	22 (50.0%)	2 (33.3%)	7 (36.9%)
Humanities &	2 (4.5%)	0	2 (10.5%)
Social Sciences			
Technological	6 (13.6%)	0	3 (15.8%)
Innovation			

Communication &	8 (18.2%)	2 (33.3%)	4 (21.0%)
Medical Sciences			
Natural Health	6 (13.6%)	2 (33.3%)	3 (15.8%)
Sciences			

# 4.7.1. Help-seeking

Before using MoodGYM, nearly half of the students reported seeking help for their mental health from their friends (n= 19, 43.2%), and a quarter of them had sought help from internet sources (n=11, 25.0%), Two participants (4.5%) sought help from family, four (9.1%) had sought help from their university tutor, and only three (6.8%) had sought help from university counselling services. Five students (11.4%) had not sought any help for their mental health.

#### 4.7.2. Depression and anxiety before and after MoodGYM

A paired-samples t-test found a significant reduction in HADS-D scores post-intervention compared to baseline (t (43) =3.07, p=0.004, d=0.5), indicating a significant reduction in depressive symptoms (Table 13). The proportion of participants scoring above the cut-off for depression caseness from 77.2 %to 27.3% (n=34 to n=12; McNemar= p<0.001). There was also a decrease in HADS-A scores post-intervention (t (43) =5.67,  $p \le .001$ , d=1.1), indicating a considerable reduction in anxiety symptoms. The proportion of students scoring above the cut-off for anxiety caseness fell from 50% to 11.4% (n= 22 to n=5; McNemar= p<0.001).

# Table 13. Participants' depression and anxiety levels before and

# after MoodGYM

	Pre-intervention	Post-intervention
	( <i>n</i> =44)	( <i>n</i> =44)
HADS-D Group		
Normal		
	10 (22.7%)	32 (72.7%) ***
Borderline	30 (68.2%)	5 (11.4%)
Clinical		
	4 (9.1.%)	7 (15.9%)
HADS-D		
Mean (SD)	8.32 (1.72)	6.64 (3.72) **
HADS-A group		
Normal	22 (50.0%)	39 (88.6%) ***
Borderline	18 (40.9%)	2 (4.6%)
Clinical	4 (9.1%)	3 (6.8%)
Mean (SD)	7.61 (2.57	4,77 (2,67) **
	,101 (210)	

Note: \*p ≤ 0.05, \*\*p≤0.01 \*\*\* P≤0.001

### 4.7.3. Academic performance before and after MoodGYM

Student GPA at pre-intervention ranged from 0.33-1.90, with a mean of 1.55 (SD=0.32). There was a significant increase in GPA at postintervention (t (43) =-9.26,  $p \le 001$ , d=1.3), reflecting substantial improvement in academic performance after using MoodGYM (Table 14). At pre-intervention, all students in the intervention group had a GPA below 2.0, indicating academic weakness. After using MoodGYM, 19 (43.2%) students had a GPA of 2.0 or above, thereby moving out of the academic warning zone.

Half the sample had received at least one attendance warning (n=22, 50.0%) during the pre-intervention period; however, the number of participants who received attendance warnings decreased by nearly half after using MoodGYM (8-week intervention) (n=11, 22.0%), with a significant reduction in the number of attendance warnings between pre-and post-intervention (Z=-2.66, p=0.008, d=0.6) (Table 14).

# Table 14. Academic outcomes pre- and post-intervention and inthe historic control group.

Intervention group ( $n=44$ )		Historic control ( <i>n</i> =19)		
	Baseline	Follow-up	Baseline	Follow-up
Mean GPA (SD)	1.54(0.33)	1.99 (0.33) **	1.56 (0.39)	1.75 (0.51)
Mean number of	1.05(0.75)	0.61(0.78) **	1.17 (1.09)	1.21 (1.08)
attendance warnings				
(SD)				

Note:  $*p \le 0.05$ ,  $**p \le 0.01$ 

# 4.7.4. Academic performance outcomes compared to historic control

At baseline, the intervention group (n=44) and the comparison group (n=19) had similar GPAs and number of attendance warnings. A repeated-measures ANOVA with group (intervention/historic control) as

the between-subjects factor and time found a significant time by group interaction (F= 5.96, df= 1.61, p=0.018). At follow-up, the intervention group had significantly higher GPAs compared to historic control (t (61) =2.22, p= 0.030, d= 0.6) and fewer attendance warnings (Z = -2.10, p=0.036, d=0.7) (Table 14).

# 4.7.5. Completed MoodGYM modules and outcome improvements

All students in the Intervention group reported completing at least two modules, with nearly half of them reporting completing all five modules (mean completed=3.75, SD= 1.52, n=44). Almost all participants completed the Feelings module (n = 42, 95.5%), followed by Thoughts (36, 81.8%), Unwrapping (34, 77.3%), De-stressing (29, 65.0%), and Relationships (24, 54.0%). There was a significant positive correlation between GPA improvement and the number of modules completed ( $r_s$ =0.388, n=44, p= 0.009). Completing more modules was also associated with a greater reduction in anxiety scores ( $r_s$ = 0.348, n=44, p= 0.020); however, no relationship was found between depression scores and the number of completed modules.

Regression analysis (entry method) with the difference between pre and post-intervention GPAs as the dependent variable (higher scores indicating greater GPA improvement), and baseline anxiety scores, baseline depression scores, completed MoodGYM modules, and improved attendance as the independent variables, found that

greater improvement in GPA was associated with a higher number of completed MoodGY modules ( $\beta$ =.392, p=0.005) and improved attendance ( $\beta$ =.388, p= 0.007; total adjusted  $r^2$ =0.35) (Table 15).

Table 15. Regression analysis for depression, anxiety, completedMoodGYM modules, attendance, and GPA pre- and post-intervention

	Post-intervention GPA			
Predictors	В	SE B	В	Т
Depression scores (pre- intervention)	.024	.028	.125	.837
Anxiety scores (pre- intervention)	022	.018	171	-1.194
Total number of modules completed.	.083	.028	.392	2.985**
Improved attendance	.126	.044	.388	2.857*

Dependent Variable: Semester GPA (Post-intervention – Pre-intervention)

Note: \*p=<0.05, \*\*p=<0.01.

# 4.7.6. Evaluation of MoodGYM

The time period over which the participants used MoodGYM ranged from 2 weeks to 8 weeks; however, the highest proportion of students used the program for more than four weeks (n=16, 36.4%) (Table 16).

Table 16. Number of weeks students spent completing MoodGYMmodules

Number of weeks	Number	of
	students (%)	
Two weeks	4 (9.0%)	
Three weeks	5 (11.4%)	
Four weeks	9 (20.5%)	
Five to eight	16 (36.4%)	
weeks		
Not sure about	10 (22.7%)	
time spent		

Participant ratings of MoodGYM were generally either overwhelmingly positive or neutral. Most students (n=31, 70.5%) rated MoodGYM as good or very good, and 35 (79.6%) found it very or slightly helpful. More than half (n=26, 59.1%) found MoodGYM easy or very easy to use, and 33 (75.0%) stated they would recommend it to a friend or family member.

Students were asked through an open-ended question to summarise how MoodGYM was helpful to them, and 70.5% (n=31) responded. The content analysis found that 20 (45.5%) students reported that MoodGYM

helped reduce anxiety and depressive symptoms by teaching them different coping skills and strategies to address their negative thoughts. From the 20 students, four mentioned that the program helped them reflect on themselves more by completing different exercises and conducting self-assessments at the end of each module, five stated that MoodGYM increased their knowledge about mental health, one specifically suggested that it was a very good tool to deal with selfcriticism, and ten mentioned that MoodGYM helped them acquire new self-help techniques and strategies to deal with their negative thoughts and change their daily routines by implementing some of the exercises. For example, one student stated, 'MoodGYM helped me deal with my worrying thoughts and understand why I get them very often'. Eight (18.2%) students found MoodGYM helpful but felt the modules were too long and time-consuming, and two students (4.6%) felt that MoodGYM was unhelpful due to its lack of clarity and complexity. For example, one student could not understand the purpose of some assessments, stating, 'In all, I do not think it was clear enough'.

#### 4.8. Discussion

Students with low academic achievement who self-reported symptoms of low mood improved their GPA significantly and significantly after using an online CBT-based intervention in the current study (MoodGYM). Comparison with a previous cohort of students with low GPAs found a significant time by group interaction,

with the MoodGYM group having very similar GPA scores to the historic control group at baseline but significantly higher GPA scores at the equivalent follow-up point. Attendance also improved compared to control. MoodGYM was also associated with significant reductions in depressive and anxiety symptoms and there were substantial reductions in the proportion of students scoring above the cut-off for anxiety and depression caseness. MoodGYM was generally positively evaluated by students, and most participants suggested they would recommend the program to friends or family members.

Although this study lacked a control group for the substantial improvement in depressive and anxiety symptoms, the findings align with previous research using MoodGYM with student populations. A study of female secondary school students (*n* = 157) used MoodGYM compared to the school's standard development activities. The results suggested that MoodGYM was associated with a significantly decreased rate of self-reported depressive symptoms than the usual curriculum, and the effect of MoodGYM was more significant after 20 weeks (O'Kearney, Kang, Christensen & Griffiths, 2009). A recent study exploring the prevention and treatment of major depressive disorder among high-risk first- and second-year university students compared MoodGYM with two other internet-based preventative programs: attentional bias modification and an active attentional control condition. Depressive symptoms were assessed at three

points: baseline, post-intervention, and 4-month follow-up using the Depression Anxiety and Stress Scale 21 (DASS-21) depression scale and the Beck Depression Inventory-II (BDI-II). The results indicated that MoodGYM was a more effective intervention at both the diagnostic and symptom levels than the other two interventions, with effect sizes for change in BDI-II and DASS-21 depression scale of d=0.40 and 0.51, respectively, at four-month follow-up (McDermott & Dozois, 2019). These were similar to the effect size (d=0.5) for change in HADS-D observed in the current study at eight weeks post-intervention. However, Twomey et al. (2014) found no significant improvements in anxiety or depressive symptoms in a clinical sample group with reported mental health issues using MoodGYM compared to a waitlist control group, despite showing some decrease in general psychological distress. Nevertheless, the mean age of the intervention group was 35, and the follow-up rate was only 18%.

In the present sample, 70.5% (n=31) considered MoodGYM to be an effective program for reducing depressive and anxiety symptoms and felt it enhanced their knowledge of mental health. This is consistent with a study by Farrer et al. (2012), which suggested that CBT interventions can effectively reduce depressive symptoms and promote knowledge about effective strategies for dealing with depression and self-management. Lintvedt et al. (2011) reported that an unquided intervention (MoodGYM) effectively improved

depressive symptoms and negative automatic thoughts in a university population. The study had a high dropout rate (62% of the participants responded post-intervention); however, more than half of the non-responders completed 2.4 modules. Lintvedt et al. (2011), in their study with university students experiencing depressive symptoms, also found that participants who used MoodGYM were very satisfied, and 90% stated that they would recommend the program to others.

The results of the present study sample suggested a significant improvement in academic performance and a significant reduction in attendance warnings after using MoodGYM. To our knowledge, this is the first study to explore the potential of a CBT-based online intervention to improve academic outcomes. However, previous studies that used different online interventions reported some improvements in academic achievement. For example, a recent study by Viskovich and Pakenham (2019) that explored the effectiveness of web-based Acceptance and Commitment Therapy (ACT) in promoting mental health in university students reported pre- to post-intervention improvements for the study's primary outcomes—including academic performance—and these improvements were maintained throughout the follow-up period. The study used a four-week web-based ACT mental health promotion intervention called 'YOLO'. Academic performance was measured using a brief, 12-item self-report scale measuring facets

of academic performance, including study habits, study motivation, and overall grades. It was unknown which items contributed to the score, as the study used a factor analysis method; however, results indicated that the intervention improved participants' perceived performance, although objective performance was not assessed.

In the current study, the comparison group (n=19) was from a recent cohort study conducted by Awadalla et al. (2020) to explore the effects of depression and anxiety on academic performance among university students. Essentially, the historic control group was from the same sample population of the current study (i.e., same university and very similar sample characteristics). Like the intervention group, the students had GPAs below 2.0 at recruitment and were considered in the academic warning (failing) category. The intervention group (n=44) had similar GPAs and attendance warnings at baseline; however, the comparison group (no-intervention) had significantly lower GPAs and more attendance warnings at follow-up, demonstrating that the intervention group had better academic outcomes over a similar period.

Many societal, attitudinal, and cultural reasons why university students with emotional difficulties may not seek professional help (Heath et al.,2016). The present study findings show a gap in the proportion of students experiencing emotional difficulties and seeking professional help. For example, although 77% scored above the cut-off for depression caseness and nearly half of the

intervention group had sought help from their friends, only three students had sought professional help. These data are particularly valuable in highlighting the poor uptake of professional support since there is lack of data including the reliable record references for the number of people seeking mental health help in UAE. Overall, in UAE, lack of awareness of the availability of mental health services and the stigma of seeking psychological help may affect the helpseeking behaviour among a higher number of university students (Sayed, 2015). MoodGYM appears to offer an effective and acceptable method of increasing access to evidence-based therapies. The fact that 88% of the students responded to the postintervention survey reflects that MoodGYM might be culturally and socially accepted.

In this study, out of the 47 students who accessed MoodGYM, halfcompleted all five modules. The results indicated that the students who completed more MoodGYM modules performed better academically than those who completed fewer modules. The findings support the importance of the dose of the intervention; however, the bias of selfreport measures and the need to assess the fidelity of MoodGYM use should also be considered. These findings are consistent with those of Calear et al. (2013), who investigated the effects of adolescent adherence to MoodGYM in schools. They reported that participants who maintained high adherence to the intervention reported more substantial intervention effects six months post-intervention than participants with

low adherence. It has been stated that MoodGYM requires the use of more than two modules, to have an impact (Powell et al.,2013). According to Christensen et al (2006) there was a significant improvement in depressive symptoms when a combination of modules one, two, and five were used. On the other hand, it was argued that a low degree of asynchronous online therapist support, when adequately integrated into the delivery of the online intervention, might increase attribution and engagement rates (Sharry et al., 2013). However, more research is needed to explore optimal dose of online CBT.

More than half (59.1%) of the students in the current study found MoodGYM easy to use, and three-quarters of the students would recommend it to a family member or friend. This is in line with another study that evaluated MoodGYM in primary care patients with mild to moderate depression. The study reported that MoodGYM was rated positively by more than half of the participants and suggested that low non-adherence rates were a sign of positive evaluation indicating the intervention's acceptability (Høifødt et al., 2013). The study concluded that significant improvements were found at twomonth follow-up, and the level of satisfaction among the participants was high, as 90% reported they would recommend MoodGYM to others.

Even though most of the students in the present study found MoodGYM helpful and easy to access, some found the modules to be very long and time-consuming.
MoodGYM users who are dissatisfied might be less likely to submit detailed qualitative feedback which may distort the pattern of feedback received and give less insight into the nature of less satisfactory elements of the program. Ideally, we would want to look for other markers of dissatisfaction such as failure to complete modules or time spent within the program. Unfortunately, this information was not available in this study.

A systematic review by Knowles et al. (2014) investigated qualitative studies exploring user experience with web-based therapies for anxiety and depression. The review included eight studies, of which six used CBT treatment, and the findings highlighted that web-based CBT interventions have shown more concern regarding improving access to therapy than on patient experience. The review suggested that considering the sensitivity and personalising the program's content to be more relevant to users could increase engagement and adherence. Furthermore, Neil et al. (2009) proposed that internet-based interventions should precisely record user activity to accurately measure adherence. Estimating the time spent on modules is significant because a user could also spend considerable time reading the modules but not complete the exercises and still display some benefits from the program. University students can benefit from the opportunities offered by web-based interventions for anonymous and non-stigmatizing access to evidence-based therapies that support emotional wellbeing. Incorporating online interventions into universities' mental

health counselling can increase their resources and improve retention rates, minimising the number of course dropouts. Furthermore, such systems could support improvements in academic skills and promote academic success.

#### 4.9. Strengths and limitations

This appears to be the first study to evaluate an online CBT-based intervention to support students with low mood and academic difficulties in the UAE. The study used a pre-and-post-intervention design, which can be valuable for providing preliminary evidence for intervention effectiveness. The fact that 88% of the students responded to the post-intervention survey indicates the credibility of the study and its subsequent results. Furthermore, the scale used in this study for anxiety and depression (HADS) has been validated and shows good sensitivity and specificity. The HADS questionnaire has been validated in many languages, countries, and settings, including the UAE (El-Rufaie & Absood, 1995). Another strength of this study was using a historical control group for GPAs, recruited from the same university and showing data at the same time points during the previous year. The results of this pilot study constitute an important step towards further longitudinal studies to explore the effectiveness of online interventions in supporting academic progress for university students with mental health issues.

Some limitations of this study should be noted. Due to the small sample size and short follow-up period, the results reflect only a short 'window of time' and within a limited university population. Thus, with more students and an extended follow-up period, the results could be more accurate and less biased, thereby estimating the intervention's benefits more reliably. Other limitations are that this study was not a randomised trial, had no control group for depressive and anxiety symptoms and used self-reported GPAs. Finally, limited qualitative data to support the quantitative findings, and the bias related to being in a trial and expected to complete the survey, can produce authentic answers.

## **4.10.** Conclusions

Results indicate that MoodGYM seems to be a convenient, acceptable and effective therapeutic intervention targeted at academically struggling students with low mood. The observed improvements in mood, GPA and attendance suggest that MoodGYM may be a costeffective way to overcome barriers to mental health support for academically struggling students. However, more research is needed to explore whether improvements are sustained and how MoodGYM can be best implemented within the curriculum.

## **Chapter Five: Discussion and Implications**

# 5.1 Overall summary

This thesis aimed to:

To systematically review the evidence looking at relationships between anxiety and depression academic performance in university students (Chapter 2). To determine the prevalence of anxiety and depression in a sample of university students in U.A.E. (Chapter 3). To explore the relationship between anxiety, depression, and academic performance (GPA) in university students in U.A.E. (Chapter 3). To explore whether the relationship between emotional disorders and academic performance is moderated by gender or socio-economic status (Chapter 3). To investigate the acceptability and potential effectiveness of a self-directed, internet-delivered, cognitive-behavioural skills training tool (MoodGYM) in improving academic performance (GPA) among academically struggling university students with low mood (Chapter 4). To investigate factors influencing improvement in GPA, including change in depression scores and level of MoodGYM use. (Chapter 4). The overall objective is to explore the impact of emotional disorders (depression and anxiety) on university students' academic outcomes and explore the need for online mental health intervention in academically struggling university students in traditional Arab culture. Hence, the effectiveness of these online programs was informed by evidence from several research projects and a literature review.

## 5.2. The first study (Systematic review, chapter 2)

Study one: only ten studies were found that explored the relationship between anxiety or depression and academic performance using an objective measure of academic performance and an objective measure of depression and anxiety. The review included studies published between 1997 and June 2020 that reported the relationship between depressive and/or anxiety symptoms on academic performance among university students. Five of the identified studies addressed both depression and anxiety, four only depression, and one only anxiety. All six studies that conducted cross-sectional analyses found a link between depression and poor academic performance. Three of the four studies to conduct longitudinal analyses found higher levels of depression were associated with poorer academic performance at follow-up.

There was less evidence that anxiety had a negative effect on academic success. Three of the four studies that performed cross-

sectional analyses found a negative cross-sectional association between higher anxiety levels and lower academic performance, indicating that more anxious students had a poorer performance. Only one reported a significant longitudinal relationship between higher anxiety and subsequent poorer academic performance from the three longitudinal studies. This association was weak and only found with regard to one of the three academic outcomes assessed. The cross-sectional associations may reflect students' concerns about their studies since longitudinal studies have not shown a predictive link between high anxiety and subsequent poorer academic performance (Andrews & Wilding, 2004).

Overall, depression tends to have a consistent negative relationship with poor academic performance among all the studies that assessed depression independently or with anxiety. Most of the studies in the review supported the negative causal relationship between depression or anxiety and academic outcomes. However, the quality of most of the studies was poor, and there was a clear need for a longitudinal study with a representative sample of students that controlled for potential confounding factors.

# 5.3. The second study (Longitudinal prevalence study, chapter three)

Study two, a longitudinal quantitative survey with students from one public university in U.A.E., found symptoms of possible major

depressive disorder (MDD) present in over a third of the sample (34.2%). Students screened with depression symptoms had lower GPAs (p=0.003) at baseline and were less satisfied with their studies (p=0.015) and had lower GPAs at follow-up (p=0.035). The students who screened for anxiety symptoms had lower GPAs at baseline (p=0.003) but did not differ at follow-up.

The survey also reported that less than a quarter of the screened students had a possible generalized anxiety disorder (GAD) (22.3%). Cross-sectional analysis showed anxiety at baseline was independently associated with poorer academic performance. There was some evidence that the relationship between GAD and anxiety was moderated by gender, with female students in the possible GAD group having a lower grade point average (GPA) than females in the non-GAD group. On the other hand, male students in the possible GAD group had non-significantly higher GPA scores than males in the non-GAD group. This suggests that for female students, either high anxiety impaired their academic performance or that their anxiety was a consequence of their academic struggles. For males, higher anxiety may have been a marker for greater engagement with their studies. As depressive symptoms, but not anxiety symptoms, independently predicted lower GPA scores at follow-up, it was concluded that a therapeutic intervention would be best targeted at students with low mood and poor academic performance.

## 5.4. The third study (Pilot study, chapter 4)

A pre-post pilot study with a historic control group explored the acceptability and feasibility of an online CBT-based intervention in improving academic performance in students with low mood. The historical group was selected from the previous longitudinal cohort study (study two) of UAE university students as the comparison group. The students had a GPA < 2.0 at baseline and a GPA score reported at two-month follow-up. The control group students had similar GPAs, attendance warnings, and demographic characteristics at baseline as the intervention group. This group was used as a comparison group to evaluate the academic improvement in the intervention group.

The results highlighted a significant reduction in depression and anxiety scores. Furthermore, the results found academically failing students with self-identified symptoms of low mood reported significant improvements in GPA after using an online CBT-based intervention, MoodGYM. Compared with a previous cohort of failing students, findings show that the MoodGYM group reported having very similar scores to the historic control.

Greater improvement in GPA was associated with a higher number of MoodGYM modules completed. MoodGYM was evaluated positively by most of the students. Within the online intervention, relevant quotes sourced from participants in this study were used to role model positive experiences of understanding mental health

problems, help-seeking, using self-help, and supporting through knowledge.

The sample in study three was a small one, and the follow-up period was short; therefore, with future longitudinal studies, it is recommended that longer follow-up periods be adequately measured. More importantly, MoodGYM appealed to the students, considering that certain barriers such as accessibility of services and stigma related to mental health prevent them from engaging in helpseeking behaviour. This was clearly reflected in the high follow-up response and the positive feedback from most of the participants. While the intervention study results produced promising findings, it is possible that students' answers could be affected by the bias of the trial period and the expectations of survey completion. Likewise, consideration should be given to the barriers that might impact engagement and adherence among students, especially those experiencing symptoms of emotional disorders and failing

academically.

