The effects of the Covid-19 pandemic on the mental health of the Chiropractic students in South Africa

By

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I, Danica Strydom, do hereby declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary)

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DEDICATION

I dedicate this dissertation to Talita Strydom, my twin sister, and forever best friend.

You helped me through these past six years of studies, and I would never have been able to get here without you! Thank you for always pushing me to achieve my potential and try my hardest, even when I felt like giving up.

"Be strong and courageous. Do not be afraid or terrified because of them, for the LORD your God goes with you; he will never leave you nor forsake you."

Deuteronomy 31:6

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ABSTRACT

Background: The SARS-CoV-2 pandemic has had an impact on tertiary education, especially the practical courses, such as Chiropractics. Learning platforms were moved online and exposure to practice, such as clinic interactions, was limited.

Aim: To determine the effect of SARS-CoV-2 on the mental health of Chiropractic students in South Africa

Methodology: A QuestionPro® survey link was sent to Chiropractic students registered at Durban University of Technology and the University of Johannesburg. A total of 187 students completed the survey and the data were captured for statistical analysis. Statistical analysis was performed using Microsoft Excel Spreadsheet Software.

Result: Of the 187 who responded, 60.10% expressed discomfort if individuals did not wear masks and 73.4% reported they experienced conflicts due to prolonged time spent with household members in limited personal space. The pandemic also had personal effects, such as 69% reported having reduced productivity, 42% increased financial difficulties, 50% decreased physical activity, and 80.85% spending more time on social media. They reported these challenges had detrimental effects on mental health, including increased anxiety (92.02%), difficulties in thought control (75.5%), withdrawal from social interactions (80.32%), decreased motivation (90.96%), and concentration issues (89.89%). A portion of the students (43.62%) experienced a decline in academic marks.

Conclusion: The SARS-CoV-2 pandemic lockdown had a negative effect on the majority of Chiropractic students, especially in terms of their academic progress, mental health, social and personal functioning.

Key words: Mental health, Chiropractic, SARS-CoV-2 pandemic, university students

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LIST OF ABBREVIATIONS

ACE 2:	Angiotensin Converting-enzyme 2
AHPCSA:	Allied Health Professions Council of South Africa
CASA:	Chiropractic Association of South Africa
CCE:	Council on Chiropractic Education
CCEI:	Council on Chiropractic Education International
DSM-5:	Diagnostic and Statistical Manual of Mental Disorders Fifth Edition
DUT:	Durban University of Technology
ECCE:	European Council on Chiropractic Education
GPA:	Grade Point Average
HDL:	High Density Lipids
HIV:	Human-immunodeficiency virus
HoD:	Head of Department
PTSD:	Post-traumatic stress disorder
SAD:	Social Anxiety Disorder
UJ:	University of Johannesburg
UK:	United Kingdom
USA:	United States of America
WFC:	World Federation of Chiropractic
WHO:	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

On the 3rd of March 2020, the first South African SARS-CoV-2 patient was detected in Johannesburg (McKenzie and Adebayo 2020). The Department of Health in South Africa then announced regulated levels of lockdown that would be implemented in order to reduce the spread of this virus. Each level allowed only a certain number of students on tertiary education campuses, and level five allowing no students on campus. In April 2020, online learning was implemented by tertiary education institutions (Department of Health 2022).

1.2 RESEARCH PROBLEM, AIM AND OBJECTIVES

1.2.1 Research Problem

The SARS-CoV-2 pandemic affected the delivery of tertiary education, especially courses with larger practical components (Elhaty *et al.* 2020). Teaching and learning platforms moved online, limiting the social interactions and practical exposure necessary for the development of a Chiropractic student (Sahu 2020). In addition, from a South African perspective in terms of Chiropractic students, SARS-CoV-2 regulations reduced practical experiences by limiting patient interactions, from which students gained valuable patient communication skills and problem-solving skills.

A study by Chandratre (2020) revealed the adverse effects of the pandemic on the mental health of medical students, showing students had higher rates of depression, suicidal ideation and anxiety during the pandemic. However, there is a paucity in the literature on assessing the effect of the pandemic on the mental health and wellbeing of Chiropractic students specifically. The purpose of this study is to provide more detailed insights of the impact of the SARS-CoV-2 pandemic on Chiropractic students in SA.

1.2.2 Aim

To determine the effect of SARS-CoV-2 on the mental health and well-being of Chiropractic students in South Africa.

1.2.3 Objectives

1) To determine the social impact of the SARS-CoV-2 pandemic on Chiropractic students in South Africa.
2) To determine the personal impact of the SARS-CoV-2 pandemic on Chiropractic students in South Africa.
3) To determine the psychological impact of the SARS-CoV-2 pandemic on Chiropractic students in South Africa.
4) To determine the academic impact of the SARS-CoV-2 pandemic on Chiropractic students in South Africa.

1.3 RATIONALE

In 2019, a new virus was introduced into the world (Babore *et al.* 2020); to prevent its spread, on 15th March 2020, the South African government announced a national "lockdown". Tertiary learning programmes were shifted to online platforms, which became a challenge for both students and lecturers (Motala and Menon 2020), because this was the first pandemic experienced by this generation. Students were also challenged with social isolation, which has been shown to be associated with high stress levels and episodes of psychiatric conditions (Kontoangelos, Economou and Papageorgiou 2020). A study conducted at a Spanish university found that students reported higher levels of anxiety and depression when compared to employees due to the uncertainty of the academic future created by online learning (Odriozola-González *et al.* 2020). Nambiar (2020) highlighted that students felt as though online learning had no structured format or time schedule and that there was an overload of information. The students also experienced a great deal of stress because of the demands and constant pressure associated with online learning, which includes managing virtual classes, technical difficulties, and the need to stay motivated and self-disciplined.

