UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

THE RELATIONSHIP BETWEEN RESILIENCE, ANXIETY AND DEPRESSION AMONG UNIVERSITY STUDENTS

by

Sello Dacious Manzini

A mini dissertation submitted in partial fulfilment of the requirements for the degree

MASTER OF ARTS IN COUNSELLING PSYCHOLOGY

Department of Psychology

Faculty of Humanities

UNIVERSITY OF PRETORIA

Supervisor: Prof N. Cassimjee

April 2024

Declaration of Originality

UNIVERSITY OF PRETORIA

The Department of Psychology, Faculty of Humanities places great emphasis upon integrity and ethical conduct in the preparation of all written work submitted for academic evaluation.

While academic staff teach you about referencing techniques and how to avoid plagiarism, you too have a responsibility in this regard. If you are at any stage uncertain as to what is required, you should speak to your lecturer before any written work is submitted.

You are guilty of plagiarism if you copy something from another author's work (eg a book, an article or a website) without acknowledging the source and pass it off as your own. In effect you are stealing something that belongs to someone else. This is not only the case when you copy work word-for-word (verbatim), but also when you submit someone else's work in a slightly altered form (paraphrase) or use a line of argument without acknowledging it. You are not allowed to use work previously produced by another student. You are also not allowed to let anybody copy your work with the intention of passing if off as his/her work. Students who commit plagiarism will not be given any credit for plagiarised work. The matter may also be referred to the Disciplinary Committee (Students) for a ruling. Plagiarism is regarded as a serious contravention of the University's rules and can lead to expulsion from the University.

Full names of student	:	Sello Dacious Manzini
Student number	:	16204817
Topic of work	:	The relationship between resilience, anxiety and depression among university students

The declaration which follows must accompany all written work submitted while you are a student of the Department of Psychology, Faculty of Humanities No written work will be accepted unless the declaration has been completed and attached.

Declaration

1. I understand what plagiarism is and am aware of the University's policy in this regard.

2. I declare that this dissertation (eg essay, report, project, assignment, dissertation, thesis, etc) is my own original work. Where other people's work has been used (either from a printed source, Internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.

3. I have not used work previously produced by another student or any other person to hand in as my own.

4. I have not allowed and will not allow anyone to copy my work with the intention of passing it off as their own work.

SIGNATURE: 

Acknowledgments

Without the assistance of these people, this mini dissertation would not have been able to be completed. I want to sincerely thank each and every one of you for the outstanding part you have played in helping me to successfully complete my Master's degree:

- Firstly, I would like to thank God for his unwavering love and support and for caring me until this point in completing my dissertation.
- My supervisor, Professor Nafisa Cassimjee, for your helpful advice during this process. I could not have completed my dissertation without your encouragement, feedback and general wisdom.
- For always being my source of strength and support, I am grateful to my mother, Mnyenyiwa Adelaide Machabane, my father, Shouting Kamos Manzini, my siblings, Lebo Collins Manzini, Thabang Clerance Manzini and Thabile Adrecia Manzini. Your unwavering faith in my potential has helped me get through my worst moments. Na Khensa, kea leboga!
- Thank you to my family and friends, Thabiso Ramohlola, Sphiwe Ramotlhoa, Retshepile Matsoalela, Thobeka Mdaka and Mudalo Ndou, for your unwavering patience and support as I pursue all of my ambitions.

Abstract

The global increase in mental health issues among university students, particularly their heightened vulnerability to anxiety and depression, underscores the need for more research on the mental health issues that are unique to the higher education context. Limited research has examined from a neurobiological perspective, the facets of resilience, despite the protective function that overall resilience may have in mitigating the symptoms of anxiety and depression. The aim of the current study was to explore the relative contribution of total resilience and facets of resilience on the variance observed on depression and anxiety outcomes among university students. This study entailed a secondary data analysis. The sample of this study comprised 135 university students.

The Beck Depression Inventory-II, the Predictive 6-Factor Resilience Scale (a neurobiological resilience measure), and the Beck Anxiety Inventory comprised the assessment battery used in this study. The data analysis method used was Multivariate Analysis of Covariance (MANCOVA) and multiple regression analysis. The findings indicated that resilience and the distinct facets of resilience such as Tenacity and Momentum accounted for significant variance in depression and anxiety outcomes among students. In the context of universities, where student support divisions have limited resources and are overburdened with an increased demand for student mental health services, novel interventions to building resilience is necessary.

Keywords: Anxiety, Depression, Neurobiology, Resilience, Student mental health.

Table of Contents

List of Tables

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This study explored university students' resilience profiles, depression and anxiety symptomatology and the facets of resilience that account for the variance in depression and anxiety profiles. The background and current state of the research are outlined briefly in this chapter. It goes on to detail the gaps in the literature. This chapter also describes the aims, objectives and, importance of the study.

1.2 Problem Statement

University students are largely a young adult population who are faced with challenges relating to separation from their families, encountering new environments and financial hardships. These factors have been shown to result in high stress levels and concomitant mental health challenges (Izadinia et al., 2010; Kaloeti et al., 2019).

Depression and anxiety have been proposed as some of the leading mental health-related challenges among university students worldwide (Drew & Matthews, 2019; Kokou-Kpolou et al., 2021; Reh, 2019). Research indicated that in relation to the general population, students encounter unique stressors arising from transitioning into university contexts, and these stressors may increase their vulnerability to depression and anxiety (Robbins et al., 2018; Verma, 2021). Research has indicated that resilience may potentially lessen the transition from prodromal symptoms to clinical diagnosis of certain disorders and, as a result, enhance prognosis when taking into account mental health risk and protective variables for students (Min et al., 2013; Poole et al., 2017). According to Rossouw and Rossouw (2016), neural connectivity and neuroplasticity form the neurobiological foundation of psychological resilience and is central to a person's ability to adapt over a lifespan. Anxiety and depression have been found to share similar and distinct underlying neurobiological networks as those proposed by Rossouw and Rossouw (2016).

Studies have investigated resilience within the context of psychological wellbeing and mental health and more specifically with anxiety and depression among university students. However, minimal studies have investigated resilience from a neuroscience perspective or the facets of resilience and their relationship with anxiety and depression among university students (Chang et al., 2021; Devi et al., 2021). Facets of resilience such as Tenacity, Vision, Collaboration, Composure, Reasoning, Momentum and Health hygiene have similar and

dissimilar neurobiological substrates (Rossouw & Rossouw, 2016) and these may have distinct relationships with depression and anxiety.

A neurobiological framework might potentially allow for the application of short-term interventions and resilience skills training by resource-limited student counselling centres guided by the principles of neuroscience and incorporating the different facets of resilience.

1.3 Research Aim and Questions

This study, using secondary data analysis, aimed to explore the relative contribution of total resilience and facets of resilience on the variance observed on depression and anxiety outcomes among students and attempted to answer the following research questions:

1) What is the neurobiological resilience, anxiety and depression profiles among university students?
2) Which facets of neurobiological resilience/total resilience significantly predict anxiety and depression outcomes among university students.

1.4 Objectives of the Study

The objectives of the study were as follows:

- To explore the resilience, depression and anxiety profiles among university students.
- To investigate total resilience and facets of resilience as significant predictors of depression and anxiety outcomes.

Hypotheses

H1: Total resilience significantly predicts depression and anxiety outcomes among students.

H2: Distinct facets of resilience significantly predicts depression and anxiety outcomes among students.

1.5 Overview of Methodology

This study used a secondary data analysis. The study adopted a cross-sectional design and was quantitative in nature, exploring through a MANCOVA both general and bi-directional relationships between independent variables (resilience and facets of resilience) and dependent variables (depression and anxiety). It also used multiple linear regression to assess the relative contributions of the independent variables to the variation observed in the dependent variables.

Students who had previously taken part in a research project on "C*ognition, Temperament, Character, Resilience, Depression and Anxiety among University Students"* comprised this study's sample. In the initial study, convenience sampling was employed, depending on the availability and willingness of participants to take part. Students enrolled in psychology courses at the University of Pretoria made up the sample. A resilience inventory (Predictive 6-Factor Resilience Scale), a depression scale (Beck Depression Inventory-II), and an anxiety assessment (Beck Anxiety Inventory) were completed by the individuals. The primary study excluded participants with any neurological ailment or mental disorder for which they had already received a diagnosis or treatment, and participants who had used drugs within the three months preceding the study.

1.6 Significance of Research

Drew and Matthews (2019) and Reh (2019) reported that despite enjoying education and life opportunities at universities, students experience higher levels of mental health challenges compared to the same age group in the general population. These researchers have further reported that students who have limited adaptive coping skills and low resilience to manage with stressors, are more prone to developing mental disorders. Marcotte et al. (2014) reported that depression is an important predicting factor which contributes to tertiary education dropout. Furthermore, in a more recent study, Marcotte and Villate (2021) found that between 25% and 40% of students do not complete their academic programmes due to mental health challenges such as depression, despite more young people enrolling for post-secondary studies. Transitioning into the post-secondary phase represents a period of vulnerability particularly for at-risk students (Marcotte et al., 2014). Because of the demanding academic environment, changes in growth, and elevated stress levels, anxiety disorders typically co-

occur with other disorders in the student population, such as adjustment disorders (Bantjes et al., 2016).

Furthermore, Cheng et al. (2020) found that developing student resilience and promoting social support may prevent the occurrence of depression and anxiety in their university life. Resilience has been proposed as a buffer against negative life outcomes especially when coping with stress of university demands such as examinations (Robbins et al., 2018; Singh et al., 2021). Rossouw and Rossouw (2016) proposed a neurobiological theory of psychological resilience, where six facets of resilience were identified. This novel conceptualisation and use of a neuroscience-based resilience inventory further enhances the significance of the study as it has not been used in South Africa previously.

Taken together with the resource challenges faced by student mental health services and the exponential increase in depression and anxiety among students, a neuroscience perspective on facets of psychological resilience allows for the development and application of novel short-term interventions, which may in turn mitigate the prognosis from prodromal symptoms to clinical manifestations.

1.7 Structure of the Dissertation

In Chapter Two, the background information, current research on depression and anxiety among students, and existing research on resiliency are reviewed. The methodology employed throughout the study is described in detail in Chapter Three, with an emphasis on the sampling strategy, the many measurement tools used, and the statistical methods used for the data processing. A comprehensive overview of the results is presented in Chapter Four. Chapter Five discusses the study's key findings by locating them in a larger body of literature and identifies the study's limitations and offers recommendations for additional research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of recent literature that is relevant to the study. Firstly, an overview of university students' mental health is provided. Thereafter, an overview of depression is outlined including its prevalence, risk factors as well as the neurobiological underpinnings of depression followed by a discussion on anxiety risk factors, neuroscience and prevalence. Lastly, a definition of resilience together with associated factors, prevalence among students and neurobiological perspective is presented.

2.2 Mental Health Among University Students

Internationally it has been reported that the importance of earning a university degree is rising, and since many students move away from home to enrol in post-secondary institutions, the change itself can be anxiety-inducing and may contribute to affective distress (Browne, 2020). Furthermore, students experience significant pressure during their university years, which is a crucial phase in the transition from youth to adulthood, due to a wide range of variables including financial hardships, academic obligations, interpersonal relationships, and changing lifestyles (Saleem & Mahmood, 2013). While some students can handle this pressure well, others may struggle with their emotions, relationships with others or their academic performance. Because of this, students may be at risk for declining mental health (Kamruzzaman et al., 2022). According to Biswas (2021) anxiety and depression are the two mental health issues that university students experience the most frequently. Various studies also reported that student's functioning in various facets of life is disrupted when symptoms of depression and anxiety worsen and last for an extended period of time (Asici & Sari, 2022; Biswas, 2021; Dhar et al., 2019; Wahab et al., 2022).

In Africa and South Africa, access to higher education has had a major impact on the growth of democracies. In South Africa, for instance, universities have been instrumental in efforts to counteract social inequality, combat the effects of apartheid, and enhance the wellbeing of students, families, and larger communities by providing educational opportunities (Manap et al., 2019; van Vuuren, 2014). Furthermore, as reported by Beiter et al. (2015),

concerns regarding students' mental health and wellbeing as well as their ability to receive the best support possible from their university's psychological support services are growing as access to higher education has increased. According to researchers (Beiter et al., 2015; Eisenberg et al., 2007; Eloff & Graham, 2020; Georgakopoulos, 2020), the number of students who require treatment for mental health disorders greatly outnumbers the resources of the majority of counselling services offered at universities and as a result, there is a sizeable unmet need among students for mental health intervention. Furthermore, it is reported that the South African universities have played an integral role in addressing inequalities in the country. However, the challenge of entering these institutions itself raises a concern for student mental health, especially among those who may feel financially segregated and are likely to experience heightened anxiety and comorbid depressive symptomatology (Eloff & Graham, 2020).

Recent research conducted globally and in South Africa, (Aluh et al., 2020; Hossain et al., 2022; Liu et al., 2021; McCready, 2018), reported that the prevalence of mental health concerns among university students is a growing concern. It was also reported that since the majority of mental problems manifest for the first time in young adults, who make up the majority of undergraduate university students, the presentation of symptoms of mental disorders should be taken into consideration (Alves et al., 2021; Gómez-Molinero et al., 2018). Furthermore, Ononye et al. (2022) and Ranizal et al. (2019) reported that university students struggle with a variety of issues, including peer pressure, independent living, family problems and the pressure of their studies, all of which increase their risk of depression. Currently, students experience a wide range of pressures that may affect their cognitive ability and emotional status such as exams, a hostile learning environment, a lack of resources for help, inadequate instructor support, and inadequate parental support (Zainab & Zafar, 2019). It is also further reported that students who endure these stressors frequently may become apathetic or uninterested in their academics, which will affect their performance and might lead to mental distress and poor performance including dropping out (Hanson, 2021; Letseka & Maile, 2008; Moodley & Singh, 2015; Ochnik et al., 2021; Sharma & Kirmani, 2015; Suleiman et al., 2017; Wang et al., 2022). Due to the various factors such as stress, and peer and academic pressure affecting students at tertiary institutions, their mental health should be prioritised as South African research has reported depression and anxiety to be common among students (Bantjes et al., 2016; Farrer et al., 2016; Janse Van Vuuren et al., 2021; Mungai & Bayat, 2019). Lastly, various studies have reported that enhancing resilience among students has been found to

protect against psychological disorders such as depression and anxiety (Chang et al., 2021; Cheng et al., 2020; Devi et al., 2021; Ko & Chang, 2019).

2.3 Depression

Depression is a common severe medical condition which has an adverse effect on a person's thoughts, feelings and behaviour (Barreto dos Santos et al., 2021). Furthermore, a variety of unpleasant emotions, such as melancholy, anxiety, restlessness, worry, helplessness and worthlessness, can be experienced by persons who are depressed. They may lose interest in formerly enjoyable activities, suffer from loss of appetite or overeating, struggle to focus, cognitive decline and even contemplate or attempt suicide. International studies reported that students in universities are not exempt from the effects of depression, which afflicts students from all walks of life (Chakrabarti et al., 2019; Oluwafunmilola, 2012). Furthermore, international research trends indicate that depression among students is common due to transitional adaptation challenges, maintaining good grades, planning for the future, and living away from home (Kaltenboeck & Harmer, 2018; Valdeavilla et al., 2019).

In Africa, depression is regarded as a major cause of disability and premature death in developing countries, and it is anticipated to be the most common cause of disability (Dapaah & Amoako, 2019). With reported low mood and aversion to activity being symptoms of depression, thus having an impact on a person's thoughts, actions, feelings and general sense of wellbeing (Birhanu & Hassein, 2016).

Findings from South African studies have indicated that university students are more prone to mental health challenges especially depression, which among university students is significantly higher when compared to the same age group in the general public (Gress-Smith et al., 2015; Kaloeti et al., 2019; Tan & Reyes-Wapano, 2021; van Zyl et al., 2017). In South Africa, although depression remains a major concern especially among students, only few receive all the support services they need (Bantjes et al., 2019; Chukwuere et al., 2021).

2.3.1 Depression among university students

Internationally and in South Africa, it is reported that students experience many challenges and stressors related to their studies (Georgakopoulos, 2020; Islam et al., 2018;

Sharma & Kirmani, 2015). Due to the stress caused by studies and independent living, depression significantly affects university students' academic performance and is one of the main causes of mental health problems in this group of students (Beiter et al., 2015; Zainab & Zafar, 2019).

Bekova et al. (2021) and Yahya et al. (2017) reported that students in their first year of university are the group most susceptible to pressure. Students must adjust to a new environment and a range of social backgrounds in addition to aiming for academic success and meeting social requirements in order to prepare for their future careers. These factors can significantly affect students, especially those who are new to the university and have to start a new life, and their high expectations for academic success may lead to stressful experiences. Furthermore, Asici and Sari (2022) and Mofatteh (2021) reported that despite all the initiatives to raise awareness and address mental health issues among university students, depression and suicide among students are still on the rise, and severe depression can lead to poor university attendance and increasing dropout rates. Suleiman et al. (2017) further reported that when examining determinants of depression among students in a Malaysian university, the initial signs of depression typically appear during the early years of the academic journey.

According to Awadalla et al. (2020) and Sawai et al. (2022), students' susceptibility to greater stressors has a detrimental effect on their lives as students. University students who experience depressive symptoms may find it difficult to complete their academic requirements satisfactorily because they may believe that they are falling short of expectations (Browne, 2020; Liu et al., 2022a). As a result, they experience frustration, have a pessimistic outlook on life, and perceive themselves as failures (Cooper et al., 2020). According to prevalence estimates, about a third of students are likely to be dealing with moderate-to-severe depression at any given moment, which could be higher than the rate seen in the general population (Grygiel et al., 2013; Manjari & Pandey, 2017; Rehman et al., 2021).

2.3.2 Prevalence of depression among students

Many studies have been conducted internationally on the prevalence of depression among university students. For instance, when examining depressive symptoms among university students in Hong Kong, Lun et al. (2018) reported a prevalence of 68%, whereas Liu et al. (2022a) in their study among Chinese students reported a prevalence of 35%.