# 5.5. Reflections on using a longitudinal study design

A longitudinal design was used in study two in this thesis to explore the relationship of depression, anxiety, and students' academic performance at different times in the academic year. The longitudinal approach has become increasingly applied in physical health and mental health services research; cross-sectional methods

alone may not adequately explore people's illness experiences and provide definite information about cause-and-effect relationships (Setia, 2016). Longitudinal studies are those where data is collected from the same sample of people at more than one-time point (Caspi et al., 2020). The longitudinal studies are considered valid for deciding long-term changes and are particularly useful in providing data about these individual changes. For example, longitudinally studying the progress of depression allows investigators to determine factors associated with commencement, remission, and deterioration, describing the long-term outcomes at the individual and group level (Anstey & Hofer, 2004).

The longitudinal approach was beneficial for the thesis, as the data obtained from study one suggested a lack of longitudinal research in this area. The longitudinal design was essential in suggesting online interventions for supporting students with mental illness and testing the feasibility of the intervention program and its impact on symptoms of depression or anxiety in study three. For example, the longitudinal study results showed that depression was the main predictor of academic performance among university students at baseline and follow-up. At baseline, both depression and anxiety had negative effects on academic performance, but after six months of follow-up, the same students with high levels of depression had lower GPAs. It allowed different types of data and perspectives to be considered in exploring the complex nature of the relationship

between anxiety, depression, and academic performance; it permitted the investigation of causal relationships between variables and focused on depression in the intervention study. For example, in study three, one of the participants' eligibility criteria is that they should have self-identified as having one or two key symptoms of low mood.

Using a longitudinal approach is not without its problems, as it can be difficult to avoid the drop-out of the participants in the follow-up stage, resulting in low response rates at the follow-up stage in study two. Individuals with symptoms of depression will be more inclined to discontinue and drop out altogether (Anstey & Hofer, 2004). However, the students who responded in the follow-up time in study two most of them had elevated symptoms of depression.

# 5.6. Clinical implications

Many societal, attitudinal, and cultural reasons why university students with emotional difficulties may not seek professional help (Heath, Vogel & Al-Darmaki, 2016). Researchers have found that among students in the UAE, counselling centres are viewed as a last resort or only to be consulted when issues become overly serious (Al-Darmaki, 2011; Al-Darmaki & Sayed, 2009). In the UAE, the established mental health resources are limited, and stigma and negative beliefs about mental health care can act as a barrier for university students to engage in help-seeking attitudes (Heath,

Vogel & Al-Darmaki, 2016). Therefore, digital interventions may appeal to students who do not attend or cannot access the established mental health clinics due to the related stigma and other barriers (Montero-Marín et al., 2016).

Study three's findings show a gap in the proportion of students experiencing emotional difficulties and those seeking professional help. For example, although 77% scored above the cut-off for depression caseness, half of the intervention group had sought help from friends, and only three students sought professional help. According to these results, university students may benefit from online education courses, such as Mental Health First Aid (MHFA). MHFA is commonly defined as the initial social, emotional, and practical help and support that individual can provide to others experiencing a mental health issue until they receive professional help or resolve the issue (Jorm et al., 2010). After several evaluations, the course has consistently proven to be an effective tool for improving a person's knowledge of mental health, increasing one's ability to provide support to a friend with a mental health problem, and alleviating the stigma associated with mental health (Morawska et al., 2012). A recent meta-analysis of 18 controlled trials reported small to moderate improvements at post-training in terms of mental health literacy and providing appropriate support for those with mental health issues up to six months later. The review suggested strong evidence that the training improvements of

mental health problems might last up to a year after training (Morgan et al., 2018). This can be one of the programs that universities in UAE could integrate into their systems, in combination with one of the digital interventions, after testing for acceptability and feasibility through long follow-up studies.

The promising results of Study three's follow-up may serve as an initial step towards considering this type of program (MoodGYM) to support students with emotional difficulties who struaale academically at Zayed University. Furthermore, universities in the UAE should consider confidential screening for mental health problems, particularly for students who are academically failing or on academic probation. However, this needs to be handled carefully in view of the stigma associated with mental health difficulties in the UAE. Qualitative research is needed to explore the feasibility and acceptability of optional screening in order that it can be implemented in a sensitive way that respects student choice and privacy. This can be efficiently accomplished through an online tool, which should be repeatedly used at the beginning of each semester and might help students access appropriate support from healthcare and counselling services.

In addition, the role of faculty and academic advisors is essential in identifying and preventing mental health difficulties among students, ultimately impacting students' subsequent seeking of interventions. Aacademic staff are often the first to observe

behaviours that indicate either the development or worsening of mental health problems among students (Pedrelli et al., 2015). Therefore, increasing mental health literacy programs among students and educators could reduce barriers to treatment and provide early identification for mentally unwell students who struggle academically. More importantly, the considerable prevalence rate of elevated symptoms of depression and anxiety in Study two, along with the findings from Study one, suggest that this population needs to be educated about the type and accessibility of available help. Including online intervention programs in the mental health systems of higher educational institutions and routine screenings for emotional difficulties could provide this generation with extra tools to support their emotional well-being and promote their academic success.

## 5.7. Summary of the findings

The evidence from the ten studies in the systematic review suggests that depressive and anxiety symptoms significantly impact university students' academic achievements. Across all studies that assessed depression only or in conjunction with anxiety, depression had a consistent negative relationship with academic performance, a result that was less frequent for anxiety. The findings of this review indicate that more attention should be given to identifying and addressing depression and anxiety in university settings, where high

demand for success is placed upon students. Their vulnerability may further increase unless more research is conducted to establish effective interventions to treat emotional difficulties, particularly depression, and enhance students' chances of success in university settings and, subsequently, in their careers. The limited number of publications in general and limited longitudinal studies, in particular, suggests that this is a neglected area of research that requires more attention.

The longitudinal study (Study two) confirms previous findings that around a third of university students are likely to experience a depressive disorder at any one time during their studies. Additionally, the cross-sectional results reveal both depression and negatively affect anxiety university students' academic performance. Overall, the findings provide important evidence of these negative impacts, support the need to consider the mental health of students who are struggling academically, and highlight the importance of supplying those students with appropriate support, including evidence-based therapies. Moreover, the results of this study suggest that depressive symptoms, and not anxiety symptoms, supporting a causal relationship between depression and poor academic performance, rather than depression resulting from poor academic performance. Anxiety had only a crosses-sectional relationship with academic performance making it difficult to determine the direction of the relationship.

Furthermore, anxiety was relatively less common in this group than depression, and some interesting gender differences need further exploration. For males, high anxiety was associated with better performance and for females with worse performance. This emphasises that depression within higher education institutions is an important issue that needs to be assessed further, as the literature shows a more negative impact on academic success longitudinally.

Study three's findings added supporting evidence regarding the effectiveness of a fully automated and self-directed intervention for improving emotional well-being among university students. Specifically, the results demonstrate the digital intervention MoodGYM's success in promoting mental health and improving academic performance among this population. The post-intervention results were also encouraging in that depressive and anxiety symptoms were reduced. Students' GPAs significantly improved after using MoodGYM, and the findings accordingly revealed a correlation between a higher number of completed program modules and improved academic skills over time. Low non-adherence rates and largely positive program evaluations as a whole also strengthen the intervention's acceptability. However, further studies confirm MoodGYM or other digital programs' effects on mental well-being and academic achievement in a control group and with a larger group of students. Future research should also determine whether

these programs are feasible and effective after a longer follow-up period.

Furthermore, the high response rate and Study three highlight that students may not be receiving proper psychological support (only three sought professional help, and 50% sought help from friends). This explains why MoodGYM might be a very appealing tool for students dealing with specific barriers, such as service accessibility and mental health stigma. The latter can include issues related to self-disclosure to counsellors or mental health providers in traditional Arab cultures.

Overall, the three studies in this thesis suggest that depression strongly affects students' academic performance and is rather prevalent among university students in the UAE. Therefore, identifying students with low moods who are struggling academically at the early stages is essential to providing proper support. For instance, directing students with early signs of depression to college resource centres may help them avoid academic impairment. Such efforts could also consequently increase their chances of success in their careers. Additionally, by opening lines of communication among students, faculty, and university counselling centres, essential referrals can be given to those who need them. A deeper understanding of emotional disorders and their relationship with academic performance variables is essential for planning appropriate early interventions for this population.

## 5.8. Overall thesis strengths and limitations

The main strength of the current thesis is the longitudinal design of the second study in Chapter Three, which is considered reliable for determining long-term changes. The longitudinal nature of the study contributed to the investigation of causal relationships between variables and focused on depression in the intervention study in Chapter Four. Furthermore, the random cluster sampling used for recruiting the sample group ensured that each student of the subgroup had an equal chance of being selected. Although the response rate at baseline (time 1) was considered high (80.4%), the potential of the study to conduct structural equation modelling to look for potential mediators for change.

The inclusion of a systematic review in the thesis is considered one of the strengths of the current thesis, which is extremely important for establishing crucial links between anxiety, depression, and academic performance in university students. However, the review study encountered some limitations: publication bias, limited eligible studies, and many studies did not report a direct relationship with academic achievement. The cross-sectional design adopted by most of the studies in this review hindered inference causality from the identified associations.

Another main strength of this thesis is the pre-post pilot study for evaluating a CBT online intervention program providing support for students with low mood and struggling academically. The novelty of this study is the evaluation of an online intervention system to support students with low mood and academic difficulties in the UAE. To our knowledge, this is the first study to explore the potential of a CBT-based online MoodGYM intervention program to improve academic outcomes. The use of a pre-and-post-intervention design can be valuable in providing preliminary evidence for intervention effectiveness. The high post-intervention response rate (88.0%) indicates that the program was convenient and culturally and socially acceptable. This can open the door for further longitudinal studies to explore the effectiveness of more online programs in supporting academic progress for university students with mental health issues.

Despite the small sample size and short follow-up period that limited results, this pilot study was encouraging in terms of the significant improvement in academic performance and reduction in symptoms of anxiety and depression in students. The study did not use random sampling, limiting the equal chances of participation for each student. Furthermore, randomised controlled studies are considered ideal for testing the effectiveness of any intervention by reducing the bias and providing an accurate method for examining cause-

effect relationships between an intervention and outcome (Hariton&Locascio, 2018).

# 5.9. Future research

Despite the high-rate prevalence of depression and anxiety among university students, the literature suggests that the relationship between academic achievements and emotional disorders is a neglected area of research in mental illness, and it needs further investigations. Therefore, longitudinal follow-up with a sample of students that compare different university students' populations is proposed for future studies.

The CBT online intervention pilot pre-post study in this thesis explored a novel and relevant area among university students. The promising follow-up results of the study make a significant contribution to the literature by drawing attention to the effect of the web-based intervention in improving symptoms of depression and anxiety, which led to an eventual positive effect on academic development and success. However, more qualitative measures should be used in future studies to explore users' perceptions of using MoodGYM and its effect upon outcomes. This should be included in a trial to explore whether changes in pre-post quantitative data reflect participants' perceptions of the effect of the intervention. Administering a battery of measurements at baseline and post-intervention (three-month and six-month follow up) would

be ideal in exploring the effects of the intervention. Additional longer-term assessment would also help explore its effect upon those who did not have any symptoms of emotional disorders at baseline.

The next stage of development needs to explore the potential for commercialising the intervention, either through Zayed University or another organisation. This would involve liaising with the university about their interest in adopting MoodGYM as part of the university mental health wellness system and exploring whether further studies are needed to evaluate the effectiveness of MoodGYM.

In the Middle East area, established mental health resources are limited; stigma and negative beliefs about mental health care can prevent engaging in help-seeking behaviour (Dardas& Simmons, 2015). Online therapeutic interventions offer considerable advantages in terms of student access and privacy. Thus, study three in this thesis might open the door for universities in UAE to consider establishing more research in exploring the effectiveness of digital interventions in supporting students with emotional and academic difficulties. Also, consideration should be given to increase the level of adherence among students, which could be achieved by accommodating those interventions to be more usable and engaging for young people by considering shorter modules, mobile apps, or computer games that support the principles of CBT. (Van der Meulen et al., 2019).

Given that UAE is a conservative community, cultural adaptation of any digital program should be considered by looking more into users' experiences and level of acceptance. Moreover, university-based counselling centres and other relevant professionals might also be interested in using or promoting the website.

# 5.10. Conclusions

While the literature suggests a big gap in research investigating the disorders relationship between emotional and academic performance, the three studies in this thesis complement each other in exploring in-depth the impact of depression and anxiety on academic success in university students in the UAE. The longitudinal research in this thesis established that depression has a negative impact on academic performance and that an online therapy (MoodGYM) is an acceptable and effective intervention to improve mood and academic performance in academically struggling students in the UAE. Further research is needed to explore the best way to implement mental health screening and access to online therapy for university students in traditional cultures.

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# Appendices

# Appendix 1. Study two published in BMC 2020

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**BMC** Psychiatry

**RESEARCH ARTICLE** 



A longitudinal cohort study to explore the relationship between depression, anxiety and academic performance among Emirati university students

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### Abstract

Background: Many university students experience depression and anxiety, both of which have been shown to affect cognitive function. However, the impact of these emotional difficulties on academic performance is unclear. This study aims to determine the prevalence of depression and anxiety in university students in United Arab Emirates (UAE). It further seeks to explore the relationship between emotional difficulties and students' academic performance. Methods: This longitudinal study recruited 404 students (aged 17-25 years) attending one UAE university (80.4% response rate). At baseline, participants completed a paper-based survey to assess socio-economic factors and academic performance, including most recent grade point average (GPA) and attendance warnings. PHQ-9 and GAD-7 scales were used to assess depressive and anxiety symptoms. At six-month follow-up, 134 participants (33.3%) provided details of their current GPA.

Results: Over a third of students (34.2%; Cls 29.7–38.9%) screened for possible major depressive disorder (MDD; PHQ-9≥10) but less than a quarter (22.3%; CIs 18.2-26.3%) screened for possible generalized anxiety disorder (GAD, GAD-7≥10). The Possible MDD group had lower GPAs (p = 0.003) at baseline and were less satisfied with their studies (p = 0.015). The MDD group also had lower GPAs at follow-up (p = 0.035). The Possible GAD group had lower GPAs at baseline (p = 0.003) but did not differ at follow-up. The relationship between GAD group and GPA was moderated by gender with female students in the Possible GAD group having lower GPAs (p < 0.001) than females in the Non-GAD group. Male students in the Possible GAD group had non-significantly higher GPA scores. Higher levels of both depression and anxiety symptoms scores were associated with lower GPAs at baseline. PHQ-9 scores, but not GAD-7 scores, independently predicted lower GPA scores at follow-up (p = 0.006). This relationship was no longer statistically significant after controlling for baseline GPA (p < 0.09). (Continued on next page)

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### (Continued from previous page)

**Conclusion:** This study confirms previous findings that around a third of university students are likely to be experiencing a depressive disorder at any one time. Furthermore, it provides important evidence regarding the negative impacts of emotional difficulties on students' academic performance. The results support the need to consider the mental health of students who are struggling academically and highlight the importance of signposting those students to appropriate support, including evidence-based therapies.

Keywords: Depression, Anxiety, Academic performance, University students

#### Background

University students represent a group of people who are typically experiencing a critical transition period from adolescence to adulthood: a time often considered as one of the most stressful in a person's life [1]. This, combined with other challenges such as social changes and exam pressures, arguably puts university students at particular risk in terms of mental health. It has been estimated that around a third of students are likely to be experiencing moderate to severe depression at any one point in time [2, 3], a rate that may exceed that found in the general population [4]. Students with fewer socioeconomic resources appear to be particularly vulnerable [5]. According to Beck's cognitive theory of depression [6], depressed individuals in achievementoriented environments (such as higher education institutions) are likely to react to low grades with a sense of failure and low self-esteem because of their tendency to negative cognitions of themselves, the world, and the future. Moreover, students who have a negative view of themselves may be reluctant to engage in challenging academic assignments, thereby negatively affecting their academic potential [7].

Depression is characterized by a combination of physical, emotional, psychomotor and cognitive impairments which can manifest itself by symptoms such as sleep disturbance, poor concentration, negative thoughts and feelings of guilt [8]. However, despite the marked rates of depression in student populations and the obvious potential negative implications for academic study, surprisingly little research has explored the impact of depression on academic performance. One of the few longitudinal studies to explore the relationship between emotional difficulties and objective academic performance found that pre-university depression and financial difficulties were related to exam performance at the end of the first year of study, with depression being the only independent predictor [9]. Hysenbegasi and colleagues [10] found that students with a history of depression had poorer academic performance, but that this association disappeared if their depression had been treated. Apart from acting as a barrier to help-seeking, depression can have a negative impact on engagement with their course of study. Students experiencing depression may miss more classes, tests and assignments, are more likely to drop courses compared to their non-depressed peers [11] and are more likely to dropout from university entirely [12].

Students experiencing depressive symptoms may be caught in a vicious cycle in which depression disrupts academic study and poor academic performance contributes to low mood [13]. On the other hand, a recent study carried out by Ngasa and colleagues [14] among medical undergraduate students suggested that, in spite of the high prevalence of major depression among the students, it had no effect on their self-reported GPA.

The relationship between anxiety and academic performance is more complex. Some cross-sectional studies have found that more anxious students have poorer performance [15]. However, that association may reflect students' concerns about their studies since longitudinal studies have not shown a predictive link between high anxiety and subsequent poorer academic performance [9]. Indeed, some studies have suggested that higher levels of anxiety may be associated with better performance [16]. Therefore, this study does not propose a hypothesis in relation to the association between anxiety and academic performance.

Stigma related to depression can hinder a person's ability to engage in university life and social activities as well as impacting on academic performance. For example, a recent systematic review of 34 studies exploring stigma associated with mental illness and its treatment in Arab culture [17] highlighted a number of ways in which a range of widely reported negative beliefs could impact on access to mental health care. This included concerns about the use of medication and negative attitudes to people with mental health conditions and to mental health professionals. Religion was found to have a strong influence on beliefs with mental illness often viewed as a curse or punishment. Despite evidence that depression and anxiety form a significant mental health problem for university students, the mental health of students in Middle Eastern countries has received little attention from researchers [18]. A better understanding of the prevalence of mood disorders in Emirati student populations and their implications for academic outcomes could help to address this gap.

### Objectives

 To determine the prevalence of anxiety and depression in university students in United Arab Emirates (UAE).  To explore the relationship between anxiety or depression and academic performance (GPA) in university students in UAE.

It is hypothesized that students with a possible depressive disorder will have lower grade point averages (GPA) and that higher levels of depressive symptoms at baseline will predict lower GPAs at follow-up.

# Methods

Participants

Participants were recruited from two campuses of one governmental university in UAE (during 2018/19 academic year). Cluster random sampling was used to recruit participants from all six faculties of the university: Business, Education, Health and Natural Sciences, Information Technology, Art & Design, and Faculty of Communication. The number of the students recruited from each faculty was determined according to its proportion of the total number of students in the university. Stratified random sampling was used to select which classes in each faculty would be asked to complete the questionnaire. Based on an estimated prevalence of depression among university students of 33.0% [2], a total university population of 9585 and a conservative response rate of 65%, it was calculated [19] that the study needed to approach 500 students in order to achieve a minimum sample size of 384 students. This allowed estimation of prevalence of depression with 5% precision and 95% confidence. Participants in their first year of study were not eligible to participate as they had not yet taken end of semester exams, and so did not have a GPA score.

#### Design

The study design consists of a longitudinal survey conducted at baseline and at 6 months follow-up, with a representative cohort of students attending one university in UAE.

#### Measures

### Demographic and socio-economic factors

Information was collected about participants' age, sex, marital status, major, year of study and parental educational level. The Family Affluence Scale (FAS) was used to assess familial material resources. The FAS comprises four items assessing parental car ownership, sharing or not sharing bedroom in the family home, computer ownership at home, and number of family holidays per year [20]. Scores range from 0 to 9 with higher scores indicating greater affluence. The FAS is a validated measure of socio-economic status and lower scores have been associated with higher risk of depression in university students [5].

#### Depressive symptoms

The Patient Health Questionnaire (PHQ-9) [21] is a short screening measure used in clinical and community settings to assess symptoms of depression. It consists of nine items that correspond to the nine DSM-IV criteria for depression (DSM-IV) [22]. Each item is rated for the previous 2 weeks prior to administration: each item is scored on a scale from zero ('not at all') to three ('nearly every day'), with a total score ranging from 0 to 27. In this study, participants scoring  $\geq$ 10 were allocated to the Possible major depressive disorder (MDD) group and students scoring  $\leq$ 9 were allocated to the Non-MDD group [21]. Although the PHQ-9 has been shown to have a sensitivity of 88% and a specificity of 88% for the classification of MDD [23].

#### Anxiety symptoms

The General Anxiety Disorder 7-item scale (GAD-7) is a short screening tool used to measure the severity of generalized anxiety disorder (GAD). It is a self-report scale consisting of seven items based on DSM-IV criteria and has excellent internal consistency ( $\alpha = .89-.92$ ) [24]. Spitzer and colleagues [25] proposed that it is a useful screening tool with strong criterion validity for identifying probable cases of GAD. In addition, the GAD-7 has been strongly associated with multiple domains of functional impairment and cognitive disability [25]. The GAD-7 total score ranges from 0 to 21. In this study participants scoring 10 or above were allocated to the Possible GAD group and students with GAD-7 scores below 10 were allocated to the Non-GAD group [25]. A cutoff score of 10 for GAD-7 was classified as the optimal point for sensitivity 89% and specificity 82% for screening for possible GAD [25].

### Academic performance

Participants provided information about their most-recent grade point average (GPA), number of academic warnings about poor attendance in the last semester, and level of satisfaction with their course of study. Possible GPA scores range from 0 to 4, with higher scores indicating better performance. Satisfaction with studies was ranked on a 0 to 6 scale from 'extremely satisfied' to 'extremely dissatisfied', with lower scores indicating greater satisfaction.

#### Ethical approval

Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Sub-Committee (reference number: 250) and the Research Ethics Committee at Zayed University (ref ZU17\_0107 F). Participation was voluntary and confidentiality was assured. Informed written consent to participate was obtained.

#### Procedure

An invitation email and participant information sheet explaining the study were sent to all students in the selected classes in each faculty by academic staff in the week before data collection. An anonymous paper questionnaire comprising demographic items, PHQ-9, GAD-7 and academic performance items was distributed to students in the pre-selected classes by the researcher in March 2018. Participation was entirely voluntary, and students consented by ticking the paper consent form attached to the anonymous baseline questionnaire. In order to link the questionnaire responses at baseline with academic performance at follow-up, participants generated their own personal study number by providing their day of birth and the last three digits of their phone number. Students completed the academic performance questionnaire again at the beginning of the next semester (approximately 6 months later).