Akat and Karataş (2020) discovered that the pandemic had the greatest psychological effect on younger people, who felt more anxious, stressed, and depressed than usual during the pandemic. Remote online learning also contributed to social isolation and lack of communication. A direct link was found between anxiety, stress, frustration and depressive disorders and factors such as changes in academic structures, examinations and a struggle with limited resources (Moghe, Kotecha and Patil 2020).

Specifically, in South Africa, students faced challenges with regards to online learning, particularly in rural settings. Students living in rural areas were found to have poorer computer

skills, a shortage of electronic devices and had to contend with expensive and limited internet access (Dube 2020). The transition to online learning posed limitations on the practical components essential for Chiropractic students to apply their theoretical knowledge (Elhaty *et al.* 2020). Nevertheless, even before the SARS-CoV-2 pandemic, Chiropractic students acknowledged feeling overwhelmed by the workload and experienced stress due to the duration of the course and long-term financial demands (Hester, Cunliffe and Hunnisett 2013). The pre-existing workload challenges faced by students were compounded by significant changes brought about by the pandemic, resulting in further impacts on their academic experience and stress levels.

A study conducted in Istanbul found that students studying social sciences experienced fear and anxiety due to the decline in practical exposure (Elhaty *et al.* 2020). Online learning also limits the opportunity for students to problem-solve and build on their communication skills, which is necessary for patient interaction in a clinical setting (Alturise 2020; Elhaty *et al.* 2020). Furthermore, as a result of social distancing measures implemented in public settings, hospitals were constrained to catering exclusively to emergency situations. The South African government issued a level five lockdown stating that the general population was confined to their respective residences, except for essential activities such as accessing vital services or goods, acquiring social grants or pensions, and seeking urgent, life-saving, or ongoing medical attention as deemed necessary (South African Government 2020). Consequently, these regulations hindered students from acquiring valuable hospital experience, which had a direct impact on their clinical education and overall training, subsequently giving rise to feelings of anxiety and fear (Elhaty *et al.* 2020).

Uddin and Uddin (2021) found that the psychological strain of students was greatly increased by the pandemic. SARS-CoV-2 reduced exposure of social interactions among students, eliminating a vital aspect of learning. The professional careers of final year university students could have been significantly disrupted as a result of interruptions in their assessments and teaching, leading to delays in the scheduling of their final exams and graduation ceremonies (Sahu 2020). The effects can have a long-term impact on students and their future careers.

Due to mental illness having an impact on people and their lives, it can cause disruptions in their social and occupational functioning. Mental health is a vital component of well-being (Uddin and Uddin 2021). Therefore, there is a need for these effects to be explored to determine whether there was an impact on the students and whether it hindered their ability to study or even graduate (Chaturvedi, Vishwakarma, and Singh 2021).

1.4 OUTLINE OF THE DISSERTATION

Chapter One: This chapter introduces the study. It outlines the problem statement, aim, research questions and rationale.

Chapter Two: This chapter provides a review of the literature related to this study. This chapter explores the impact of the SARS-CoV-2 pandemic on the mental health of students.

Chapter Three: This chapter stipulates the research methodology used for data collection of this study.

Chapter Four: The fourth chapter answers the research question of this study by highlighting the findings/results of the study.

Chapter Five: This chapter discusses the results established in this study.

Chapter Six: The final chapter stipulates the conclusions and recommendations of the study.

1.5 CONCLUSION

Chapter One has included the background to the study, the study aims, objectives and research problem and an outline of the dissertation. The following chapter will discuss the literature relevant to this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter Two is a review of the literature relating to this study. The search engines used in collecting literature for this study were Google Scholar, Durban University of Technology (DUT) Open Scholar, PubMed, Science Direct, the DUT's Institutional Repository, The World Health Organization (WHO) webpage, the University of Johannesburg's (UJ) Institutional Repository and ResearchGate. The keywords used in collecting literature from relevant articles were "Chiropractic students", "mental health", "SARS-CoV-2 pandemic", "mental health in students", and "Chiropractics".

The literature reviewed in this chapter aimed to interpret mental health, the SARS-CoV-2 pandemic and Chiropractic students individually and concludes with the significance of mental health in Chiropractic students and how the SARS-CoV-2 pandemic could impact this.

2.2 THE SARS-COV-2 PANDEMIC

2.2.1 Definition of the SARS-CoV-2 Pandemic

There was an outbreak of a unique respiratory viral infection in Wuhan City, China, at the end of 2019. This outbreak spread globally in 2020 and the WHO declared this event as the SARS-CoV-2 pandemic. The hosts of the disease were infected with the Severe Acute Respiratory Syndrome Coronavirus 2, also known as SARS-CoV-2 (World Health Organization. 2020).

The coronavirus is also termed Covid-19. There are many mutations of the virus which cause respiratory diseases in humans. The symptoms of the virus can range from mild flu-like symptoms to Severe Acute Respiratory Distress Syndrome, which is a major risk of mortality. There are four variants of the virus, namely alpha, beta, gamma, and delta (World Health Organization 2020).

The SARS-CoV-2 virus has an ideal affinity for the angiotensin converting-enzyme 2 receptor. It also has an affinity for a polybasic cleavage site at the S1/S2 spike junction which controls the infectivity and host range (Nao *et al.* 2017; Andersen *et al.* 2020). SARS-CoV-2 patients have shown to have decreased levels of lymphocyte and eosinophil and median haemoglobin values. It has also showed an increase in white blood cells, neutrophil counts and serum levels

of C-reactive protein (CRP), lactate dehydrogenase, aspartate aminotransferase and alanine transaminase (Lippi and Plebani 2020).