Furthermore, Parra (2020) reported the prevalence of depression among students in Peru at 35% and 11% for Venezuelan students, with Valdeavilla et al. (2019) reporting the prevalence of depression at 53% in their study when examining symptoms of depression among Filipino university students. A lower prevalence of 28% was reported by Gao et al. (2020) while Shamsuddin et al. (2013) reported depression prevalence of 27%. Astutik et al. (2020) and Yahya et al. (2017) reported a 25% and 37% prevalence respectively in their studies among Malaysian university students. Awadalla et al. (2020) found a 34% prevalence of depression in their study among Emirati university students, whereas Browne (2020) reported a 59% prevalence of depression among university students in Minnesota. Chakrabarti et al. (2019) reported a prevalence of 34% and Ramezankhani et al. (2013) reported a 50% prevalence among Iranian university students, with Moutinho et al. (2017) reporting a 35% prevalence of depression among Brazilian students. Vigo et al. (2021) reported 61% of depressive prevalence among university students in Canada. Furthermore, various studies reported similar trends in depression prevalence ranging between 41%-47% among students (Bekova et al., 2021; Brenneisen Mayer et al., 2016; Islam et al., 2020; Liu et al., 2021; Wahab et al., 2022) while similar trends were also observed by Ghanim et al. (2022) and Tung et al. (2014), and Dhar et al. (2019) at 56%, 60% and 10% respectively. More recent studies found that 82% of Malaysian university students reported depressive symptoms together with a 64% prevalence among university students in Mexico, which may indicate an increasing trend among university cohorts (Carrasco-Carballo et al., 2021; Kechil et al., 2022).

Regarding the severity classification, of the 27% reported by Shamsuddin et al. (2013), 10% were classified as severely depressed. Asif et al. (2020) in their study of depression among Pakistani university students reported the following prevalence of depression for mild (16%), moderate (36%), severe (15%), and extremely severe (9%). Corroborating this trend, Islam et al. (2020) further reported the prevalence of mild depression at 25% and severe at 4% in their study on depression among university students in Bangladesh. Furthermore, Karmakar and Behera (2017) reported 17% minimal depression, 36% mild, 41% moderate and 6% severe among university students in India. And a recent study in Bangladesh indicated a similar prevalence of moderate-severe of 22% and 7% respectively (Hossain et al., 2022). From these studies, conducted mainly in developing countries, the presence of moderately-severe depression is a growing concern for university students.

Studies conducted in Africa reported various prevalence estimates of depression. For instance, Najjuka et al. (2021) reported 28% of depressive prevalence among Ugandan university students while Birhanu and Hassein (2016) reported 32% prevalence of depression among Ethiopian students, with Anyayo et al. (2022) reporting similar trends at 31% of depression prevalence. Studies have been conducted in South Africa reporting prevalence of depression among students. In their study on depression, anxiety, stress and substance use among medical students, van Zyl et al. (2017) reported a prevalence of 27% for depression and 27% for anxiety. Furthermore, Bantjes et al. (2019) also reported a similar trend (25%) for depression among first year South African university students while Dworzanowski-Venter (2019) found that 12% of students reported depression.

Regarding the severity classification, Aluh et al. (2020) reported the prevalence of mild depression at 45%, while that of severe depression was 5% and extreme depression at 4% when examining depressive symptoms amongst university students in Nigeria. Peltzer et al. (2013) reported 7% moderate depression, 25% severe depression among university students in Nigeria. Furthermore, a study in Kenya by Othieno et al. (2014) reported the prevalence at 6% for severe depression and 36% moderate depression among students while Ogachi et al. (2019) found the prevalence of depression to be at 77% mild, 13% moderate, and 2% severe. Although prevalence and severity vary across studies and countries, these estimates of prevalence and severity indicate significant mental health challenges faced by university students.

2.3.3 Factors associated with depression

Internationally, various factors associated with depression have been identified. Farrer et al. (2016) reported that the level of depressive symptomatology students' experience is related to the type of stressors they experience such as examination anxiety. Furthermore, the difficulties that students have while pursuing their education, such as a high workload, insufficient sleep and physical activity, financial difficulties, social isolation, and a lack of support from others, are some of the factors that predict depression as reported in various studies (Manap et al., 2019; Sharma & Kirmani, 2015). Other characteristics of the learning process, such as student motivation, confidence in their abilities, and course enjoyment, are included as another consideration. Also, it is well recognised that psychological aspects such as interpersonal dynamics, a feeling of loneliness, and self-esteem are linked to depression in university students as reported by Bekova et al. (2021).

In Africa and South Africa, a study by Anyayo et al. (2022) found that depression levels vary based on the field of study, year of study, satisfaction with academic performance and quality, place of residence, regions and countries, as well as gender groups. This is supported by van Zyl et al. (2017) who identified various risk and protective factors underlying the onset of depressive symptomatology among South African students. Furthermore, the prolonged and constant stressors associated with separation from parents and academic pressures, financial problems and lack of sleep may exacerbate vulnerability to depression and excessive worry, especially due to lack of resources and support to enable coping with these challenges (Meintjes, 2020; Rousseau et al., 2021; Tan & Reyes-Wapano, 2021).

Various associated risk factors for depression among students have been identified; for example, Asif et al. (2020) stated that not only is depression an individual problem but it also involves society and disrupts both occupational, individual and social functioning. In their study, it was found that factors predicting depression were pessimism, indecisiveness, lack of self-confidence as well as avoiding challenges (Bitsika et al., 2010). Zainab and Zafar (2019) and Valdeavilla et al. (2019) reported that depression is linked to poor academic performance, dropping out, unstable relationships, suicide thoughts and attempts, subpar employment performance, substance abuse, severe infectious illnesses and generally poor physical and mental health among university students. Moreover, depression during this formative stage might have a severe impact on social interactions and career possibilities later in life. There are many risk factors for depression among university students, including lower socioeconomic position, heavy alcohol use, smoking, gambling, life stressors, physical inactivity, obesity or overweight, and sleep issues (Wahab et al., 2022). Time constraints, ongoing financial failures, absence of past knowledge to address courses and other factors, increase the likelihood that depressive illnesses may appear at different levels as reported by Islam et al. (2018) and Parra (2020). It was further reported that social interpersonal stress, residence, and the environment as well relationships with friends significantly contributed to depression symptoms and that university students may not have access to adequate resources (such as social support and practical coping mechanisms) to handle difficulties (Liu et al., 2022a; Rehman et al., 2021; Rousseau & Thompson, 2019; Yahya et al., 2017).

2.3.4 Neurobiology of depression

Jacobs et al. (2000) focused on the neurogenesis process, which affects depressive symptomatology. They stressed the importance of neurogenesis in the dentate gyrus as influencing the development of the hippocampal region. They further highlighted and affirmed the prominence of neurogenesis in the recovery from and the onset of depressive episodes. They assumed that stress as a factor lead to neurogenesis suppression and subsequent manifestation of symptoms of depression. A related perspective was proposed by Wohleb et al. (2016) who suggested that depression may be a result of alterations in the brain regions of the corticolimbic system, where the neuronal atrophy and synaptic dysfunction are evident in the prefrontal cortex and hippocampus. Interestingly, the neurobiological perspective of resilience as proposed by Rossouw and Rossouw (2016), focuses on similar systems, that may underlie facets of resilience such as Vision, Tenacity and Reasoning.

Kaltenboeck and Harmer (2018) reported that the anterior cingulate cortex, orbitofrontal cortex, basal ganglia, hippocampus, parahippocampus and amygdala are all part of the limbic-cortico-striato-pallido-thalamic circuit, which is associated with anatomical and functional abnormalities in depression. This is supported by Davidson et al. (2002) and Dean and Keshavan (2017) as they reported that neurobiologically, depression is linked to anatomical and functional abnormalities of the brain, stressing the limbic system and the complicated pathophysiology of depression as immunological processes. They also emphasised that the most commonly studied brain region in connection with depression is the hippocampus. Furthermore, it is essential for memory and learning, based on emotional reactions, and it is one of the two brain regions where neo-neurogenesis is known to continue in the mature brain explaining its high capacity for neuroplasticity (Jacobs et al.,2000). It is also rich in corticosteroid receptors and is closely connected physiologically and anatomically to the hypothalamus via a bundle of axons, the fornix. In addition to recruiting and directing cortical arousal and neuroendocrine response to unexpected and confusing inputs, the amygdala is involved in memory and emotional learning. (Palazidou, 2012). The degree of depression is correlated with abnormal amygdala activation (Davidson et al., 2002; Maletic et al., 2007).

Albert et al. (2012) and Li et al. (2021) reported that in students with depression, there has been evidence of a loss of glial cells and a reduction in amygdala volume. It is believed that the hypothalamus has a substantial relationship with the neurophysiological signs and

symptoms of depression, such as sleeplessness, lack of appetite and diminished sexual arousal. Long acknowledged as a key idea in the aetiology of depression, a neuronal adaptation, also known as structural plasticity or neural plasticity, is an individual reaction to the environment that occurs in the adult brain and involves both the production of new cells and the genetically healthy cell death of existing cells (Jeon & Kim, 2016). Stress, memory, learning, and the environment can all trigger an intracellular signal transduction cascade, which is a fundamental aspect of brain plasticity, to be triggered in a particular neuronal circuit (Krishnan & Nestler, 2008; Manji et al., 2001).

2.4 Anxiety

The American Psychiatric Association (2013) indicates that features of anxiety disorder include excessive fear or feelings of prolonged anxiety and the distress or impairments in significant areas of functioning. This is further supported by Jones et al. (2018) who reported that anxiety is an emotional state that encompasses a range of emotions, thoughts, behaviours and physical reactions or experiences. They also reported on the subjective experience where anxiety is considered as a distinct sensation and can be identified by varying degrees of feelings of dread, terror or unease. On a more objective or behavioural level, anxiety shows itself as heightened autonomic nervous system activity and symptoms including sweating, breathing problems, muscle tightness and palpitations. Under normal circumstances, anxiety is thought to be a universal phenomenon that improves performance and contextual adaptation in social, professional and academic settings. It can also be viewed as a warning and activation mechanism for potentially dangerous situations. Its main goal is to get us moving in dangerous or uncomfortable situations so we can react appropriately to reduce, eliminate, assume or face the risk.

Alatawi et al. (2020) reported that the general population is prone to anxiety disorders, which are a serious health issue. They further found that approximately 50% of university students who have anxiety say that their symptoms started during childhood when examining prevalence of anxiety and risk factors among students. Furthermore, several studies found that the percentage of persons who experience anxiety has nearly doubled and increased by nearly 50% between 1990 and 2013 (Daviu et al., 2019; Jones et al., 2018). Students in higher education are more likely than ever to experience mental health issues, particularly anxiety (Daviu et al., 2019). Academic research on anxiety has grown, especially in relation to anxiety

treatment. It is a topic that holds significance in the context of education because it is connected to achievement, failure, and school dropout (Daviu et al., 2019; Hernández et al., 2020).

2.4.1 Anxiety among students

It has been reported that anxiety is a psychological condition that can afflict students of any class, colour, gender or religion (Duraku, 2017; Torija et al., 2016). Its effects can make it difficult to focus for extended periods of time or do jobs that need concentration. It also includes an unsettling, hazy and perplexing sense of fear and apprehension. As a result, anxious students worry a lot, especially about potential threats (Jones et al., 2018). Vitasari et al. (2010) further reported that anxiety was one of the predictors of poor academic performance with anxious students indicating lack of interest in learning, poor academic assessment outcomes and feelings of helplessness, nervousness and panic when doing academic work and attending lectures. These high levels of anxiety further cause disruptions in an individual's overall daily activities. Furthermore, Hernández et al. (2020) and Torija et al. (2016) reported that anxiety is linked to dropout and underachievement among university students when it comes to selecting a programme, learning new ideas, fitting in with groups, passing exams or planning their activities within the university. It was further identified that the lecturer's demeanour, instructional strategies, emphasis on academic achievement, pressure to succeed and postgraduation plans, subject difficulty, new roommates, identity crises, culture shock, and interpersonal issues all contributed to anxiety in the classroom (Beiter et al., 2015; Jones et al., 2018; Mohamad et al., 2021; Vitasari et al., 2010).

When examining anxiety among students, Duraku (2017) reported that students' academic failures, unhealthy relationships between students and course instructors, and evaluations and competition among students increased their anxiety levels, Sharma and Kirmani (2015) further identified developmental problems, psychological problems like identity formation and confusion, problems in relationships and the workplace, modifications in social and familial dynamics, and exposure to new ideas and temptations to be associated with anxiety. Researchers have reported that students' poor performance is strongly correlated with high levels of anxiety (Afolayan et al., 2013; Vitasari et al., 2010). They further reported that anxiety symptoms have been related to cognitive dysfunction and memory loss, which can lead to poor academic performance and failure in school.

2.4.2 Prevalence of anxiety among students

Studies have been conducted internationally on prevalence of anxiety among students. For instance, Alatawi et al. (2020) in their study among Saudi university students found 10% of students with anxiety reported feeling this way almost daily with symptoms including feeling nervous or on edge. In their study on prevalence of anxiety among Mexican university students, Torija et al. (2016) further reported that 25% of students had anxiety disorders. In a study on Canadian students, it was found that the anxiety prevalence was at 41% (Liyanage et al., 2021). Bisson (2017) reported that the prevalence of anxiety among university students particularly in the United States rose from 7% in 2000 to 13% in 2013. Mohamad et al. (2021) found that 29% of their Malaysian student cohort reported anxiety. Anxiety was also reported as the most common mental health challenge faced by students attending a Pakistan university (Asif et al., 2020). These international trends of increasing anxiety prevalence are seen across developed and developing countries.

Regarding severity classification, Hernández et al. (2020) reported anxiety prevalence at 32% mild, 40% expected, 20% moderate, and 7% severe when associating anxiety with academic performance of students. In studies by Amendola et al. (2021) and Jones et al. (2018), 20% of students felt moderate-to-severe anxiety, with Manap et al. (2019) reporting similar trends when examining anxiety among students in Malaysia. Furthermore, Lun et al. (2018) found that 54% of students had mild anxiety, while 6% had severe anxiety. Asif et al. (2020) reported anxiety prevalence from 12% normal, to 4% mild, 19% moderate, 18% severe, and 47% extremely severe when examining frequency of anxiety among Pakistani university students, while Zhang et al. (2021) found 44% of students in China lived with mild to severe anxious symptoms. Various studies reported similar trends of anxiety among students at prevalence range of between 25% to 34% (Alves et al., 2021; Shamsuddin et al., 2013; Sharma & Kirmani, 2015; Wang & Liu, 2022; Wang et al., 2022).

In Africa and South Africa various studies have reported on anxiety prevalence among students. Aluh et al. (2020) reported a prevalence of 64%, with 14% extreme in severity among Nigerian students. Furthermore, anxiety prevalence was reported to be 33% among Ethiopian students by Reta et al. (2020). Among Ugandan university students, Najjuka et al. (2021) reported 98% prevalence of anxiety following an online survey conducted during the COVID pandemic. When assessing levels of anxiety among South African first-year university

students, Bantjes et al. (2019) reported a 21% prevalence, Aronsson and Agren (2020) found a higher prevalence of anxiety (55%) and more severe symptoms among students. In a recent study conducted during the COVID-19 period, a similar prevalence trend was shown, with 46% of students reporting anxiety (Visser & Law-van Wyk, 2021). Bantjes et al. (2016) reported that 84% experienced mild anxiety with 12% moderate and 4% severe among South African university students.

2.4.3 Factors associated with anxiety

Various risk factors for anxiety disorders have been identified among university students. Vitasari et al. (2010) noted both personal, academic and social factors (issues with self-identity, difficult modules, relationship problems, shared living arrangements) as putative risk factors for anxiety disorders. Mohamad et al. (2021) stated that factors such as being fearful, excessive worry and stress would lead to a response in the body known as anxiety occasionally, however, intense and persistent worry and excessive fear can lead to anxiety disorders.

In their study on resilience, anxiety and depression, Bitsika et al. (2010), found that anxiety was predicted by failure to persist, lack of purpose and confidence, avoiding challenges and lack of solution-focused skills. Alves et al. (2021) further reported other factors that could affect academic achievement included a lack of social support, a heavy workload and volume of studying, little sleep, and mistreatment by classmates and lecturers with risk factors for developing anxiety included having a low socioeconomic position, environmental risk factors and being abused as a child. Furthermore, Duraku (2017) and Georgakopoulos (2020) reported that the transition from high school to university and the challenge of juggling academic demands with a personal life outside of school are some of the many stressors that university students are subjected to, which increase their susceptibility to anxiety. This was supported by Vitasari et al. (2010) who identified math anxiety, class presentation anxiety, social anxiety, exam anxiety and language anxiety when examining anxiety sources.

2.4.4 Neurobiology of anxiety

The neurobiological underpinnings of anxiety are thought to include alteration in brain functioning, which may be influenced by experiences in the environment, genetic predisposition and the disruptions in the neurotransmitter systems. The increased activity in the brain regions and alterations in neurotransmission in the limbic system associated with emotion processing may contribute to the presentation of anxiety symptoms (Martin et al., 2009). Interestingly, these underlying neuroanatomical structures and neurotransmitters are proposed as underlying the Composure and Collaboration facets of neurobiological resilience (Rossouw & Rossouw, 2016).

According to Daviu et al. (2019) anxiety and stress share common behavioural and neurobiological basis. Perceived threats, also known as psychological stressors, are situations that present a risk of harm and pose a homeostatic challenge. They also introduce the vital component of anticipation. For an understanding of the association between anxiety and stress, one must grasp the idea of anticipation in the stress reaction. This perspective holds that stress is an emotional reaction to a stimulus that occurs concurrently with a physical reaction. The perception of the immediacy of the threat influences this emotional response to some extent. When healthy individuals experience stress or anxiety, certain brain regions are activated, including the brainstem nuclei, prefrontal cortex, amygdala and hypothalamus. This is further supported by Etkin (2012) and Jessee (2019) who reported that anxiety is significantly influenced by the amygdala, visual cortex, prefrontal cortex and superior temporal gyrus. These unique amygdala connections interpret sensory information and transmit it to the hypothalamus, which subsequently triggers behavioural and physiological responses. These amygdala anomalies may be the cause of some anxiety-related emotional processing symptoms, like excessive worry. Amygdala malfunction may be an attribute that sets anxiety apart since it influences emotions such as fear and worry as well as autonomous reactions to emotional cues. The largest area of the brain, the prefrontal cortex, influences a wide range of functions, including anxiety-related ones. These anomalies are indications of cognitive anxiety since they interfere with mentalisation and the person's ability to regulate their emotions.