#### Statistical analysis

Data were analysed using SPSS v.24 (SPSS, 2017). Nonparametric correlations were performed to explore the relationship between socioeconomic factors and anxiety and depression and to explore factors associated with poor academic performance. Chi-square was used to assess associations for nominal data and group differences in ordinal and continuous data were assessed using Mann-Whitney U tests or t-tests as appropriate. Linear regressions (entry method) were used to explore independent predictors of poor academic performance. Two-way ANOVAs were used to explore the possible moderating effect of gender on the relationship between MDD or GAD group and GPA.

#### Results

A total of 404 of 500 undergraduate students (300 females and 200 males) were recruited to the study (80.8% response rate). The response rate for the female students was significantly higher than for male students (96.7% vs 57.5%; X<sup>2</sup> = 123.37, df = 1, p < 0.001). No student refused to participate, but 96 students (19.2%) were absent from class when the baseline questionnaires were distributed. All students recruited to the study (baseline responders) completed the baseline questionnaire. The sample's mean age was 19.6 (SD = 2.76) years (range 17-25), and the sample was almost three-quarters female (n = 290, 72.2%). There was a broad distribution in the educational level of participants' parents, with 56.7% (n = 229) of paternal and 48.5% (n = 196) of maternal being university graduates. The majority of participants were single (n = 381, 94.3%). Table 1 shows the demographic make-up of the sample. According to the results of this study at baseline males are older than females, come from more affluent families and have less educated parents than females

#### Prevalence of depression and anxiety in the sample and socioeconomic factors associated with poorer mental health

At baseline, 34.2% (n = 138, CIs 29.7–38.9%) of students scored above the cut-off for possible MDD (Table 2). Females had higher PHQ-9 scores compared to males (Z = 3.63, p < 0.001,) although rates of possible MDD were similar between males (31.6%) and females (35.3%). Students with higher PHQ-9 scores came from less affluent families ( $r_s = -.276$ , n = 404, p < 0.001) and had less maternal education ( $r_s = -.118$ , n = 403, p < 0.05). PHQ-9 scores were unrelated to year of study, participant age or paternal educational level (all p = >.05).

Eighty-nine students (22.3%, CIs 18.2–26.3%) scored above the cut-off for possible GAD (Table 2). Total GAD-7 anxiety scores were higher in females (Z = -4.77, P < 0.001,) and female students were also more likely to be in the possible GAD group compared to males ( $X^2 = 6.063$ , df = 1, P = 0.014). Students with higher levels of anxiety symptoms came from less affluent families ( $r_s = -.271$ , n =401, p < 0.001) and had less maternal education ( $r_{ss} = -.167$ , n = 404, p < 0.01). Levels of anxiety were unrelated to year of study, participant age or paternal level of education. PHQ-9 scores were positively and strongly correlated with GAD-7 scores ( $r_s = .736$ , n = 404, p < 0.001).

Students' GPA at baseline ranged from 0.66 to 4.00 with a mean of 2.8 (0.65): n = 48 (11.9%) students had a GPA below 2.00 indicating poor academic performance and triggering academic support within the university. Students were moderately satisfied with their studies, with a median score of 4 out of 7 with lower scores indicating greater satisfaction. Nearly half of the sample had received at least one attendance warning (n = 171, 47.8%). Students with lower GPAs had had more attendance warnings (rs = 0.24, n = 376, p < 0.01) and were less satisfied with their studies (r = -0.182, n = 397, p < 0.01) (Table 3). Poorer academic performance was also associated with older age (r =-.176 n = 398 p = 0.01), higher year of study (r = -0.17, n =392, p < 0.01), lower level of paternal education (r = .127, n = 395, p = .011), and lower level of maternal education (r = .11, n = 398, p = .028). There was no relationship between GPA and family affluence or gender.

# Relationship between depressive symptoms and academic performance at baseline

At baseline, students with higher PHQ-9 scores had lower current GPAs ( $r_s = -.171$ , n = 397, p < 0.001). There was no relationship between PHQ-9 scores and number of attendance warnings or satisfaction with course. As hypothesized, students in the Possible MDD group (n = 136) had lower GPA scores compared to students below the cut-off (t = 2.98 p = 0.003, d = 0.3). They were also less satisfied with their studies (Z = 2.42, p =

Table 1 Demogra	aphic composition of	the sample at baselin	ne ( $N = 404$ ) and follow-u	p (N = 138)
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Variables	Baseline (N = 404) n (%)	Follow-up (n = 138) n (%)
Gender		
Male	114 (28.2%)	41 (30.6%)
Female	290 (72.2%)	93 (69.4%)
Age		
17–20	292 (72.3%)	94 (71.2%)
21–25	91 (22.5%)	33 (25%)
26-30	8 (1.9%)	4 (3%)
31-41	4 (0.896)	1 (.8%)
Mean age (SD)	19.64 (2.75)	19.8(2.91)
Marital status		
Married	20 (5.0%)	6 (4.5%)
Divorced	2 (.5%)	0
Single	381 (94.3%)	128 (95.5%)
Year of study		
2nd year	303 (75.0%)	95 (72%)
3rd year	65 (16.1%)	23 (17.4%)
4rd year	30(7.496)	14 (10.6%)
Faculty of study		
Business	138 (34.0%)	49 (36.6%)
Humanities & Social Sciences	77 (19.1%)	21 (15.7%)
Technological Innovation	71 (17.6%)	23 (17.2%)
Communication & Medical Sciences	57 (14.1%)	25 (18.7%)
Natural Health Sciences	46 (11.496)	16 (11.9%)
Maternal level of education		
None/below secondary school education	43 (10.6%)	12 (9%)
Completed secondary school education	165 (40.8%)	52 (38.8%)
Completed college university education	196 (48.5%)	70 (52.2%)
Paternal level of education		
None/below secondary school education	41 (10.0%)	14 (10.496)
Completed secondary school education	131 (32.4%)	41 (30.6%)
Completed college university education	229 (56.7%)	79 (59%)
Family Affluence Scale		
Mean (SD)	7.09 (1.52)	7.01 (1.57)
Median (range)	7.00 (2-9)	7.02(2-7)

0.015) but there was no relationship with number of at-

0.015) but there was no relationship with number or at-tendance warnings (Table 3). Regression analysis (entry method) with baseline GPA as the dependent variable and PHQ-9 scores, GAD-7 scores, age, gender and maternal education as independent variables found that, although the model was significant (F = 5.617, df = 3388, p < 0.001), it accounted for only a small proportion of variance (R<sup>2</sup> = 0.056). Only age was significantly related to GPA, with older students having poorer GPA (B = -.034, t = -2.59, p = 0.01).

However, although there was no evidence of serious problems with multicollinearity, GAD-7 scores were just above the threshold for an acceptable variance inflation factor (VR = 2.06) (Table 4).

A two-way ANOVA with gender and MDD group as the independent factors, GPA as the dependent variable and age as the covariant, found a main effect of MDD group (F = 6.692, df = 1389, p = 0.01) with Possible MDD group having higher scores but no gender effect and no interaction between gender and MDD group.

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#### **Table 2** Mental health and academic outcomes at baseline (n = 404)

Scale	Males (n = 114)	Females (n = 290)	Total (N = 404)
Mean PHQ-9 score (SD)	6.29 (5.65)	8.29 (5.03) ***	7.76 (5.29)
Possible MDD group	36 (31.6%)	102 (35.3%)	138 (34.2%)
Mean GAD-7 score (SD)	4.22 (4.57)	6.75 (5.13) ***	6.07 (5.12)
Possible GAD group	16(14.3%)	73 (25.2%) *	89(22.3%)
GPA	2.73 (0.60)	2.83 (0.67)	2.8 (0.65)
Attendance warning Median (range)	1.00(0-3)	0.00(0-6)	0.00(0-6)
Study satisfaction Mean (SD)	3.90(1.65)	3.54(1.74)	3.64(1.74)

\*p = < 0.05, p = < 0.001 \*\*\*

### Relationship between anxiety and academic performance at baseline

Higher GAD-7 scores (indicating more symptoms of anxiety) were associated with poorer GPA scores ( $r_s = -.176$ , n = 398, p > 0.001). However, there was no independent relationship between GAD-7 scores and baseline GPA once depression and sociodemographic variables had been accounted for (Table 4). There was no relationship between total GAD-7 scores and number of attendance warnings or satisfaction with studies rating. Students above the cut-off for possible GAD had lower GPA scores (mean 2.62, SD = 0.71) in comparison to students below the cut-off (mean 2.86, SD = 0.62) (t = 3.04 p = 0.003 d = 0.4) but did not differ in terms of number of attendance warnings or rating of satisfaction with course (Table 5).

Two-way ANOVA with GAD group and gender as independent factors, age as covariate and baseline as dependent variable, found no main effects of group or gender, but a significant group by gender interaction (F = 5.75, df = 1387, eta =0.15). The effect of GAD group on GPA was moderated by gender: females in the Possible GAD group had lower GPA (mean 2.91 SD, 0.62) than those in Non-GAD group (mean 2.57, SD 0.73) (t = 3.8, df = 280, p < 0.001 d = 0.48). In contrast, males in the Possible GAD group had non-significantly higher GPA (mean 2.71 SD 0.61) compared to males in the Non-GAD group (2.82 SD 0.59).

up response rate. Follow-up responders were significantly more likely to be in the Possible MDD group (43.0% vs 29.0%;  $X^2$  (1) = 11.54, p = < 0.01) at baseline and to have higher PHQ-9 scores (8.84, SD = 5.25 vs mean 7.20 SD = 5.25; Z = -3.37 p < 0.01) compared to non-responders at follow-up. Similarly, follow-up responders were more likely to be in the Possible GAD group (32% vs 17%; X<sup>2</sup> (1) =7.29, p < 0.01) at baseline and to have higher GAD-7 scores (2.62, SD 0.71 vs 2.43, SD 0.70; p < 0.05). There were no significant differences in baseline GPA, satisfaction with studies or number of attendance warning between responders at follow-up and non-responders at follow-up.

### Relationship between levels of anxiety and depression at baseline and academic performance at follow-up

Higher PHQ-9 scores at baseline were associated with lower GPA scores at follow-up ( $r_s = -0.24$ , n = 134, p =0.006), and students in the Possible MDD group (n = 58)had significantly lower GPA scores at follow-up compared to students in the Non-MDD group (n = 76)(mean 2.40 vs 2.68, t = 2.13, p = 0.035, d = 0.4) (Table 3). There was no relationship between GAD-7 scores and follow-up GPA and no significant difference in GPA at follow-up between participants in the Possible GAD group and the Non-GAD group. Higher GPA scores at follow-up were associated with younger age ( $r_s = -.0162$ , n = 134, p = 0.05) but there was no relationship between family affluence, parental education or gender and follow-up GPA.

#### Factors influencing GPA at follow-up A total of 134 (93 females and 41 males) completed the

follow-up survey (follow-up responders), a 33.3% follow-

Table 3 Possible MDI	and academic	outcomes at	baseline and	follow-up
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	Baseline (N = 404)		Follow-up ( $N = 138$ )	
	Possible MDD (N = 136) Mean (SD)	Non MDD(N = 261) Mean (SD)	Possible MDD (N = 58) Mean (SD)	Non MDD(N = 76 Mean (SD)
Semester GPA	2.67 (0.70)	2.87 (0.61) **	2.40 (0.70)	2.68 (0.76) **
Attendance warnings	0.93 (1.05)	0.77 (1.07)	1.12 (1.03)	0.92 (1.00)
Satisfaction level	3.78 (1.58)	3.60 (1.85) *	3.98 (1.42)	3.71 (1.55)

Table 4 Regression analysis to explore relationship between depression, anxiety and baseline GPA

Predictors	Baseline GPA				
	B	SE B	β	T	
Age	034	.013	145*	-2.595**	
Gender	.088	.082	.062	1.085	
Maternal level of education	.064	.051	.066	1.266	
PHQ-9 scores	011	.009	088	-1.276	
GAD-7 scores	014	.009	111	-1.584	

p = < 0.05, p = < 0.01

Regression analysis (entry method) was conducted with GPA at follow-up as the dependent variable and PHQ-9 scores, GAD-7 scores, age, and gender as independent variables.

The overall model was significant (F = 2.66, df = 4127, p = 0.035) but only accounted for a small proportion of variance (adjusted R<sup>2</sup> = 0.048). Only PHQ-9 scores (B = -.043, p = 0.014) at baseline predicted GPA at 6 months follow-up (Table 6).

Including baseline GPA into the regression meant that the relationship between depressive symptoms at baseline and follow-up GPA just failed to reach significance (B = -.019, p = 0.09) and the total adjusted r<sup>2</sup> increased to 0.633 reflecting the fact that baseline GPA accounted for a high proportion of the variance in GPA at follow-up.

#### Discussion

This representative survey found just over a third of students (34.2%) scored over the threshold for possible Major Depressive Disorder on the PHQ-9. Although female students had higher PHQ scores they did not differ statistically from males in terms of rates of MDD. A smaller proportion of students (22.3%) scored above the cut-off for possible generalized anxiety disorder, with females having higher rates of GAD-7 scores. Cross-sectional analyses found that higher levels of both depression and anxiety were significantly but weakly associated with poorer academic performance. Students scoring above the cutoffs either for possible MDD or possible GAD had lower GPA scores, although the effect sizes were small. There was evidence that gender moderated the relationship Table 6 Regression analysis to explore relationship between PHO-9 scores at baseline and GPA at follow-up

Predictors	Follow-up GPA					
	B	SEB	β	τ		
(Constant)	2.612	.524		4.314		
PHQ-9 scores	043	.017	302	-2.500**		
GAD-7 scores	.011	.017	.083	.682		
Age	.022	.024	.085	.914		
Gender	.248	.151	.153	1.640		

emester GPA at follow-up as dependent variable  $t^{**}p = < 0.01$ 

between GPA scores and anxiety as females in the Possible GAD group had substantially poorer GPA scores compared to females in the Non-GAD group, but there was no evidence that Possible GAD group influenced GPA in males. Longitudinal analysis found depression, but not anxiety, predicted poorer GPA at six-months followup. However, this just failed to reach significance (p = < 0.09) after controlling for baseline GPA.

In the present sample, the level of depression appears high compared to other student-sampled studies in similar communities, but this probably reflects differences in the classification of depression. For example, a study carried out at Al Ain University in UAE found a prevalence rate for depression of 22.2% [8], but although this study used the PHQ-9 it used the higher cut-off of 11 and required students to endorse specific items in order to be classified as having possible MDD. Another study in Oman [26] estimated a prevalence of 27.7% also using a cut point of 11. That study recruited through the university health clinic which may also have impacted on the reported prevalence. The prevalence in the present sample (34.2%; CIs 29.7-38.9%) is similar to that found in a systematic review of 24 studies of depression among university students [3] which estimated a weighted mean prevalence of 30.6% (CIs 95% CI, 30.2-31.1) in student populations.

Consistent with previous studies [10, 27, 28], baseline findings support an association between higher levels of depressive symptoms and poorer academic performance among university students. However, this relationship was no longer significant once other factors such as

Table 5 GAD group and academic outcomes at baseline and follow-up

	Baseline ( $N = 404$ )		Follow-up (N = 138)		
	Possible GAD (N = 87) Mean (SD)	Non-GAD(N = 309) Mean (SD)	Possible GAD (N = 43) Mean (SD)	Non-GAD(N = 91 Mean (SD)	
Semester GPA	2.62 (0.71)	2.86 (0.62) **	2.43 (0.70)	2.62 (0.76)	
Attendance warnings	1.02 (1.16)	0.75 (1.01)	1.19 (1.12)	0.92 (0.96)	
Satisfaction level	3.77 (1.59)	3.63 (1.80)	3.95 (1.45)	3.77 (1.48)	

anxiety and age had been controlled for. The results signified that students scoring above the cut-off for possible MDD (PHQ-9 score ≥ 10) have poorer academic performance. This is consistent with studies carried out by Bostani and colleagues [29] in 2014 and Eisenberg and colleagues [30] in 2009. Follow-up was conducted by the end of the semester (i.e. 6 months from baseline). Students classified as having scores above the cut-off for possible MDD had lower GPA scores at follow-up compared to students below the cut-off. The relationship between PHQ-9 scores at baseline and GPA at follow-up was stronger than the cross-sectional relationship, and was also independent of anxiety and sociodemographic variables, supporting a causal relationship between higher levels of depressive symptoms and poorer academic performance. These findings align with a previous study at a UK university [9] which found depression (but not anxiety) measured midway through the second year was negatively related to exam scores at the end of the second year. In a related context, Hysenbegasi and colleagues [10] in 2005 compared the GPA of 121 students over six-months following a diagnosis of depression and found a significant negative relationship between academic performance and untreated symptoms of depression. Students who received treatment for depression during the six-month period, had GPA scores that were statistically similar to the non-depressed group at follow-up, supporting a causal relationship between depression and academic performance.

Depression could impact on academic performance in a number of ways. Young people with depression may find social interactions difficult and may fail to engage with their courses [31]. However, in this study depression was not associated with poorer attendance in contrast to a recent study [32] conducted in Jordan suggesting a negative relationship between depression and high absence among nursing university students. The relationship in this study may reflect the fact that attendance is mandatory and missing classes is penalized. Whilst encouraging students to attend may help to mitigate the impact of depression, the low level of absenteeism may contribute to the difficulty of identifying academically struggling students.

The prevalence of anxiety found in the present study (22.3%) was similar to a study carried out among Malaysian student population [33], where the rate of prevalence was 27.4% taking to consideration the study used the cut-off of 8 and the current study used the cut-off of 10. Furthermore, the prevalence of anxiety in this sample was lower compared to other studies: e.g. 64.3% in Egyptian students [34] using the short-form Depression Anxiety Stress Scales and 47.1% in Turkish students [35] using the long-form Depression Anxiety Stress Scales.

Consistent with previous studies [36, 37], findings from baseline data supported a negative relationship between

symptoms of anxiety and academic performance among university students. Moreover, students meeting the criteria for possible generalized anxiety disorder (GAD) had lower GPA scores compared to students in the Non-GAD group. This is consistent with studies carried out by Bostani and colleagues [29] in 2014 and Eisenberg and colleagues, [30] in 2009. In contrast, some studies found that students with moderate levels of anxiety had better academic achievement [9, 16, 38] reflecting that appropriate degrees of anxiety concerning fear of failure could enhance self-motivation of students to perform better in different academic tasks. In this study anxiety was no longer associated with GPA at baseline once other variables such as depression had been controlled for. The lack of a longitudinal relationship between anxiety and GPA has been observed in previous studies [9] and suggests that anxiety may be reflective of academic difficulties rather than causal. One possible interpretation of the interaction between gender. Possible GAD group and GPA at baseline is that for female's poor performance contributes to anxiety but not for males. This is a novel finding and needs further investigation.

Furthermore, it should be considered that in the Middle East area, accessing help for mental health services is challenging [39]. Stigma and shortage of clinicians who are efficient and able to provide intervention that respects and integrates patients' cultural values [40] in the health care system are the critical barriers to effective treatment [41].

Identification of low mood in students who are struggling academically and offering appropriate support may help to improve both mental health and academic outcomes but the findings from this study suggest that may be difficult as students with low mood had not had poorer attendance. Increasing mental health literacy in students and educators could reduce barriers to treatment. Academic staff are often the first to observe behaviours that indicate either the development or worsening of mental health problems among students [42]. An Australian survey found that academic staff with higher levels of depression literacy were more likely to initiate engagement with students with mental health problems and were more likely to be approached by students who wanted to discuss their mental health. Staff with higher depression literacy also felt more confident that they had the knowledge to help students with their mental health problems [43]. Staff would therefore be in a good position to signpost academically struggling students with mental health problems to sources of support and treatment.

Theory driven, web-based intervention programs offer an acceptable and effective method of providing psychological treatment within the university system. Online therapy may appeal to students who do not attend or cannot access established mental health clinics due to a range of different barriers including the stigma related to mental health issues [44]. Furthermore, web-based interventions could be combined with face-to-face support to achieve best improvements in emotional wellbeing among university students [45].

### Strengths and limitations

This appears to be first study to explore the impact of depression and anxiety on the academic performance of university students in the UAE, with a representative sample of the targeted population. In addition, the longitudinal nature of the present study assessed academic performance of the students over time to enable some conclusions about the causal nature of the relationship between emotional difficulties and subsequent academic difficulties. Furthermore, the two scales that have been used in this study for anxiety and depression (GAD-7 and PHQ-9) are validated and have excellent sensitivity and specificity. Another strength of this study was that participants lost to follow-up were similar to responders at follow-up in terms of socio-demographic and educational characteristics. However, responders at followup did have higher rates of baseline possible MDD and possible GAD, but the repeated measures design means that this is unlikely to have biased the findings. Some limitations were encountered in the present study. For example, the response rate at follow-up was low, which limited the potential of the study to conduct structural equation modelling to look for potential mediators for change. The survey was kept anonymous in order to maximize the baseline response rate and to ensure the veracity of students' responses. However, this meant that it was not possible to target non-responders which contributed to the low followup response rate.

Another limitation was that, in order to preserve anonymity, we had to rely on self-reported GPA for measuring academic performance. Finally, the sample of this study consists of a group of students in just one university in the UAE, limiting the generalizability of the results.

#### Conclusion

Findings in the current study indicated that higher levels of depressive and anxiety symptoms affected around a third of university students in the sample. Crosssectional analyses show that students scoring above the cut-off for possible MDD or possible GAD have poorer academic performance. Depressive symptoms predict GPA in the subsequent semester suggesting a causal link but as students with possible MDD did not have reliably poorer attendance it may be difficult to identify at-risk students. This study provides evidence regarding the negative impacts of emotional difficulties on students' academic achievements and chances of success, accordingly academic counsellors should consider routinely signposting academically failing students to mental health support. Future research could distinguish the impacts of different types of anxiety disorder, particularly social anxiety which is common in university students and may impact on non-exam-based assessments such oral presentations [46].

### Abbreviations

GPA: Grade point average: MDD: Major depressive disorder: GAD: General Gark Giade point areage, Mub. Mojo depters unstudy. Gruenal anxiety discrete (JRC) Central anxiety discrete (JRC) Place 11 Relative the anxiety discrete (P-1) Relative the scale (7-item interval: ANOVA: Analysis of variance

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#### Authors' contributions

SA, CG and EBD designed the study protocol and surveys. SA analysed the data under CG's supervision. SA prepared the first draft of the paper and CG and EBD reviewed subsequent drafts. All authors read and approved the final manuscript

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#### Availability of data and materials

The datasets generated during and/or analysed during the current study are not publicly available [PhD study under progress] but are available from the corresponding author on reasonable request

#### Ethics approval and consent to participate

Ethical approval and consent to participate Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Sub-Committee (reference number: 250) and the Research Ethics Committee at Zayed University (ref ZU17\_0107 F). Participation was voluntary and confidentiality was assured. Informed written consent to participate was obtained.

Consent for publication

#### Not applicab

**Competing interests** authors declare they have no competing interests.

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# Appendix 2. Study three under review for publishing in BMC 2021



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# Using an online CBT-based intervention to improve academic performance in students with low mood: A pre-post study with historical control

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# Research article

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# Abstract

# Background

Online CBT-based interventions have shown potential to improve mental health in university students. However, their impacts in West Asian cultures and on educational achievement have yet to be fully investigated. This study aims to explore the feasibility, acceptability and potential effectiveness of a selfdirected, internet-delivered, cognitive-behavioural skills training program (MoodGYM) in reducing depression and improving academic performance in university students in the United Arab Emirates (UAE).