The transmission of SARS-CoV-2 virus happens mainly through the respiratory tract. The virus has also been found to have a high infectivity and efficacy (Han *et al.* 2020; Leung *et al.* 2020). Other routes of transmission have also been established, namely through the saliva, urine, eyes, oral-faecal route, and inanimate surfaces (Colavita *et al.* 2020; Han *et al.* 2020; Holshue *et al.* 2020; Wyllie *et al.* 2020; Chan *et al.* 2021). The virus has an incubation period ranging from 2.1 days to 11.1 days and a mean incubation period of 6.4 days (Backer, Klinkenberg and Wallinga 2020).

SARS-CoV-2 infected patients who had an initial raised CRP level prior to infection reported to develop more severe symptoms compared to those who had normal levels of CRP prior to infection (Bhargava *et al.* 2020; Wang *et al.* 2020b). SARS-CoV-2 infected patients could present with symptoms ranging from mild to severe. The majority of the carrier have also presented asymptomatically. The most common symptoms that presented in SARS-CoV-2 infected patients included fever (83%), cough (82%) and shortness of breath (31%) (Wang *et al.* 2020c). Patients with acute respiratory distress syndrome may present with multiple organ failure due to a “cytokine storm” which may quickly lead to death (Wang *et al.* 2020c). The cytokine storm is described as an increase in levels of interleukin (IL)-2, IL-7, granulocyte colony stimulating factor, interferon-y inducible protein-10, monocyte chemoattractant protein 1, macrophage inflammatory protein 1-α and tumour necrosis factor-α (Huang *et al.* 2020).

2.2.2 Epidemiology of the SARS-CoV-2 Pandemic

The SARS-CoV-2 virus was discovered in late 2019 and by December 2019, 90% of the SARS-CoV-2 cases were located in Hubei, China. The virus rapidly spread across to Europe and America, and by March 2020, Italy, Spain, France, Iran, Germany, and the United States reported the highest number of SARS-CoV-2 cases (Rauf *et al.* 2020). In 2020, the basic reproduction number of the virus was calculated to be an average of 2.2–2.4. Therefore, two new SARS-CoV-2 cases were likely to develop as a result of one SARS-CoV-2 case not isolating (Wu *et al.* 2020).

The virus is spread through airborne particles, such as droplets from sneezing or coughing. It can also be spread through physical contact or contaminated fomites similar to the Middle East respiratory syndrome coronavirus (Yang *et al.* 2013; Rauf *et al.* 2020). The virus is highly infectious, and the risk of transmission is greater among symptomatic individuals compared to asymptomatic carriers (Chavez *et al.* 2021).

In order to reduce the spread of the virus, it was highly recommended that individuals wear face masks to limit the community transmission and to control the spread of the SARS-CoV-2

virus. Mask wearing in conjunction with other interventions, proves to be very successful in limiting the transmission (Eikenberry *et al.* 2020).

The fatality rate of the SARS-CoV-2 virus was estimated to be 11%–15% of infected cases. The death rate of cases without comorbid conditions was 0.9%, while the patients with comorbid conditions had a death rate of 10.51%. It was also found that patients over 80 years old were more likely to be severely affected by the viral infection compared to those under the age of 80 years (Chinese Centre for Disease Control and Prevention 2020). The incubation period of the virus can range from two to 14 days with an average of 5.2 days (Li *et al.* 2020).

2.2.3 The Effect of the SARS-CoV-2 Pandemic on Healthcare Delivery

The SARS-CoV-2 pandemic demonstrated that even the emergency departments in the most advanced health care systems were not able to support a large influx of critically ill patients (Rosenbaum 2020). As a result of this, elective or semi-elective surgeries were postponed or cancelled. Surgical wards were also reorganised to treat high care SARS-CoV-2 patients and any follow up medical visits were delayed. Furthermore, asymptomatic patients or those with mild symptoms were required to stay at home and monitor their symptoms by health care operators (Ciotti *et al.* 2020).

During the first 100 days of the pandemic in South Africa, from 28 March to 3 July 2020, the government reported a cumulative death toll of 3,088. (Pillay *et al.* 2020). Thus far, among the reported 4,076,463 cases of SARS-CoV-2 in South Africa, only 102,595 deaths have been documented (Worldometer 2023). A study by Vandoros (2020) in the United Kingdom (UK) discovered that a significant number of additional deaths occurred during the pandemic, which were not officially recorded as being caused by SARS-CoV-2. Similarly, a study conducted in Iran revealed that the reported number of deaths attributed to SARS-CoV-2 was less than half of the estimated deaths during the same period (Ahmadi *et al.* 2022).

2.2.4 The Effect of the SARS-CoV-2 Pandemic on Work and Lifestyle

According to a study conducted by Wang *et al.* (2020), a significant number of participants experienced substantial life changes as a result of the pandemic. These changes included changes in employment, financial circumstances, limitations on movement, and the postponement of significant life events. The study showed that 63% of participants from Spain reported symptoms of minimal to mild acute stress and about 45% of participants from China reported symptoms of minimal to mild acute stress.

The changes observed involved a shift towards remote work in less conventional work settings, a decrease in face-to-face social interactions during both work and leisure activities, and alterations in health behaviours, which included both negative changes such as increased

sitting and screen time, as well as positive changes such as heightened focus on personal health (Barone Gibbs *et al.* 2021). Most people turned to social media for learning and knowledge, social support, work, and pandemic updates (Saud *et al.* 2020).

According to a study conducted in the United States of America (USA), during the pandemic (Clark *et al.* 2021), approximately 20% of respondents were found to be economically disadvantaged and lacking the financial means to cope with unexpected emergencies. Similarly, a study conducted in South Africa highlighted how the financial situation of the country was exacerbated by the SARS-CoV-2 pandemic (Rogerson *et al.* 2020).