Both Cohodes and Gee (2017) and Mufford et al. (2020) attest that anxiety manifests in childhood and adolescence, when the frontolimbic circuitry is undergoing dynamic changes due to development. Garakani et al. (2006) further reported that the amygdala is the part of the

brain where fear conditioning is learned and expressed. Martin et al. (2009) further reported that pathways that process sensory input, associate sensory data, and trigger arousal circuits are all part of the neurobiology of fear where in which the amygdala and the hypothalamus send signals to the locus coeruleus, which releases norepinephrine into the neocortex to cause broad cortical arousal.

2.5 Resilience

Serrano Sarmiento et al. (2021) reported that the concept of resilience originated from physics and refers to the ability of the body to recover after being deformed. van Vuuren (2014) posited that the concept of resilience originated from the 16th century and has been studied in various disciplines and stems from the Latin word "re-silere" which means to "recover". According to Watanabe and Takeda (2022), the ability to overcome hardship and nimbly adjust to shifting environmental demands is referred to as resilience. Resilience is considered as a protective factor assisting individuals with their wellbeing and facilitating adaptation when encountering threats and stressors (Hutchinson et al., 2010; Robbins et al., 2018; Singh et al., 2021). Subsequently, resilience can be understood as the ability to bounce back from adversities and stabilise emotional health, and has, therefore, been established in research as an important factor in the prevention of psychological disorders such as depression and anxiety (Devi et al., 2021; Izadinia et al., 2010; Kesebir et al., 2013; McGillivray & Pidgeon., 2015; Verma, 2021).

Researchers have found that resilience is positively correlated with psychological wellbeing (i.e., a stable, positive mental state that enables students to operate effectively) and negatively correlated with depressive and anxiety symptoms (Liu et al., 2021; Rasheed et al., 2022). Furthermore, in a study on the mediating role of resilience in mental wellbeing and life, it was found that resilient students can modify their reactions by using constructive self-evaluation and problem-solving techniques in the face of internal and external stresses, therefore lowering the negative feelings associated with stressful circumstances and overall stress levels (Rasheed et al., 2022). Resilience can be an internal strength that aids in coping, for students who have little access to coping mechanisms from external social networks. Mental disorders like depression and anxiety can develop as a result of not managing stressful events. The capacity to manage these stressors differs from person to person (Hamdan-Mansour et al., 2014; Osório et al., 2017).

Rasheed et al. (2022) reported that the idea that a resilient individual does not experience anxiety, emotional upheaval or stress is untrue. Resilience is a dynamic process that is impacted by one's responses to various life events. There are three steps in the resilience process: 1) maintaining a steady, resistant, and sound mental state throughout periods of adversity; 2) recovering from adversity or regaining psychological strength after a trying time; and 3) progressing after recovery, with the person maintaining a sound mental state and displaying improved performance from even before the hardships (Binti Ahmad & bin Khairani, 2018).

2.5.1 Resilience among university students

Shilpa and Srimathi (2015) indicated that in order to raise students' quality of life, knowledge and skills on resilience should be imparted. Those who are resilient can use their own and other students' resources to deal with the negative effects of stress. This is further supported by Bastaminia et al. (2016) who identified characteristics of resilience to be a) a coherent relationship with one's family; b) a coherent social environment; c) a coherent physical surroundings; d) a coherent inner sense of wisdom; and e) a coherent attitude that upholds the person's beliefs. These dimensions assist students to develop adequate coping strategies in stressful and challenging situations. They further reported that those who are resilient can exercise self-control, empathise, have a positive self-concept, be organised and be optimistic. These characteristics enable traumatised students to efficiently adapt and cope rather than displaying vulnerability (Tung et al., 2014). It was further reported that resilience is essentially universal; however, it is also highly unlikely that everyone has the same level of resilience or that the same environmental conditions affect everyone equally (Mirza & Arif, 2018).

Xu et al.'s (2021) research on resilience among students in China found that resilience is thought to be an essential risk-reducing protective factor of stressful or unfavourable events and fosters the normal growth of students. As many of the precipitating factors overlap with resilience facets, enhancing resilience for young people at risk should be emphasised (Marcotte & Villatte, 2021). In a study on resilience among students in Kenya, Oyoo et al. (2018) reported that resilience is a positive attitude and stress-reduction technique. They also found that although all students face similar difficult or dangerous situations, resilient students are able to use these situations as opportunities for their own personal development. Because of this, they

have the capacity for successful adaptation, and when they respond to the challenges, rather than losing their ability, they gain new skills. This suggests that resilient students are more likely to maintain a high level of academic motivation and performance despite the difficult circumstances that increase the likelihood that they will perform poorly in school.

Both global and South African studies further reported that resilience as a phenomenon is a multi-generational, socially based process that relates to students' ability to withstand adversity (Graber et al., 2015; Theron, 2016). Thus, students cannot be exclusively blamed for their responses to difficult life circumstances. Resilience is also developed through protective mechanisms, evolves as a dynamic psychosocial process, and can be facilitated by constructive adaptation (Biswas, 2021). Mercer (2010) reported that resilience is thought to have an impact on students in a university context because university life may be demanding and difficult and requires the ability to combine employment and family obligations, academic workload and financial difficulties. It also aids in the students' adjustment to their academic environment. According to Mwangi et al. (2017), students that are resilient have less psychological anguish, are better able to manage their academic tasks, and have access to more sophisticated coping mechanisms when faced with academic challenges. They further reported that resilience is generally a skill that students require because it supports their mental health and aids in their adjustment to university life. A resilient person is one who is adept at adopting coping mechanisms to adapt to stressful situations, maintains an internal locus of control, and develops a positive self-image, which are traits that contribute to a healthy mind and body (Mercer, 2010).

Furthermore, van Vuuren (2014) and Hussain and Thakur (2019) reported that autonomy, time management, goal-setting and a feeling of purpose are among the variables related to resilience, Resilience is all about how an individual's personal traits interact with their surroundings to determine whether they are resilient or vulnerable. In fact, a combination of innate and external protective characteristics is what makes a person robust. It is necessary to recognise the existence of resilience in order for students to deal with potential adversity in their life, adapt and overcome these adversities. Self-regulation is linked with resilience traits. This is supported by Ngubane (2019) and Shastri (2013), who reported that there are several resilience traits that reflect resilient capacity, including the ability to influence how one remembers horrific events, integrating of memory and emotions, control of symptoms, regulation of trauma-related emotions, self-worth, internal cohesiveness (thoughts, emotions,

and behaviours), and creation of trusting relationships. Resilience is essential for university students who, for the most part, are adjusting to new social and academic environments for the first time (Liu et al., 2022b; van Wyk et al., 2022).

2.5.2 Factors associated with resilience

Chmitorz et al. (2018) identified factors involved in one's resilience to adversity. Factors such as cognitive control, inhibition and risk-taking, executive functioning, self-control, impulsivity, self-regulation and effortful control were considered under the rubric of resilience. Furthermore, Rossouw and Rossouw (2016) reported that neurobiologically, functions controlled by the prefrontal cortex significantly influence resilience. They further reported that characteristics such as hardiness, optimism and positive coping are often associated with resilient people, which in turn through its facilitative adaption mechanism to life stressors, has been found to assist in better mental health outcomes. Both higher academic achievement and lower mental health issues have been linked to higher resilience levels (Anyan & Hjemdal, 2016; Min et al., 2013; Peng et al., 2012; Poole et al., 2017). High resilience has thus been proposed as potentially improving both the prognosis and diagnosis of mental health among students

In a European study on psychological resilience, Graber et al. (2015) identified family environment, especially parental support, to be the most important protective factor for fostering resilience in students and throughout their life. In a study by Hamdan-Mansour et al. (2014), 50% of participants reported a high level of social support from friends, family, and other students which indicated a significant resilience among students, and that resilience was predicted by depression and perceived social support when studying correlates of resilience among students. This was further supported by an American study on resilience by Hunter et al. (2018) who reported that systems encouraging meaningful interpretations of hardship, such as religion, strong social support and healthy relationships with caregivers all increase resilience. They further attested that the same cognitive characteristics that affect adults also affect students, as intellect, strong executive function, emotional regulation, motivation to succeed, and mastery are all linked to higher levels of resilience.

In a study conducted in Africa, factors associated with resilience have been reported. For instance, in a Kenyan study, Mwangi et al. (2017) found that a resilient student has personal

agency, which has a significant influence on students' determination to overcome academic obstacles. A complex and strengths-based concept, resilience focuses on offering safeguards that improve achievement. In South Africa, several studies reported that both internal and external elements can be used to develop protective factors. Internal protective factors include intellectual prowess, a good self-concept, a sense of autonomy and a strong locus of control. Family traits, social support and cultural protective resources are examples of external protective factors. It was further found that good social interactions between students and their families, peers, or teachers can influence how a person develops their identity and makes decisions while indicating that resilience can be linked to contextual and normative variables that support young students' healthy and positive development (Ngcobo, 2019; van Breda, 2018). When assessing factors contributing to resilience, Mampane (2014) further identified factors such as appraising a situation more favourably, controlling emotions, leveraging social support, gaining access to material resources and planning are some specific coping strategies that have been shown to promote resilience.

2.5.3 Neurobiological resilience

Turner et al. (2017) reported that not only is resilience a personal characteristic, but it can also be influenced by contextual factors such as university context where resilience tendencies are developed from various sources including peers and accessibility to student health services. As reported by Theron and Theron (2010) in their study on resilience in South African communities, resilience as a protective factor is embedded not only in the individual but in the families and cultural practices, asserting that those who are from wealthy families, enriching and providing them with adequate security, are likely to exhibit high levels of resilience than those who do not receive such support from their families. Notably, neuroscience research indicates that neurodevelopment and neuroplasticity are contextually influenced through the processes of dynamic interaction between the brain and contextual experiences (Kwon et al., 2021).

Resilience as a construct can also be influenced by neural processes and dynamics linked to genes, behaviour and context, along with brain development. This implies that resilience is more than just the ability to recover from hardships due to the underlying neuroscience and the physiological processes at play (Theron & Theron, 2010; Windle et al., 2008). This conceptualisation led to the development of resilience measures which included a

neurobiological perspective and the inclusion of health hygiene factors, such as exercise, sleep, nutrition and hygiene (Rossouw & Rossouw, 2016). Furthermore, the resilience facets as constructed by Rossouw and Rossouw (2016) included Tenacity which incorporates hardiness and perseverance, Vision , which refers to goal setting and self-efficacy, Collaboration which entails psychosocial interaction including support networks and secure attachment, Composure which encompasses emotional control as well as the capacity to comprehend, identify, and respond to physical and internal cues, Reasoning which refers to cognitive traits such as resourcefulness and problem solving, Momentum which includes force or strength acquired by action or a sequence of actions, and Health and includes factors such exercise, nutrition and sleep. Neurobiological links include for example, the Vision facet involving the higher-level decision-making, the ventral striatum (Davidson & Begley, 2012) and the Composure facet linked to the efficient control of the amygdala (or HPA). Resilience as a construct tends to overlap with both cognitive and somatic features as found in depressive individuals whose activation of serotonin synapses are potentially inhibited (Jacobs et al., 2000). As health resilience increases, this may also increase the levels of serotonin, which in turn may stimulate the neurogenesis of the dentate gyrus and indirectly alleviate severe depressive symptoms from developing (Jacobs et al., 2000). The emphasis on the amygdala on the development of resilience has been proposed based on the functional neuroanatomy of the amygdala's involvement with affective states, arousal and flight-fight response activation (Rossouw & Rossouw, 2016).

Watanabe and Takeda (2022) reported that the brain and body cooperate to help a person adapt when presented with difficulty. Various neurophysiological components that contribute to this adaptation process include monoamines, oscillatory brain activity, hemodynamics, stress hormones, autonomic activity and immunological systems. Throughout certain time periods after exposure to stress, each component is interactively activated. As a result, variations in the temporal dynamics of neurophysiological resilience can be used to describe individual variances in psychological resilience levels. Watanabe and Takeda (2022) further reported that the dynamics can be recognised as (a) neurophysiological models before stress exposure as a predictor of depression in the future (stress vulnerability); (b) individual response variability to the stress encountered; and (c) behavioural changes following the onset of depressive symptoms (stress susceptibility). Hunter et al. (2018) identified the prefrontal cortex and hippocampus to be affected in resilience.

Ramosala (2021) reported that resilience has a neurobiological basis in the dynamic neural networks of the brain. This suggests that resilience changes throughout time, not merely assisting students in adjusting to severe and stressful life situations. Resilience's capacity for adaptation is thought to result from neuroplasticity processes that affect general coping strategies (Rossouw, 2015; Rossouw & Rossouw, 2016; Windle et al., 2008). A higher rate of the neurogenesis in the dentate gyrus, which has been demonstrated to provide a protective effect against the onset of depression by means of indirectly raising serotonin levels, may result from increased health resilience (Jacobs et al., 2000). The following characteristics were discovered to be linked to resilience through a systematic analysis of resilience frameworks: Executive functioning, impulsivity, risk-taking, inhibition, effortful control, self-regulation, and self-control (Chmitorz et al., 2018). This is corroborated by Rossouw and Rossouw (2016), who claimed that resilience is neurobiologically effected and impacted by several of the prefrontal cortex's regulatory activities. The idea that stress manifests itself in various circumstances and at multiple levels such as emotional, biological, social, psychological, and spiritual led Rossouw (2015) to develop the concept of neurobiological resilience. According to Rossouw (2015), the amygdala plays an important part in the growth of resilience. It records resilience following distressing experiences as a preventative measure to serve as protection against future danger. According to Ioannidis et al. (2020), the neurobiology of individual resilience is a dynamic process that is always changing; hence the trajectories and predictors of resilient functioning are subject to change.

2.6 Conclusion

In summary, studies have found an increasing trend in depression and anxiety symptoms among students (Saleem & Mahmood, 2013; van Vuuren, 2014). These mental health challenges pose a significant risk for student wellbeing, academic, social and future vocational success. Neuroscience perspectives indicate that depression and anxiety have neurobiological substrates that potentially overlap with neurobiological facets of resilience.

According to a neurobiological explanation of resilience, resilience not only aids people in adjusting to traumatic and stressful life situations but is a dynamic process akin to neurogenesis and neuroplasticity that promotes changes in resilience over time (Liu et al., 2021; Rasheed et al., 2022). Although research has found that resilience in general may be a protective factor, it is important to understand from a neurobiological perspective which facets

of resilience play a role in potentially impeding the transitions from prodromal to acute anxiety and depression. This will facilitate future research on interventions focusing on neurobiological basis of resilience. In Chapter Three, the research methodology is described.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

A discussion of the study's methodology is provided in this chapter. The chapter starts out by describing the purpose and objectives of the study. The research methodology that was followed in the study is then described. There is also a description of the participants. The measurement tools that were used to gather the data are then discussed. In addition, the steps involved in gathering and analysing data are described in depth. The study's ethical considerations are then outlined.

3.2 Research Aim and Objectives

This study aimed to explore the relative contribution of total resilience and facets of resilience on the variance observed on depression and anxiety outcomes among students.

Objectives

- To explore the resilience, depression and anxiety profiles among university students.
- To investigate total resilience and facets of resilience as significant predictors of depression and anxiety outcomes among university students.

3.3 Research Design

This study adopted a secondary data analysis. The study adopted a cross-sectional design and was quantitative in nature, exploring through a MANCOVA both general and specific bi-directional relationships between independent variables (resilience and facets of resilience) and dependent variables (depression and anxiety), as well as using multiple linear regression to assess the relative contributions of the independent variables to the variation observed in the dependent variables.

3.4 Participants

3.4.1 Sampling

The sample of this study consisted of psychology students from the University of Pretoria, who took part in the research in 2018-2019 on "C*ognition, Temperament, Character, Resilience, Depression and Anxiety among University Students".* In the initial study, convenience sampling was employed, depending on the availability and willingness of participants to take part (Gravetter & Forzano, 2018). University of Pretoria psychology students were voluntarily recruited to take part in the study. The management of practical components, such as the use of an online platform for assessment and scheduling the online assessment's group assessment depending on available shared time slots, motivated the decision to use psychology students from the University of Pretoria as a sample.

3.4.2 Description of participants

Students who voluntarily participated were between the ages of 18 and 25 and made up the sample. A final sample consisting of 135 students was attained. The following characteristics made up the exclusion criteria for this sample: any diagnosed mental disorders, any neurological illness that would affect performance on the assessments and substance abuse within three months of the assessment.

3.4.3 Data collection instruments:

For the purpose of this study, data from the sociodemographic questionnaire, Beck's Depression Inventory- 2 (BDI-II), Beck's Anxiety Inventory (BAI) and Predictive 6-Factor Resilience Scale (PR6) were analysed.

3.4.3.1 *Sociodemographic Questionnaire*

The sociodemographic details regarding first language, age, gender and degree were collected from participating students. The sociodemographic questionnaire further requested clinical data from the participants that were aligned with the exclusion criteria as stipulated above.

3.4.3.2 *Beck Depression Inventory -II*

The BDI-II was utilised to identify the existence of state-based depressive symptomology (Beck et al., 1996). The 21 item self-assessment inventory examines the depressive symptomology. The item responses are used to yield a total score of 63. The BDI-II has been utilised in the South African context, with reported Cronbach's alpha of 0.84, and test–retest reliability of r = 0.55 (Makhubela & Mashegoane, 2016). The total score was used for the purpose of analysis.