# Methods

This exploratory pre-post intervention study with an historic control group recruited 50 students from one UAE university, with GPA < 2 and self-reporting at least one of two key depressive symptoms. Preintervention, participants completed an online survey including most recent grade point average (GPA), number of attendance warnings and the Hospital Anxiety and Depression Scale (HADS). Participants were then sent a link to MoodGYM. After eight weeks, 44 participants repeated the survey and provided feedback on MoodGYM (88% follow-up). A subgroup of 19 students with GPA scores < 2 at baseline formed an historical control group for change in GPA and attendance warnings.

# Results

Total HADS-Depression scores fell at post intervention (P = 0.004) and the proportion of participants scoring above the cut-off for depression (HADS-D  $\geq$  8) fell from 77.2–27.3% (p < 0.001). There was also a substantial fall in HADS-Anxiety scores (p < 0.001) and the proportion of participants above the cut-off for anxiety (HADS-A  $\geq$  8) fell from 50% to 11.4% (p = 0.001). GPA scores improved substantially over time (p < 0.001, d = 1.3) and attendance warnings reduced (*p* = 0.008, *d* = 0.6). Compared to historic control, the intervention group had higher GPA at follow-up (*p* < 0.030 *d* = 0.6) fewer attendance warnings (*p* = 0.036 *d* = 0.7). Most students (79.6%) evaluated MoodGYM as useful and all students completed at least 2 MoodGYM modules. More modules completed (p = 0.005) and greater reduction in attendance warnings (*p* = 0.007) were independently associated with greater improvement in GPA scores at follow-up.

# Conclusions

This study provides support for a web based mental health promotion intervention (MoodGYM) to improve academic achievement in university students with depressive symptoms. Further research is needed to explore how MoodGYM can be best implemented within University settings.

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# Background

Studies indicate a high prevalence of mental health problems, such as depression, among university students compared to their non-student peers [1]. This is concerning, as depression has been shown to impact all areas of student well-being, including academic achievement. Students with depressive symptoms tend to have poor classroom engagement, peer interactions, and attendance [2]. Thus, depression negatively influences academic progress and encourages under-achievement among university students.

A recent representative survey [3] reported that over one-third of Emirati students at one university scored above the threshold for major depressive disorder. Depressive symptoms at baseline, but not anxiety symptoms, were shown to predict academic performance at follow-up, as measured by grade point average (GPA). This supports previous evidence that depression negatively impacts university students' academic performance [4] and suggests that an intervention to help students manage low mood could reduce this educational disadvantage.

In many Arab countries, established mental health resources are limited, and negative beliefs about mental health care can act as a barrier to engaging in help-seeking behaviour [5]. Therefore, online therapeutic interventions offer considerable advantages in terms of student access and privacy. Existing research suggests that technology-based interventions could fill the gap between the need for and access to mental health services among university students [6]. There is a growing need to create supportive environments for students who may experience emotional difficulties during university life [7]. 'Internet-delivered technology' in counselling refers to psychological online interventions provided by utilising various multimedia formats and interactive features to engage users and promote intervention effectiveness [8]. Benefits of internet-delivered interventions include customisation to student needs, anonymous access, and a more comfortable private setting in which to access sensitive information [6]. Recently, these advantages have led to increased focus on the use of online interventions, resulting in several studies that examined such programs. [9].

It is known that online interventions can effectively improve university students' mental health [10, 11]; however, their impact on educational attainment has yet to be fully explored. In 2020, Bolinski and colleagues [12] conducted a systematic review to evaluate the impact of online mental health interventions on academic performance. Meta-analysis of the six RCT studies to include academic performance as an outcome showed beneficial effects for depression but revealed only a small nonsignificant effect for academic achievement. None of the six studies to address mental health and academic performance targeted students who had symptoms of depression and struggled academically at baseline.

Cognitive behavioural therapy (CBT) is a collaborative therapy that focuses on how a person's thoughts, beliefs, and attitudes affect their emotions and behaviours [13]. CBT is recommended as a treatment for mild to moderate depression and has been shown to be effective [14]; however, limited access—particularly in middle- and low-income countries—and stigma associated with poor mental health, may Page 3/20

hinder access to physical treatment resources [15]. Thus, cost-effective and widely accessible alternatives to in-person treatment are required. Adolescents use technology at high rates [16], yet innovative methods of online treatment have not fully exploited students' expertise. For example, despite evidence confirming the effectiveness of computerised CBT for reducing depressive and anxiety symptoms, to our knowledge, no study has evaluated a CBT-based online intervention targeting students with depressive symptoms who are also struggling academically.

MoodGYM (https://moodgym.anu.edu.au/welcome/faq) is an online CBT-based program designed to prevent symptoms of emotional distress and various mental health disorders in adolescents, which has shown promise in Australian studies [17]. MoodGYM comprises five modules consisting of written information, animations, interactive exercises, and quizzes designed to teach skills known to prevent depression and anxiety among young people [18, 19].

Research has investigated the effects MoodGYM across a variety of settings and using different study designs. Twomey and O'Reilly [20] conducted a systematic review of 11 studies to evaluate the effectiveness of MoodGYM in reducing depressive symptoms and general psychological distress in adults. They found that studies with no treatment controls, face-to-face guidance, and high adherence to MoodGYM modules revealed a more positive effect on symptoms of depression and other psychological stress. Furthermore, a stronger effect was found in studies conducted in Australia compared with Europe. The study concluded that MoodGYM could provide primary support to participants with mental health issues, considering that adherence rates and cross-cultural factors may affect the influence of CBT webbased programs.

There is some evidence that MoodGYM may be more effective where the intervention is targeted, Christensen and colleagues [21] found that in people with baseline levels of anxiety and depression who accessed MoodGYM, their symptoms significantly decreased after completing the program. Canadian university students at risk of depression randomised to MoodGYM showed greater reduction in depressive symptoms and were significantly less likely to be diagnosed with a major depressive disorder at 4-month follow-up compared to attentional control [22].

This study aims to evaluate the feasibility, acceptability and effectiveness of targeting MoodGYM at academically struggling Emirati students with symptoms of depression.

# Objectives

The objectives of the present study were as follows:

- To explore the acceptability and feasibility of using MoodGYM to improve academic achievement in university students with symptoms of low mood and poor academic performance in the UAE.
- To investigate the potential effectiveness of a self-directed, internet-delivered cognitive-behavioural skills therapy (MoodGYM) in improving academic performance (GPA) and mood in university students in the UAE with poor academic performance.

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 To investigate the relationship between Moodgym uptake and improvement in GPA at postintervention.

# Methods

# Design

This study used a pre-post pilot design with an historical control group to evaluate changes in GPA. Data were collected via online surveys administered at baseline and follow-up two months after using MoodGYM.

## Participants and recruitment

Participants were undergraduate students at a public university in the UAE, aged 18 and over. Students were selected from two campuses (Dubai and Abu-Dhabi), and recruited through their academic advisors. The target recruitment was 50 participants.

The target sample size was 50 male and female undergraduate students who met the following inclusion criteria:

- · Undergraduate students in their second, third, or fourth year of study at one university in the UAE
- Scheduled to attend an academic advisory seminar to address poor academic performance (GPA less than 2.0)
- · Aged 18 years or over
- Self-identified as having at least one of two key symptoms of low mood,[23]

## Historical control group

Students from a previous longitudinal cohort study of UAE university students [3] were selected as the comparison group, if they had a GPA < 2.0 at baseline and a GPA score reported at two-month follow-up. The control group students (n = 19) had similar GPAs, attendance warnings, and demographic characteristics at baseline as the intervention group (n = 44). This group (no intervention) was used as a comparison group to evaluate the academic improvement in the intervention group.

# Power calculation

With a historic control group of n=19 and assuming a 70% response rate at follow-up in the intervention group (35/50), it was estimated that the study would have 90% power to detect 1 SD difference (d=1) in GPA between groups at follow-up with a probability of a type 1 error < 0.05 [24].

# Ethical approval

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Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Subcommittee (reference number: 0397) and the Research Ethics Committee at Zayed University (ref ZU19\_46\_F). Participation was voluntary. Students provided the written consent online to participate in the two anonymous online surveys, which were linked by self-generated identifiers.

### Measures

# Mental health

The Hospital Anxiety and Depression Scale (HADS) is a self-assessment tool developed to detect states of depression and anxiety in non-psychiatric settings [25]. The HADS consists of 14 items, with 7 assessing anxiety (HADS-A) and 7 assessing depression (HADS-D). For both subscales, scores of  $\leq$ 7 indicate non-cases, while scores of 8–10, 11–14, and 15–21 indicate mild, moderate, and severe depression and anxiety respectively [26]. Cronbach's alpha ranged from 0.68 to 0.93 (mean = 0.83) for the HADS-A and from 0.67 to 0.90 (mean = 0.82) for the HADS-D; [27]. The optimal cut off for anxiety caseness is HADS-A  $\geq$ 8 (sensitivity 0.89, specificity 0.78) and for depression caseness HADS-D  $\geq$ 8 (sensitivity 0.83 and specificity 0.79 [27]. The HADS has been validated in many languages, countries, and settings, including with university students [28]. An Arabic version of the HADS has been validated in Saudi Arabia [29], Kuwait [30], and the UAE [31] in primary-care settings and, recently, in hospitalised patients [32]. Since UAE students study in English, the English language version was used in the present study.

# Academic performance

Participants reported their most recent GPA and the number of academic warnings about poor attendance they had received during the last semester. Possible GPA scores range from 0–4, with higher scores indicating better academic performance. In the present study, a GPA below 2.0 was considered a sign of academic difficulties.

## Intervention

MoodGYM is an internet-based CBT program to prevent depression and teach coping skills and can be provided with or without clinician guidance, it was developed by by researchers at the Australian National University in 2013 (www.moodgym.anu.edu.au). In this study MoodGYM was entirely self-directed. The program teaches key components of CBT for depression in five modules: *Feelings, Thoughts, Unwrapping, De-stressing,* and *Relationships* as shown in (Table 1) . Each module contains exercises to be completed during the module, homework to be completed during the week, and a workbook to record progress throughout the program. The modules are designed to be completed in order, with each module estimated to take 30–45 minutes to complete, with 28 exercises and 13 quizzes in total across all modules [33].

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### Table 1. Modules of MoodGYM (www.ehubhealth.com)

Modules	Descriptions
Feelings	The <i>Feelings</i> module focuses on the basic tenets of CBT by highlighting connections between events, thoughts, feelings, and behaviours. Those who will be using the program will be introduced to six characters that have unique thought patterns and feelings, some adaptive and some maladaptive.
Thoughts	The second module's basis is <i>Thoughts,</i> teaching users how to challenge what the program identifies as their 'warped thoughts', by exploring the reasons behind their thinking.
Unwarping	The third module is <i>Unwarping</i> . It has a total of ten exercises, which is the most any module contains. These exercises aim to attack distorted thinking and build self-esteem. One part of this module offers techniques on how to address the areas of the vulnerability identified by the Warpy Thoughts Quiz.
Distressing	The fourth module is <i>Distressing</i> , which centres around recognizing the different sources of stress and learning how to deal with them. An exercise known as 'Life Whacks' consists of major stressful events, such as losing someone who is important or having a conflict with parents. This module also focuses on relaxation programs.
Relationships	The fifth module, <i>Relationships</i> , focuses on emotional and behavioural reactions to relationship breakups and offers more ways to argue against related distorted thoughts.

### Procedure

Academic advisors sent invitation emails and participant information sheets explaining the study to all students scheduled to attend a seminar to address their poor academic performance in the previous semester (GPA < 2.0). Students who self-reported in the previous two weeks that they had felt that down, depressed, or hopeless, or had had little interest or pleasure in doing things, were invited to take part in the study by emailing the researcher. The academic advisor reminded students about the study invitation during the scheduled remedial class. All participants who contacted the researcher within the study timeframe (September 2019) were sent a link to the baseline survey. All parts of this study were conducted online, and data at baseline and eight-week follow-up were collected via anonymous surveys hosted by JISC Online Surveys. Students were able to re-read the participant information sheet before completing the online consent form. Participants were asked to create their own unique study ID code by providing their birthday and the last three digits of their mobile phone number. This personal ID was used to link baseline and follow-up data. Participants then completed the baseline survey, which included demographics, GPA, number of attendance warnings in the previous semester, previous help-seeking for mental health problems, and the HADS. At the end of the survey, students were thanked for their time and asked to click on a second survey link, which allowed them to enter their email address in order to receive a link and user code for MoodGYM. They were also provided with information regarding the University Counselling Centre if they felt they needed any further support. For those who provided their emails, the researcher sent them an email with instructions and user code for accessing MoodGYM. All participants

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were emailed a reminder about using MoodGYM four weeks after entering the study. Eight weeks after the baseline survey, they were emailed a link to the follow-up survey, which collected data on their GPA, number of attendance warnings in the current semester and the HADS. The follow-up survey also included text boxes to allow participants to comment on the positive and negative aspects of MoodGYM. A reminder email was sent to all participants two weeks after the follow-up survey email.

### Data analysis

Data from the baseline and follow-up surveys were imported into SPSS (version 26). After cleaning and checking the data, HADS and GPA scores were compared pre- and post-intervention, using appropriate paired statistics. Univariate correlations and regression analysis were also used to explore the relationship between self-reported MoodGYM use and changes in GPA. A repeated-measures ANOVA with group (historic control/ intervention) as the independent factor, time of testing as the within-subjects factor and GPA score as the dependent variable was conducted to look for group by time interactions in GPA score. Descriptive statistics were used to explore the acceptability and usability of MoodGYM. Content analysis was used to classify and group the participants' responses to the open-ended question for evaluating MoodGYM.

# Results

Fifty consecutive respondents (36 female and 14 male) completed the baseline survey and received access to the MoodGYM program. Of the 50 students, 47 accessed the program, and 44 completed the post-intervention survey and formed the study sample (88.0% follow-up). Mean participant age was 20.7 years (SD=1.55; range 18–24) and the majority were female (72%) (Table 2). At baseline, there were no detectable differences in demographic characteristics or baseline GPA, depressive symptoms or number of attendance warnings between responders at follow-up (Intervention group, n=44) and non-responders at follow-up (n = 6) or between the intervention group responders at follow-up and the historic control group (n = 19) (all p=>0.05). However, non-responders were substantially and significantly more anxious at baseline than responders (M = 11.00, SD = 3.63, n = 6, vs. M = 7.61, SD = 2.57, n = 44 p = 0.006, d = 1.2). There was no difference in baseline anxiety between the Intervention group and historic control.

Table 2. Demographic characteristics of the sample and comparison groups at baseline.

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Variables	Intervention group	Non-responders	Historic control group
	(n=44)	(n=6)	(n=19)
Gender			
Male	13 (29.5%)	1 (16.7%)	6 (31.6%)
Female	31 (70.5%)	5 (83.3%)	13 (68.4%)
Age			
18-20	19 (43.2%)	4 (66.6%)	8 (42.1%)
21-24	23 (52.3%)	2 (33.3%)	11 (57.9%)
Mean age (SD)	20.7 (1.46)	20.4 (1.95)	20.00 (1.84)
Marital status			
Married	4 (9.1%)	2 (33.3%)	2 (10.5%)
Single	40 (90.9%)	4 (66.6%)	17 (89.5%)
Year of study			
2 <sup>nd</sup> year	24 (54.5%)	4 (66.6%)	12 (63.2%)
3 <sup>rd</sup> year	18 (40.9%)	2 (33.3%)	6 (31.6%)
4 <sup>rd</sup> year	2 (4.5%)	0	1 (5.3%)
Department of study			
Business	22 (50.0%)	2 (33.3%)	7 (36.9%)
Humanities & Social Sciences	2 (4.5%)	0	2 (10.5%)
Technological Innovation	6 (13.6%)	0	3 (15.8%)
Communication & Medical Sciences	8 (18.2%)	2 (33.3%)	4 (21.0%)
Natural Health Sciences	6 (13.6%)	2 (33.3%)	3 (15.8%)

# Help seeking

Prior to using MoodGYM, nearly half of the students reported seeking help for their mental health from their friends (n= 19, 43.2%) and a quarter of them had sought help from internet sources (n=11, 25.0%), Two participants (4.5%) sought help from family, four (9.1%) had sought help from their university tutor and only three (6.8%) had sought help from university counselling services. Five students (11.4%) had not sought any help for their mental health.

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### Depression and anxiety before and after MoodGYM

A paired-samples t-test found a significant reduction in HADS-D scores post-intervention compared to baseline (t(43) = 3.07, p = 0.004, d=0.5), indicating a significant reduction in depressive symptoms (Table 3). The proportion of participants scoring above the cut-off for depression caseness from 77.2% to 27.3% (n=34 to n = 12; McNemar = p < 0.001). There was also a decrease in HADS-A scores post-intervention (t (43) = 5.67,  $p \le .001$ , d = 1.1), indicating a considerable reduction in anxiety symptoms. The proportion of students scoring above the cut-off for anxiety caseness fell from 50% to 11.4% (n= 22 to n = 5; McNemar = p < 0.001).

	Pre-intervention	Post-intervention
	(n=44)	(n=44)
HADS-D Group	10 (22.7%)	32 (72.7%) ***
Normal		
Borderline	30 (68.2%)	5 (11.4%)
Clinical	4 (9.1.%)	7 (15.9%)
HADS-D	8.32 (1.72)	6.64 (3.72)
Mean (SD)		
HADS-A group		
Normal	22 (50.0%)	39 (88.6%) ***
Borderline	18 (40.9%)	2 (4.6%)
Clinical	4 (9.1%)	3 (6.8%)
HADS-A	7.61 (2.57	4.77 (2.67)
Mean (SD		

Table 3. Participants' depression and anxiety levels before and after MoodGYM

Note: \*p ≤ 0.05, \*\*p ≤ 0.01, \*\*\* p ≤ 0.001

# Academic performance before and after MoodGYM

Student GPA at pre-intervention ranged from 0.33-1.90, with a mean of 1.55 (SD = 0.32). There was a significant increase in GPA at post-intervention (t(43) = -9.26,  $p \le 001 d = 1.3$ ), reflecting substantial improvement in academic performance after using MoodGYM (Table 4). At pre-intervention, all students in the intervention group had a GPA below 2.0 indicating academic weakness. After using MoodGYM, 19 (43.2%) students had a GPA of 2.0 or above, thereby moving out of the academic warning zone.

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Half the sample had received at least one attendance warning (n = 22, 50.0%) during the pre-intervention period; however, the number of participants who received attendance warnings decreased by nearly half after using MoodGYM (8 week intervention) (n = 11, 22.0%), with a significant reduction in the number of attendance warnings between pre- and post-intervention (Z = -2.66, p = 0.008, d = 0.6) (Table 4).

Table 4. Academic outcomes pre- and post-intervention and in historic control group.

Intervention group (n=44)			Historic (n=19)	Historic control (n=19)	
	Baseline	Follow-up	Baseline	Follow-up	
Mean GPA (SD)	1.54 (0.33)	1.99 (0.33) **	1.56 (0.39)	1.75 (0.51)	
Mean number of attendance warnings (SD)	1.05 (0.75)	0.61 (0.78) **	1.17 (1.09)	1.21 (1.08)	

Note: \*p ≤ 0.05, \*\*p ≤ 0.01

# Academic performance outcomes compared to historic control

At baseline, the intervention group (n = 44) and the comparison group (n = 19) had similar GPAs and number of attendance warnings. A repeated-measures ANOVA with group (intervention/historic control) as the between-subjects factor and time found a significant time by group interaction (F = 5.96, df = 1.61, p = 0.018). At follow-up, the intervention group had significantly higher GPAs compared to historic control (t(61) = 2.22, p = 0.030 d = 0.6) and fewer attendance warnings (Z = -2.10, p = 0.036 d = 0.7) (Table 4).

# Completed MoodGYM modules and outcome improvements

All students in the Intervention group reported completing at least two modules, with nearly half of them reporting completing all five modules (mean completed = 3.75, SD = 1.52, n = 44). Almost all participants completed the *Feelings* module (n = 42, 95.5%), followed by *Thoughts* (36, 81.8%), *Unwrapping* (34, 77.3%), *De-stressing* (29, 65.0%), and *Relationships* (24, 54.0%). There was a significant positive correlation between GPA improvement and the number of modules completed ( $r_s = 0.388$ , n = 44, p = 0.009). Completing more modules was also associated with a greater reduction in anxiety scores ( $r_s = 0.348$ , n = 44, p = 0.020); however, no relationship was found between changes in depression scores and number of completed modules.

Regression analysis (entry method) with the difference between pre and post-intervention GPAs as the dependent variable (higher scores indicating greater GPA improvement), and baseline anxiety scores, baseline depression scores, completed MoodGYM modules, and improved attendance as the independent variables, found that greater improvement in GPA was associated with a higher number of completed

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MoodGYM modules ( $\beta$  = .392, *p* = 0.005) and improved attendance ( $\beta$  = .388, *p* = 0.007; total adjusted *r*<sup>2</sup> = 0.35) (Table 5).

Predictors	Post-intervention GPA			
	В	SE B	В	Т
Depression scores (pre-intervention)	.024	.028	.125	.837
Anxiety scores (pre-intervention)	022	.018	171	-1.194
Total number of modules completed.				
	.083	.028	.392	2.985
Improved attendance	.126	.044	.388	2.857

**Table 5**. Regression analysis for depression, anxiety, completed MoodGYM modules, attendance, and
 GPA pre- and post-intervention

Dependent Variable: Semester GPA (Post-intervention - Pre-intervention)

Note: \*p = < 0.05, \*\*p = < 0.01.

# **Evaluation of MoodGYM**

The time period over which the participants used MoodGYM ranged from 2 weeks to 8 weeks; however, the highest proportion of students used the program for more than 4 weeks (n = 16, 36.4%) (Table 6).

Table 6. Number of weeks students spent completing MoodGYM modules

Number of weeks	Number of students (%	
Two weeks	4 (9.0%)	
Three weeks	5 (11.4%)	
Four weeks	9 (20.5%)	
Five to eight weeks	16 (36.4%)	
Not sure about time spent	10 (22.7%)	

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Participant ratings of MoodGYM were generally either overwhelmingly positive or neutral. Most students (n = 31, 70.5%) rated MoodGYM as good or very good, and 35 (79.6%) found it very or slightly helpful. More than half (n = 26, 59.1%) found MoodGYM easy or very easy to use, and 33 (75.0%) stated they would recommend it to a friend or family member.

Students were asked through an open-ended question to summarise how MoodGYM was helpful to them, and 70.5% (n=31) responded. Content analysis found that 20 (45.5%)

students reported that MoodGYM was helpful in reducing anxiety and depressive symptoms by teaching them different coping skills and strategies to address their negative thoughts. From the 20 students; four mentioned that the program helped them reflect on themselves more by completing different exercises and conducting self-assessments at the end of each module; five students stated that MoodGYM increased their knowledge about mental health; one student specifically suggested that it was a very good tool to deal with self-criticism and ten students mentioned that MoodGYM helped them acquire new self-help techniques and strategies to deal with their negative thoughts and change their daily routines by implementing some of the exercises. For example, one student stated *'MoodGYM helped me to deal with my worrying thoughts and to understand why I get them very often'*.