Research also found that the majority of employees who frequently worked from home had decreased productivity rates, often linked to social isolation, interference of family life and distracting working environments (Galanti *et al.* 2021; Kitagawa *et al.* 2021; Morikawa 2020). However, other studies found that working from home actually led to a positive productivity rate on call centre workers prior and during the pandemic (Bloom *et al.* 2015; Emmanuel 2020).

The decline in domestic leisure travel, coupled with a decrease in business travel and the necessity to comply with SARS-CoV-2 health and safety measures, caused substantial economic challenges for local businesses in SA. As a result, businesses were compelled to downsize, retrench employees, lower prices, and increase their marketing expenditures (Rogerson *et al.* 2020).

The lockdown measures and restrictions on public areas led to diverse adaptations in exercise routines during the pandemic. A study conducted by Robertson *et al*. (2020) in the UK during the pandemic found that women and young individuals engaged in increased physical exercise, while those with past or current eating disorders reported higher perceived changes in body image, eating habits, and exercise routines. The study also found that greater fluctuations in eating patterns and body image were linked to elevated psychological distress (Robertson *et al.* 2021). Those individuals with disruptions to daily routines and limitations on outdoor activities may have led a more sedentary lifestyle (Di Renzo *et al.* 2020; Rodgers 2020). An article focusing on exercise considerations during the pandemic highlighted that regular, moderate-intensity aerobic exercise can enhance the presence of immune response cells necessary to combat viral infections like SARS-CoV-2 (Shirvani 2020).

2.2.5 The Effect of the SARS-CoV-2 Pandemic on University Students

Students whose families experienced a large financial loss were found to be more severely impacted (Aucejo *et al.* 2020). Those students were more likely to delay graduation or change majors. Fisher *et al.* (2020) found that students who had to live with or move back in with their parents during this period also faced new challenges that potentially worsened their

psychological well-being. Balancing academic responsibilities with home-related obligations, including interpersonal conflicts and financial troubles, added to the burdens faced by students (Zainal *et al.* 2022).

Despite the Department of Higher Education's call for institutions to assist students with devices and data during the pandemic, a study revealed that not all South African universities complied, leaving some students without access to necessary resources (Maphalala *et al.* 2021).

Lollobrigida *et al.* (2022) concluded that distance learning was inadequate for clinical, practical training, which forms the foundation of medical education. In order to address the challenges faced by students during the pandemic, while upholding the quality of their training programmes, universities such as UJ and DUT made adjustments to their clinical requirements, reducing the graduation targets as outlined by O'Connor and Yelverton (2022). A thematic analysis of accreditation reports conducted by the ECCE (European Council on Chiropractic Education) from 2015 to 2021 underscored the significance of clinical training as the most crucial aspect of Chiropractic education. Given the impact of the SARS-CoV-2 pandemic on patient volumes and treatment options, it became imperative for Chiropractic institutions to expedite a return to normal training conditions, as highlighted by Davies and Browning (2021) and Yelverton *et al.* (2022).

Results suggest that students generally prefer face-to-face learning over online learning (Aguilera-Hermida 2020), which may have contributed to a decline in their academic performance during lockdown, as their studies were primarily online. Additionally, the psychological impact of the pandemic on students could be another contributing factor. Students with lower academic motivation were found to be less likely to achieve academically, whereas those with better mental health demonstrated higher motivation levels, leading to improved performance (Mahdavi *et al.* 2023).

Furthermore, studies by Morales-Rodríguez (2021) and Rodriguez-Rey (2021) found high levels of daily stress, fear, and technological stress during the pandemic, with the psychological impact being particularly pronounced among participants aged 18 to 24 years.

2.2.6 The Effect of the SARS-CoV-2 Pandemic on Mental Health

Since the declaration of the SARS-CoV-2 pandemic, there was a striking rise in the prevalence of mental health disorders globally (Pfefferbaum and North 2020). Numerous events, such as strict infection control, quarantine, physical distancing, and national lockdown contributed to the population's psychological distress (Brooks *et al.* 2020). The psychological distress then contributed to the development of mental health disorders, such as depressive symptoms, anxiety, stress, post-traumatic stress disorder and sleep disturbances (Kaufman *et al.* 2020).

A study investigating the reasons and trends in suicide rates during the pandemic among the youth in Japan also found that there were slightly higher rates of suicide in younger individuals compared to pre-Covid times (Goto *et al.* 2022).

A study conducted in Shanghai, China, by Guo *et al.* (2020) compared patients who tested positive for SARS-CoV-2 and patients who tested negative for SARS-CoV-2. The SARS-CoV-2 negative participants acted as the control. The study identified that the SARS-CoV-2 positive patients had higher levels of depression, anxiety and post-traumatic stress disorders when compared to the control group (Guo *et al.* 2020; Hossain *et al.* 2020b). Another study by Huang and Zhao (2020) found that SARS-CoV-2 positive patients had higher levels of C-reactive protein and that these increased levels were linked to higher levels of depression among participants in China.

According to a systematic review and meta-analysis by Nochaiwong *et al.* (2021), poverty was directly related to a higher prevalence of mental health disorders during the SARS-CoV-2 pandemic due to inequalities. Healthcare providers suffered immensely with mental health problems during the pandemic, with high rates of fear, anxiety and depression (Hossain et al. 2020b).

A cross-national study among nine countries (Poland, Slovenia, Czechia, Ukraine, Russia, Germany, Turkey, Israel, Colombia) found an elevated prevalence of stress (61.30%), depression (40.30%) and general anxiety disorder (30%) among the total sample of university students during the initial stages of the SARS-CoV-2 pandemic. The study also discovered that female students reported a higher prevalence of perceived stress, depression and anxiety and that students in urban settings reported a higher incidence of depression (Ochnik *et al.* 2021).