3.4.3.3 *Beck Anxiety Inventory*

The BAI (Beck et al., 1990) measures the severity of anxiety symptoms. The inventory consists of 21 items and yields a total score of 63. In a South African student study by Bantjes et al. (2016), the scale's internal consistency score ranged from α=0.92 to 0.94, and test-retest reliability of r= 0.75. The total score was used in the analysis.

3.4.3.4 *Predictive 6-Factor Resilience Scale (PR6)*

Through a neurobiological lens, the PR6 assesses psychological resilience and seeks to identify the risk- and adversity-reducing protective factors (Rossouw & Rossouw, 2016). Responses are recorded on 5-point Likert scale ranging from 1= *not at all like me* (strongly disagree) to 5= *very much like me* (strongly agree). In order to produce facet profiles, each resilience facet is rated separately. A score is also computed to produce an overall continuous resilience score, which ranges from 0 (lowest resilience) to 1 (highest resilience) and is computed as an average of each of the seven facets. These facets include Tenacity, Vision, Collaboration, Composure, Reasoning, Momentum and Health. The overall PR6 showed adequate internal consistency with reported a Cronbach's α of 0.74 (Rossouw & Rossouw, 2016). This instrument has not been used in a South African context before, thus adding to the value of the present study through a neuroscience conceptualisation of resilience and inclusion of physiological health facet. Total resilience score and facets scores were included in the analyses.

3.5 Data Collection

Because some of the data obtained from the initial study were used in this secondary analysis, no new data was collected. In 2019, the initial study's data was gathered at the physiological laboratory of the University of Pretoria. A research assistant and a master's student studying psychology collected the data. The initial's study's methodology was as follows: After receiving approval from the University of Pretoria's Postgraduate Research and Ethics Committee in the Faculty of Humanities as well as the Psychology Department's Research Committee, the researchers approached module coordinators to request for permission to post a comprehensive information sheet on ClickUp, the university's intranet in order to recruit volunteers for the study. An overview of the study in brief and a comprehensive explanation of the requirements for participation were included in the information sheet.

Students who felt that they met the inclusion criteria, were willing to participate and expressed interest in the study contacted the researchers through SMS or email. All inquiries about the study were responded to. The potential timeslots for the assessments were then given to potential participants who felt comfortable with the process. Every participant was limited to selecting one time slot. Volunteer participants received a reminder with venue details closer to the assessment day, after which a time slot was reserved based on mutual availability. The next step in the assessment process was as follows. Weekly schedules were emailed to participants who expressed interest in participating but were unable to make it during one of the designated times. This allowed both parties to select a time that was suited for them.

3.5.1 Administration conditions (Initial Study)

Every session was facilitated by the researchers. In group sessions, there were three to ten students. The online exam was administered via the campus computer lab that provided ideal testing conditions, meaning there were no outside distractions and all groups were subjected to the same testing procedures. Desktop computers connected to the University of Pennsylvania Computerised Neuropsychological Test Battery (PennCNP) were used for online assessments. Numerical codes were given to each student as a unique identifier, which they used to access the online assessments. Test results were kept confidential as a result. At the beginning of each session, the sociodemographic questionnaire data was examined and clarified to ensure that participants satisfied the required conditions. Participants completed the

BDI-II, BAI, and PR6 after completing the online battery (Neuropsychological section and Temperament and Character Inventory-revised), Depending on the participant's pace, the full assessment battery took 45 to 60 minutes to administer.

Based on the information collected, the researcher conceptualised the parameters of the investigation for the current study. The researcher also chose the most appropriate design and statistical analysis, evaluated the literature and examined the instruments used to collect the data. The researcher worked with the University of Pretoria's Department of Statistics to analyse and evaluate the data.

3.6 Data Analysis

The data was analysed using the following statistical procedures namely, descriptive statistics, multivariate test, between-subjects analysis (MANCOVA) and multiple linear regression. Descriptive statistics (e.g., standard deviations, range, means) were used to contextualise the sociodemographic information and student resilience, depression and anxiety profiles. Following analysis of data distribution, skewness, kurtosis, linearity and multi-collinearity, the MANCOVA analysis (multivariate tests) was used to measure as well as, describe the general effects and bi-directional relationship between depression and anxiety (dependent variables) and resilience/facets of resilience (independent variables). This MANCOVA analysis was selected because the technique could account for the fact that each of the two dependent variables were interrelated and through a MANCOVA the means for each were adjusted while controlling for the other simultaneously. Furthermore, to examine the relative contribution of independent variables (total resilience and facets of resilience) on the variances observed on dependent variables (depression and anxiety), a multiple regression analysis was performed. A statistical technique called multiple linear regression was used to examine the linear relationship between several independent variables and a dependent variable (Leedy & Ormrod, 2015).

3.7 Ethical Consideration

On 9 March 2018, the Faculty of Humanities' Postgraduate Research and Ethics Committee (GW0170723HS) granted ethical approval for the initial study. All informed consent protocols were put into place at the time of the original data collection. Consent was given by study participants for data to be shared for upcoming research projects. The Postgraduate Research and Ethics Committee of the Faculty of Humanities granted this study's ethical approval on August 26, 2022 (HUM17/0722). Since the protocols did not include any personal identifiers, information confidentiality was guaranteed. In accordance with University of Pretoria policy, data gathered will be stored for 15 years in the Department of Psychology (HSB 11-24).

3.8 Conclusion

The study's methodology was described in detail in Chapter Three. An overview of the measurement tools, the research design and the participant description was provided. Additionally, the process of collecting data and the methodology for analysing it were discussed. The results of the study are described in depth in Chapter Four.

CHAPTER FOUR: RESULTS

4.1 Introduction

The results of the statistical analysis are provided in this chapter. The sample characteristics are described followed by the descriptive data obtained from the various measurement instruments. Furthermore, results from the MANCOVA and multiple linear regression are outlined below.

4.2 Characteristics of Participants

The demographics of the overall sample are shown in Table 4.1. In total 135 participants were recruited and completed the assessments. All participants qualified for study participation by meeting the inclusion criteria as outlined in chapter 3.

Participants' mean age was 20.27 years (SD = 1.76), and 87% of the participants were females, compared to 13% males. English was identified as the participants' primary language at home among 45% of the sample. In addition, most of the participants (82%) were pursuing and enrolled for undergraduate degrees.

Table 4.1

Demographic Characteristics of the Sample

Demographic Characteristics	Frequency	Percentage
Gender		
Female	117	87%
Male	18	13%
Home Language		
English	61	45%
Afrikaans	44	33%
African	28	20%
Other	2	2%
Study Phase		
Undergraduate	111	82%
Postgraduate	24	18%

N = 135

4.3 Descriptive Statistics for the PR6

Through a neurobiological lens, the PR6 assesses psychological resilience and seeks to identify the risk- and adversity-reducing protective factors (Rossouw & Rossouw, 2016). The average of the seven facets of the PR6 provides an overall/total resilience score that goes from 0 (poor resilience) to 1 (high resilience). Furthermore, the seven resilience facets (Tenacity, Vision, Collaboration, Composure, Reasoning, Momentum and Health) are included. The instrument has a total of 16 questions. The descriptive data for the PR6 are shown in Table 4.2.

Table 4.2

Descriptive Statistics for the PR6

Facets	N	Minimum	Maximum	Mean	SD
Tenacity	135	2.00	10.00	7.63	2.07
Vision	135	2.00	10.00	6.81	1.85
Collaboration	135	2.00	10.00	5.65	1.88
Composure	135	2.00	10.00	5.71	2.20
Reasoning	135	2.00	10.00	6.53	1.89
Momentum	135	2.00	10.00	6.56	1.97
Health	135	2.00	10.00	6.00	1.74
Total Resilience	135	0.29	0.97	0.64	0.13

SD = Standard Deviation

This participant group (N=135) reported a high level of total resilience, as shown in Table 4.2 (M=.64, SD=.13). On individual facets, participants reported lower levels of Collaboration (M=5.65, SD=1.88) and Composure (M=5.71, SD=2.20) when compared to other facets such as Tenacity (M=7.63, SD=2.07).

4.4 Descriptive Statistics for the BDI-II and BAI

The total scores for depression and anxiety symptomatology are divided into four severity categories by the BDI-II. Total score ranges include 0–13 for minimal, 14–19 for mild, 20–29 for moderate and 29–63 for severe. While the BAI score ranges from 0-7 for minimal, 8-15 for mild, 16-25 moderate and 26-63 for severe.

Firstly, Table 4.3 and 4.3.1 detail the BDI-II classification of score ranges and percentages together with categories followed by BAI at Table 4.4 and 4.4.1.

Table 4.3

Beck Depression Inventory – 2: Classification of Symptom Severity

Category	Total Score Range	N	Percentage
Minimal	0-13	64	47%
Mild	14-19	25	19%
Moderate or Severe	20-63	46	34%

n = number of participants

According to severity classification, 47% of students reported minimal depression followed by moderately-severe. The 34% of students who endorsed moderately-severe were at-risk students with potential prodromal signs.

Table 4.3.1

Descriptive Statistics for the BDI-II

	Mean	SD	Minimum	Maximum
BDI-II	15.70	9.92	0	41

Note. N = 135; BDI-II = Beck Depression Inventory-II

The mean score for the BDI-II was 15.70 (SD = 9.92). Scores between 14 - 19 on the BDI-II are classified as mildly depressed, according to Beck et al. (1996). According to the Beck et al. (1996) criteria, the student sample fell into the mild depressive symptomology category. Being a self-assessment tool, the BDI-II is susceptible to bias in responses (Beck et al., 1996), therefore it is vital to remember that scores could increase or decrease during the testing process.

Table 4.4

Beck Anxiety Inventory: Classification of symptom severity

Category	Total Score Range	N	Percentage
Minimal	0-7	58	43%
Mild	8-15	33	24%
Moderate/Severe	16-63	44	33%

n=number of participants

According to the severity classification, 43% of students indicated minimal symptoms followed by moderately-severe. However, when students with anxiety symptoms in the mild and moderately severe categories were combined, the majority showed anxiety symptoms that were of significance as potential prodromal signs.

Table 4.4.1

Descriptive Statistics for the BAI

	Mean	SD	Minimum	Maximum
BAI	16.50	10.27	1	48

Note. N = 135; BAI = Beck Anxiety Inventory

The mean score for the BAI was 16.50 (SD = 10.27). Scores on the Beck Anxiety Inventory between 16 - 25 are classified as moderate anxiety, according to Beck et al. (1996). According to Beck et al. (1996)'s classifications, this student sample can be categorized as having moderate anxiety symptomology. As mentioned above, being a self-assessment tool, the BDI-II is susceptible to bias in responses (Beck et al., 1996). As such, scores could increase or decrease during the testing scenario.

4.5 Reliability

When measuring the same construct, a measuring instrument's consistency in producing results is referred to as instrument reliability. A trustworthy measurement device is also devoid of random error (Segal & Coolidge, 2018).

4.5.1 Internal consistency

The method of evaluating reliability known as internal consistency is popular. To ascertain whether an instrument is measuring what it should, this method looks at how closely each item on a scale coincides with the other items in that scale. To assess the study's internal consistency, Cronbach's alpha was used. Cronbach's α values for the BDI-II, BAI, and PR6 were 0.90, 0.92, and 0.81, respectively, indicating adequate internal consistency.

4.6. Inferential Statistics

4.6.1 Hypotheses

According to the literature study, students are reportedly dealing with more mental health issues, which have an impact on graduation rates and general academic success (Hanson, 2021; Letseka & Maile, 2008; Moodley & Singh, 2015). Students at tertiary institutions are subject to a variety of stressors, as well as peer and academic pressure, thus it is important to prioritise their mental health because research has shown that depression and anxiety are prevalent among students (Bantjes et al., 2016; Mungai & Bayat, 2019). Furthermore, according to the literature, resilience has been postulated as a defence mechanism against adverse life outcomes like anxiety and depression (Robbins et al., 2018; Singh et al., 2021).

The following hypotheses were developed in light of the studied literature:

H1: Total resilience significantly predicts depression and anxiety outcomes among students.

H2: Distinct facets of resilience significantly predict depression and anxiety outcomes among students.

4.7. Multivariate Analysis of Covariance (MANCOVA)

The multivariate analysis of covariance (MANCOVA) was performed, where two dependent variables (depression and anxiety) are modelled with continuous independent variables (total resilience & facets of resilience). Due to the study variables being covariates and not fixed variables, MANCOVA was chosen for the statistical analysis.

Following the steps in a MANCOVA analysis, Table 4.5 details the multivariate tests which provides an overall estimation of the significant variance between depression and anxiety (dependent variables) and total resilience/facets of resilience (independent variables). Between-subjects analysis details the bi-directional relationship between independent variables and dependent variables while controlling for covariate (Table 4.6). Lastly, the results of the multiple linear regression are presented to detail the relative contribution of independent variables (total resilience and facets of resilience) on the variance observed on each of the dependent variables (depression and anxiety) (Table 4.7).

Table 4.5

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.61	98.88[b]	2.00	126.00	<.001	0.61
Tenacity	Pillai's Trace	0.12	8.30[b]	2.00	126.00	<.001***	0.12
Vision	Pillai's Trace	0.04	2.26[b]	2.00	126.00	0.11	0.04
Collaboration	Pillai's Trace	0.03	1.76[b]	2.00	126.00	0.18	0.03
Composure	Pillai's Trace	0.02	1.18[b]	2.00	126.00	0.31	0.02
Reasoning	Pillai's Trace	0.01	0.52[b]	2.00	126.00	0.60	0.01
Momentum	Pillai's Trace	0.08	5.26[b]	2.00	126.00	0.006*	0.08
Health	Pillai's Trace	0.00	0.21[b]	2.00	126.00	0.81	0.00
TR	Pillai's Trace	0.45	54.43[b]	2.00	132.00	<.001***	0.45

TR=total resilience; *p < .05; **p < .01; ***p < .001.

Pillai's Trace was used to identify statistically significant variations between the resilience facets. Table 4.5 shows that the multivariate results were significant for Tenacity- Pillai's Trace = 0.12, F = 8.30, df = (2,126), p = <.001 and Momentum - Pillai's Trace = 0.08, F = 5.260, df = (2,126), p = 0.006. Lastly, total resilience was also significant, Pillai's Trace = 0.45, F = 54.43, df = (2,126), p < .001.

The bi-directional relationship between resilience facets/total resilience and the dependent variables were identified using a between-subjects analysis (Table 4.6).

Table 4.6

Between-Subjects Analysis

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	BDI-11	9838.70	1	9838.70	183.48	<.001	0.59
	BAI	7357.06	1	7357.06	90.14	<.001	0.42
Tenacity	BDI-11	879.88	1	879.88	16.41	<.001***	0.11
	BAI	423.97	1	423.97	5.20	0.024*	0.04
Vision	BDI-11	199.64	1	199.64	3.72	0.06	0.03
	BAI	226.73	1	226.73	2.78	0.10	0.02
Collaboration	BDI-11	187.48	1	187.48	3.50	0.06	0.03
	BAI	29.87	1	29.87	0.37	0.55	0.00
Composure	BDI-11	39.67	1	39.67	0.74	0.39	0.01
	BAI	189.96	1	189.96	2.33	0.13	0.02
Reasoning	BDI-11	46.92	1	46.92	0.88	0.35	0.00
	BAI	50.23	1	50.23	0.62	0.43	0.01
Momentum	BDI-11	543.09	1	543.09	10.13	0.002**	0.07
	BAI	48.25	1	48.25	0.59	0.44	0.01
Health	BDI-11	0.30	1	0.30	0.01	0.94	0.00
	BAI	24.44	1	24.44	0.30	0.59	0.00
TR	BDI-11	5753.03	1	5753.03	102.94	<.001***	0.44
	BAI	3613.48	1	3613.48	45.64	<.001***	0.26

TR=total resilience; *p < .05; **p < .01; ***p < .001.

Table 4.6 indicates that Tenacity has a significant effect on both depression and anxiety outcomes with $F = 16.41, p < .001$ *and* $F = 5.20, p = 0.024$, respectively. Momentum has significant effect on depression; $F = 10.13, p = 0.002$. Total resilience has a significant effect on both the BDI-II and the BAI with $F = 102.94$, $p < .001$ and $F = 45.64$, $p < .001$, respectively.

4.8 Multiple Linear Regression

Following this analysis, a multiple linear regression was used to determine the relative contribution of total resilience and facets of resilience on the variance observed on depression and anxiety (Table 4.7).

Table 4.7

Multiple Linear Regression

Dependent Variable	Parameter	B	Std. Error	t	Sig.	Partial Eta Squared
BDI-11	Intercept	49.08	3.62	13.55	<.001	0.59
	Tenacity	-1.51	0.37	-4.05	<.001***	0.11
	Vision	-.71	0.37	-1.93	0.06	0.03
	Collaboration	-.67	0.36	-1.87	0.06	0.03
	Composure	-.34	.39	-.86	0.39	0.01
	Reasoning	-.42	0.45	-.94	0.35	0.01
	Momentum	-1.34	0.420	-3.18	.002**	0.07
	Health	0.03	0.41	0.08	0.94	0.00
BAI	Intercept	42.44	4.47	9.49	<.001	0.42
	Tenacity	-1.05	0.46	-2.28	0.024*	0.04
	Vision	-.75	0.45	-1.67	0.10	0.02
	Collaboration	-.27	0.44	-.61	0.55	0.00
	Composure	-.74	0.48	-1.53	0.13	0.02
	Reasoning	-.43	0.55	-.79	0.43	0.01
	Momentum	-.40	0.51	-.77	0.44	0.01
	Health	-.28	.050	-.55	0.59	0.00
Total resilience	BDI-11	-51.58	5.08	-10.15	<.001***	0.47
	BAI	-40.88	6.05	-6.76	<.001***	0.26

*p < .05; **p < .01; ***p < .001.

Table 4.7 indicates that Tenacity accounts for a significant proportion of variance in depression outcomes $(\beta = -1.51, p < .001)$ where a unit increase in Tenacity will result in a decrease of -1.51 in the Depression score. Furthermore, Momentum was found to account for a significant proportion of variance in student depression outcomes, where a unit increase will lead to a decrease of -1.34 in the Depression score $(\beta = -1.34, p = .002)$.