Eight (18.2%) students found MoodGYM helpful, but felt the modules were too long and time-consuming and two students (4.6%) felt that MoodGYM was unhelpful, due to its lack of clarity and complexity. For example, one student was not able to understand the purpose of some assessments, stating, 'In all, I don't think it was clear enough'.

# Discussion

In the present study, students with poor academic achievement who self-reported symptoms of low mood demonstrated significant and substantial improvements in GPA (d=1.3) and attendance (d=0.6) after using an online CBT-based intervention (MoodGYM). Comparison with a previous cohort of students with low GPAs found a significant time by group interaction, with the MoodGYM group having very similar GPA scores to the historic control group at baseline, but significantly higher GPA scores at the equivalent follow-up point. Attendance also improved compared to control. Level of MoodGYM usage and improved attendance independently predicted improvement in GPA. MoodGYM was also associated with significant reductions in depressive and anxiety symptoms and there were substantial reductions in the proportion of students scoring above the cut-off for anxiety and depression caseness. MoodGYM was generally positively evaluated by students, and most participants suggested they would recommend the program to friends or family members.

Although this study lacked a control group for the substantial improvement in depressive and anxiety symptoms, the findings are in line with previous research using MoodGYM with student populations. A study of female secondary school students (n = 157) used MoodGYM in comparison with the school's standard development activities. The results suggested that MoodGYM was associated with a significantly decreased rate of self-reported depressive symptoms, compared to the usual curriculum, and Page 13/20

the effect of MoodGYM was more significant at after 20 weeks [34]. A recent study exploring the prevention and treatment of major depressive disorder among high-risk first- and second-year university students [35] compared MoodGYM with two other internet-based preventative programs: attentional bias modification and an active attentional control condition. Depressive symptoms were assessed at three points: baseline, post-intervention, and 4-month follow-up using the Depression Anxiety and Stress Scale 21 (DASS-21) depression scale and the Beck Depression Inventory II (BDI-II). The results indicated that MoodGYM was a more effective intervention at both the diagnostic and symptom levels than the other two interventions, with effect sizes for change in BDI-II and DASS-21 depression scale of d = 0.40 and 0.51, respectively, at four-month follow-up. These were similar to the effect size (d = 0.5) for change in HADS-D observed in the current study at eight weeks post-intervention. Conversely, Twomey and colleagues [36] found no significant improvements in anxiety or depressive symptoms in a clinical sample group with reported mental health issues using MoodGYM compared to a waitlist control group, despite showing some decrease in general psychological distress. However, the mean age of 35 in the intervention group was substantially older than the present sample and the follow-up rate was only 18%.

In the present sample, 70.5% (*n* = 31) considered MoodGYM to be an effective program for reducing depressive and anxiety symptoms and felt it enhanced their knowledge of mental health. This is consistent with a study by Farrer and colleagues [19], which suggested that CBT interventions can effectively reduce depressive symptoms and promote knowledge about effective strategies for dealing with depression and self-management. Lintvedt and colleagues [37] reported that an unguided intervention (MoodGYM) effectively improved depressive symptoms and negative automatic thoughts in a university population. The study had a high dropout rate (62% of the participants responded post-intervention). Linvedt and colleagues (37) in their study with University student experiencing depressive symptoms also found that participants who used MoodGYM were very satisfied, and 90% stated that they would recommend the program to others.

The results of the present study sample suggested a significant improvement in academic performance and a significant reduction in attendance warnings after using MoodGYM. To our knowledge, this is the first study to explore the potential of a CBT-based online intervention to improve academic outcomes. However, previous studies that used different online interventions reported some improvements in academic achievement. For example, a recent study by Viskovich and Pakenham [38] that explored the effectiveness of web-based Acceptance and Commitment Therapy (ACT) in promoting mental health in university students reported pre- to post-intervention improvements for the study's primary outcomes including academic performance—and these improvements were maintained throughout the follow-up period. The study used a four-week web-based ACT mental health promotion intervention called 'YOLO'. Academic performance was measured using a brief, 12-item self-report scale measuring facets of academic performance, including study habits, study motivation, and overall grades. It was not known which items contributed to the score, as the study used a factor analysis method; however, results indicated that the intervention improved participants' perceived performance, although objective performance was not assessed.

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In the present sample, the comparison group (n = 19) was from a recent cohort study conducted by Awadalla and colleagues [3], to explore the effects of depression and anxiety on academic performance among university students. Essentially, the historic control group was from the same sample population of the current study (i.e. same university and very similar sample characteristics). Like the intervention group the students in this group had GPAs below 2.0 at recruitment and were considered in the academic warning (failing) category. In comparison with the intervention group (n = 44), they had similar GPAs and attendance warnings at baseline; however, the comparison group (no-intervention) had significantly lower GPAs and more attendance warning at follow-up, demonstrating that the intervention group had better academic outcomes over a similar period.

There are many societal, attitudinal, and cultural reasons why university students with emotional difficulties may not seek professional help [39]. The present study findings show a gap in the proportion of students experiencing emotional difficulties and those who had sought professional help. For example, although 77% scored above the cut-off for depression caseness and nearly half of the intervention group had sought help from their friends, only three students had sought professional help. MoodGYM appears to offer an effective and acceptable method of increasing access to evidence based therapies.

In this study, out of the 47 students who accessed MoodGYM, half completed the all five modules. The results indicated that the students who completed more MoodGYM modules performed better academically than those who completed fewer modules. The findings support the importance of the dose of the intervention; however, the bias of self-report measures and the need to assess the fidelity of MoodGYM use should also be considered These findings are consistent with those of Calear and colleagues [40], who investigated the effects of adolescent adherence to MoodGYM in schools. They reported that participants who maintained high adherence to the intervention reported more substantial intervention effects six months post-intervention, compared with participants with low adherence.

In the current study more than half (59.1%) of the students found MoodGYM easy to use, and threequarters of the students would recommend it to a family member or friend. This is in line with another study that evaluated MoodGYM in primary care patients with mild to moderate depression. The study reported that MoodGYM was rated positively by more than half of the participants and suggested that low non-adherence rates was a sign of positive evaluation indicating the intervention's acceptability [41]. The study concluded that significant improvements were found at two-month follow-up, and the level of satisfaction among the participants was high, as 90% reported they would recommend MoodGYM to others.

Even though most of the students in the present study found MoodGYM to be helpful and easy to access, some found the modules to be very long and time-consuming. These students may require additional therapist support. A systematic review by Knowles and colleagues [42] investigated qualitative studies exploring user experience with web-based therapies for anxiety and depression. The review included eight studies, of which six used CBT treatment, and the findings highlighted that web-based CBT interventions have shown more concern regarding improving access to therapy than on patient experience. The review

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suggested that considering the sensitivity and personalising the program's content to be more relevant to users could increase engagement and adherence. Furthermore, Neil and colleagues [43] proposed that internet-based interventions should precisely record user activity to accurately measure adherence. Estimating the time spent on modules is significant, in light of the fact that a user could also spend considerable time reading the modules but not complete the exercises, and yet still display some benefits from the program.

#### Strengths and limitations

This appears to be the first study to evaluate an online CBT-based intervention to support students with low mood and academic difficulties in the UAE. The study used a pre- and post-intervention design, which can be a valuable for providing preliminary evidence for intervention effectiveness. The fact that 88% of the students responded to the post-intervention survey supports the credibility of the study and its subsequent results. Furthermore, the scale used in this study for anxiety and depression (HADS) has been validated and shows good sensitivity and specificity. The HADS questionnaire has been validated in many languages, countries, and settings, including in the UAE [34]. Another strength of this study was the use of a historical control group for GPAs, recruited from the same university and showing data at the same timepoints during the previous year. The results of this pilot study constitute an important step towards further longitudinal studies to explore the effectiveness of online interventions in supporting academic progress for university students with mental health issues.

Some limitations of this study should be noted. Due to the small sample size and short follow-up period, the results reflect only a short 'window of time', and within a limited university population. Thus, with more students and an extended follow-up period, the results could be more accurate and less biased, thereby more reliably estimating the intervention's benefits. Other limitations are that this study was not a randomised trial, had no control group for depressive and anxiety symptoms and used self-reported GPAs. Finally, limited qualitative data to support the quantitative findings, and the bias related to being in a study and the expectation to complete the survey, can produce inauthentic answers.

# Conclusions

Results indicate that MoodGYM seems to be a convenient, acceptable and effective therapeutic intervention when targeted at academically struggling students with low mood. The observed improvements in mood, GPA and attendance suggest that MoodGYM may be a cost-effective way to overcome barriers to mental health support for academically struggling students. However, more research is needed to explore whether improvements are sustained and how MoodGYM can be best implemented within the curriculum.

# Abbreviations

ACT Acceptance and Commitment Therapy

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CBT Cognitive Behavioural Therapy GPA Grade Point Average HADS Hospital Anxiety and Depression Scale DASS-21 Depression Anxiety and Stress Scale 21 BDHI Beck Depression Inventory II ANOVA Analysis of Variance UAE United Arab Emirates

# Declarations

#### Ethics approval and consent to participate

Ethical approval was obtained from the Division of Psychiatry and Applied Psychology Ethics Subcommittee (reference number: 0397) and the Research Ethics Committee at Zayed University (ref ZU19\_46\_F). Participation was voluntary. Students provided the written consent online to participate in the two anonymous online surveys, which were linked by self-generated identifiers.

#### Consent for publication

Not applicable

#### Availability of data and materials

The datasets generated during and/or analysed during the current study are not publicly available [PhD study under progress] but are available from the corresponding author on reasonable request.

## **Competing interests**

The authors declare they have no competing interests.

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#### Authors' contributions

SA, CG and EBD designed the study protocol and surveys. SA analysed the data under CG's supervision. SA prepared the first draft of the paper and CG and EBD reviewed subsequent drafts. All authors read and approved the final manuscript.

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# Appendix 3. Study one under review for publishing in ACH 2021

1	Title page
2	The impact of depressive and anxiety symptoms on academic achievement among
3	undergraduate university students: A systematic review
4	
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# 28 The impact of depressive and anxiety symptoms on academic achievement among

- 29 undergraduate university students: A systematic review
- 30

# 31 Abstract

32	Objective: This systematic review explores the relationship between
33	depression, anxiety, and academic performance among undergraduate university
34	students.
35	Methods: Peer-reviewed articles published between 1997 and June 2020 were
36	included if they: (a) were in English; (b) had a study population that was
37	exclusively undergraduate students; (c) the study assessed depression and/or
38	anxiety through standardized, validated measures; and (d) included an objective
39	outcome measure of academic performance.
40	Results: Of 2,746 citations, 10 met the eligibility criteria, representing 14,695
41	participants. All six cross-sectional analyses and three of four longitudinal
42	studies reported a negative relationship between depression and academic
43	performance. Three cross-sectional analyses and one longitudinal study reported
44	a negative relationship between anxiety and academic performance. This review
45	supports a consistent relationship between depression and academic
46	performance, but less support for anxiety
47	Conclusion: Depressive and anxiety symptoms have a significant impact on
48	university students' academic performance.
49	Keywords: depression; anxiety; academic performance; university students
50	
51	

#### 52 Introduction

#### 53 Prevalence of depression and anxiety among university students

54 Depression and anxiety disorders are two of the most prevalent mental health 55 disorders among university students.<sup>1</sup> A previous study suggested that university students have higher prevalence rates of mental health problems, including depression and anxiety 56 57 than the general population.<sup>2</sup> In recent years, depression and anxiety have been reported in 58 university students at alarming levels. For example, a recent, representative, cross-sectional 59 survey of first-year students residing in dormitories at a Bangladesh University reported that 60 more than two-thirds of students experienced moderate to severe depression (69.5%) and 61 anxiety (61.0%).3 62 As noted in the latest annual report of the Center for Collegiate Mental Health records, anxiety and depression are the top reasons college students seek counselling 63 64 in the USA. The report suggests that anxiety and depression continue to be the most common 65 problems presenting in mental healthcare<sup>4</sup>, with a reported prevalence rate of 62.7% for anxiety, followed by depression at 49.3% of 82,685 students who completed the Counseling 66 67 Center Assessment of Psychological Symptoms.4 Similarly, in the UK, it was estimated that 68 one in six university students experience a common mental health condition, such as 69 depression or anxiety.5 Both are associated with a decreased quality of life, impairment of cognitive and social skills, and are a dominant cause of disability.1 70 71 The cost of affective mood disorders can be particularly high in young people. They 72 are in a transitional period between adolescence and early adulthood when they need to make

73 key decisions about their future and take more responsibility for their lives and achievements.

74 Hence, this can be perceived as one of the most stressful times in a person's life.<sup>6</sup>

- 75 Additionally, university students face many new experiences (e.g., changes in the learning
- 76 environment and making new friendships) and associated behavioral, emotional, academic,

and socioeconomic changes.<sup>7</sup> For example, university academic courses require greater selfdirected learning, with demands to obtain high-class grades that put the students under great
pressure to adapt to a new environment and to new modes of learning. Therefore, failing to
make this transition effectively has the potential to affect the mental health and social
wellbeing of this group.<sup>8</sup>

#### 82 Depression, anxiety and academic performance

83 Depression is a mood disorder characterized by a composite of physical, emotional, 84 psychomotor, and cognitive impairments that display various symptoms, including sleep 85 disturbance, poor concentration, negative thoughts, and feelings of guilt. Students with high 86 levels of depression might struggle to perform well academically because they do not have 87 interest and motivation.9 They may lack confidence, not reach the required standard of 88 performance, discern things negatively and consider themselves inefficient. Thus, their academic and social life is bound to be affected and result in poor grades, low achievement, 89 90 and absence from college or university.10 A recent study among graduate and undergraduate 91 students in Jordan reported that students with persistently high levels of anxiety and 92 depressive symptoms are more likely to exhibit lower academic achievement and a higher 93 absenteeism rate than those experiencing normal and moderate levels of anxiety and depression.<sup>11</sup> The same study's findings reflect that depression is highly correlated with 94 95 students' academic success and classes attendance. Furthermore, a study by Deroma et al12 reported that university students experiencing a moderate level of depressive symptomology 96 97 perform worse, academically, than those with symptoms that are milder or normal. 98 Anxiety symptoms reflect an emotional and physical condition distinguished by 99 intellectual, somatic, emotional, and behavioral elements that create a distasteful feeling that is usually associated with uneasiness, fear, and worries.<sup>13</sup> High levels of anxiety impact an 100 101 individual's attention and memory, which may result in hyper-vigilance and impairments in

reasoning and judgment, leading to the impairment of cognitive functioning and academic
 performance.<sup>14</sup>

104 A survey from the American College Health Association (ACHA 2018/19) suggested 105 that about 60% of the students in the USA felt "overwhelming" anxiety. However, little is 106 known about any association between high levels of anxiety symptoms and academic 107 achievement at universities. A cross-sectional study among high school students found a 108 negative relationship between anxiety symptoms and poor academic performance.15 109 Furthermore, a study conducted by Vitasari et al<sup>16</sup> among engineering university students 110 found that students who have high levels of anxiety, display low academic performance. In a 111 different context, some studies revealed a positive correlation between low levels of anxiety 112 and better academic performance.<sup>17</sup> Conversely, appropriate degrees of anxiety about the fear of failure could enhance the self-motivation of students to perform better academically.18 113 114 There have been several studies on the prevalence of depression among university 115 students worldwide.<sup>19</sup> However, a minority of studies have explored the impact of depressive 116 symptoms and anxiety on university students' academic performance. Academic performance 117 is affected by a variety of factors such as cognitive function and motivation, as well as prior 118 educational experience. Furthermore, motivation and cognition are both affected by symptoms of depression and anxiety.20 119 120 Given that less is known about emotional difficulties and academic performance, the effect of depression and anxiety is of particular interest in the present undertaking. An in-121 122 depth exploration of the correlation between depression/anxiety and academic achievement 123 could be very beneficial in supporting university students' success. Therefore, further 124 research, specifically longitudinal studies, is needed in this area. Moreover, additional efforts to validate the causal association between depressive and anxiety symptomatology and 125 126 academic challenges are essential.

# 127 Rationale and objectives

128	To the best of our knowledge, no published systematic review has examined the
129	impact of depressive and anxiety symptoms on academic performance in undergraduate
130	university students. Considering this research gap, this review has two main objectives:
131	1. To identify studies reporting the relationship between depression and/or anxiety
132	and academic performance among university students.
133	2. To examine the hypothesis that higher levels of depression and higher levels of
134	anxiety are associated with poorer academic performance among university students.
135	Methods
136	Search methods for identification of studies
137	Electronic searches
138	A systematic literature review of the PsychINFO, PubMed, Embase, Google Scholar,
139	and Medline databases was conducted in June 2020 to identify peer-reviewed studies
140	published between January 1997 and June 2020 on the impact of depressive and/or anxiety
141	symptoms on the academic performance of university students.
142	Searching other resources
143	References within included studies were examined to identify further relevant studies.
144	Eligibility criteria
145	Studies published in peer-reviewed journals were included in the review if they met
146	the following inclusion criteria:
147	1. The sample consisted solely of undergraduate university students in any year of
148	study at higher education institutions (i.e., universities and colleges) in any
149	country. If studies included a mix of university students and another sample (e.g.,
150	adolescents, non-student age-matched peers, postgraduates), they were included if
151	undergraduates had been analyzed and reported separately.

152	2.	The study assessed depression and/or anxiety through standardized validated
153		outcome measures or through clinical diagnosis.
154	3.	The study reported an objective outcome measure of academic performance, such
155		as GPA, degree classification, or examination results.
156	4.	The study reported a statistical estimate of the association between depression
157		and/or anxiety and academic performance.
158	5.	The study was a cross-sectional, longitudinal, or randomized controlled trial of an
159		intervention to reduce depression and/or anxiety that measured academic
160		outcomes. If the study was a randomized control trial, baseline data was
161		considered to explore the effect of depression and anxiety on academic
162		performance.
163	6.	The study was published in English and peer-reviewed journal.
164	The follow	ving studies were excluded:
165	1) A :	study that involved a mixed sample (e.g., undergraduate, and postgraduate students)
166	an	d did not separately report outcomes for undergraduate university students.
167	The study	design was a systematic review, case study, meta-analysis, gray literature,
168	unpublish	ed research, or thesis.
169	Database	search strategy
170	Boolean te	erms and/or combinations of the following keywords were used to search for
171	relevant li	terature: depression, depressive symptoms, major depression, depressive disorder,
172	academic	performance, university students, college students, anxiety symptoms, anxiety
173	disorders,	and academic achievements (Table 1).
174		
175		

Table 1. Search terms used in online databases (except publisher websites and Google Scholiz)

178

Data base	Search strategy
Psych INFO	Exp Major Depression/ Exp Anxiety Disorders/ OR Exp Anxiety/ Depress* OR Anxiety /.ti,ab. Exp Colleges Students/ OR Exp Students/ Undergraduate*.ti,ab/ College OR University) Adj2 Student*.ti,ab. Exp Academic Achievement/ Academic OR Education*) Adj2 (Perform* OR Achiev* OR Function* OR Succes*ti,Ab. Limit TO (English Language AND yr="1997 - 2020")
PubMed	Undergraduate*.ti,ab/ College OR University) Adj2 Student*.ti,ab. Exp Academic Achievement/ Academic OR Education*) Adj2 (Perform* OR Achiev* OR Function* Educational Status/ OR((academic or education*) adj2 (perform* or achiev* OR function* or succes*)).ti,ab. Limit TO (English Language AND yr="1997 - 2020")
Embase	exp MAJOR DEPRESSION/ OR exp ANXIETY DISORDERS/ OR exp ANXIETY/ depress* OR anxiety), ti, ab. OR exp COLLEGE STUDENTS/ or exp STUDENTS OR undergraduate*, ti, ab ((college or university) adj2 student*), ti, ab. OR exp ACADEMIC ACHIEVEMENT/ ((academic or education*) adj2 (perform* OR achiev* OR function* OR succes*)), ti, ab. limit 13 to (english language and yr="1997 - 2020")
Medline	exp Depression/ OR exp Anxiety/ exp Anxiety Disorders/ (depress* or anxiety).ti,ab. exp Students/ undergraduate*.ti,ab. ((college or university) adj2 student*).ti,ab.OR exp Achievement/ OR exp Educational Status/ OR ((academic or education*) adj2 (perform* or achiev* OR function* or succes*)).ti,ab. limit 15 to (english language and yr="1997 - 2020")

179 Google Scholar (reduced search terms were used)

180

#### 181 Data collection and analysis

182 Selection of studies

183 Search results were imported into EndNote X8 and duplicates were removed. Titles

184 and abstracts were screened according to the inclusion criteria of the review. Full texts of the

- 185 remaining articles were obtained and reviewed against the inclusion criteria.
- 186 Findings and recommendations from studies published in the past two decades are
- 187 more relevant and applicable to current university students. Evidently, the higher education
- 188 sector has experienced unparalleled growth over the past 20 years globally with regard to
- 189 students' expectations and perceptions of the quality of their learning experience and

- 190 academic standards.<sup>21</sup> Nevertheless, consideration should be given to the significant changes
- 191 in university life for the new generation of undergraduates over the past two decades in terms
- 192 of technology, economics, and social aspects.<sup>22</sup>
- 193
- 194 Data extraction and management
- 195 Extraction
- 196 A data extraction form was created using Microsoft Excel, to produce a tabulated
- 197 summary of study characteristics such as population, psychological and academic
- 198 performance scales, outcomes, study design and other characteristics that were considered
- 199 important for inclusion.
- 200 Management
- 201 A Microsoft Excel sheet was used as a data entry and management tool to create the
- 202 relevant tables included in the review.
- 203 Analyzing/synthesizing the data
- 204 Meta-analysis was not considered in this review as the data and the objectives of the
- 205 review did not meet the criteria for a meta-analysis design.
- 206 Quality evaluation
- 207 We adapted the quality assessment tool for surveys developed by Parker et al.<sup>23</sup> in
- 208 order to assess risk of bias in the studies included in this systematic review. Articles scored
- 209 one point for each of the following quality markers:
- 210
- 211 1. The target population was defined clearly by describing the inclusion and exclusion
- 212 criteria (i.e., undergraduate university students).
- 213 2. Complete, random, or consecutive recruitment was conducted.