Depression, anxiety, stress, panic, anger, impulsivity, sleep disorders, emotional disturbance, post-traumatic stress disorder and suicidal behaviour were commonly experienced by people during the pandemic (Wang *et al.* 2020a). Studies discovered an increased prevalence of insomnia, poor quality of sleep and poor sleep hygiene (Li *et al.* 2020; Marelli *et al.* 2021; Voitsidis *et al.* 2020). This is believed to have been due to the increased anxiety before sleep during this period (Marelli *et al.* 2021). The findings of another study reported that overall sleep was affected during the pandemic, and that those individuals who reported poor quality of sleep had also reported to have slept less hours (Trakada *et al.* 2020)

The practice of social distancing during the pandemic necessitated household members spending extended periods of time together, often within limited personal space. This created a home environment that had significant potential for conflict, as family members found themselves in close proximity for extended hours within a confined physical setting, while

navigating a stressful situation (Behar-Zusman *et al.* 2020). An environment with high levels of family conflict can potentially be toxic, acting as a stressor that worsens the negative effects of major stressful life events (Avison 2010).

2.3 MENTAL HEALTH

2.3.1 Definition of Mental Health

The WHO defines mental health as a “state of well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (World Health Organization 2022). The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) defines a mental health disorder as “a condition that involves change in emotion, thinking or behaviour (or a combination of these) that are associated with distress and/or problems while functioning in social, work, or family activities” (American Psychiatric Association 2010).

2.3.2 Epidemiology of Mental Health

A significant number of individuals experience mental health struggles to some extent at various stages of their lives (Kessler *et al.* 2013). Research findings indicate that a significant proportion, approximately 20%, of children and adolescents experience a mental disorder across different income levels in various countries. The significance of mental health conditions in this age group lies in the potential for these issues to persist into adulthood (Flisher *et al.* 2012). Furthermore, a substantial portion, nearly 30%, of South Africa’s population has encountered a mental disorder at some point during their lives (Peterson *et al.* 2016).

The elderly population has been shown to be particularly susceptible to the development of mental illnesses. These conditions can manifest differently in older individuals, underscoring the importance of identifying mental illness to enhance their overall wellbeing. Common mental illnesses prevalent in the elderly include dementia, Alzheimer’s disease, depression, delirium, and anxiety-related disorders. Often, mental illnesses, particularly dementia and Alzheimer’s, are associated with coexisting conditions, such as hypertension or osteoarthritis. Risk factors for mental illness in the elderly include poor health, feelings of loneliness, and social isolation (Lilford and Hughes 2020).

While the psychological aspects of SARS-CoV-2 are still not fully understood, prior research indicates that infectious outbreaks significantly impact the mental well-being of individuals. According to existing literature, individuals impacted by the SARS-CoV-2 pandemic may have

experienced a significant increase in mental health issues. These include conditions such as depression, anxiety disorders, panic attacks, uncontrolled anger, impulsivity, somatization disorder, sleep disturbances, emotional disruptions, posttraumatic stress symptoms, and suicidal tendencies. The available evidence strongly indicates the simultaneous occurrence of a mental health crisis alongside the SARS-COV-2 pandemic, demanding urgent attention from the global health community (Hossain *et al.* 2020).

2.3.3 Risk Factors for Mental Health Problems During the SARS-CoV-2 Pandemic

Several psychosocial and socio-demographic factors have been shown to have had an impact on individuals' mental health during the SARS-CoV-2 pandemic (Hossain *et al.* 2020). A study conducted in Chongqing, China, by Hao *et al.* (2020) highlighted that those participants with pre-existing mental health problems were more likely to experience further mental health problems when compared to the controls with no existing mental health disorders. Psychosocial support also played a role in mental health during the pandemic. Psychological support from family and social networks were related to a decrease in psychosocial stressors during the SARS-CoV-2 pandemic (Lei *et al.* 2020). Another risk factor was the presence of co-morbid physical health problems. The presence of conditions such as diabetes, cerebrovascular disease, heart disease and other chronic conditions was associated with anxiety (Özdin and Bayrak Özdin 2020).

The level of education that was being delivered to students during the pandemic was also identified as a risk factor for the development of mental health issues. A study, conducted in China among scholars in high school and higher education, identified that those scholars who felt that they were being less educated during the pandemic were more likely to have associated poor mental health outcomes (Lei *et al.* 2020; Liang *et al.* 2020). A similar study, done from a global perspective among Africa, South America, Asia, Europe, North America and Oceania, identified that higher education students from all different programmes at a postgraduate level felt less affected by the SARS-CoV-2 pandemic compared to those at an undergraduate level (Aristovnik *et al.* 2021). Occupation and income have also been recognised as risk factors for developing mental illnesses. Socioeconomic challenges experienced during lockdown critically affected the mental health of the population, especially among marginalised individuals (Hossain *et al.* 2020a).

Individuals' place of living and close contact with people with SARS-CoV-2 demonstrated to have an effect on their mental health during the pandemic. Urban areas were linked to higher rates of depression, as opposed those in rural areas (Li *et al.* 2020b; Özdin and Bayrak Özdin 2020). This point is crucial to note as the urban population in South Africa is reported to be expanding at rapid rates (Mlambo 2018).

People who were in contact with SARS-CoV-2 positive patients or lived in an epidemic area were more likely to experience depression compared to the contrary (Li *et al.* 2020b; Özdin and Bayrak Özdin 2020). An epidemic area is a geographical region that experiences an unexpected spike in the number of individuals infected with the same disease (Columbia Mailman School of Public Health 2021).

Another risk factor was the exposure to SARS-CoV-2 related news and social media. A study by Ni *et al.* (2020) found that exposure to two or more hours of SARS-CoV-2 related news via social media was related to a higher prevalence of anxiety and depression. It was also noted that those who spent three or more hours a day concentrating on SARS-CoV-2 were at risk for suffering from generalised anxiety disorder (Ni *et al.* 2020).