Significant variance in anxiety was related to Tenacity outcomes $(\beta = -1.05, p = 0.024)$ where a unit increase in Tenacity will result in a decrease of -1.05 in the Anxiety Score.

Total resilience score for Depression is $(\beta = -51.58, p < .001)$ and for Anxiety $(\beta = -40.88, p < .001)$ indicates that the higher the resilience score the lower depression and anxiety scores among students.

5. Conclusion

The demographic data for the sample, descriptive and inferential statistical analyses, were presented in this chapter. Further discussion on the findings from the statistical analysis will be provided in Chapter Five. The study's limitations, as well as recommendations for further research, will be discussed.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

Following the analysis, this study found that total resilience and specific resilience facets accounted for significant variance in depression and anxiety outcomes. This chapter provides a detailed discussion of the research results in the context of relevant literature. This chapter also details the practical implications of the study and includes limitations and recommendations for further research.

5.2 Depression Among Students

The existence and intensity of state-based depression symptomatology were determined by the study using the BDI-II. The BDI-II is a reliable psychometric tool for assessing the severity of state-based depression both worldwide and within the South African setting (Makhubela & Mashegoane, 2016). Despite being a self-report measure, the instrument has found widespread application in both clinical and research settings (Bantjes et al., 2019).

The overall mean for this study cohort was 15.70 (SD = 9.92), placing them in the mild group of depressed symptomatology (Beck et al., 1996). Furthermore, when considering severity levels 47% of the students reported minimal symptoms, whereas more than half of the study cohort reported mild to moderately/ severe depression symptomatology (53%). Notably, when considering moderately/severe depressive symptomatology, more than one-third of the students reported experiencing this level of severity. Studies carried out globally and in South African universities (Bantjes et al., 2019; Lun et al., 2018; Najjuka et al., 2021) concur to some extent with these patterns and highlight the mental health challenges facing university students. According to van Zyl et al. (2017), most South African medical students in their study had moderate depressive symptoms, which is consistent with other studies (Asif et al., 2020; Karmakar & Behera, 2017). The contradictory results regarding severity between this study and van Zyl et al. (2017) may potentially be related to the different student samples, where it is assumed that medical students have a greater level of stress that can influence mental health. However, different results may also arise due to differences in when students self-report symptoms as Beiter et al. (2015) and Eloff and Graham (2020) found that undergraduate students' measures of mental health and wellbeing significantly decrease from the start of the academic year to the finish. Based on this study, findings corroborated that both nationally and

globally, more mental health programmes are required due to the increasing trajectory in mental health challenges. There is a greater need for students to be able to access psychological services in a variety of institutions and to develop their resilience to buffer against prodromal symptoms manifesting over time as clinical depression.

5.3 Anxiety Among Students

The Beck Anxiety Inventory (BAI) was employed in the study to determine the presence and degree of state-based anxiety symptomatology. According to Bantjes et al. (2016), the BAI is a reliable psychometric tool for assessing the intensity of state-based anxiety both globally and within the South African setting. Despite being a self-report measure, the tool has found widespread usage in both clinical and research settings (Garcia et al., 2021).

Overall, the current study's results showed that the mean anxiety level was 16.50 (SD = 10.27), which is in the moderate range and supports previously reported trends in students' anxiety symptoms. For instance, a study conducted among South African university students reported 12% of moderate anxiety with 19% of moderate anxiety reported in a Pakistani university as well (Asif et al., 2020; Bantjes et al., 2016). The results further indicated that 43% of the students in the study had minimal symptoms, whereas the majority reported mild to moderately/severe anxiety symptomatology (57%). When compared to depression severity, a similar pattern was reported, although with a slightly higher number of students reporting mild anxiety and the mean anxiety level reported was higher. Studies carried out globally and in South African universities (Reta et al., 2020; Torija et al., 2016) support these reporting trends to some extent. Furthermore, the differences in the reported trends could be largely due to methodological artefacts such as differences in the countries, socioeconomic standing, culture, religion and social hierarchy.

5.4 Resilience Among Students

To measure psychological resilience, the PR6 was used. The PR6 is notable for its innovative approach to measuring and conceptualising resilience from a neurobiological approach, as mentioned in the literature review chapter (Chapter 2) (Rossouw & Rossouw, 2016). Results showed that the PR6 demonstrated good reliability in measuring and assessing resilience, despite the fact that it had not been employed previously in the South African setting.

The study cohort's overall resilience score indicated that students had a high level of resilience (M=.64, SD=.13). These results are supported by findings from earlier studies on psychological resilience (Anyan & Hjemdal, 2016; McGillivary & Pidgeon, 2015). Over half of the students in McGillivary and Pidgeon's (2015) study had high levels of resilience, Similar to this, Tung et al. (2014) found that 53% of pupils in Hong Kong, had high levels of resilience. The findings of this study and those of other studies indicate that, despite a variety of academic and mental health obstacles, university students are resilient. Bantjes et al. (2019) and Turner et al. (2017) highlighted the importance of fostering student resilience and providing access to psychological treatments in a variety of institutions

In the university setting, psychological stress has also been linked to subpar academic performance and sleep difficulties (Xu et al., 2021). For instance, Chang et al. (2021) found that stronger resilience scores were consistently and significantly associated with decreased depression and other psychological stresses among students at a university in China. Additionally, a study by Devi et al. (2021) among students in Indonesia found that resilience was important for academic success even when anxiety and depressive symptoms were present.

Resilience, according to Rossouw and Rossouw (2016), has seven dimensions that each contribute to overall resilience. In order to determine which of the resilience facets (Tenacity, Vision, Collaboration, Composure, Reasoning, Momentum, and Health) were more common among university students when depression and anxiety symptomatology was modelled, the PR6 facets scores were included in this studies analyses. To recap, the Vision facet describes a person's feeling of purpose and behaviour that is goal oriented. This facet is linked to abilities including the capacity to specify and explain one's goals including the development of congruence between goals (Rossouw & Rossouw, 2016). The facet of Reasoning has to deal with problem-solving, creativity as well as adaptability. Skills related to the executive functions of the brain are those that are associated with this facet (Watanabe & Takeda, 2022).

In addition, a Health facet that considers aspects of physical hygiene including sleep, diet, and exercise was included (Rossouw & Rossouw, 2016). This element reflects one's direction and approach including willingness to new tasks. The Tenacity facet connects to resilience's common traits, like toughness and perseverance. The facet of Collaboration examines attachment, preserving social impressions and connections. Finally, Composure has to do with controlling your emotions, managing your tension and being emotionally aware. On

individual facets, descriptive analysis indicated a trend showing that participants reported lower levels of Collaboration and Composure compared to other facets such as Tenacity.

5.5 Depression, Anxiety and Resilience Among Students

According to the MANCOVA results, when depression and anxiety were included as dependent variables, there were significant variations due to overall resilience and resilience facets. Results from the multiple regression analysis support the hypothesis that resilience accounts for a significant proportion of the variance in depression and anxiety outcomes. A study by Ran et al. (2020) found that psychological resilience had a significant negative relationship with anxiety and depression, which is further supported in a study on associations between individual resilience, and anxiety and depression where Yap et al. (2023) reported that resilience was inversely associated with anxiety and depression. Furthermore, various recent studies reported that resilience had a significant link on anxiety and depression and highlighted that higher resilience was a protective factor against poor mental health outcomes among students (Ben Salah et al., 2021; Lau, 2022; Miller et al., 2023; To et al., 2022).

Furthermore, specific facets of resilience such as Tenacity, which accounted for changes in depression and anxiety outcomes, while Momentum featured specifically in depression outcomes, which indicates that it may have a potentially specific role in depression and not anxiety. Using the perspective of Rossouw and Rossouw (2016), this may mean that individuals who are less goal driven and open to new challenges are more likely to experience depressive symptoms, and those who persevere and are hardy are less likely to experience depression and anxiety. This further supports the hypothesis that in addition to overall resilience, distinct facets of resilience are important when investigating depression and anxiety and in planning skills-based interventions.

Overall, when considering total resilience, the results from the regression analysis showed that total resilience accounted for significant variance in both depression and anxiety outcomes, whereby students in this study with higher total resilience scored lower on both depression and anxiety. Importantly, although overall resilience in this cohort was relatively high, depression and anxiety ranging from mild to moderate were still reported. This further supports the contention that facets of resilience play a significant role and should inform specific interventions. The study's overall results emphasise the neuroscience framework for understanding the role of resilience in mental health, the distinctive ways that anxiety and

depression symptoms manifest in university students, and the possible protective effect of total resilience and more specifically resilience-related facets such as Tenacity and Momentum on depression and anxiety symptom severity. A deeper understanding of resilience's neurobiology would also help with the development of intervention strategies that focus on specific resilience-related facets that could ease the transition from prodromal to severe depression and/or anxiety as most studies have focused on the overall role of resilience.

5.6 Prevention and Intervention Strategies for Student Mental Health Services

The major goal of the student centre's support is to establish a setting where all students may accomplish their academic objectives and uphold a feeling of health that is balanced. According to the literature however, it has become a regular occurrence for these student support departments to be overburdened because the university setting has a larger demand for services regarding mental health when compared to the broader public (Beiter et al., 2015; Eloff & Graham, 2020).

According to a study by Kamruzzaman et al. (2022), anxiety, depression and academic stress are the issues raised most often by university students. Zainab and Zafar (2019) also noted complaints about a hostile learning environment, a lack of aid resources, insufficient lecturer support and insufficient parental support. The distinctive demographic characteristics of South Africa as a result of many social, political, and economic variables further intensify these concerns among university students (Manap et al., 2019; van Vuuren, 2014). As a result, it is important for university students to have the option of contacting their student support divisions for counselling services and for these divisions to be well-equipped (Mungai & Bayat, 2019).

According to research (Chang et al., 2021; Reh, 2019), resilience plays a protective role against the transition of anxiety and depression symptoms from prodromal to more severe acute symptoms. Research has also shown that resilience can be learned on a continuum and can therefore be promoted through a variety of interventions (Robbins et al., 2018). For instance, a study by Rasheed et al. (2022) found that resilience can be learned through resilience-based interventions such as programmes aiming to train maladaptive thoughts and problem-solving skills in addition to buffering the perceptions of stress on depression and anxiety symptoms. The findings of this study also revealed lower scores in resilience facets such as Composure, Collaboration and Health when compared to Tenacity and Vision. Focused interventions and

training workshops can be structured to enhance these facets that may potentially increase students coping skills interpersonally (Collaboration) and intrapersonally (Vision/Health) for optimal mental health outcomes (Cheng et al., 2020; Devi et al., 2021; Eloff & Graham, 2020, Rossouw & Rossouw, 2016).

Resilience appears to have neurobiological underpinnings, according to ongoing research (Kwon et al., 2021; Rossouw & Rossouw, 2016). Additionally, resilience is now thought of as a dynamic, adjustable, and multifaceted state and process rather than as an inherent attribute (Watanabe & Takeda, 2022). Therefore, by creating and implementing interventions that are based on the neurobiological foundations of resilience, university students could benefit from focused interventions that build on the general premise that resilience per se is a protective buffer against depression and anxiety; however, specific neurobiological facets of resilience can be incorporated in prevention and intervention strategies. For instance, Buttazzoni (2022) emphasised interventions that help enhance resilience in students in higher education, including relaxation techniques, stress management strategies and mindfulness-based efforts. Furthermore, the range of individual skill development initiatives can be separated into two main subthemes: individual autonomy, taking charge, and leadership/initiative skill building methods; and coping, stress management and mindfulness skill building approaches. In addition, personal interventions such as education programmes were suggested (Buttazzoni, 2022). While interpersonal strategies aimed to foster positive interpersonal engagement, institutional interventions included initiatives like reimagined course conception or curricular designs to reduce stress and burnout through the implementation of a series of complementary initiatives (Buttazzoni, 2022; Eisenberg et al., 2016). Lastly, they discussed the significance of community-level approaches, which occasionally appeared in programmes to boost student resilience. Examples include initiatives to foster social integration and cohesion or to raise awareness of institutional resources.

Additionally, research found that group and seminar-based interventions support students' resilience (Eisenberg et al., 2016). Furthermore, using seminars or group interventions focusing on resilience facets is necessary in environments with limited resources, to foster goal-driven behaviour (Momentum), perseverance skills through teaching adaptive coping skills (Tenacity), interpersonal engagement and support (Collaboration) and health strategies for sleep, diet and exercise (Health). This would be a relevant factor to consider for interventions

in the South African university setting where there are already concerns about the limited resources and time available for providing individual counselling.

5.7 Summary

According to the results of the current study, students typically exhibit anxiety and depressed symptoms in all severity levels minimal, mild, moderate and severe. Furthermore, for this student cohort, the average depression score indicated mild symptoms and the average anxiety score indicated moderate symptoms. However, fact that a growing number of students are reporting mild to moderately/severe symptoms highlight the increasing mental health concerns and the need for focused interventions at university level.

Among this group of students, total resilience was found to be high and accounted for significant variance in depression and anxiety outcomes. Importantly, the results of the present study revealed that facets of resilience such as Tenacity and Momentum account for a significant variance in depression and anxiety outcomes. This indicates that students' capacity to work on activities with an obvious goal in mind may help control their stress reactions and coping mechanisms. Hence, those who scored high on Tenacity had lower levels of anxiety and depression. The Momentum facet of resilience also accounted for significant variance in depression scores but not anxiety, suggesting that there may be distinct resilience facets related to depression and anxiety outcomes. From a neurobiological perspective of dynamic resilience, specific facets can be emphasised in focused intervention programmes.

Lastly, despite the fact that there were no significant differences found in the other aspects of resilience, literature and the results of this study support the need for developing and designing interventions that take into account the many resilience facets in order to ascertain that students who are prodromal or have preclinical symptoms benefit as well from treatments that could potentially prevent progression to severe stages. For example, the facets of Collaboration and Composure which showed the lowest means, are very amenable to dynamic change especially in a peer-based university context and resilience-based university interventions can incorporate strengthening these facets to counter the occurrence of symptoms and the progression of symptoms.

5.8 Strengths and Limitations of the Study

5.8.1 Strengths

This exploratory study was motivated by the exponential increase in depressive and anxiety symptoms among university students as well as the paucity of studies on the neurobiological resilience profiles (facets of resilience) of students in South Africa (Bantjes et al., 2016; Bantjes et al., 2019; van Zyl et al., 2017). This study also showed that specific aspects of resilience may be protective indicators against symptom progression, which further supports not just the role of overall resilience but facets of resilience as well.

The ability to examine how resilience profiles/facets of resilience manifest differently in subclinical anxiety and depression, as well as across severity levels, was limited in studies that examined the relationship between anxiety, depression and resilience symptomatology (Reh, 2019; Song et al., 2021; Tan & Reyes-Wapano, 2021). If resilience is considered as a dynamic, complex construct, understanding the different resilience profiles along the anxiety and depression intensity continuum may help student centres to better target their interventions, especially for those with minimal or mild traits (subclinical/prodromal level).

Furthermore, another strength of this study is the inclusion of a neurobiologically based resilience assessment instrument. This is significant because the literature has shown that the neurobiological grounds of resilience and the neuroanatomical foundations of depression and anxiety overlap. Furthermore, the PR6 had been used in a South African context for the first time.

5.8.2 Limitations

Firstly, the study's limitations derive from the sample size that was employed. The sample consisted of University of Pretoria psychology course students. Given that more than half of participants were undergraduate female students, the results cannot be generalised to other genders or study levels due to the utilisation of this sample. The robustness of the results may have been improved and confounding factors may have been controlled for with more complete sociodemographic data. In addition, the group categories had a modest size due to the small sample size. Future studies should therefore use larger samples that are typical of the university setting.

Another limitation of the study is that it relied on self-report measures like the PR6, BDI-II and BAI. As a result, both social desirability and response biases could affect the results. The participants might have overstated or underreported their anxiety and depression symptoms.

5.9 Recommendations for Future Research

Future studies should focus on group interventions and individual programmes in university student support divisions to promote resilience and lessen the intensity of depressive and anxiety symptoms in this population. Carrying out research using more extensive and varied sample sizes, incorporating individuals from different age brackets, genders, and educational backgrounds. This could entail enlisting students from several universities or other educational establishments in order to improve the findings' generalisability. Explore alternatives to self-report assessments for evaluating the symptoms of depression and anxiety. This may entail supplementing self-report data with objective measurements, such as physiological markers or clinician-administered assessments, in order to reduce the impact of response biases and social desirability.

Furthermore, to obtain a more comprehensive picture of participants' experiences and perceptions of anxiety and depression, complementing quantitative data with qualitative insights may be considered. This could entail doing focus groups or interviews to investigate dimensions of mental health that might not be fully represented by quantitative measurements. Assessment of the efficacy of therapies designed to lessen symptoms of depression and anxiety among university students. This could entail putting different interventions into practice, including peer support programmes, mindfulness-based interventions, or cognitive-behavioural therapy programmes. Evaluating how these affect mental health outcomes could be another recommendation for future studies.

5.10 Conclusion

An integrated approach to the study of resilience, anxiety and depression, as well as the use of a measure of resilience that adopts a neurobiological perspective are warranted given the overlap between the neurobiological underpinnings of resilience and depression and anxiety (Biswas, 2021; Rossouw & Rossouw, 2016). According to several studies, overall resilience acts as a buffer on the progression of depressive and anxious symptoms from prodromal to clinical stages (AI Omari, 2023; Chang et al., 2021; Lau, 2022). This study highlighted the protective and significant relationship of total resilience, specific facets of resilience and depression and anxiety.

Group interventions and individual programmes in university student support divisions may help to promote resiliency and lessen the intensity of depressive and anxiety symptoms in this population because resilience is a modifiable state with multiple dimensions. Furthermore, group interventions have been shown to be effective in resource limited settings. Therefore, university student mental health centres can focus on integrating intervention strategies that will increase resilience and focused facets of resilience, such as goal setting and time-management, for better mental health outcomes.