214	3.	The targeted sample is representative, or the report presents evidence that the results
215		can be generalized to the undergraduate population and has a minimum 50% response
216		rate.
217	4.	The scale used is a validated measure of depression or anxiety with valid cut-off
218		values for the classification of depression and anxiety.
219	5.	The sample size was adequate, with a minimum sample size of 300. $^{\rm 24}$ The last quality
220		criterion was added because the larger the sample, the more precise the results. $^{\rm 25}$
221	6.	Missing data are accounted for. For example, reasons for dropout are explained, the
222		impact of missing data on results is discussed, and people lost in the follow-up
223		compared to initial responders is explained.
224	7.	The study accounted for potential confounding variables either by design and/or
225		statistical analysis.
226	A full	description of the quality assessments for the examined studies is provided in Table 2.
227		

Table 2. Quality assessment of the 10 included stades

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SN	Source	Sample definition	Recruitment	Representative sample	Scale	Sample size	Accounts for missing values	Controls for confounding variables	Quality Score
1	Andrews & Wilding 2004	1	0	1	1	1	1	1	6
2	Bahmani et al. 2018	1	1	1	1	1	0	1	6
3	Cheung et al. 2020	1	1	1	1	1	0	0	5
4	Deb et al. 2016	0	0	0	1	1	0	0	2
5	Hysenbegasi et al. 2005	1	0	0	1	1	1	1	5
6	Junaid et al. 2018	1	1	1	1	0	0	1	5
7	Mihailescu et al.2016	1	1	1	1	0	0	1	5
8	Newcomb-Anjo et al. 2016	1	0	1	1	1	1	1	6
9	Sindhu & Basha, 2017	0	1	0	1	0	0	0	2
10	Yeh et al. 2007	1	0	1	1	0	0	0	3

0	- 4	1
1	4	1
-		-

#### 243 Study search and screening

The search yielded 2,746 citations. After examining the titles and abstracts, 112
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- 245 text articles were retrieved and thoroughly examined. Subsequently, 102 articles were
- 246 excluded as a result of the following justifications: studies examining test anxiety and
- 247 motivation (n=14); the study population was non-university students or young adults (n=21);
- 248 studies that reported only the prevalence of depression and anxiety and not academic
- 249 performance, (n=19), studies that did not report any measure of academic performance
- 250 (n=18); studies examining the relationship between academic performance and other
- 251 psychological disorders (n=24); and studies that did not assess depression or anxiety with
- 252 standardized measures (n=6). The remaining articles (n=10) were included and evaluated for
- 253 quality. Figure 1 outlines the search process.
- 254
- 255
- 256
- 257

# Figure 1. Process of identification of eligible studies for inclusion within the review $258\,$



Results The search yielded 2,746 citations. After examining the titles and abstracts, 112 full-text articles were retrieved and thoroughly examined. Ten studies met all inclusion criteria (Figure 1). Nearly half (n=4) was carried out in Western countries: one in the USA,<sup>26</sup> one in Canada,27 one in Romania,28 and one in the United Kingdom.29 Four studies were conducted in East and South Asia: two in India,<sup>30, 31</sup> one in China,<sup>32</sup> and one in Hong Kong.<sup>33</sup> Finally, two were in the Middle East: one in Iran<sup>34</sup> and one in Saudi Arabia<sup>35</sup> (Table 3). 

276 Table 3. Description of the included studies (N=10)

Study	Year	Country	Period of study	Sample size	Scale to measure depression/anxiety	Academic performance measure
Andrews & Wilding	2004	UK	2000-2002	University students	14-HADS	2 <sup>nd</sup> year-exam averages
Bahmani et al.	2018	Iran	NR	Medical students	21-BDI=II	Exam scores
Cheung et al.	2020	Hong Kong	2019–2020	University students	DASS-21	sGPA, cGPA, aGPA
Deb et al.	2016	India	NR	University students	30-USDI	Choice Based Credit System (CBCS)(cGPA)
Hysenbegasi et al.	2005	USA	NR	University students	Clinical diagnosis	GPA
Junaid et al.	2020	KSA	March 2018 to August, 2018	Medical students	21 -BAI-II	cGPA
Mihailescu et al.	2016	Romania	NR	Medical students	ZAS ZDS	GPA Academic Achievements Records
Newcomb-Anjo et al.	2016	Canada	NR	University students	20- CES-D	Grades and academic assignment
Sindhu & Basha	2017	India	NR	University students	BAI- BDI-II	Course marks
Yeh et al.	2007	China	2006-2007	Medical students	20-ZDS 20-ZAS	Achievement Scale marks

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ZDS: Zung Self-Rating Depression Scale, ZAS: Zung Self-Rating Anxiety Scale, BAI: Beck Anxiety Inventory Scale, BDI: Beck Depression Inventory Scale, GHO-12: General Health Questionnaire, HADS: Hospital Anxiety and Depression Scale, USDI: University Students Depression Inventory, DASS: The Depression, Anxiety and Stress Scale, GPA: Grade Point Average, cGPA: Cumulative Grade Point Average, sGPA: Semester Grade Point Average and Choice Based Credit System (CBCS)

Medical students were the sole sample in four studies.<sup>28,32,34,35</sup> Six studies recruited 285 and collected data from students across different faculties.<sup>26,27, 29,30,31, 33,</sup> The majority of 286 studies (n=6) used a random sample, 27,28,30,31,33,34 with three studies using convenience 287 sampling, 26, 29, 32 and one study employing the systematic method for selecting the sample.35 288 The majority adopted a cross-sectional design (n=6), <sup>27, 30,31,33,34,35</sup> with four studies applying 289 a longitudinal design.26,28,29,32 290 291 A range of measures were used to assess depressive and anxiety symptoms in the 292 articles included in this review. The 10 studies used rating scales to identify depression or 293 anxiety and academic scales to measure academic performance (Table 2). Seven different 294 scales were used to measure depression and anxiety in the 10 articles included in the review:

295 the Beck Depression Inventory (BDI) was used in two studies  $(n=2)^{31,34}$  Zung's Anxiety and

296 Depression Scale (ZDS-ZAS) was used in two studies (n=2), 28,32 Center for

297 Epidemiological Studies Depression Scale (CES-D) was used in one study (n=1),<sup>27,</sup> the

298 Depression Anxiety and Stress Scale (DASS-21) was used in one study (n=1).33 Hospital

299 Anxiety and Depression Scale (HADS) was used in one study (n=1)<sup>29</sup> University Students

300 Depression Inventory (USDI) was used in one study (n=1),<sup>30</sup> the Beck Anxiety Inventory

(BAI (Annexure) was used in one study (n=1)<sup>35</sup>and one study had clinically diagnosed
 sample.<sup>26</sup>

303 Seven different measures were used to measure academic performance. Grade point 304 averages (GPAs) were used in three studies (n=3),<sup>26,33,35</sup> followed by the examination marks 305 and the year examination average, which were used in two studies (n=2).<sup>29,34</sup> The Academic 306 Achievements scale was used in two studies (n=2).<sup>31, 32</sup> Academic records and academic 307 project assignments were used in two studies (n=2),<sup>27,28</sup> and one study  $(n=1)^{31}$  used Choice 308 Based Credit System (CBCS) which includes cumulative grade point average (CGPA).

309	In terms of study quality, the actual quality scores for the 10 included studies ranged
310	from 2 to 6 of a possible maximum score of 7 (Table 1). The overall sample size of the
311	current review was n=14,695, ranging from n=20 to n=9,479 participants. <sup>31,33</sup> The mean age
312	of the samples in the ten studies was between 18 and 26 years. <sup>26-30,31-35</sup>
313	Five studies did not report participants' gender. 26,28,31-33 In three studies, females
314	comprised 54%–82% of the sample, $^{27,29,34}$ while males made up 56%–68% of the sample in
315	two studies. $^{30,35}$ The majority of studies (n=8) $^{26\cdot32,34}$ reported no significant gender
316	differences in rates of anxiety and depression ; one study reported that anxiety rates were
317	higher among female students,35 and another study reported that male students screened for
318	greater elevated depressive symptoms than females. <sup>33</sup> Half of the included studies (n=5)
319	assessed both anxiety and depression (n=5); $^{28,\ 29,\ 31-33}$ Four studies looked at depression only
320	(n=4), <sup>26,27,30,34</sup> and one study investigated anxiety only. <sup>35</sup>
321	
321 322	Cross-sectional and longitudinal relationships between depression and academic
<ul><li>321</li><li>322</li><li>323</li></ul>	Cross-sectional and longitudinal relationships between depression and academic performance
<ul><li>321</li><li>322</li><li>323</li><li>324</li></ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression
<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and
<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> <li>326</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer
<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> <li>326</li> <li>327</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer performance. <sup>27,30-34,</sup> One of the six studies did not find a significant cross-sectional
<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> <li>326</li> <li>327</li> <li>328</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer performance. <sup>27,30-34,</sup> One of the six studies did not find a significant cross-sectional correlation between depression and academic performance. However, dividing students into
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<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> <li>326</li> <li>327</li> <li>328</li> <li>329</li> <li>330</li> <li>331</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Monog the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer performance. $^{27,30.34}$ , One of the six studies did not find a significant cross-sectional correlation between depression and academic performance. However, dividing students into high, medium and low groups for depression revealed a significant effect of group (p<0.05), with students in the low depression group at time one having higher academic scores in block one. <sup>32</sup>
<ul> <li>321</li> <li>322</li> <li>323</li> <li>324</li> <li>325</li> <li>326</li> <li>327</li> <li>328</li> <li>329</li> <li>330</li> <li>331</li> <li>332</li> </ul>	Cross-sectional and longitudinal relationships between depression and academic performance Among the six studies that assessed a cross-sectional relationship between depression and academic performance all reported a negative relationship between depression and academic performance so that higher levels of depression were associated with poorer performance. <sup>27,30-34.</sup> One of the six studies did not find a significant cross-sectional correlation between depression and academic performance. However, dividing students into high, medium and low groups for depression revealed a significant effect of group (p<0.05), with students in the low depression group at time one having higher academic scores in block one. <sup>32</sup> Of the four studies <sup>26,28,29,32</sup> to conduct longitudinal analyses, three <sup>26,28,29</sup> found that higher

- 334 indicated that a diagnosis of depression was associated with a decrease in student GPA of
- 335 0.49 points, and depression also mediated the negative relationship between financial
- 336 difficulties and decline in academic performance. Academic performance improved for
- 337 students having treatment for depression.
- 338 Cross-sectional and longitudinal relationships between anxiety and academic performance
- 339 Four studies conducted cross-sectional analyses to explore the relationship between anxiety
- 340 and academic performance.<sup>31,32,33,35</sup> Of which, three found a relationship between higher
- 341 levels of anxiety and poorer academic performance<sup>31,33,35</sup>.
- 342 Of the three longitudinal studies<sup>28,29,32</sup> only one<sup>28</sup> reported a significant longitudinal
- 343 relationship between higher anxiety and subsequent poorer academic performance. This was
- 344 significant for first-year students only (Table 4).
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- 335 0.49 points, and depression also mediated the negative relationship between financial
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- 344 significant for first-year students only (Table 4).
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357 Table 4. Characteristics of methodologies employed in the 10 studies and details of the results relating to depression and/or anxiety and academic performance among university students from

358 1997 to June 2020

Study	Sample size	Response rate	% female in sample	Location of the study	Mean/Range age	Study results	Correlation coefficient
Andrews & Wilding 2004	351	76%	75%	UK	NR	Depression made an independent contribution to decrease in exam scores between year 1 and year 2 (controlling for first year marks and demographic variables). Anxiety not related to subsequent exam performance. In the first year, no significant correlation was found. In the second year, depression made an independent contribution to exam marks (beta= - -11) P value < 0.01	$\label{eq:product} \begin{array}{l} r \mbox{ square } = 0.51 \\ p < 0.01 \end{array}$
Bahmani et al. 2018	275	84.87%	66.2%	Iran	21.24	Depression is associated with low academic achievement.	Coefficient = -0.49 p < 0.001
Cheung et al. 2020	9,479	56.5%	NR	Hong Kong	18.9	Among the direct entry from secondary school (DEfSS) students' group, there was a negative relationship between GPA (sGPA and cGPA) and depression score. All the groups in this study found a significant negative relationship between high levels of	Depression for all groups: Spearman r Semester GPA: r = -0.045 p<-0.001 Cumulative GPA: r = -0.038 p<-0.001

						depression, anxiety, and academic performance but the effect sizes very small.	Awarded GPA: r = -0.050 p<0.05 Anxiety for all groups: Semester GPA: r = -0.007 p>0.05 Cumulative GPA: r = -0.003 p>0.05 Awarded GPA: r =-0.040 p<-0.05
Deb et al. 2016	717	NR	43%	India	22.5	Students who had poorer academic performance had higher depression scores.           With means of depression as following:           Very good (CGPA 9–10) = 69.92           Good (CGPA 7–8) = -74.93           Moderate (CGPA 5–6) = \$0.67           Poor (CGPA below 5) = \$6.6	F = 12.56 p < 0.001
Hysenbegasi et al. 2005	330	37%	NR	USA	NR	The coefficient of the depression variable indicates that the diagnosis of a depressive disorder was associated with 0.49-point drop in GPA. An increase in students' GPA of 0.44 was associated with treatment for depression in the depressed group.	Regression coefficient= -0.4854 p<0.0001 r square= 0.14
Junaid et al. 2020	247	90%	31.2%	KSA	NR	The cumulative GPA was significantly and negatively associated with higher anxiety levels.	p=0.017 p=0.014

Mihailescu et al. 2016	356	89%	NR	Romania	18-24	First year students only experienced a negative association between depression, anxiety and GPA (time 1). There was no correlation between depression, anxiety and academic performance among second year students (time 2).	Anxiety rho =290 p < 0.05 Depression rho=254 p < 0.05
Newcomb-Anjo et al. 2016	903	NR	82%	Canada	18-25	Weak negative correlation between grades and depression. No significant relationship once controlled for demographic variables.	Grades and depression r= -0.14
Sindhu & Basha 2017	20	75%	NR	India	NR	Students in low achieving group (n=3) reported a higher level of depression and anxiety compared to those in the high achieving group (n=12). P values 1-tailed.	Level of significance for anxiety and academic performance= t (15) = 1.74, p=0.05 Level of significance for depression and academic performance= t (15) =2.45, p = 0.014

Yeh et al. 2007	252	90%	NR	China	NR	The first assessment (time 1):	First assessment (time 1):
						There was no significant cross-sectional	
						correlation between anxiety and academic	Severe depression r= -0.252
						performance. Although depression didn't	p < 0.05
						correlate with academic scores, dividing	
						depression scores into high, medium and low	
						showed a significant effect on the group (p<0.05),	
						with students in the low depression group at time 1	
						having higher academic scores in block 1.	
						Second assessment (time 2):	
						There was no longitudinal association between	
						anxiety or depression and subsequent academic	
						performance.	

364	Factors affecting the relationship between depression/anxiety and academic performance
365	Five studies (n=5) mentioned potential (psychological, social and financial) factors
366	that are most likely to affect the association between depressive or anxiety symptoms and
367	academic achievements. Andrews and Wilding <sup>29</sup> reported that only two factors, depression
368	and financial difficulties, were significantly related to examination performance. Sindhu and
369	Basha <sup>31</sup> stated that stress among university students could affect both high academic
370	achievers and low academic achievers and mediate the relationship between depression,
371	anxiety, and academic performance. Deb et al <sup>30</sup> reported that students who had poorer
372	academic performance had higher depression scores.
373	Bahmani et al <sup>34</sup> reported that depression, loneliness and scores on all dimensions of
374	social satisfaction were independently associated with academic achievement scores.
375	Additionally, Cheung et al <sup>33</sup> reported that both higher study load and academic performance
376	were associated with depression but did not control for study load in their when correlating
377	academic performance with depression.
378	The remaining five studies (n=5) did not include or analyze any confounding factors that
379	could affect the impact of depression or anxiety on academic performance. <sup>26,27,28,32,35</sup>
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381	Discussion
382	The current review included studies published between 1997 and June 2020, that
383	reported the relationship between depressive and/or anxiety symptoms on academic
384	performance among university students. Of the identified studies, five addressed depression
385	and anxiety, four examined depression only, and one investigated anxiety only.
386	After reviewing the 10 studies, all six studies to have conducted cross-sectional analyses
387	revealed negative associations between depression and academic performance. 27,30-34 From

388 the four longitudinal studies, three studies found negative longitudinal associations between

depression and poorer academic outcome.<sup>26,28,29</sup> The evidence for the negative impact of anxiety on academic performance was less strong. Of the four studies to have conducted cross-sectional analyses .<sup>31,32,33,35</sup> three reported a negative cross-sectional a relationship between higher levels of anxiety and poorer academic performance.<sup>31,33,35</sup> Of the three longitudinal<sup>28,29,32</sup> studies only one reported a significant longitudinal relationship between higher anxiety and subsequent poorer academic performance.<sup>28</sup>

The association between higher levels of depression and poorer academic performance
 was supported by a recent longitudinal study conducted by Awadalla et al<sup>36</sup> of a

397 representative sample of university students in the UAE. The study's cross-sectional analysis

398 found higher levels of depression and anxiety were independently but weakly associated with

399 poorer academic performance. Longitudinal analysis found that baseline depression - but not

400 anxiety - predicted poorer GPA at the six-month follow-up. Furthermore, a previous study

401 conducted by Bostanci et al<sup>37</sup> among university students in Turkey supported these results.

402 The study found that students with elevated symptoms of depression have poorer subjective

403 self-rated academic performance, compared to students who do not report symptoms of

404 depression. Similarly, another study of undergraduate and postgraduate students conducted

405 by De Roma et al<sup>38</sup> found that students with moderate depressive symptoms had significantly

406 lower GPA compared to those with normal and minimal depressive symptoms. Interestingly,

407 students with severe levels of depression did not have lower GPA than those with mild or

408 moderate depression. Another prospective study carried out in two cohorts of first year

409 medical students reported, for the first cohort, a negative relationship between mental health

410 as measured by GHQ12 scores assessed in the second semester and average marks for the

411 first and second year.<sup>39</sup> In the second cohort, GHQ-12 scores were assessed in the first

412 semester and no relationship was found with first- or second-year exam performance.

413	A number of studies have shown that symptoms of depression affect students'
414	performance and achievement across different levels of education.40,12,36,17 Findings in this
415	area indicate that academic workload can be highly stressful and psychologically demanding
416	and is a factor that increases the risk of one developing mental health problems. <sup>41</sup>
417	In this study only one of the three longitudinal studies found anxiety predicated
418	subsequent academic performance although three out of four cross-sectional analyses
419	supported a relationship. This is in accord with our recent findings in university students in
420	UAE that depression but not anxiety predicted subsequent academic performance.36
421	In consistencies in the relationship may reflect the fact that the relationship between
422	anxiety and performance is not linear. For example, Al-Qaisy,17 reported a negative
423	relationship between depression and academic achievement, and a positive relationship
424	between anxiety and academic achievement. The results of this study and other cross-
425	sectional studies that reported a positive relationship between anxiety and academic
426	achievement by Bostani et al <sup>42</sup> and Eisenberg et al <sup>43</sup> reflect the complicated relationship
427	between anxiety and academic performance. Some studies suggested that appropriate degrees
428	of anxiety concerning fear of failure could enhance students' self-motivation to perform
429	better in different academic tasks. <sup>44</sup> This can be explained by Yerkes Dodson anxiety curve
430	that suggests performance increases with physiological or mental arousal (stress or anxiety),
431	but only to an extent, after which it can negatively affect the accuracy of one's judgment,
432	working memory and coping, which can lead to poor performance. <sup>45</sup>
433	Some studies in this review examined the relationship between depression or anxiety at
434	different times of the academic year. For example, Andrews and Wilding <sup>29</sup> reported that
435	depression made an independent contribution to a decrease in examination scores at the
436	beginning of the first college year and by the end of the second college year (controlling for
437	first year marks and demographic variables). Anxiety, however, was not related to subsequent

438 examination performance. Deb et al<sup>30</sup> reported that there was a significant difference in the 439 level of depression among students in the first and second years of study at the university. 440 Students in the first year recorded higher levels of depression and poorer academic performance compared to students in the more advanced years. The impact of anxiety and 441 442 depression on academic may increase during the course. A study conducted by Wyatt et al,46 443 found first-year students experienced less negative impact from anxiety and depression compared to second-, third-, and fifth-year students, by referring to the lower workload 444 445 required by the academic curriculum in the first year compared to what was required in the 446 second and subsequent years of the university study program. 447 The current review revealed that few studies controlled for potentially confounding 448 factors, and there was a lack of longitudinal studies, which made it difficult to clarify the 449 direction of the relationship. The existence of confounding variables in these studies makes it 450 challenging to establish a clear causal link between depression or anxiety and academic 451 performance among university students, unless appropriate statistical methods were used to measure the impact of the confounding factors.<sup>47</sup> This is consistent with a study carried out 452 by Turner et al48 colleagues to study depressive symptoms and academic performance among 453 454 North Carolina college students using National College Health Assessment (NCHA) for assessing depressive symptoms. Their study considered other factors that may play a role in 455 456 the relationship between academic performance and levels of depression, such as race, 457 substance use, and level of financial debt. After statistical adjustment and controlling for 458 variables to measure the level of impact, the study showed a significant association between 459 the controlled confounders, depression level, and cumulative grade average. 460 Some of the studies identified were conducted in Eastern and South Asia (n=4), the Middle East (n=2), and nearly half of the studies (n=4) were conducted in the West. This may 461 462 reflect both publishing bias and a general lack of research in developing countries, generally

463 and specifically in the Middle East, where higher vulnerability to depression and anxiety

- 464 among people in less economically developed countries due to financial difficulties, stressful
- 465 life events, mental illness, and a lack of proper sources of health care is culturally

466 dependent.49

467 Limitations

- The quality scores for the 10 included studies, ranged from 2 to 6 out of a possible maximum score of 7. As most of the studies included in this review are cross-sectional, identifying the causal relationship among variables might be difficult. In this review, most studies did not control for potentially confounding variables; therefore, the direct relationship could not be assessed. Moreover, the risk of bias due to the low response rate can also affect
- 473 these analyses' results. For example, the small sample size of four studies in this review
- 474 (<300 participants) and one of the four had only 20 participants, which increases the
- 475 possibility of bias in the identified studies.
- 476 Research bias is the main drawback in a systematic review: studies with statistically
- 477 significant findings are more likely to be published than those with null findings.<sup>50</sup>
- 478 It was a strength of the review that studies used either validated measures or a clinical
- diagnosis of depression and anxiety and an objective measure of academic performance suchas grade point average.
- 481 Conclusion and recommendations
- 482 Although there is a need for in-depth research to confirm the findings of this review,
- 483 evidence from the ten studies suggests that depressive and anxiety symptoms have a
- 484 significant impact on university students' academic achievements. The results of this review
- 485 suggest that more attention should be given to the identification and administration of
- 486 depression and anxiety in university settings, where there is a high demand for success
- 487 among students. Student vulnerability may increase further unless research is conducted to

- 488 establish effective interventions for the treatment of depression and anxiety to enhance
- 489 students' chances of success in university settings and careers.