Age has been identified as another risk factor, but the research is somewhat contradictory. Younger individuals were found to have higher rates of generalised anxiety and depression (Kang *et al.* 2020), with the onset of 75% of mental health disorders starting before the age of 18 years (Aguirre Velasco *et al.* 2020). However, a study conducted in Singapore and India by Chew *et al.* (2020) established a high prevalence of mental health problems among older adults.

Another risk factor that has been identified is gender. Females were found to have greater rates of anxiety and depression compared to males due to increased levels of perceived helplessness (Li *et al.* 2020a; Zhou *et al.* 2020). Females also seemed to suffer from higher rates of insomnia during the pandemic (Li *et al.* 2020b).

Marital status was also identified as a risk factor. A study with medical staff showed that those individuals who were divorced, widowed, or separated, as compared to those who were single, had increased levels of insomnia, anxiety and depression and a greater severity of psychiatric symptoms when they returned to the workplace. (Li *et al.* 2020b; Tan *et al.* 2020).

2.3.4 The Effect of Mental Health

2.3.4.1 Academic Productivity

A study conducted in the north eastern USA by Wilks *et al.* (2020) highlighted the importance of good mental health among college students and the role that it plays in student achievement, emphasising that poor mental health is related to academic impairment. Mental health disorders can negatively affect individuals' self-perceived academic performance. This can present in the form of a slower work pace, more mistakes, being forgetful, a lower quality of work, difficulty with focus and varying levels of energy (Hennekam, Richard and Grima 2020). Students who self-reported higher levels of stress were also found to have

compromised psychological, social, cognitive, and physical health and an overall poorer quality of life (Ribeiro *et al.* 2018).

Studies have also shown that university students suffering with mental health disorders were more likely to drop out of their studies before completing their degree, compared to those with good mental health (Hartley 2010; Storrie *et al.* 2010). A study conducted in Belgium by Bruffaerts *et al.* (2018) found that students with mental health problems had a decrease in their grade point average at the end of their academic year, highlighting the impact of mental health on academic performance. A systematic review conducted in 2010 found that emotional distress in university students led to reduced academic grades, reduced emotional and behavioural skills and social isolation (Storrie *et al.* 2010), and a study by Pascoe, Hetrick and Parker (2020) found a high prevalence of academic-related stress in tertiary students.

According to Birmingham *et al.* (2021), a significant majority of college students, specifically 90.5%, experienced difficulties focusing on their schoolwork, while 91% of students struggled to find motivation to study during the pandemic. While stress can have some positive effects on students' learning ability and motivation, excessive stress can have a detrimental impact on their academic performance (Haines 1996). The findings from Birmingham *et al.*'s (2021) study further highlight the challenges faced by students in terms of maintaining focus and motivation in their academic pursuits due to the overwhelming levels of stress.

2.3.4.2 Social Relationships

Social interactions can be considered a fundamental human need (Baumeister and Leary 1995). There is a strong association between social interactions and both physical and mental health. Adequate social connections have been found to have a positive impact on physical and mental well-being, leading to favourable outcomes and reduced mortality rates (Hawkley and Cacioppo 2010). Research findings indicate that individuals experiencing loneliness face an increased likelihood of developing cardiovascular disorders. These individuals exhibit higher systolic blood pressure, elevated HDL cholesterol levels, and even a higher body mass index (BMI) (Caspi *et al.* 2006).

After considering baseline mental and physical health, research has established a link between loneliness, social isolation, and a heightened risk of mortality (Steptoe *et al.* 2013). In a systematic review conducted by Holt-Lunstad *et al.* (2012), it was found that maintaining stable social relationships has a significant impact on reducing the risk of mortality.

2.3.4.3 Physical Health

A study found that mental health and physical health have a significant mutual impact. Mental health can indirectly influence physical health through lifestyle choices and social interactions,

while physical health can also affect mental health (Ohrnberger *et al.* 2017). Engaging in physical activity has a positive indirect effect on both physical and mental well-being. Participating in physical activity improves overall physical and mental health, leading to increased involvement in physical activity. Moreover, research suggests a correlation between better mental health and reduced cigarette consumption, resulting in improved physical well-being (Ohrnberger *et al.* 2017; Szatkowski and McNeill 2015).

2.3.5 Mental Health in University Students

Mental health issues are becoming more prevalent among university students (Roberts 2018). A study conducted in the USA by Zivin *et al.* (2019) showed that over a half of the college students who participated in the study had at least one existing mental health problem and at least 60% of those students further developed a second mental health problem two years after the initial consult. A study by Tian-Ci Quek *et al.* (2019) also found that 33.8% of medical students globally suffered from anxiety.

Stress has been identified as a trigger of psychosocial vulnerability and university students have been recognised as experiencing increased amounts of stress. A few stressful triggers in students have been identified as decision validation among fellow peers, changes in daily routine involving self-care habits, academic work shifting from a supervised high school environment to an independent university environment and a change in sleep habits. Young adults also encounter a stigma around psychiatric disorders which lead to the dismissal of mental health symptoms, or not seeking help when needed (Roberts 2018).