References

Afolayan, J., Donald, B., Onasoga, O., Babafemi, A., & Agama Juan, A. (2013). Relationship between anxiety and academic performance of nursing students, Niger Delta University, Bayelsa State, Nigeria. *Advances in Applied Science Research*, *4*(5), 25-33. https://api.semanticscholar.org/CorpusID:11957826

AI Omari, O., Al Yahyaei, A., Wynaden, D., Damra, J., Aljezawi, M., Al Qaderi, M., Al Ruqaishi, H., Abu Shahrour, L., & ALBashtawy, M. (2023). Correlates of resilience among university students in Oman: A cross-sectional study. *BioMed Central Psychology*, *11*(1), 1-9. https://doi.org/10.1186/s40359-022-01035-9

Alatawi, A., Alghamdi, A., Albalwi, A., Altayar, M., Jalal, M., & Frah, E. A. (2020). Prevalence of Generalized Anxiety Disorder (GAD) among Saudi medical students and associated risk factors. *International Journal of Research Studies in Medical and Health Sciences*, *5*(9), 1 – 9. http://doi.org/10.22259/ijrsmhs.0509001

Albert, P. R., Benkelfat, C., & Descarries, L. (2012). The neurobiology of depression—revisiting the serotonin hypothesis. I. Cellular and molecular mechanisms. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *367*(1601), 2378-2381. https://doi.org/10.1098%2Frstb.2012.0190

Aluh, D. O., Abba, A., & Afosi, A. B. (2020). Prevalence and correlates of depression, anxiety and stress among undergraduate pharmacy students in Nigeria. *Pharmacy Education*, *20*, 236-248. https://doi.org/10.46542/pe.2020.201.236248

Alves, J. V. d. S., Paula, W. d., Netto, P. R. R., Godman, B., Nascimento, Renata Cristina Rezende Macedo do, & Coura-Vital, W. (2021). Prevalence and factors associated with anxiety among university students of health sciences in Brazil: Findings and

implications. *Jornal Brasileiro De Psiquiatria, 70*, 99-107. https://doi.org/10.1590/0047-2085000000322

Amendola, S., von Wyl, A., Volken, T., Zysset, A., Huber, M., & Dratva, J. (2021). A longitudinal study on generalized anxiety among university students during the first wave of the COVID-19 pandemic in Switzerland. *Frontiers in Psychology, 12*, 1-10. https://doi.org/10.3389/fpsyg.2021.643171

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425596

Anyan, F., & Hjemdal, O. (2016). Adolescent stress and symptoms of anxiety and depression: Resilience explains and differentiates the relationships. *Journal of Affective Disorders, 203*, 213-220. https://doi.org/10.1016/j.jad.2016.05.031

Anyayo, L. G., Kabunga, A., Okalo, P., Apili, B., & Nalwoga, V. (2022). Prevalence of and institutional factors associated with depression among undergraduate students at Gulu University. *Insights on the Depression and Anxiety, 6*(1), 1-6. https://doi.org/10.29328/journal.ida.1001029

Aronsson, G., & Ågren, H. (2020). *Self-assessed anxiety and physical fitness in South African university students* [Unpublished honours thesis]. University of the Western Cape. https://www.diva-portal.org/smash/get/diva2:1434460/FULLTEXT02.pdf

Asici, E., & Sari, H. I. (2022). Depression, anxiety, and stress in university students: Effects of dysfunctional attitudes, self-esteem and age. *Acta Educationis Generalis, 12*(1), 109-126. http://doi.org/10.2478/atd-2022-0006

Asif, S., Muddassar, A., Shahzad, T. Z., Raouf, M., & Pervaiz, T. (2020). Frequency of depression, anxiety and stress among university students. *Pakistan Journal of Medical Sciences, 36*(5), 971-976. https://doi.org/10.12669/pjms.36.5.1873

Astutik, E., Sebayang, S. K., Puspikawati, S. I., Tama, T. D., Sintha, D. M., & Dewi, K. (2020). Depression, anxiety and stress among students in newly established remote university campus in Indonesia. *Malaysian Journal of Medicine and Health Sciences, 16*(1), 270-277. https://medic.upm.edu.my/upload/dokumen/2020011612245840_MJMHS_0229.pdf

Awadalla, S., Davies, E. B., & Glazebrook, C. (2020). A longitudinal cohort study to explore the relationship between depression, anxiety and academic performance among Emirati university students. *BioMed Central Psychiatry, 20*, 1-10. https://doi.org/10.1186/s12888-020-02854-z

Bantjes, J. R., Kagee, A., McGowan, T., & Steel, H. (2016). Symptoms of posttraumatic stress, depression and anxiety as predictors of suicidal ideation among South African university students. *Journal of American College Health, 64*(6), 429-437. https://doi.org/10.1080/07448481.2016.1178120

Bantjes, J., Lochner, C., Saal, W., Roos, J., Taljaard, L., Page, D., Auerbach, R. P., Mortier, P., Bruffaerts, R., & Kessler, R. C. (2019). Prevalence and sociodemographic correlates of common mental disorders among first-year university students in post-apartheid South Africa: Implications for a public mental health approach to student wellness. *BioMed Central Public Health, 19*(1), 1-12. https://doi.org/10.1186/s12889-019-7218-y

Barreto dos Santos, L., Gomes do Nascimento, K., Oliva Fernandes, A. G., & Raminelli-da-Silva, T. d. C. (2021). Prevalence, severity and factors associated with depression in university students. *SMAD Revista Electronica Salud Mental, Alcohol Y Drogas, 17*(1),

92-100. http://pepsic.bvsalud.org/scielo.php?pid=S1806-69762021000100013&script=sci_abstract&tlng=en

Bastaminia, A., Reza, M., & Tazesh, Y. (2016). Resilience and quality of life among students of Yasouj State University. *International Journal of Research in Humanities and Social Studies, 6*, 1-10. https://www.ijrhss.org/papers/v3-i8/2.pdf

Beck, A. T., & Steer, R. A. (1990). *Manual for the Beck Anxiety Inventory*. Psychological Corporation.

Beck, A., Steer, R., & Brown, G. (1996). *Manual for the Beck depression inventory, (BDI-II).* The Psychological Association.

Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety and stress in a sample of college students. *Journal of Affective Disorders, 173*, 90-96. https://doi.org/10.1016/j.jad.2014.10.054

Bekova, S., Dementeva, J., & Smirnov, I. (2021). Factors associated with depression among university students: The role of student's satisfaction. *Institute of Education, HSE University*, 1-17. http://doi.org/10.31235/osf.io/9fg8t

Ben Salah, A., DeAngelis, B. N., & al'Absi, M. (2021). Resilience and the role of depressed and anxious mood in the relationship between perceived social isolation and perceived sleep quality during the COVID-19 pandemic. *International Journal of Behavioral Medicine, 28*, 277-285. https://doi.org/10.1007/s12529-020-09945-x

binti Ahmad, N. S., & bin Khairani, A. Z. (2018). Assessing resilience among Malaysian university undergraduates. Paper presented at the *3rd ASEAN Conference on*

Psychology, Counselling, and Humanities (ACPCH 2017), 293-296. http://doi.org/10.2991/acpch-17.2018.59

Birhanu, A., & Hassein, K. (2016). Prevalence and factors associated to depression among Ambo university students, Ambo, West Ethiopia. *Journal of Health, Medicine and Nursing, 25*, 26-24. https://api.core.ac.uk/oai/oai:ojs.localhost:article/30105

Bisson, K. H. (2017). *The effect of anxiety and depression on college students' academic performance: Exploring social support as a moderator* [Unpublished doctoral dissertation]. Abilene Christian University. https://digitalcommons.acu.edu/cgi/viewcontent.cgi?article=1057&context=etd

Biswas, A. (2021). A study on resilience among the students at higher education level in West Bengal. *International Journal of Multidisciplinary Educational Research, 10*(1), 126-129. http://ijmer.s3.amazonaws.com/pdf/volume10/volume10-issue1(4)/23.pdf

Bitsika, V., Sharpley, C. F., & Peters, K. (2010). How is resilience associated with anxiety and depression? Analysis of factor score interactions within a homogeneous sample. *German Journal of Psychiatry, 13*(1), 9-16. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.629.3635&rep=rep1&type=pdf

Brenneisen Mayer, F., Souza Santos, I., Silveira, P. S., Itaqui Lopes, M. H., de Souza, Alicia Regina Navarro Dias, Campos, E. P., de Abreu, B. A. L., Hoffman II, I., Magalhães, C. R., & Lima, M. C. P. (2016). Factors associated to depression and anxiety in medical students: A multicenter study. *BioMed Central Medical Education, 16*(1), 1-9. https://doi.org/10.1186/s12909-016-0791-1

Browne, H. D. (2020). *Depression and awareness of mental health resources among minority and non-minority college students* [Unpublished doctoral dissertation], Walden University. https://scholarworks.waldenu.edu/dissertations/8680/

Buttazzoni, A. (2022). Pedagogical approaches to support student resilience in higher-education settings: A systematic literature review. *Compass: Journal of Learning and Teaching, 15*(1), 1-24. https://doi.org/10.21100/compass.v15i1.1285

Carrasco-Carballo, A., Luna-Centeno, L. D., Rojas-Morales, A., Alatriste, V., Martínez, I., Martínez, L., Limón, D., & Luna, F. (2021). Anxiety and depression among exact and natural science college students of BUAP-México under COVID-19 lockdown. *Open Journal of Depression, 10*(3), 103-120. http://doi.org/10.4236/ojd.2021.103007

Chakrabarti, D., Biswas, S., & Adhikari, A. (2019). Prevalence of depression in suburban college students of Kolkata, West Bengal and its relation with BMI and percentage of body fat. *International Journal of Indian Psychology, 7*(4), 742-751. http://doi.org/10.25215/0704.085

Chang, J., Ji, Y., Li, Y., Yuan, M., & Su, P. (2021). Childhood trauma and depression in college students: Mediating and moderating effects of psychological resilience. *Asian Journal of Psychiatry, 65*, 1-6. https://doi.org/10.1016/j.ajp.2021.102824

Cheng, J., Zhao, Y., Wang, J., & Sun, Y. (2020). Academic burnout and depression of Chinese medical students in the pre-clinical years: The buffering hypothesis of resilience and social support. *Psychology, Health & Medicine, 25*(9), 1094-1105. https://doi.org/10.1080/13548506.2019.1709651

Chmitorz, A., Kunzler, A., Helmreich, I., Tüscher, O., Kalisch, R., Kubiak, T., Wessa, M., & Lieb, K. (2018). Intervention studies to foster resilience–A systematic review and

proposal for a resilience framework in future intervention studies. *Clinical Psychology Review, 59*, 78-100. https://doi.org/10.1016/j.cpr.2017.11.002

Chukwuere, P. C., Ojong-Alasia, M. M., Sehularo, L. A., & Manyedi, M. E. (2021). Emerging South African trends on adolescent depression and management literacy: A narrative literature review. *Gender and Behaviour*, *19*(1), 17522-17535. https://journals.co.za/doi/abs/10.10520/ejc-genbeh_v19_n1_a31

Cohodes, E. M., & Gee, D. G. (2017). Developmental neurobiology of anxiety and related disorders. *Oxford Research Encyclopedia of Neuroscience*, 1-29. https://doi.org/10.1093/acrefore/9780190264086.013.129

Cooper, K. M., Gin, L. E., Barnes, M. E., & Brownell, S. E. (2020). An exploratory study of students with depression in undergraduate research experiences. *CBE—Life Sciences Education, 19*(2), 1-17. https://doi.org/10.1187/cbe.19-11-0217

Dapaah, J. M., & Amoako, H. (2019). The causes of depression among university students and its effects on their academic life in the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. *International Journal for Innovation Education and Research, 7*(6), 154-167. https://doi.org/10.31686/ijier.vol7.iss6.1504

Davidson, R. J., & Begley, S. (2012). *The emotional life of your brain: how its unique patterns affect the way you think, feel and live--and how you can change them*. Penguin.

Davidson, R. J., Pizzagalli, D., Nitschke, J. B., & Putnam, K. (2002). Depression: Perspectives from affective neuroscience. *Annual Review of Psychology*, *53*(1), 545-574. https://doi.org/10.1146/annurev.psych.53.100901.135148

Daviu, N., Bruchas, M. R., Moghaddam, B., Sandi, C., & Beyeler, A. (2019). Neurobiological links between stress and anxiety. *Neurobiology of Stress, 11*, 1-9. https://doi.org/10.1016/j.ynstr.2019.100191

Dean, J., & Keshavan, M. (2017). The neurobiology of depression: An integrated view. *Asian Journal of Psychiatry, 27*, 101-111. https://doi.org/10.1016/j.ajp.2017.01.025

Devi, H. M., Purborini, N., & Chang, H. (2021). Mediating effect of resilience on association among stress, depression and anxiety in Indonesian nursing students. *Journal of Professional Nursing, 37*(4), 706-713. https://doi.org/10.1016/j.profnurs.2021.04.004

Dhar, R., Ali, A., Gujar, N. M., Baisha, B., & Saikia, P. (2019). Mindfulness, resilience and psychological distress among youth in a university setting. *Indian Journal of Mental Health, 6*(4), 347-352. http://doi.org/10.30877/IJMH.6.4.2019.347-352

Drew, B., & Matthews, J. (2019). The prevalence of depressive and anxiety symptoms in student-athletes and the relationship with resilience and help-seeking behavior. *Journal of Clinical Sport Psychology, 13*(3), 421-439. https://doi.org/10.1123/jcsp.2017-0043

Duraku, Z. H. (2017). Factors influencing test anxiety among university students. *The European Journal of Social & Behavioural Sciences, 18*(1), 69-78. http://doi.org/10.15405/ejsbs.206

Dworzanowski-Venter, B. (2019). Activating youth resilience: Lessons learnt from a 2018 survey of two university-based helplines. *Mental Health Matters, 6*(1), 18-20. https://hdl.handle.net/10520/EJC-15934be75d

Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety and suicidality among university students. *American Journal of Orthopsychiatry, 77*(4), 534-542. https://doi.org/10.1037/0002-9432.77.4.534

Eisenberg, D., Lipson, S. K., & Posselt, J. (2016). Promoting resilience, retention and mental health. *New Directions for Student Services, 156,* 87-95. http://doi.org/10.1002/ss.20194

Eloff, I., & Graham, M. (2020). Measuring mental health and well-being of South African undergraduate students. *Global Mental Health, 7*, 1-10. https://doi.org/10.1017/gmh.2020.26

Etkin, A. (2012). Neurobiology of anxiety: From neural circuits to novel solutions? *Depression and Anxiety, 29*(5), 355-358. https://doi.org/10.1002/da.21957

Farrer, L. M., Gulliver, A., Bennett, K., Fassnacht, D. B., & Griffiths, K. M. (2016). Demographic and psychosocial predictors of major depression and generalised anxiety disorder in Australian university students. *BioMed Central Psychiatry, 16*(1), 1-9. https://doi.org/10.1186/s12888-016-0961-z

Gao, L., Xie, Y., Jia, C., & Wang, W. (2020). Prevalence of depression among Chinese university students: A systematic review and meta-analysis. *Scientific Reports, 10*(1), 1-11. https://doi.org/10.1038/s41598-020-72998-1

Garakani, A., Mathew, S., & Charney, D. S. (2006). Neurobiology of anxiety disorders and implications for treatment. *Mount Sinai Journal of Medicine, 73*(7), 941-949. https://pubmed.ncbi.nlm.nih.gov/17195879/#:~:text=Abstract,mechanisms%20of%20memory%20and%20learning.

Garcia, J. M., Gallagher, M. W., O'Bryant, S. E., & Medina, L. D. (2021). Differential item functioning of the Beck Anxiety Inventory in a rural, multi-ethnic cohort. *Journal of Affective Disorders, 293,* 36-42. https://doi.org/10.1016/j.jad.2021.06.005

Georgakopoulos, C. (2020). *Stress, anxiety and depression in Australian university students, incorporating the impact of balancing study and employment, and the experience of COVID-19* [Unpublished honours thesis]. University of Adelaide. https://digital.library.adelaide.edu.au/dspace/handle/2440/131179#:~:text=Results%20indicated%20that%20the%20impact,genders%20(female%20and%20male).

Ghanim, M., Rabayaa, M., Atout, S., Al-Othman, N., & Alqub, M. (2022). Prevalence of anxiety and depression among Palestinian university students: A cross-sectional study during COVID-19 pandemic. *Middle East Current Psychiatry, 29*(1), 1-10. https://doi.org/10.1186%2Fs43045-022-00238-5

Gómez Molinero, R., Zayas García, A., Ruiz González, P., & Guil, R. (2018). Optimism and resilience among university students. *International Journal of Developmental and Educational Psychology Revista INFAD de psicología 1*(1), 147-153. https://doi.org/10.17060/ijodaep.2018.n1.v1.1179

Graber, R., Pichon, F., & Carabine, E. (2015). Psychological resilience. *Overseas Development Institute, ODI Working Paper*, 1-27. https://odi.org/en/publications/psychological-resilience-state-of-knowledge-and-future-research-agendas/

Gravetter, F. J., & Forzano, L. B. (2018). *Research methods for the behavioral sciences*. Cengage learning.

Gress-Smith, J. L., Roubinov, D. S., Andreotti, C., Compas, B. E., & Luecken, L. J. (2015). Prevalence, severity and risk factors for depressive symptoms and insomnia in college undergraduates. *Stress and Health, 31*(1), 63-70. https://doi.org/10.1002/smi.2509

Grygiel, P., Switaj, P., Anczewska, M., Humenny, G., Rebisz, S., & Sikorska, J. (2013). Loneliness and depression among Polish university students: Preliminary findings from a longitudinal study. *Bulgarian Comparative Education Society, 11*, 286-292. https://doi.org/10.13140/RG.2.1.4507.0803

Hamdan-Mansour, A. M., Azzeghaiby, S. N., Alzoghaibi, I. N., Al Badawi, T. H., Nassar, O. S., & Shaheen, A. M. (2014). Correlates of resilience among university students. *American Journal of Nursing Research, 2*(4), 74-79. https://pubs.sciepub.com/ajnr/2/4/4/index.html

Hanson, M. (2021, November 22). College dropout rates. *Education data*. https://educationdata.org/college-dropout-rates.