490 This review highlights the importance of access to counseling centers, academic 491 advisors, faculties, and mental health treatment resources to university students and the value 492 of educating this population on the availability of those facilities. Considering the results of 493 this review, to date, little research has been conducted to systematically examine the 494 relationship between depression/anxiety and specific academic performance in a college 495 setting. Therefore, to fully understand the relationship between depression, anxiety, and 496 academic functioning, future research utilizing assessment techniques that would allow for 497 data analysis that enlightens the causality and the specific nature of depression and anxiety is 498 needed. Additionally, future studies might extend the assessment of psychopathology 499 associated with low academic achievement to include symptoms of conditions other than 500 depression and anxiety. Longitudinal designs as well as other prospective methods of 501 assessing the effects of depressive and anxiety symptoms on academic functioning over 502 semesters could be utilized to improve our understanding of how academic distress affects 503 depression in college. A well-validated and reliable online therapeutic intervention tools 504 should also be considered as they offer considerable advantages in terms of student access 505 and privacy<sup>51</sup>. 506

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- 515 Ethics approval and consent to participate
- 516 Not applicable
- 517 Consent for publication
- 518 Not applicable
- 519 Competing interests
- 520 The authors declare they have no competing interests.

#### 521 Authors' contributions

- 522 Titles and abstracts were screened by SA for assessment against the inclusion criteria for the
- 523 review and the work was double-checked and supervised by CG and EBD. SA provided the
- 524 first draft which included conceptualization, data curation, formal analysis and methodology.
- 525 CG and EBD reviewed and edited the whole review.

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# Appendix 4. Figure 1 flow chart outlining process of study selections for the systematic review (study one)



# Appendix 5. Ethics Committee approval letter University of Nottingham (study two)



UNITED KINGDOM · CHINA · MALAYSIA

Faculty of Medicine & Health Sciences School of Medicine Division of Psychiatry and Applied Psychology The University of Nottingham YANG Fujia Building Jubilee Campus Nottingham NG8 1BB t: +44 (0)115 82 32214

Investigators: Suheir Awadalla, Cris Glazebrook and

www.nottingham.ac.uk/medicine

Bethan Davies

Title of study: Study to explore the influence

of emotional difficulties on the academic achievement

of undergraduate students.

Duration of study: Until September 2020

Ethics reference number: 250

Tuesday 20<sup>th</sup> February 2018

A favourable opinion is given to the above-named study on the understanding that the applicants conduct their research as described in the above numbered application, and adhere to all conditions under which the ethical approval has been granted and use only materials and documentation that have been approved. If any amendments to the study are required, an amendment should be submitted to the committee for approval.

David Daley

David Daley (Professor)

Co-Chair of DPAP Ethics Subcommittee

Analle aptorte

Amanda Griffiths (Professor)

Co-Chair of DPAP Ethics Subcommittee

Appendix 6. Ethics Committee approval letter Zayed University (study two)

Research

Research Ethics Committee (REC) Proof of Ethical Clearance

Mercedes Sheen

Chair of the Research Ethics Committee

Suheir Awadalla

Instructor

College of Natural and Health Sciences

Zayed University

Dubai Main Campus

Date	29 <sup>th</sup> Nov. 2017
Ethics Application Number	ZU17_0107_F
Research Title	The impact of anxiety and depressive disorder on the academic productivity of university students
Submitted Form	🔀 Full Application for Ethical Clearance 🗌 Exemption from Full Application
Valid until	28 <sup>th</sup> Nov. 2018

Dear Suheir,

Thank you for submitting the above-mentioned research proposal to the Research Ethics Committee at Zayed University. The following submitted documents were reviewed:

- Full Application for Ethical Clearance Form

- Informed consent form(s)

- Data collection tool(s)

- Participation invitation email

The project was discussed in the Research Ethics Committee's meeting held on Monday, 27th Nov. 2017, and I am pleased to advise you that that the Committee has granted

🔀 Full Ethical Clearance	Exemption from Full Ethical Clearance

The following Committee members and Office of Research representatives were present at the meeting when your study was discussed:

**Dr Mercedes Sheen (chair)**, Associate Professor, College of Natural and Health Sciences

**Shurooq AL Hashimi,** Research Development Coordinator, office of Research

Jerry Spring, Instructor, Academic Bridge Program

Dr Kennon Rider, Associate Professor, College of Education

**Dr Teresa Arora,** Assistant Professor, College of Natural and Health Sciences

**Dr Abdelrahman Baqrain,** Assistant Dean for Research and Graduate Studies, College of Business

**Dr Anoud Bani-Hani,** Assistant Professor, College of Technological Innovation

Notes from the Committee

Approval is given on the understanding that the Principal Investigator reports the following to the Office of Research at Zayed University:

• Any amendments or significant change that occur in connection to the study which may alter the ethical consideration, such as

\* any serious or unexpected adverse events, and

\* any unforeseen events that might affect the continued ethical acceptability of the project

 Any proposed changes to the research protocol or the conduct of the research

• Premature suspension or termination of the study

 Arrangements for publication or dissemination the research including any

feedback to participants

Progress Report on annual basis

• Final Report within 3 months after termination or completion of the study

On behalf of the Committee, I am wishing you a productive and successful accomplishment of this research study.

Sincerely,

## Mercedes Sheen, Ph.D.

Chair, Research Ethics Committee

Zayed University

Appendix 7. Email sent to the lecturers of the classes for recruiting participants (study two)

# Email to be sent to the lecturer of the class that the researcher will use to administrate the survey questionnaire among the students.

Dear Professor (name),

My name is Suheir Awadalla, Instructor in college of Natural and Health Sciences at Zayed University. I am also studying for a PhD at University of Nottingham UK. Currently I am working on my doctorate thesis which is titled; The impact of depressive symptoms and anxiety on the academic productivity of University students. The study will investigate the influence of emotional symptoms rates on the academic achievements of undergraduate university students. The research was approved by the Ethical Committee of Zayed University.

The sample of students in the study will be selected from both campuses at Zayed University. I would be very grateful if you would allow me to visit your lecture and administer my survey to your students. This will be at the beginning of the lecture and will take approx. 15 minutes to complete.

Your support will be highly appreciated as it is hoped that the results of the study will help to improve services for the university students. Identifying factors associated with symptoms of low mood

and academic performance at an early stage will result in increasing levels of student academic success in the university.

Attached is the Participant Information Sheet and the Invitation Email to be sent to students, that you are kindly requested to send to the students at least 24 hours before your lecture on Wednesday 14<sup>th</sup> of February 2018.

Many thanks

Yours sincerely

Suheir

Appendix 8. Invitation email sent to the students to participate in study two

**Date of the class**: (14<sup>th</sup> of February 2018)

**Course Name**: (Fundamentals of <u>Innovation</u> and Entrepreneurship) Dear student,

# Study to explore the influence of emotional difficulties on the academic achievement of undergraduate students.

I am a Ph.D. student at the University of Nottingham (UK), and as part of my studies I am carrying out a survey to investigate the influence of emotional symptoms such as anxiety and low mood on the academic achievements of undergraduate university students in UAE. I would be very grateful if you would consider taking part in this project.

This email has been sent to you because you are undergraduate student registered in one of the courses included in the study. All students registered in your course have been approached, and we are targeting different colleges across both campuses of the University. We hope that more than 400 students will take part in the study which involves completing a questionnaire survey. The questionnaire is anonymous and should take no more than 15 minutes to complete. You don't have to take part in this research, and you are free to withdraw from the study

at any point. All information will be entirely confidential, and you will not be identifiable in any data published from the study.

The research is being supervised by Professor CrisGlazebrook and Dr. Bethan Davies in the Division of Psychiatry and Applied Psychology, School of Medicine at the University of Nottingham. Their contact details are given below.

It is hoped that the results of the study will help to improve services for the university students. If you have any questions or concerns about completing the questionnaire or about being in this study, please contact me using the details below. Regardless of whether you choose to participate, please let me know if you would like a summary of my findings.

Also, attached a participant information sheet that include more information about the study for you to read.

Many thanks

Suheir Awadalla

Ph.D. student-

Division of Psychiatry and Applied Psychology, School of Medicine

University of Nottingham

Email: msxsa26@nottingham.ac.uk

Professor Cristine Glazebrook

Professor of Health Psychology

Room B12, B Floor

Institute of Mental Health

University of Nottingham

Email cris.glazebrook@nottingham.ac.uk

Dr. Bethan Davies

NIHR MindTech MedTech Co-Operative

Institute of Mental Health

University of Nottingham

Nottingham Email: <u>Bethan.Davies@nottingham.ac.uk</u>

#### Appendix 9. Information sheet for participants (study two)



#### **PARTICIPANT INFORMATION**

(version 1.0: 16/01/2018)

Division of Psychiatry & Applied Psychology

School of Medicine, Faculty of Medicine & Health Sciences

**Project Title:** Study to explore the influence of emotional difficulties on the academic achievement of undergraduate students.

**Researcher:** Suheir Awadalla (<u>msxsa26@nottingham.ac.uk</u>), PhD student, the University of Nottingham

Supervisors:ProfessorCrisGlazebrook(cris.glazebrook@nottingham.ac.uk)andDrBethanDavies(bethan.davies@nottingham.ac.uk)

Ethics Reference Number: ... [to be inserted following ethical review]

This is an invitation to take part in a research study about looking into the influence of emotional symptoms such as anxiety on the academic achievements of undergraduate university students. I would be very grateful if you would consider taking part in this project. This information is designed to tell you what it will involve.

Your participation is voluntary, and you may change your mind about being involved, or decline to answer a particular question. You are free to withdraw at any point before or during the study. Withdrawal does not require a reason. Once you have completed and submitted the questionnaire it is not possible to withdraw the data because we won't know who you are.

#### What is the project about?

This study aims to investigate the prevalence of depressive and anxiety symptoms among university students and its impact on their academic performance. It is helpful if healthcare professionals and tutors understand this relationship, in order to develop appropriate preventive services, to ensure that students get appropriate support for mental health problems and to enable universities to develop appropriate resources and interventions for students.

#### Who is being asked to take part, and why?

We are looking for students in their second semester or beyond to take part in this study. The students will be randomly selected from different faculties of Zayed University, both at Dubai and Abu-Dhabi campuses. We are looking for male and female undergraduate students from different colleges as they may experience different levels of emotional symptoms and the impact of those symptoms may differ.

#### What will I be asked to do?

The study consists of two stages, the first stage and the follow-up stage.

In the first stage, you will be asked to fill out two psychological scales assessing depression and anxiety symptoms. Both scales have been used in research and educational institutions. You will also be asked for information about yourself, including your age, gender and GPA. This questionnaire will be distributed to the participants in their lectures and will take approx. 15 minutes of their time. The researcher will explain the study, and then each student will be asked to fill out the questionnaire. There will be an opportunity to ask questions about the survey items if necessary.

The second part of the study will be a small follow-up survey where the students need only to provide the researcher with their GPA at the end of the semester. Participants will be given a form to write down their GPA and hand it back to assistant administrator in their faculties. The name and location of that person will be provided in the form. If for any

reason, a student misplaces the follow-up form and can't remember their study number they can provide the assistant administrator with their GPA including the last three digits of their phone number and day of birth. Three bits of information (day of birth, last three digits of mobile phone and the code number in the survey questionnaire) will be used to connect students' information during the 6-month follow-up process to insure that the participants will not be identifiable and recognized at any stage of the study.

#### Will the research be of any personal benefit to me?

Although the research is unlikely to benefit you directly we hope that the findings will be used to help to improve mental health services for students at Zayad University. By publishing the research, we hope that the study will raise awareness of student mental health needs and encourage students to seek help for mental health problems.

#### What will happen to the information I provide?

All information and data that you provide to us is kept confidential to the three members of the research team (see their names at the top of the previous page). - Only they have access to it, and it will not be shared with anyone outside of this team. All your information and data are anonymous, so that you are not personally named or identifiable from the information you provide us. All your information is kept in a locked

cabinet at Zayed University, and on a password-protected database on a secure server at the University of Nottingham.

#### What will you do with the data?

The study will be written as part of the researcher's PhD thesis within the Division of Psychiatry and Applied Psychology, School of Medicine, the University of Nottingham, UK. The study findings may be published a peer-reviewed journal in the future, and if so, all participants' data will be anonymised in this publication. The findings might be shared with the staff in the Counselling Center at Zayed University who are involved with the students' emotional wellbeing. If you wish to have the results of this study, please contact Suheir Awadalla by emailing her at <u>msxsa26@nottingham.ac.uk</u>

At the end of the project, all raw data will be kept securely by the University of Nottingham under the terms of the Data Protection Act. The data will not be kept elsewhere.

If you have any questions or concerns, please don't hesitate to ask. We can be contacted before and after your participation at the above address.

#### Who has reviewed the study?

The research is being organized by the University of Nottingham and is being supervised by the Division of Psychiatry and Applied Psychology within the school of Medicine. All research in the University of

Nottingham is looked at by independent group of people, called a Research Ethics Committee, to protect your interests.

This study also has been reviewed and approved by the University of Nottingham's Division of Psychiatry and Applied Psychology (ref number: xyz) and Zayed University's ethical committee (reference number: ZU17\_0107\_F).

Regardless of whether or not you participate in this study, if you are concerned about yours or a friend's mental health, you can contact the Zayed University Counseling Center for help and support:

Tel: 02-5993389 AUH; 04-4021477 Dubai

Email: counseling@zu.ac.ae

https://www.zu.ac.ae/main/en/counseling/welcome.aspx

### Appendix 10. Consent form for participants (study two)



#### **PARTICIPANT CONSENT**

(version 1.0: 16/01/2018)

Division of Psychiatry & Applied Psychology

School of Medicine, Faculty of Medicine & Health Sciences

Project Title: Study to explore the influence of emotional difficulties on

the academic achievement of undergraduate students.

Researcher: Suheir AwadallaEmail: <u>suheir.awadalla@nottingham.ac.uk</u>

Supervisor : Professor CrisGlazebrook Email:

cris.glazbrook@nottingham.ac.uk

Ethics Reference Number: .... [to be inserted following ethical review]

I have read the information sheet describing the study.

	Yes / No
I have had the opportunity to consider the information, ask	
questions and have had these answered satisfactorily	
	Yes / No
I understand that I can refuse to take part if I wish, without giving	
a reason and my refusal will not affect my ability to take part in	
future studies.	Yes / No
I understand that I can withdraw from the study at any time	
without giving a reason without prejudice.	
	Yes / No
I understand that I will be providing my GPA scores at two time	
points.	
I understand that all information I give will be confidential and	
anonymized, and that it will not be possible to identify any of the	
respondents in the study report.	Yes / No
I understand that quotations used will be anonymous and I will	Yes / No
not be identifiable in any report or publication	

## Appendix 11. Baseline questionnaire (study two)



### **Baseline questionnaire**

**Study title:** Study to explore the influence of emotional difficulties on the academic achievement of undergraduate students.

What is your age in years?

#### Gender:

- Male
- □ Female

As part of this study, we ask that you create an ID number so that we can link your information with the GPA information that you will provide us in six months' time.

- Please specify your Day of Birth \_\_\_\_\_\_
- Please specify the last three digits of your mobile number:

# What is your marital status?

- □ Single □ Divorced
- □ Married □ Widowed

#### What year of the study are you in?

- □ 2<sup>nd</sup> year
- □ 3<sup>rd</sup> year
- □ 4<sup>th</sup> year

### What is your father's occupation?

What is your mother's occupation?

#### What is your major?

- Business
- □ Communication and Media Sciences
- Natural Health Sciences
- Technological Innovation
- □ Humanities and Social Science

# What is your father's highest level of educational achievement?

- □ No educational qualifications/did not complete education
- □ Completed secondary school education
- □ Completed university or college qualification

# What is your mother's highest level of educational achievement?

- □ No educational qualifications/ did not complete education
- □ Completed secondary school education
- □ Completed university or college qualification

#### Family Affluence Scale

#### Does your family own a car, van or truck?

- □ No
- □ Yes, one
- □ Yes, two or more

In your family home, do you have your own bedroom for yourself?

- 🗆 Yes
- 🗆 No

# During the past 12 months, how many times did you travel away on holiday with your family?

- A. Not at all
- B. Once
- C. Twice
- D. More than twice

#### How many computers does your family own?

- □ None
- One
- 🗆 Two
- $\hfill\square$  More than two

Last semester GPA:

Cumulative GPA (CGPA):

#### Number of attendance warnings this semester

0 1 2 3

## How satisfied are you with your studies?

1234567Completely SatisfiedCompletely Dissatisfied

## Patient Health Questionnaire – 9-item version

# Over the past 2 weeks, how often have you been bothered by any of the following problems?

		Not	Several	More	Nearly
		at all	days	than half	every
				the days	day
1.	Little interest or pleasure in				
	doing things				
2	Eagling down, doprocood, or				
2.					
	hopeless				
3.	Trouble falling or staying				
	asleep, or sleeping too much				
4.	Feeling tired or having little				
	energy				
5	Poor apporito or overesting				
э.	Poor appende of overeating				
6.	Feeling bad about yourself -				
	or that you are a failure or				
	have let yourself or your				
	family down				
7.	Trouble concentrating on				
	things, such as reading the				
	newspaper or watching				
	television				

8.	Moving or speaking so slowly		
	that other people could have		
	noticed? Or the opposite -		
	being so fidgety or restless		
	that you have been moving		
	around a lot more than usual		
9.	Thoughts that you would be		
	better off dead or of hurting		
	yourself in some way		

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- □ Somewhat difficult
- Very difficult
- □ Extremely difficult

**General Anxiety Disorder Scale – 7-item version** 

Over the past 2 weeks, how often have you been bothered by any of the following problems?

		Not	Several	More	Nearly
		at all	days	than half	every
				the days	day
1.	Feeling nervous, anxious or				
	on edge				
2.	Not being able to stop or				
	control worrying				
3.	Worrying too much about				
	different things				
4.	Trouble relaxing				
5.	Being so restless that it is				
	hard to sit still				
6.	Becoming easily annoyed or				
	irritable				
7.	Feeling afraid as if something				
	awful might happen				
				1	1

### If you checked off any problems, how difficult have these

## problems made it for you to do your work, take care of things

#### at home, or get along with other people?

- □ Not difficult at all
- □ Somewhat difficult
- Very difficult
- □ Extremely difficult

## Appendix 12. Follow-up questionnaire (study two)

Follow-up questionnaire (for the second stage of the study)							
Please be info	Please be informed that you will keep this form with you, to be filled by the						
end of the ser	nester whe	en you ge	et your GPA	after the e	xams.		
Day of birth	Day of birth						
Last three dig	its of your	mobile n	umber				
What is your I	Major?						
Semester GPA	A						
Cumulative Gl	PA						
Number of a	ttendance	e warnin	gs this ser	nester	01	23	
How satisfied are you with your studies?							
1	2	3	4	5	6	7	
Completely							
Completely							
						Satisfied	
					Dis	ssatisfied	
After filling out this form, please send it back to Reem Qasim at							

#### Reem.Qasim2@zu.ac.ae
Reem Qasim

#### Administrative Assistant

# **Advising Department**

R-GF-097

Tel-04-4021468

# Appendix 13. Ethics Committee approval letter University of

## Nottingham (study three)



**DPAP** Committee

11/06/2019

Supervisor: Cristine Glazebrook

Applicant: Suheir Awadalla

Project: Project Id Evaluation of an online intervention to support students with low mood and academic difficulties.

A favourable opinion is given to the above-named study on the understanding that the applicants conduct their research as described in the above numbered application. Applicants need to adhere to all conditions under which the ethical approval has been granted and use only materials and documentation that have been approved. If any amendments to the study are required, an amendment should be submitted to the committee for approval. An end of study form will be required once the study is complete.

Sincerely yours,

David Daley

Professor David Daley

Co-Chair of DPAP Ethics Subcommittee

Ameride Grittitts

Professor Amanda Griffiths

Co-Chair of DPAP Ethics Subcommittee

Appendix 14. Ethics Committee approval letter Zayed University (study three)

Research

Research Ethics Committee (REC) Proof of Ethical Clearance

Teresa Arora

Chair

Research Ethics Committee

Suheir Awadalla

Instructor

Human Resources Department

Dubai Main Campus

Zayed University

Date	13 <sup>th</sup> May 2019
Ethics Application Number	ZU19_46_F
Research Title	Evaluation of an online intervention to support students with low mood and academic difficulties
Submitted Form	<ul> <li>Full Application for Ethical Clearance</li> <li>Exemption from Full Application</li> </ul>
Valid until	12 <sup>th</sup> May 2021

Dear Suheir,

Thank you for submitting the above-mentioned research proposal to the Research Ethics Committee at Zayed

University. The following submitted documents were reviewed:

- Full Application for Ethical Clearance Form

- Data collection tool(s)
- Participation invitation email
- Informed Consent form(s)
- CITI completion reports of the PI

The project was discussed in the Research Ethics Committee's meeting held on Wednesday, 8th May 2019, and I am pleased to advise you that that the Committee has granted

l Clearance
l Clearance

The following Committee members and Office of Research representatives were present at the meeting

**Dr Teresa Arora**, Assistant Professor, College of Natural and Health Sciences

Ms. Shurooq AL Hashimi, Research Development Coordinator, office of Research

Dr Anoud Bani-Hani, Assistant Professor, College of Technological Innovation Dr Abdelrahman Baqrain, Assistant Dean for Research and

Graduate Studies, College of Business

Dr JR Ratliff, Assistant Professor, University College

**Dr Habibul Khondker,** Professor, College of Humanities and Social Sciences

Notes from the	
Committee	

Approval is given on the understanding that the Principal Investigator reports the following to the Office of Research at Zayed University:

§ Any amendments or significant change that occur in connection to the study which may alter the ethical consideration, such as

\* any serious or unexpected adverse events, and

\* any unforeseen events that might affect the continued ethical acceptability of the project

§ Any proposed changes to the research protocol or the conduct of the research

§ Premature suspension or termination of the study

§ Arrangements for publication or dissemination the research including any feedback to participants

§ Progress Report on annual basis

§ Final Report within 3 months after termination or completion of the study

On behalf of the Committee, I am wishing you a productive and successful accomplishment of this research study.

Sincerely,

Tofatt

Teresa Arora, Ph.D.

Chair, Research Ethics Committee

Zayed University

# Appendix 15. Email sent to the academic advisor for recruiting students (study three)

Dear Professor (name),

My name is Suheir Awadalla, Instructor in college of Natural and Health Sciences at Zayed University. I am also studying for a PhD at University of Nottingham UK. Currently I am working on my doctorate thesis, which is titled, The impact of depressive symptoms and anxiety on the academic productivity of University students. Part of my study is to implement a pilot study to investigate the effectiveness of a web-based cognitive-behavioral tool to improve emotional wellbeing in University students in U.A.E. The research was approved by the Ethical Committee of Zayed University reference number (xxxx). The study will include students with academic warning (GPA less than 2) and had some symptoms of low mood over the past few weeks such as feeling down or little interest in doing things.

The sample of students in the study will be selected from both campuses at Zayed University. I would be very grateful if you can help and support in recruiting students by sending an invitation letter and information sheet to the targeted students asking them to participate in the study and by reminding them again about the study in your next class which will take place next week.