Numerous studies have consistently found elevated levels of mental health problems among university students compared to the general population, both before and during the SARS-CoV-2 pandemic (Denovan *et al.* 2017; Mortier *et al.* 2018; Tran *et al.* 2017; Williams *et al.* 2018). In fact, 92.02% of Chiropractic respondents experienced some degree of anxiety during the pandemic. This percentage is significantly higher than what was reported in a previous study conducted in South Africa prior to the pandemic (Bantjes *et al.* 2019). During the pandemic, research conducted with university students in Pretoria, SA, identified that approximately one-third of the participants experienced psychological challenges during the lockdown, with 22.1% of students describing the experience as traumatic. Nearly half of the students (45.6%) reported experiencing anxiety, and 35% reported symptoms of depression (Visser and Wyk 2021). These findings are similar to a study among university students in Bangladesh, where 97% of the participants reported experiencing some degree of anxiety during the pandemic outbreak (Dhar *et al.* 2020). Another study conducted at a university in Pakistan found that 34% of students suffered from moderate to severe anxiety, and 24% experienced moderately severe to severe depression (Salman *et al.* 2020). Similarly, a survey

conducted at a university in Malaysia reported varied levels of anxiety among 29.8% of the participating students (Sundarasen *et al.* 2020).

Research conducted in Egypt during the pandemic found that a significant proportion of students exhibited psychological symptoms, with 70.5% experiencing anxiety, 53.6% suffering from depression, and 47.8% facing stress (Ghazawy *et al.* 2021). These research findings also align with a study conducted in China, which reported that 24.9% of students suffered from anxiety (Cao *et al.* 2020). Additionally, Aucejo *et al.* (2020) found that 13% of students had to delay their graduation because of the pandemic, further highlighting the challenges faced by students during this time.

2.4 CHIROPRACTIC

2.4.1 Definition of Chiropractic

The World Federation of Chiropractic (WFC) defined Chiropractic as “a health profession concerned with the diagnosis, treatment, and prevention of mechanical disorders of the musculoskeletal system, and the effects of these disorders on the function of the nervous system and general health. There is an emphasis on manual treatments including spinal adjustment and other joint and soft-tissue manipulation” (World Federation of Chiropractic 2001).

A Chiropractor is classified as a health care professional who aims to reduce pain and improve the functionality of patients. They focus on the diagnosis and treatment of neuromuscular disorders. Chiropractors provide treatment through manipulation of the spine, soft tissue therapy as well provide their patients with education on exercise, ergonomics, and other therapies to treat back pain. By establishing spinal mobility, Chiropractors aim to alleviate the irritation of the spinal nerve which will alter an individual’s reflexes. Chiropractors also refer patients to other health care professionals for specialised treatments which they are unable to perform (Yeomans 2013). Chiropractors treat a variety of conditions, such as low back pain, neck pain, headaches, repetitive strains, injuries, and arthritic pain (Yeomans 2013). The profession does not make use of prescription drugs or surgery (World Federation of Chiropractic 2000).

The Chiropractic profession was founded by Daniel David Palmer. The term “Chiropractic” was established from the Greek words “cheiro” meaning “hand” and “praktikos” meaning “doing or action” (World Federation of Chiropractic 2022). Chiropractic started as an independent profession in the 1890s in the USA. The profession expanded from North America in the 1950s, to the rest of the globe in the 1960s and 1970s. The expansion of the

profession was due to improved education and licensing standards, significant research, research texts and scientific journals, legal recognition and regulations implemented in other countries (World Federation of Chiropractic 2000).

2.4.2 The Scope of Chiropractors

Chiropractors worldwide are sought after for the treatment of spinal pain and dysfunction. Chiropractors aim to prevent future occurrences or maintain patients at their optimal level once improvement has been achieved (Leboeuf-Yde and Hestbæk 2008).

The average Chiropractic patient typically seeks treatment for musculoskeletal issues, particularly low back pain (50%) and neck pain (23%). Practice styles may vary; the majority of individuals seeking Chiropractic care can expect to receive spinal manipulation. Additionally, approximately one-third of patients may also receive patient education, exercises, and soft-tissue therapy as part of their treatment plan (Hartvigsen and French 2020).

Chiropractors, similar to most health care professions, regularly attend congresses, conferences, and seminars to further their professional education. Their treatment plans usually include patient education and advice on how to perform activities of daily living, exercises, and rehabilitation. Chiropractors in South Africa are also trained to interpret diagnostic images and to refer patients for the necessary imaging. Treatment modalities, such as dry needles, Transcutaneous Electrical Nerve Stimulation units, shockwave therapy, ultrasound therapy, have also been identified as a useful treatment tool for South African Chiropractors (Johl *et al.* 2017).

2.4.3 Chiropractic Education Worldwide

Chiropractic education is offered in 51 institutions in 18 countries as listed in the following table (**Table 2.1**) according to the World Federation of Chiropractic (World Federation of Chiropractic 2022).

Table 2.1. Global list of Chiropractic educational institutions

Country	University	Total number
Australia	Central Queensland University	5
	Macquarie University	
	Murdoch University	
	RMIT University	
	Australian Chiropractic College	
Brazil	Centro Universitario Gama e Souza	4
	Centro Universitario UCEFF	
	Universidade Anhembi Morumbi	
	Universidade Feevale	
Canada	Canadian Memorial Chiropractic College	2
	Université du Québec à Trois- Rivères	
Chile	Universidad Central de Chile	1
Denmark	Syddansk Universitet Odense	1
France	Institut Franco- Européen de Chiropratique	1
Japan	Tokyo College of Chiropractic	1
Malaysia	International Medical University	1
Mexico	Universidad Estatal del Valle de Ecatepec	3
	Universidad Estatal del Valle de Toluca	
	Universidad Veracruzana	
New Zealand	New Zealand College of Chiropractic	1
Puerto Rico	Universidad Central del Caribe	1
South Africa	Durban University of Technology	2
	University of Johannesburg	
Spain	Barcelona College of Chiropractic	2
	Madrid College of Chiropractic	
Sweden	Skandinavian College of Chiropractic	1
Switzerland	University of Zurich	1
Turkey	Bahçeşehir Űniversity- Chiropractic Program	1
United Kingdom	AECC University College	5
	London South Bank University	
	McTimoney College of Chiropractic	
	Teeside University	
	University of South Wales	
USA	Campbellsville University	17
	Cleveland University	
	D'Youville College	
	Keiser University	
	Life Chiropractic College West	
	Life University	
	Logan University	
	National University of Health Sciences	
	Northeast College of Health Sciences	
	Northwestern Health Sciences University	
	Palmar College of Chiropractic Davenport	
	Palmar College of Chiropractic West	
	Parker University	
	Sherman College of Chiropractic	
	Southern California University of Health Sciences	
	Texas Chiropractic College	
	University of Bridgeport	
	University of Western States	
		51

Chiropractic education is predominantly offered in high-income, English-speaking countries, with the majority of the institutions located in USA (Stochkendahl *et al.* 2019).