Hernández, E. V., Ortega, M. A. M., & Briceño, V. E. S. (2020). Anxiety and academic performance in university students. *American International Journal of Contemporary Research, 10*(2), 8-12. https://doi.org/10.30845/aijcr.v10n2p2

Hossain, M. M., Alam, M. A., & Masum, M. H. (2022). Prevalence of anxiety, depression and stress among students of Jahangirnagar university in Bangladesh. *Health Science Reports, 5*(2), 1-10. https://doi.org/10.1002/hsr2.559

Hunter, R. G., Gray, J. D., & McEwen, B. S. (2018). The neuroscience of resilience. *Journal of the Society for Social Work and Research, 9*(2), 305-339. https://doi.org/10.1086/697956

Hussain, I., & Thakur, N. (2019). Association between resilience, mindfulness and academic stress among university students. *International Journal of Research and Analytical Reviews, 6*(1), 316-319. http://ijrar.com/upload_issue/ijrar_issue_20542781.pdf

Hutchinson, A. K., Stuart, A. D., & Pretorius, H. G. (2010). Biological contributions to well-being: The relationships amongst temperament, character strengths and resilience. *SA Journal of Industrial Psychology, 36*(2), 1-10. https://doi.org/10.4102/sajip.v36i2.844

Ioannidis, K., Askelund, A. D., Kievit, R. A., & Van Harmelen, A. (2020). The complex neurobiology of resilient functioning after childhood maltreatment. *BioMed Central Medicine, 18*, 1-16. https://doi.org/10.1186/s12916-020-1490-7

Islam, M. A., Barna, S. D., Raihan, H., Khan, M. N. A., & Hossain, M. T. (2020). Depression and anxiety among university students during the COVID-19 pandemic in Bangladesh: A web-based cross-sectional survey. *PloS One, 15*(8), 1-12. https://doi.org/10.1371%2Fjournal.pone.0238162

Islam, M. A., Low, W. Y., Tong, W. T., Yuen, C. W., & Abdullah, A. (2018). Factors associated with depression among university students in Malaysia: A cross-sectional study. *Presented at the 2nd International Meeting of Public Health 2016 with theme "Public Health Perspective of Sustainable Development Goals: The Challenges and Opportunities in Asia-Pacific Region, KnE Life Sciences*, 415–427. http://doi.org/10.18502/kls.v4i4.2302

Izadinia, N., Amiri, M., Ghorban Jahromi, R., & Hamidi, S. (2010). A study of relationship between suicidal ideas, depression, anxiety, resiliency, daily stresses and mental health among Tehran university students. *Procedia-Social and Behavioral Sciences, 5*, 1615-1619. https://doi.org/10.1016/j.sbspro.2010.07.335

Jacobs, B. L., Van Praag, H., & Gage, F. H. (2000). Adult brain neurogenesis and psychiatry: A novel theory of depression. *Molecular Psychiatry, 5*(3), 262-269. https://doi.org/10.1038/sj.mp.4000712

Janse van Vuuren, C., Bodenstein, K., & Oberholzer, M. (2021). Exploring the psychological well-being of postgraduate accounting students at a South African university. *South African Journal of Accounting Research, 35*(3), 219-238. https://doi.org/10.1080/10291954.2021.1887440

Jeon, S. W., & Kim, Y. (2016). Molecular neurobiology and promising new treatment in depression. *International Journal of Molecular Sciences, 17*(3), 1-17. https://doi.org/10.3390/ijms17030381

Jessee, L. A. (2019). Anxiety disorders: A review of neurobiological structures, neurocognitive expressions and treatment options. *Intuition: The BYU Undergraduate Journal of Psychology, 14*(2), 161-175. https://scholarsarchive.byu.edu/intuition/vol14/iss2/13

Jones, P. J., Park, S. Y., & Lefevor, G. T. (2018). Contemporary college student anxiety: The role of academic distress, financial stress and support. *Journal of College Counseling, 21*(3), 252-264. https://doi.org/10.1002/jocc.12107

Kaloeti, D. V. S., Rahmandani, A., Sakti, H., Salma, S., Suparno, S., & Hanafi, S. (2019). Effect of childhood adversity experiences, psychological distress and resilience on depressive symptoms among Indonesian university students. *International Journal of Adolescence and Youth, 24*(2), 177-184. https://doi.org/10.1080/02673843.2018.1485584

Kaltenboeck, A., & Harmer, C. (2018). The neuroscience of depressive disorders: A brief review of the past and some considerations about the future. *Brain and Neuroscience Advances*, *2*, 1-6. https://doi.org/10.1177/2398212818799269

Kamruzzaman, M., Hossain, A., Islam, M. A., Ahmed, M. S., & Kabir, E. (2022). Prevalence of depression, anxiety, stress and their associated factors among university students in Bangladesh. *Frontiers in Public Health*, *11*, 1-11. https://doi.org/10.3389/fpubh.2023.1136557

Karmakar, T., & Behera, S. K. (2017). Depression among the college students: An empirical study. *Educational Quest-an International Journal of Education and Applied Social Sciences*, *8*(1), 163-170. http://doi.org/10.5958/2230-7311.2017.00024.1

Kechil, R., Abd Rahman, N. H., & Abd Razak, N. (2022). A study on depression and anxiety among university students during ODL. *International Journal of Practices in Teaching and Learning (IJPTL)*, *2*(1), 1-7. https://ijptl.uitm.edu.my/files/v2n1-feb2022/IJPTL_208(1).pdf

Kesebir, S., Gündoğar, D., Küçüksubaşı, Y., & Yaylacı, E. T. (2013). The relation between affective temperament and resilience in depression: A controlled study. *Journal of Affective Disorders*, *148*(2-3), 352-356. https://doi.org/10.1016/j.jad.2012.12.023

Ko, C. A., & Chang, Y. (2019). Investigating the relationships among resilience, social anxiety and procrastination in a sample of college students. *Psychological Reports*, *122*(1), 231-245. https://doi.org/10.1177/0033294118755111

Kokou-Kpolou, C. K., Jumageldinov, A., Park, S., Nieuviarts, N., Noorishad, P., & Cénat, J. M. (2021). Prevalence of depressive symptoms and associated psychosocial risk factors

among French university students: The moderating and mediating effects of resilience. *Psychiatric Quarterly, 92*(2), 443-457. https://doi.org/10.1007/s11126-020-09812-8

Krishnan, V., & Nestler, E. J. (2008). The molecular neurobiology of depression. *Nature, 455*(7215), 894-902. https://doi.org/10.1038/nature07455

Kwon, J.Y., Wormley, A., & Varnum, M.E.W (2021). Changing cultures, changing brains: A framework for integrating cultural neuroscience and cultural change research. *Biological Psychology, 162*(3), 1-9. https://doi.org/10.1016/j.biopsycho.2021.108087

Lau, W. K. (2022). The role of resilience in depression and anxiety symptoms: A three-wave cross-lagged study. *Stress and Health, 38*(4), 804-812. https://doi.org/10.1002/smi.3136

Leedy, P. D., & Ormrod, J. E. (2015). *Practical research: Planning and design, global edition*. Pearson.

Letseka, M., & Maile, S. (2008). High university drop-out rates: A threat to South Africa's future. *HSRC Policy Brief. (pp. 1-9). Human Sciences Research Council*, https://hsrc.ac.za/uploads/pageContent/1088/Dropout%20rates.pdf

Li, Z., Ruan, M., Chen, J., & Fang, Y. (2021). Major depressive disorder: Advances in neuroscience research and translational applications. *Neuroscience Bulletin, 37*, 863-880. https://doi.org/10.1007/s12264-021-00638-3

Liu, C., McCabe, M., Kellett-Renzella, S., Shankar, S., Gerges, N., & Cornish, K. (2021). Addressing depression symptoms among university students under COVID-19 restrictions—the mediating role of stress and the moderating role of resilience. *International Journal of Environmental Research and Public Health, 18*(23), 1-11. https://doi.org/10.3390/ijerph182312752

Liu, X., Guo, Y., Zhang, W., & Gao, W. (2022a). Influencing factors, prediction and prevention of depression in college students: A literature review. *World Journal of Psychiatry, 12*(7), 860-873. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9331452/

Liu, X., Wang, Q., & Zhou, Z. (2022b). The association between mindfulness and resilience among university students: a meta-analysis. *Sustainability, 14*(16), 1-15. http://doi.org/10.3390/su141610405

Liyanage, S., Saqib, K., Khan, A. F., Thobani, T. R., Tang, W., Chiarot, C. B., AlShurman, B. A., & Butt, Z. A. (2021). Prevalence of anxiety in university students during the COVID-19 pandemic: A systematic review. *International Journal of Environmental Research and Public Health, 19*(1), 1-13. https://doi.org/10.3390/ijerph19010062

Lun, K. W., Chan, C. K., Ip, P. K., Ma, S. Y., Tsai, W. W., Wong, C. S., Wong, C. H., Wong, T. W., & Yan, D. (2018). Depression and anxiety among university students in Hong Kong. *Hong Kong Medical Journal, 24*(5), 466-472. https://doi.org/10.12809/hkmj176915

Makhubela, M., & Mashegoane, S. (2016). Validation of the Beck Depression Inventory-II in South Africa: Factorial validity and longitudinal measurement invariance in university students. *South African Journal of Psychology, 46*(2), 203-217. https://doi.org/10.1177/0081246315611016

Maletic, V., Robinson, M., Oakes, T., Iyengar, S., Ball, S. G., & Russell, J. (2007). Neurobiology of depression: An integrated view of key findings. *International Journal of Clinical Practice, 61*(12), 2030-2040. https://doi.org/10.1111%2Fj.1742-1241.2007.01602.x

Mampane, M. R. (2014). Factors contributing to the resilience of middle-adolescents in a South African township: Insights from a resilience questionnaire. *South African Journal of Education, 34*(4), 1-11. http://doi.org/10.15700/201412052114

Manap, R., Hamid, S. A., & Ghani, M. A. (2019). Depression, anxiety and stress among undergraduate students. *E-BANGI: Jurnal Sains Sosial dan Kemanusiaan, 16*(2), 1-7. https://ejournal.ukm.my/ebangi/issue/view/1174

Manjari, Y., & Pandey, V. (2017). Comparison of depression among freshmen and last year college students. *International Journal of Indian Psychology, 5*(1), 33-38. https://doi.org/10.25215/0501.084

Manji, H. K., Drevets, W. C., & Charney, D. S. (2001). The cellular neurobiology of depression. *Nature Medicine, 7*(5), 541-547. https://doi.org/10.1038/87865

Marcotte, D., & Villatte, A. (2021). Resilience factors in college students at risk of depression. *Journal of School Counseling, 19*(3), 1-37. https://eric.ed.gov/?id=EJ1290080

Marcotte, D., Villatte, A., & Potvin, A. (2014). Resilience factors in students presenting depressive symptoms during the post-secondary school transition. *Procedia-Social and Behavioral Sciences, 159*, 91-95. https://doi.org/10.1016/j.sbspro.2014.12.335

Martin, E. I., Ressler, K. J., Binder, E., & Nemeroff, C. B. (2009). The neurobiology of anxiety disorders: Brain imaging, genetics and psychoneuroendocrinology. *Psychiatric Clinics, 32*(3), 549-575. https://doi.org/10.1016/j.psc.2009.05.004

McCready, K. (2018). *Anxiety and stress in first year university students* [Unpublished honours thesis]. Brescia University College. https://ir.lib.uwo.ca/brescia_psych_uht/14

McGillivray, C. J., & Pidgeon, A. M. (2015). Resilience attributes among university students: A comparative study of psychological distress, sleep disturbances and mindfulness. *European Scientific Journal*, *11*(5), 33-48. https://eujournal.org/index.php/esj/article/view/5174

Meintjes, R. (2020). *Depression and self-regulated learning as predictors of first-year students' academic performance: A case study* [Unpublished master's thesis]. University of Free State. https://scholar.ufs.ac.za/handle/11660/10953

Mercer, J. C. (2010). *College student resilience: Selected effects of service-learning*. [Unpublished doctoral dissertation], University of North Texas. https://digital.library.unt.edu/ark:/67531/metadc30495/m2/1/high_res_d/dissertation.pdf

Miller, L. R., Divers, R., Reed, C., Pugh, E., & Calamia, M. (2023). Resilience as a moderator of depression and anxiety: A bidimensional approach to predictors of subjective cognition in older adults. *Aging & Mental Health*, *27*(1), 29-34. https://doi.org/10.1080/13607863.2021.2013432

Min, J., Yu, J. J., Lee, C., & Chae, J. (2013). Cognitive emotion regulation strategies contributing to resilience in patients with depression and/or anxiety disorders. *Comprehensive Psychiatry*, *54*(8), 1190-1197. https://doi.org/10.1016/j.comppsych.2013.05.008

Mirza, M. S., & Arif, M. I. (2018). Fostering academic resilience of students at risk of failure at secondary school level. *Journal of Behavioural Sciences*, *28*(1), 33-50. http://pu.edu.pk/images/journal/doap/PDF-FILES/03_v28_1_18.pdf

Mofatteh, M. (2021). Risk factors associated with stress, anxiety and depression among university undergraduate students. *AIMS Public Health, 8*(1), 36-65. https://doi.org/10.3934%2Fpublichealth.2021004

Mohamad, N. E., Sidik, S. M., Akhtari-Zavare, M., & Gani, N. A. (2021). The prevalence risk of anxiety and its associated factors among university students in Malaysia: A national cross-sectional study. *BioMed Central Public Health, 21*, 1-12. https://doi.org/10.1186/s12889-021-10440-5

Moodley, P., & Singh, R. J. (2015). Addressing student dropout rates at South African universities. *Alternation, 17*, 91-115. http://hdl.handle.net/10321/1648

Moutinho, I. L. D., Maddalena, N. d. C. P., Roland, R. K., Lucchetti, A. L. G., Tibiriçá, S. H. C., Ezequiel, O. d. S., & Lucchetti, G. (2017). Depression, stress and anxiety in medical students: A cross-sectional comparison between students from different semesters. *Revista Da Associação Médica Brasileira, 63*, 21-28. https://doi.org/10.1590/1806-9282.63.01.21

Mufford, M. S., van der Meer, D., Andreassen, O. A., Ramesar, R., Stein, D. J., & Dalvie, S. (2020). A review of systems biology research of anxiety disorders. *Brazilian Journal of Psychiatry, 43*, 414-423. https://doi.org/10.1590%2F1516-4446-2020-1090

Mungai, K., & Bayat, A. (2019). An overview of trends in depressive symptoms in South Africa. *South African Journal of Psychology, 49*(4), 518-535. https://doi.org/10.1177/0081246318823580

Mwangi, C. N., Ireri, A. M., & Mwaniki, E. W. (2017). Correlates of academic resilience among secondary school students in Kiambu County, Kenya. *Interdisciplinary*

Education and Psychology, 1(1), 1-10. http://doi.org/10.31532/InterdiscipEducPsychol.1.1.004

Najjuka, S. M., Checkwech, G., Olum, R., Ashaba, S., & Kaggwa, M. M. (2021). Depression, anxiety, and stress among Ugandan university students during the COVID-19 lockdown: An online survey. *African Health Sciences, 21*(4), 1533-1543. https://doi.org/10.4314/ahs.v21i4.6

Ngcobo, S. N. (2019). *An exploration of resilience to poverty among the UKZN students from disadvantaged backgrounds* [Unpublished master's thesis]. University of KwaZulu Natal. https://researchspace.ukzn.ac.za/handle/10413/17524

Ngubane, M. F. (2019). *Exploring resilience among South African female masters students: An ecological systems perspective* [Unpublished master's thesis]. University of KwaZulu Natal. https://researchspace.ukzn.ac.za/handle/10413/17048

Ochnik, D., Rogowska, A. M., Kuśnierz, C., Jakubiak, M., Schütz, A., Held, M. J., Arzenšek, A., Benatov, J., Berger, R., & Korchagina, E. V. (2021). A comparison of depression and anxiety among university students in nine countries during the COVID-19 pandemic. *Journal of Clinical Medicine, 10*(13), 1-22. https://doi.org/10.3390/jcm10132882

Ogachi, F. M., Karega, M., & Oteyo, J. S. (2019). Relationship between depression and pathological internet use among university students. *Cypriot Journal of Educational Sciences, 14*(2), 201-207. http://doi.org/10.18844/cjes.v14i2.3123

Oluwafunmilola, O. O. (2012). *Depression among international students* [Unpublished honours thesis]. Central Ostrobothnia University of Applied Sciences. https://www.theseus.fi/bitstream/handle/10024/44723/KEMI_OMODONA.pdf

Ononye, U., Ndudi, F., Bereprebofa, D., & Maduemezia, I. (2022). Academic resilience, emotional intelligence and academic performance among undergraduate students. *Knowledge and Performance Management, 6*(1), 1-10. http://doi.org/10.21511/kpm.06(1).2022.01

Osório, C., Probert, T., Jones, E., Young, A. H., & Robbins, I. (2017). Adapting to stress: Understanding the neurobiology of resilience. *Behavioral Medicine (Washington, D.C.), 43*(4), 307–322. https://doi.org/10.1080/08964289.2016.1170661

Othieno, C. J., Okoth, R. O., Peltzer, K., Pengpid, S., & Malla, L. O. (2014). Depression among university students in Kenya: Prevalence and sociodemographic correlates. *Journal of Affective Disorders, 165*, 120-125. https://doi.org/10.1016/j.jad.2014.04.070

Oyoo, S. A., Mwaura, P. M., & Kinai, T. (2018). Academic resilience as a predictor of academic burnout among form four students in Homa-Bay County, Kenya. *International Journal of Education and Research, 6*(3), 187-200. http://ir-library.ku.ac.ke/handle/123456789/23089