Your support will be highly appreciated as it is hoped that the results of this studymay have a major impact on the prevention of mood disorders and their possible negative consequences specially on

academic achievement and career life among university students. Identifying factors associated with symptoms of low mood and academic performance at an early stage will result in increasing levels of student academic success in the university

Yours sincerely,

Researcher

# Appendix 16. Invitation email to the recruited participants (study three)

Dear student,

# Study title: Evaluation of an online intervention to support students with low mood and academic difficulties.

This is an invitation to take part in a research study

I am a Ph.D. student at the University of Nottingham (UK), and as part of my studies I am carrying out a survey to investigate theabout the effectiveness of a self-directed Internet-delivered cognitivebehavioral skills training tool in improving emotional well-being among university students. I would be very grateful if you would consider taking part in this project. This information is designed to tell you what it will involve

You have been invited becauseWe are asking those students who are beyond their first semester of study, who are attending academic advisory classes and who have some symptoms of low mood, to take part. For example, over the past two weeks have you sometimes felt down, depressed, or hopeless? Or had little interest or pleasure in doing things? If you answer Yes to any one of those questions, then we believe that you might want to try Moodgym program and tell us later if it was helpful. We are able to offer Moodgym for free to 50 students. If you accept to participate, please email the researcher by clicking here <u>Suheir.awadalla@nottingham.ac.uk</u>.

We hope that 50 students will take part in the study which involves completing a questionnaire survey and psychological scale at the first stage then participate in MoodGym program andat eight weeks' time you will be asked to complete another questionnaire survey including psychological scale for the second time. The two questionnaires are anonymous and should take no more than 15 minutes to complete.

You don't have to take part in this research, and you are free to withdraw from the study at any point. All information will be entirely confidential, and you will not be identifiable in any data published from the study.

The research is being supervised by Professor CrisGlazebrook and Dr. Bethan Davies in the Division of Psychiatry and Applied Psychology, School of Medicine at the University of Nottingham. Their contact details are given below. It is hoped that the results of the study will help to introduce an on-line intervention to support students with low mood and academic difficulties

If you have any questions or concerns about completing the questionnaire or about being in this study, please contact me using the details below. Regardless of whether you choose to participate, please let me know if you would like a summary of my findings.

Also, attached a participant information sheet that include more information about the study for you to read.

Many thanks,

Suheir Awadalla

Ph.D. student-

Division of Psychiatry and Applied Psychology, School of Medicine

University of Nottingham

Email-msxsa26@nottingham.ac.uk

Professor Cristine Glazebrook

Professor of Health Psychology

Room B12, B Floor

Institute of Mental Health

University of Nottingham

Email cris.glazebrook@nottingham.ac.uk

Dr. Bethan Davies

NIHR MindTech MedTech Co-Operative

Institute of Mental Health

University of Nottingham

Nottingham

Email: Bethan.Davies@nottingham.ac.uk

# Appendix 17. Information sheet for participants (study three)



## PARTICIPANT INFORMATION

(version 1.0: 16/03/2019)

Division of Psychiatry & Applied Psychology

School of Medicine, Faculty of Medicine & Health Sciences

**Project Title:** Effectiveness of a Web-Based Cognitive-Behavioral Tool to Improve Emotional Well-Being in University Students in U.A.E

**Researcher**: Suheir Awadalla (<u>msxsa26@nottingham.ac.uk</u>), PhD student, the University of Nottingham

Supervisors: Professor CrisGlazebrook (cris.glazebrook@nottingham.ac.uk) and Dr Bethan Davies (bethan.davies@nottingham.ac.uk)

Ethics Reference Number: ... [to be inserted following ethical review]

This is an invitation to take part in a research studyabout theacceptability and effectiveness of a self-directed Internetdelivered cognitive-behavioral skills training tool in improving emotional well-being among university students. I would be very grateful if you would consider taking part in this project. This information is designed to tell you what it will involve.

Your participation is voluntary, and you may change your mind about being involved, or decline to answer a particular question. You are free to withdraw at any point before or during the study. Withdrawal does not require a reason. Once you have completed and submitted the questionnaire it is not possible to withdraw the data because we won't know who you are.

#### What is the project about?

This pilot study aims to evaluate acceptability and effectiveness of a self-directed, interactive, internet-delivered program (Moodgym) to improve emotional well-being.Moodgym is based on principles of Cognitive Behavioural therapy (CBT) which aims to promote positive mental health by encouraging more healthy patterns of thinking and behavior. Moodgym is the most widely used as computerized CBT program in the world with over 1million registered users (<u>https://moodgym.anu.edu.au/welcome/faq</u>) and there is evidence that it is helpful in improving psychological wellbeing. Poor mental health has been associated with poorer academic outcomes so we want to see if Moodgym is useful for UAE students who are struggling academically and may also be experiencing low mood. We want to

see if improving mood can also help students manage their academic studies better.

#### Who is being asked to take part, and why?

We are asking those students who are beyond their first semester of study, who are attending academic advisory classes and who have some symptoms of low mood, to take part. We have 50 free Moodgym logins and we think that these students will particularly benefit from the program.

#### 3. Do I have to take part?

It is up to you to decide whether or not to take part – you are under no pressure from us to participate. If you do decide to take part, you will be able to keep this information sheet, and be asked to complete an online consent form in order to assert your willingness to participate in the study. If you do decide to take part and consent to participation, you are still free to withdraw from the study at any time and without giving a reason.

#### What will I be asked to do?

Your participation in the study would last eight weeks in total, and involves completing two online surveys: one immediately after consenting to participation, and a second one eight weeks later. Students referred to academic advisory classes in September 2019 who feel that have had some symptoms of low mood over the past few weeks such as feeling down or little interest in doing things will

be asked to express interest in taking part in the study and using moodgym by emailing the researcher, Suheir Awadalla. If email Mrs Awadalla she will send you a link to the study survey and a study number - where you will be able to consent to participate and complete some questions on your psychological wellbeing and your academic performance.

The first online survey will ask you for basic information about yourself and your course, GPA, major, and any attendance warnings. We will also ask you to complete a questionnaire assessing symptoms of anxiety and low mood. The survey should take no more than 15 minutes to complete. All responses are confidential, and we will only record your study number. There will be no personal identifiers. After this has been completed you will be sent a code to allow you to use the the online intervention program (Moodgym) at your own pace over an eight-week period and free of charge. The Moodgymwebbased cognitive-behavioral program takes approximately six to eight hours to complete and is done so at your own pace. Moodgym contains five modules consisting of written information, animations and interactive exercises and quizzes, which are designed to teach skills that are known to prevent depression and anxiety among young people. During this period, you would receive two emails from us to remind you to complete the course.

After 8 weeks you will be sent a second online survey involves many of the same questions asked in the first online survey, with the additional questions about your use of moodgym and how helpful you

found. The researchers will not have access to any information about your use of Moodgym unless you choose to tell us in this survey.

# 5. What are the possible disadvantages and risks of taking part?

You will be required to give up some of your time if you do decide to participate – and more time will be required if you are assigned to receive access to theweb-Based cognitive-behavioral program, you will need to be self-motivated to complete the sections of the program in your own time. We believe there are no known risks associated with the Moodgym internet-based program, but this is something that we will ask you when you complete the follow-up online survey – we will ask you if you experienced any positive and negative consequences of completing the program.

#### Will the research be of any personal benefit to me?

According to our knowledge this is the first trial of web-based cognitive-behavioral tool to improve emotional well-being and academic performance in university students in U.A.E: importantly, it will help us explore whether this program is suitable and effective in supporting students with mood disorders and what its impact on academic achievement, and also help to inform us whether a larger trial involving a bigger group of students is possible and the logistics of conducting a trial.

Although the research is unlikely to benefit you directly, we hope that the findings will be used to help to improve mental health

services for students at Zayad University. By publishing the research, we hope that the study will raise awareness of student mental health needs and increase the awareness of some possible intervention tools that can contribute in encouraging students to seek help for mental health problems.

#### What will happen to the information I provide?

All information and data that you provide to us is kept confidential to the three members of the research team (see their names at the top of the previous page). - Only they have access to it, and it will not be shared with anyone outside of this team. All your information and data are anonymous, so that you are not personally named or identifiable from the information you provide us. All information which is collected about you during the course of the research will be kept **strictly confidential**, stored on a password-protected database within a secure computer. Any information about you which leaves the institution (e.g., in reports and publications arising from this study) will be anonymised, and you will not be personally identifiable.

As the study is all conducted online, this means that all data that you enter into the online surveys is also collected online. Within the first survey that you complete once you consent to participation, However, as with any online related activity, the risk of a breach is always possible. To the best of our ability your answers in this study will

remain confidential. We will minimize any risks through password protecting the online survey and databases created during this study.

#### What will you do with the data?

The study will be written as part of the researcher's PhD thesis within the Division of Psychiatry and Applied Psychology, School of Medicine, the University of Nottingham, UK. The study findings may be published a peer-reviewed journal in the future, and if so all participants' data will be anonymised in this publication. The findings might be shared with the staff in the Counselling Center at Zayed University who are involved with the students' emotional wellbeing.

If you wish to have the results of this study, please contact Suheir Awadalla by emailing her at <u>msxsa26@nottingham.ac.uk</u>

At the end of the project, all raw data will be kept securely by the University of Nottingham under the terms of the Data Protection Act. The data will not be kept elsewhere. If you have any questions or concerns, please don't hesitate to ask. We can be contacted before and after your participation at the above address.

#### Who has reviewed the study?

The research is being organized by the University of Nottingham and is being supervised by the Division of Psychiatry and Applied Psychology within the school of Medicine. All research in the University of Nottingham is looked at by independent group of people, called a Research Ethics Committee, to protect your interests. This

study also has been reviewed and approved by the University of Nottingham's Division of Psychiatry and Applied Psychology and Zayed University's ethical committee

Regardless of whether or not you participate in this study, if you are concerned about yours or a friend's mental health, you can contact the Zayed University Counseling Center for help and support:

Tel: 02-5993389 AUH; 04-4021477 Dubai

Email: <a href="mailto:counseling@zu.ac.ae">counseling@zu.ac.ae</a>

https://www.zu.ac.ae/main/en/counseling/welcome.aspx

# Appendix 18. Consent form for participants (study three)



## **PARTICIPANT CONSENT**

## STUDENT RESEARCH PROJECT ETHICS REVIEW

Division of Psychiatry & Applied Psychology

**Project Title:** Project Title: Evaluation of an online intervention to support students with low mood and academic difficulties.

Researcher: Suheir Awadalla

Email: <a href="mailto:suheir.awadalla@nottingham.ac.uk">suheir.awadalla@nottingham.ac.uk</a>

Supervisor: Professor CrisGlazebrook Email: <u>cris.glazbrook@nottingham.ac.uk& Dr Bethan Davies Email:</u> <u>bethan.davies@nottingham.ac.uk</u> Ethics Reference Number: [insert when your project has received ethical approval]

I have read the information sheet describing the study and	
understand what is involved.	
	Yes / No
I have had the encertantiation consider the information ack	
Thave had the opportunity to consider the information, ask	
questions and have had these answered satisfactorily.	Yes / No
	,
I understand that I can refuse to take part if I wish, without	
giving a reason and my refusal will not affect my ability to take	
part in future studies.	Yes / No
I understand that I can withdraw from the study at any time	
without giving a reason.	Yes / No
I understand that for anonymous questionnaire studies, once I	Yes / No
have completed the study and submitted my answers, the data	
cannot be withdrawn	
I understand that all information I give will be confidential and	
anonymized, and that it will not be possible to identify any of	
the respondents in the study report.	Yes / No
I understand that quotations used will be anonymous and I will	Yes / No
not be identifiable in any report or publication	

By clicking the button below, I indicate that I understand what the study involves, and I agree to take part. If I do not want to participate, I can close this window/press the exit button.

# Appendix 19. Online preintervention survey (study three)

Evaluation of an online intervention to support students with low mood and academic difficulties.



## Webpage 1

Thank you for your interest in our study

The participant information sheet can be viewed here.

The link below will take you to the consent form where you need to complete and sign off your acceptance to participate in this study. After you finish, please press next to start answering the online survey which will take 10-15 minutes followed by HADS screening questionnaire. At the end of the questionnaire a link will take you to another survey where you can enter your email address so that you can receive an emailed link to MoodGYM and a user code.

What is your age in years? \_\_\_\_\_

#### Gender:

Male

□ Female

As part of this study, we ask that you create an ID number so that we can link your information with the GPA information that you will provide us in eight weeks' time.

Please specify your Day of Birth (e.g., for birthdate 10<sup>th</sup> April 2000 enter 10)

Please specify the last three digits of your mobile number:

## First some information about you

What is your marital status?

- □ Single
- Married
- Divorced
- □ Widowed
- Prefer not to say

#### What year of the study are you in?

□ 2<sup>nd</sup> year

- □ 3<sup>rd</sup> year
- □ 4<sup>th</sup> year

#### What is your major?

- Business
- Communication and Media Sciences
- Natural Health Sciences
- □ Technological Innovation
- □ Humanities and Social Science

Last semester GPA: -----

Cumulative GPA:-----

Number of attendance warnings last semester 0 1

2 3

Have you ever sought help or advice for your emotional

## wellbeing?

Please tick all the help sources that youhave used. You can also add any other sources in the box below.

- □ My local health centre / health professional
- University counselling service
- University tutor
- □ My friend
- My family
- Religious leader

- Internet sources
- □ Internet information
- Books
- □ No help sought
- □ Other sources of help ...... (text box)

Depression and anxiety scale: HADS (14-item version) (Zigmond& Snaith, 1983).

Please read each statement and tick which number (0, 1, 2 or 3) which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

Over the past week, how often have you been bothered by any of the following problems?

**Question 1/14** 

I feel tense or 'wound up'

- $\circ$  Most of the time
- $\circ~$  A lot of the time
- From time to time. occasionally
- $\circ \quad \text{Not at all} \quad$

Question 2/14

#### I still enjoy the things I used to enjoy

- Verv definitely and guite badly
- Yes, but not too badly
- A little, but it doesn't worry me
- Not at all

## Question 3/14

## I get a sort of frightened feeling as if something awful is

#### about to happen:

- Verv definitely and auite badly
- Yes, but not too badly
- A little, but it doesn't worry me
- Not at all

## Question 4/14

## I can laugh and see the funny side of things:

- $\circ~$  As much as I alwavs could
- Not auite so much now
- Definitely not so much now
- Not at all

Question 5/14

#### Worrying thoughts go through my mind:

- A areat deal of the time
- $\circ$  A lot of the time
- From time to time, but not too often
- Onlv occasionallv

#### Question 6/14

#### I feel cheerful:

- $\circ \quad \text{Not at all} \\$
- Not often
- Sometimes
  Most of the time

## Question 7/14

## I can sit at ease and feel relaxed:

- Definitely
  Usually
  Not Often
  Not at all

## Question 8/14

## I feel as if I am slowed down:

- Nearly all the time
- Verv often
   Sometimes
   Not at all

## Question 9/14

## I get a sort of frightened feeling like 'butterflies' in the

#### stomach:

- Notatall
- o Occasionally
- Ouite Often
   Verv Often

# Question 10/14

## I have lost interest in my appearance

• Definitely

- $\circ~~$  I don't take as much care as I should
- I may not take quite as much care
  I take just as much care as ever

#### Question 11/14

#### I feel restless as I have to be on the move:

- Verv much indeed
- Ouite a lot
   Not verv much
- Not at all

# Question 12/14

## I look forward with enjoyment to things:

- As much as I ever did
- Rather less than I used to
   Definitely less than I used to
   Hardly at all

#### Question 13/14

#### I get sudden feelings of panic:

- Verv often indeed
- Ouite often
- Not verv often
- Not at all

#### Question 14/14

#### I can enjoy a good book or radio or TV program:

- o Often
- Sometimes

- Not oftenVerv seldom

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult

Thank you again for choosing to participate in this study. To save your data and move to the next page please click on the box below.

Save data / Next page

## **Debrief page**

Thank you for completing the baseline survey.

Your responses to this survey are anonymous and cannot be linked to your email address

You will receive the link to the follow-up questionnaire in 8 weeks' time plus 2 reminder emails.

If this survey has raised any concerns about your mental health, then you could contact Counselling Center for help and support Email: <u>counseling@zu.ac.ae</u>

Please click on the link below. You will be taken to another survey site where you will be asked to enter your email address. We can then email you a weblink to MoodGYM together with an access code which will give you free use of MoodGYM.

# Please click on this link to submit your email address and receive access to MooGYM.

[DONE]

# **Appendix 20. Online postintervention survey (study three)**



The post-intervention (post-course) survey is completed eight weeks after participants have received access to MoodGYM program It is completed online – participants receive the link to the online survey via email

## Web page 1

Thank you for participating in our study over the past eight weeks. We will now ask you to complete the follow-up online survey and HADS screening scale. This survey should take approximately 15-20 minutes to complete, depending on the amount of feedback you wish to give.

Please click 'Next' to go onto the next page of the survey.

We would like you to answer the following two questions so that we can identify the unique ID code you made in the first online survey. This is so that we can connect your answers from the first survey (eight weeks ago) to this survey and see if there have been any changes in your answers/scores.

Please specify your Day of Birth -----

Please specify the last three digits of your mobile number:

## <u>Gender</u>

- □ <u>Male</u>
- End Female

Semester GPA				
Cumulative GPA				
Number of attendance warnings this semester	0	1	2	

Which Modules of MoodGYM did you complete? Select all that apply.

3

- □ 1. Feeling module
- □ 2.Thoughts module
- □ 3. Unwrapping module
- □ 4. Destressing module
- □ 5. Relationships module
- □ I am not sure/ I can't recall

How many weeks did it take you to complete MoodGYM, starting

from the day you completed the first survey?

- One week
- Two weeks
- □ Three weeks
- □ Four weeks
- □ More than four weeks
- I am not sure
- □ Other (please specify)

## How would you rate MoodGYM overall?

- Very poor
- □ Poor
- Neutral
- □ Good
- Very good

How helpful did you find Moodgym program?

- Not at all
- A little
- $\Box$  A lot
- Not sure

How easy to use did you find MoodGYM?

- Very easy
- Easy
- Neutral
- Difficult
- Very difficult

Do you think you can recommend MoodGYM to colleague or friend?

- I would definitely recommend it
- I would recommend it
- Neutral
- $\hfill\square$  I would not recommend it
- □ I would definitely not recommend it

Has MoodGYM program had any impact upon your knowledge of mental health?

- □ Yes
- □ No
- Unsure

In your own words, how (if at all) hasMoodGYM has helped you? [text box]

## Web page 2

Depression and anxiety scale: HADS (14-item version) (Zigmond& Snaith, 1983).

Please read each statement and tick which number (0, 1, 2 or 3) which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

## Over the past week, how often have you been bothered by

## any of the following problems?

## I feel tense or 'wound up'

- $\circ$   $\,$  Most of the time  $\,$
- $\circ~$  A lot of the time
- From time to time, occasionally
- Not at all

#### I still enjoy the things I used to enjoy
- Verv definitely and guite badly
- Yes, but not too badly
  A little, but it doesn't worry me
- Not at all

#### I get a sort of frightened feeling as if something awful is

#### about to happen:

- Verv definitely and guite badly
- Yes, but not too badly
- A little, but it doesn't worrv me
   Not at all

#### I can laugh and see the funny side of things:

- As much as I alwavs could
- Not auite so much now
- Definitely not so much now
- Not at all

#### Worrying thoughts go through my mind:

- A areat deal of the time
- A lot of the time
- From time to time, but not too often
- Only occasionally

#### I feel cheerful:

- Not at all
- Not often
- Sometimes
- Most of the time

#### I can sit at ease and feel relaxed:

• Definitely

- o Usually
- o Not Often
- Not at all

#### I feel as if I am slowed down:

- Nearly all the time
- Verv often
  Sometimes
  Not at all

#### I get a sort of frightened feeling like 'butterflies' in the

#### stomach:

- Not at all
- o Occasionally
- Ouite Often
- Verv Often

#### I have lost interest in my appearance

- Definitely
- I don't take as much care as I should
- I may not take quite as much care
- I take just as much care as ever

#### I feel restless as I have to be on the move:

- Verv much indeed
- Ouite a lot
- Not very much
- Not at all

#### I look forward with enjoyment to things:

- As much as I ever did
- Ratherless than I used to
- Definitely less than I used to
- Hardlv at all

#### I get sudden feelings of panic:

- Verv often indeed
  Ouite often
  Not verv often
  Not at all

#### I can enjoy a good book or radio or TV program:

- o Often

- Sometimes
  Not often
  Verv seldom

# If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- □ Not difficult at all
- □ Somewhat difficult
- Very difficult
- □ Extremely difficult

Please check you have answered all the questions

Participants provided with contact details of research team, how to withdraw from study, university health counselling services.

Please click the done button to submit your answers.

Thank you for completing the survey. The purpose of this survey was to explore the effectiveness of a Web-Based cognitive-behavioral tool to support students with low mood and academic difficulties.

# Appendix 21. Reminder email sent to participants (study three)

## Evaluation of an online intervention to support students with low mood and academic difficulties.

This reminder email will be sent out four weeks and four weeks after the participant is sent the email detailing the instructions about how to self-enrol on the moodgym program and begin it. It is sent out regardless of whether they have or have not accessed the program. The self-enrolment instructions are attached to the email, in case they have not yet enrolled.

Subject: Your participation in a study to evaluate an online intervention program to support students with low mood and academic difficulties

Dear Participant,

You are being sent this email to remind you about your participation in the study involving evaluation of an online intervention to support students with low mood and academic difficulties. You can access the course here -<u>https://moodgym.com.au</u> and login using the 8 character alpha-numeric code provided to you in our previous email.

Please complete the course in your own time. You have until [insert date, four weeks after original instructions were emailed to them] to access and completemoodgym – after this date we will send you the final online survey to complete.

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If you are having difficulties accessing the moodgym online program, or cannot remember your login details, please reply to this email and I will try and solve the issue or re-send you your login details.

Thank you for participating in this study – we really appreciate it and hope that it is not too demanding for you. If you have any concerns or questions, please feel free to contact me via email. Likewise, if you wish to withdrawal from the study, please email me to say so.

Many thanks,

Suheir Awadalla

### Appendix 22 PRISMA checklist

Section and Topic	ltem #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	P 60
ABSTRACT	_		
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	P 60,65, 76, 89,97
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	P 64
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	P 64
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	P 65, 66
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	P 67, 68
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	P 67
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record	P 68, 69

Section and Topic	ltem #	Checklist item	Location where item is reported
		and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	P 69
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	P 77
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Р
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	P 70
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	P 71
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	-
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	-
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	-
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	-
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	-
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	-
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	P 72

Section and Topic	ltem #	Checklist item	Location where item is reported	
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	-	
RESULTS				
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	P 75	
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	P 76	
Study characteristics	17	Cite each included study and present its characteristics.	P 77	
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	P 72, 73	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	P 84	
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	-	
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	-	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	-	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	-	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	-	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	-	
DISCUSSION				

Section and Topic	ltem #	Checklist item	Location where item is reported
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	P 89
	23b	Discuss any limitations of the evidence included in the review.	P 96
	23c	Discuss any limitations of the review processes used.	P 96
	23d	Discuss implications of the results for practice, policy, and future research.	P 97
OTHER INFORMATION			
Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	-
protocol	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	-
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	-
Competing interests	26	Declare any competing interests of review authors.	-
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	-