Palazidou, E. (2012). The neurobiology of depression. *British Medical Bulletin, 101*(1), 127-145. https://doi.org/10.1093/bmb/lds004

Parra, M. R. (2020). Depression and the meaning of life in university students in times of pandemic. *International Journal of Educational Psychology*, *9*(3), 223-242. http://doi.org/10.17583/ijep.2020.6784

Peltzer, K., Pengpid, S., Olowu, S., & Olasupo, M. (2013). Depression and associated factors among university students in Western Nigeria. *Journal of Psychology in Africa, 23*(3), 459-465. http://doi.org/10.1080/14330237.2013.10820652

Peng, L., Zhang, J., Li, M., Li, P., Zhang, Y., Zuo, X., Miao, Y., & Xu, Y. (2012). Negative life events and mental health of Chinese medical students: The effect of resilience, personality and social support. *Psychiatry Research, 196*(1), 138-141. https://doi.org/10.1016/j.psychres.2011.12.006

Poole, J. C., Dobson, K. S., & Pusch, D. (2017). Childhood adversity and adult depression: The protective role of psychological resilience. *Child Abuse & Neglect, 64*, 89-100. https://doi.org/10.1016/j.chiabu.2016.12.012

Ramezankhani, A., Gharlipour, Z., Heydarabadi, A. B., Tavassoli, E., Motalebi, M., Barekati, H., Gilasi, H. R., Ranjbar, T. K., & Moosavi, S. A. (2013). Perceived social support, depression and perceived stress in university students. *Archives of Advances in Biosciences, 4*(4), 31-36. https://doi.org/10.22037/jps.v4i4.4846

Ramosala, K. T. (2021). *Depressive symptomatology and resilience profiles among university students* [Unpublished master's thesis]. University of Pretoria. http://hdl.handle.net/2263/79758

Ran, L., Wang, W., Ai, M., Kong, Y., Chen, J., & Kuang, L. (2020). Psychological resilience, depression, anxiety, and somatization symptoms in response to COVID-19: A study of the general population in China at the peak of its epidemic. *Social Science & Medicine, 262*, 1-6. https://doi.org/10.1016/j.socscimed.2020.113261

Ranizal, M. A. B. M., Zabidi, W. Q. B. W., Shariff, S. A. B. M., Stanis, J., & Amir, S. A. B. S. (2019). Depression among university students. *E-Journal of Media and Society 2*(1),1-15. https://philarchive.org/rec/RANDAU

Rasheed, N., Fatima, I., & Tariq, O. (2022). University students' mental well-being during COVID-19 pandemic: The mediating role of resilience between meaning in life and

mental well-being. *Acta Psychologica*, *227*, 1-6. https://doi.org/10.1016/j.actpsy.2022.103618

Reh, L. (2019). *Perceived stress, depression and anxiety in university students: The role of resilience* [Unpublished master's thesis]. University of Twente. https://purl.utwente.nl/essays/78148

Rehman, R., Fatima, K., Hussain, M., Sarim, M., Gazzaz, Z. J., & Baig, M. (2021). Association between depression and health risk behaviors among university students, Karachi, Pakistan. *Cogent Psychology*, *8*(1), 1-13. https://doi.org/10.1080/23311908.2021.1886626

Reta, Y., Ayalew, M., Yeneabat, T., & Bedaso, A. (2020). Social anxiety disorder among undergraduate students of Hawassa University, College of Medicine and Health Sciences, Ethiopia. *Neuropsychiatric Disease and Treatment,16*, 571-577. https://doi.org/10.2147%2FNDT.S235416

Robbins, A., Kaye, E., & Catling, J. (2018). Predictors of student resilience in higher education. *Psychology Teaching Review*, *24*(1), 44-52. https://eric.ed.gov/?id=EJ1180345

Rossouw, P. J. (2015). Resilience: A neurobiological perspective. *Neuropsychotherapy in Australia*, *31*, 3-8. https://www.researchgate.net/publication/275947336_Resilience_-_A_Neurobiological_perspective

Rossouw, P. J., & Rossouw, J. G. (2016). The predictive 6-factor resilience scale: Neurobiological fundamentals and organizational application. *International Journal of*

Neuropsychotherapy, *4*(1), 31-45. https://thescienceofpsychotherapy.com/wp-content/uploads/2016/05/IJNPT_Vol4_issue1p31-45.pdf

Rousseau, K., & Thompson, S. (2019). *Trends in depression among undergraduate students at a South African university, 2016–2019* [Unpublished honours thesis]. University of Cape Town. https://humanities.uct.ac.za/media/252869#:~:text=The%20proportion%20of%20students%20reporting,2016%20to%2012.63%25%20in%202019.

Rousseau, K., Thompson, S., Pileggi, L., Henry, M., & Thomas, K. G. (2021). Trends in the prevalence and severity of depressive symptoms among undergraduate students at a South African university, 2016–2019. *South African Journal of Psychology*, *51*(1), 67-80. https://doi.org/10.1177/0081246320977759

Saleem, S., & Mahmood, Z. (2013). Mental health problems in university students: A prevalence study. *FWU Journal of Social Sciences, Winter*, *7*(2), 124-130. http://sbbwu.edu.pk/journal/FWU%20Journal%20Vol.7,%20No.2/3.Mental%20Health%20Problems%20in%20University.pdf

Sawai, R. P., Sawai, J. P., Hawari, U. S. L., Aziz, A. R. A., & Ahmad, R. (2022). Academic stress and depression among medical students. *International Journal of Academic Research in Business and Social Sciences*, *12*(1), 2611–2620. http://doi.org/10.6007/IJARBSS/v12-i1/12326

Segal, D. & Coolidge, F. (2018). Reliability. In SAGE E*ncyclopedia of Lifespan Human Development*. SAGE. https://doi.org/10.4135/9781506307633.n683.

Serrano Sarmiento, Á, Sanz Ponce, R., & González Bertolín, A. (2021). Resilience and COVID-19. An analysis in university students during confinement. *Education Sciences, 11*(9), 1-18. https://doi.org/10.3390/educsci11090533

Shamsuddin, K., Fadzil, F., Ismail, W. S., Shah, S. A., Omar, K., Muhammad, N. A., Jaffar, A., Ismail, A., & Mahadevan, R. (2013). Correlates of depression, anxiety and stress among Malaysian university students. *Asian journal of psychiatry*, *6*(4), 318–323. https://doi.org/10.1016/j.ajp.2013.01.014

Sharma, P., & Kirmani, M. N. (2015). Exploring depression & anxiety among college going students. *International Journal of Science and Research, 4*(6), 528-532. http://doi.org/10.13140/RG.2.2.14616.19206

Shastri, P. C. (2013). Resilience: Building immunity in psychiatry. *Indian Journal of Psychiatry*, *55*(3), 224-234. https://doi.org/10.4103/0019-5545.117134

Shilpa, S., & Srimathi, N. L. (2015). Role of resilience on perceived stress among pre university and under graduate students. *International Journal of Indian Psychology*, *2*(2), 141-149. https://ijip.in/wp-content/uploads/2019/01/B00317V2I22015.pdf

Singh, A., Prakash, S., Yadav, J. S., & Jain, M. (2021). A cross-sectional study on resilience, depression, anxiety and stress among exam going students. *The International Journal of Indian Psychology*, *9*(1), 1135-1143. https://ijip.in/wp-content/uploads/2021/03/18.01.119.20210901.pdf

Song, H., Zhang, M., Wang, Y., Yang, L., Wang, Y., & Li, Y. (2021). The impact of resilience on anxiety and depression among grass-roots civil servants in China. *BioMed Central Public Health, 21*(1), 1-10. https://doi.org/10.1186/s12889-021-10710-2

Suleiman, A. K., Ismadi, N. F. I., Choudhry, F. R., Munawar, K., & Hameed, M. A. (2017). Determinant factors of depression: A survey among university students. *Malaysian Journal of Public Health Medicine, 17*(3), 97-103. http://doi.org/10.37268/mjphm/vol.17/no.3/art.222

Tan, R., & Reyes-Wapano, M. R. (2021). The role of resilience in the relationship between stress and depression among medical students. *International Journal of Research and Innovation in Social Science, 5*(9), 460-471. https://doi.org/10.47772/IJRISS.2021.5930

Theron, L. C. (2016). Enabling resilience: Shifting the intergenerational career expectations of South Africans challenged by structural disadvantage. *South African Journal of Higher Education, 30*(3), 37-53. https://doi.org/10.20853/30-3-657

Theron, L. C., & Theron, A. M. (2010). A critical review of studies of South African youth resilience, 1990-2008. *South African Journal of Science, 106*(7), 1-8. https://hdl.handle.net/10520/EJC97066

To, Q. G., Vandelanotte, C., Cope, K., Khalesi, S., Williams, S. L., Alley, S. J., Thwaite, T. L., Fenning, A. S., & Stanton, R. (2022). The association of resilience with depression, anxiety, stress and physical activity during the COVID-19 pandemic. *BioMed Central Public Health, 22*(1), 1-8. https://doi.org/10.1186/s12889-022-12911-9

Torija, C. S. T., Pozo, M. D. R. H., Bravo, Y., Hurtado, A. C., & Romero, M. (2016). Prevalence of anxiety symptoms in a sample of college students at a faculty of health sciences in Mexico. *Tesis Psicológica, 11*(2), 12-22. https://www.researchgate.net/publication/325722653_Prevalence_of_anxiety_symptoms_in_a_College_sample_at_a_Health_faculty_in_Mexico

Tung, K. S., Ning, W. W., & Kris, L. (2014). Effect of resilience on self-perceived stress and experiences on stress symptoms a surveillance report. *Universal Journal of Public Health, 2*(2), 64-72. https://doi.org/10.13189/ujph.2014.020205

Turner, M., Scott-Young, C. M., & Holdsworth, S. (2017). Promoting wellbeing at university: The role of resilience for students of the built environment. *Construction Management and Economics, 35*(11-12), 707-718. https://doi.org/10.1080/01446193.2017.1353698

Valdeavilla, D. D. R., Santos, N. A. V., Domingo, A. L. S., & Pulido, M. T. R. (2019). Investigating the presence of the symptoms of depression among university-age Filipinos. *Paper presented at the IoTBDS*, 359-363. https://doi.org/10.5220/0007748903590363

van Breda, A. D. (2018). Resilience of vulnerable students transitioning into a South African university. *Higher Education, 75*, 1109-1124. https://doi.org/10.1007/s10734-017-0188-z

van Vuuren, N. (2014). *Promoting student success by tapping into the resilience of the at-risk student: A South African higher education perspective* [Unpublished doctoral dissertation]. University of South Africa. http://hdl.handle.net/10500/18756

van Wyk, M., Mason, H. D., van Wyk, B. J., Phillips, T. K., & van der Walt, P. E. (2022). The relationship between resilience and student success among a sample of South African engineering students. *Cogent Psychology, 9*(1), 1-18. https://doi.org/10.1080/23311908.2022.2057660

van Zyl, P. M., L. Metz, L. M., Joubert, G., Francis, C., du Plooy, F., Jadhunandan, S., Fredericks, F., & Bowen, E. (2017). Depression, anxiety, stress and substance use in

medical students in a 5-year curriculum. *African Journal of Health Professions Education, 9*(2), 67-72. https://ajol.info/index.php/ajhpe/article/view/158421

Verma, A. (2021). Resilience attributes among lovely professional university students: A correlation study of depression, anxiety and stress. *Psychology and Education Journal, 58*(4), 1610-1615. https://psychologyandeducation.net/pae/article/view/4901/4282

Vigo, D., Jones, L., Munthali, R., Pei, J., Westenberg, J., Munro, L., Judkowicz, C., Wang, A. Y., Van den Adel, B., & Dulai, J. (2021). Investigating the effect of COVID-19 dissemination on symptoms of anxiety and depression among university students. *British Journal of Psychiatry Open, 7*(2), 1-10. https://doi.org/10.1192/bjo.2021.24

Visser, M., & Law-van Wyk, E. (2021). University students' mental health and emotional wellbeing during the COVID-19 pandemic and ensuing lockdown. *South African Journal of Psychology, 51*(2), 229-243. https://doi.org/10.1177/00812463211012219

Vitasari, P., Abdul Wahab, M. N., Othman, A., & Awang, M. G. (2010). A research for identifying study anxiety sources among university students. *International Education Studies, 3*(2), 189-196. https://doi.org/10.5539/ies.v3n2p189

Wahab, I. A., Goh, K. W., Zainal, Z. A., Yusof, N. S. M., Huri, H. Z., Jacob, S. A., Alwi, M. N. M., Hashim, R., Hisham, S. A., & Jamil, N. (2022). Targeted primary and secondary preventive strategies for depression among Malaysian pharmacy students. *International Journal of Environmental Research and Public Health, 19*(15), 1-14. https://doi.org/10.3390/ijerph19159629

Wang, X., & Liu, Q. (2022). Prevalence of anxiety symptoms among Chinese university students amid the COVID-19 pandemic: A systematic review and meta-analysis. *Heliyon,8*, 1-10. https://doi.org/10.1016/j.heliyon.2022.e10117

Wang, X., Zhang, N., Pu, C., Li, Y., Chen, H., & Li, M. (2022). Anxiety, depression, and PTSD among college students in the Post-COVID-19 era: A cross-sectional study. *Brain Sciences, 12*(11), 1-12. https://doi.org/10.3390/brainsci12111553

Watanabe, N., & Takeda, M. (2022). Neurophysiological dynamics for psychological resilience: A view from the temporal axis. *Neuroscience Research, 175*, 53-61. https://doi.org/10.1016/j.neures.2021.11.004

Windle, G., Markland, D. A., & Woods, R. T. (2008). Examination of a theoretical model of psychological resilience in older age. *Aging and Mental Health, 12*(3), 285-292. https://doi.org/10.1080/13607860802120763

Wohleb, E. S., Franklin, T., Iwata, M., & Duman, R. S. (2016). Integrating neuroimmune systems in the neurobiology of depression. *Nature Reviews Neuroscience, 17*(8), 497-511. https://doi.org/10.1038/nrn.2016.69

Xu, S., Liu, Z., Tian, S., Ma, Z., Jia, C., & Sun, G. (2021). Physical activity and resilience among college students: The mediating effects of basic psychological needs. *International Journal of Environmental Research and Public Health, 18*(7), 1-11. https://doi.org/10.3390/ijerph18073722

Yahya, Y., Mohd, N., Nazaruddin, N., & Sanusi, S. N. (2017). Predictive factors of depression among university students: A study on university Kuala Lumpur Malaysian institute of information technology students. *Science International (Lahore), 29*(3), 561-564. http://www.sci-int.com/pdf/636329462361174898.pdf

Yap, M. C., Wu, F., Huang, X., Tang, L., Su, K., Tong, X., Kwok, S. C., Wu, C., Wang, S., & He, Z. (2023). Association between individual resilience and depression or anxiety

among general adult population during COVID-19: A systematic review. *Journal of Public Health, 45*(4), 639-655. https://doi.org/10.1093/pubmed/fdad144

Zainab, T., & Zafar, A. (2019). Poor academic performance as predictor of depression among university students. *Career Development, 2*(10), 1-5. http://www.ijlrhss.com/paper/volume-2-issue-10/1-HSS-471.pdf

Zhang, L., Zhao, S., Lin, Q., Song, M., Wu, S., & Zheng, H. (2021). Algorithms to predict anxiety and depression among university students in China after analyzing lifestyles and sport habits. *Neuropsychiatric Disease and Treatment, 17*, 2011-2025. https://doi.org/10.2147/NDT.S315148

Appendix A: Ethics Approval Letter

Faculty of Humanities
Fakulteit Geesteswetenskappe
Lefapha la Bomotho

26 August 2022

Dear Mr SD Manzini

Project Title:	The relationship between resilience, anxiety and depression among university students
Researcher:	Mr SD Manzini
Supervisor(s):	Prof N Cassimjee
Department:	Psychology
Reference number:	16204817 (HUM017/0722)
Degree:	Masters

Thank you for the application that was submitted for ethical consideration.

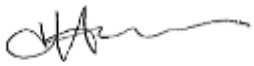
The Research Ethics Committee notes that this is a literature-based study and no human subjects are involved.

The application has been approved on 25 August 2022 with the assumption that the document(s) are in the public domain. Data collection may therefore commence, along these guidelines.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. However, should the actual research depart significantly from the proposed research, a new research proposal and application for ethical clearance will have to be submitted for approval.

We wish you success with the project.

Sincerely,



Prof Karen Harris
Chair: Research Ethics Committee
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail: tracey.andrew@up.ac.za

Appendix B: Editor's Letter

Blue Diamonds Professional Editing Services (Pty) Ltd
Polishing your brilliance
Email: jacquibaumgardt@gmail.com
Website: www.jaybe9.wixsite.com/bluediamondsediting

30 March 2024

Declaration of editing

THE RELATIONSHIP BETWEEN RESILIENCE, ANXIETY AND DEPRESSION AMONG UNIVERSITY STUDENTS
by
Sello Dacious Manzini

I declare that I have edited and proofread this thesis. My involvement was restricted to language usage and spelling, completeness and consistency. I did no structural re-writing of the content.

I am qualified to have done such editing, being in possession of a Bachelor's degree with a major in English, having taught English to matriculation, and having a Certificate in Copy Editing from the University of Cape Town. I have edited more than 500 Masters and Doctoral theses, as well as articles, books and reports.

As the copy editor, I am not responsible for detecting, or removing, passages in the document that closely resemble other texts and could thus be viewed as plagiarism. I am not accountable for any changes made to this document by the author or any other party subsequent to the date of this declaration.

Sincerely,

Dr J Baumgardt
UNISA: D. Ed. Education Management
University of Cape Town: Certificate in Copy Editing
University of Cape Town: Certificate in Corporate Coaching

Professional EDITORS Guild 30+ Est 1999

Jacqui Baumgardt
PEG Member
Membership year: March 2024 to February 2025
+44 7426146098
jacquibaumgardt@gmail.com
https://jaybe9.wixsite.com/bluediamondsediting
www.editors.org.za

ciep Intermediate Member