International education standards of education for the profession are achieved through a group of accrediting agencies. The agencies started with the American Council of Chiropractic (CCE) in 1974 which was recognised by the American Office of Education. The Councils on Chiropractic Education International (CCEI) now represent the agencies (World Federation of Chiropractic 2000). The requirements to enter the Chiropractic education vary according to each country. The requirement in North America is a minimum of three-year university credits in qualifying subjects. The Chiropractic college professional programme results in a master's degree and has a minimum of four full-time academic years. The degree is then followed by postgraduate clinical training (World Federation of Chiropractic 2000).

2.4.4 Chiropractic Education in South Africa

In January 1989, the first intake of Chiropractic students was at the Technikon Natal, now DUT. This was one of the first Chiropractic education programmes in the world that had the first exit at a master's degree level. Shortly after, other international universities started to adopt this new standard. In 1993, a second Chiropractic programme opened at Technikon Witswaterstrand, now known as the University of Johannesburg (UJ). In 2010, the European Council on Chiropractic Education granted an international accreditation (Chiropractic Association of South Africa 2022). Both UJ and DUT are accredited by the Council for Higher Education and South African Qualifications Authority (SAQA). These registrations allow Chiropractic students to register with the Allied Health Professions Council in South Africa (AHPCSA) (Allied Health Professions Council in South Africa 2022).

The Chiropractic programme in South Africa consists of a bachelor's programme and a master's programme. The programme consists of a four year professional bachelors (BHSc) followed by a two year master's (MHSc) programme. The South African Chiropractic qualification is recognised and highly regarded internationally (Chiropractic Association of South Africa 2022).

The Chiropractic programme consists of core subjects related to Chiropractics, as well as general education modules and research modules that are offered by the institution (Durban University of Technology Chiropractic Handbook 2022) After Chiropractic students have graduated from the institution (UJ or DUT), they will be able to register as a Chiropractic intern with the AHPCSA. The internship consists of a minimum of 75 academic hours and a minimum of 600 hours of work experience and practical work. Once the internship is completed, Chiropractic interns are able to register with the AHPCSA as Chiropractic practitioners. (Allied Health Professions Council in South Africa 2022).

2.4.5 The Effect of the SARS-COV-2 Pandemic on Chiropractic Students in South Africa

The pandemic created a problem for tertiary education, as students were not allowed to attend campus lectures and assessments for a period of time between 2020 and 2021. Tertiary institutions had to move the academic programme to an online platform. This became a concern for courses that require practical training, such as Chiropractics. The South African lockdown regulations only allowed students to return to campus in stages, starting with the senior students (South African Government 2022). This law reduced the students' exposure to practical skills and knowledge.

Chiropractic students at both the UJ and the DUT obtain their clinical experience in the clinics situated on each of the campuses (Durban University of Technology Handbook 2020; University of Johannesburg 2020). The student Chiropractic clinics allow for the students to obtain clinical experience while providing the public a service at a reduced rate. Chiropractic treatments require a physical hands-on approach and close human-to human contact. This became a concern for many Chiropractors, as well as Chiropractic students, as they were at an increased risk of contracting the SARS-CoV-2 infection and transmitting it to their patients and family (Taylor *et al.* 2020).

Chiropractic institutions around the world were anxious about upholding the clinical training requirements during the SARS-CoV-2 lockdown (Johnson *et al.* 2020). A study done on the knowledge, attitudes and perceptions of the Chiropractic students and their return to clinical training found that 62.9% of the respondents were nervous and anxious about returning to clinical training during the pandemic. The study also found that 96.3% of the participants felt that the Chiropractic department should adjust the requirements for clinical training to make up the time lost during the pandemic (O'Connor and Yelverton 2022).

2.5 CONCLUSION

The literature relevant to the topic was reviewed and discussed in this chapter. The chapter in this chapter outlined mental health, the SARS-CoV-2 pandemic, Chiropractic and how all three of these topics are linked. The following chapter will discuss the methodology of this study.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

This chapter presents the methodology of the study. This includes the study design, study population, participant recruitment, sample size characteristics and sample characteristics. This chapter also consists of an overview of the measurement tool, the research procedure, data analysis and ethical considerations that were used for this study.

3.2 STUDY DESIGN

This study used a quantitative, descriptive, cross-sectional questionnaire design.

A quantitative design entails a numerical data analysis that was obtained using precise mathematically based methods in order to explain the phenomena that the data represent (Rutberg and Bouikidis 2018). Descriptive designs define the key features of a set of data and summarise it (Kaur, Stoltzfus and Yellapu 2018). Cross-sectional statistics are used to measure an outcome of an interest in a given population with similar interests. This is usually done over a short period in time (Levin 2006).

Therefore, this type of study design is best suited for this research topic as the participants will be chosen based on the distinct characteristics that they share, and the outcomes of the survey will be assessed by the researcher at the same time.

3.3 STUDY POPULATION

The study population included registered Chiropractic students at UJ and DUT. The study only included Chiropractic students registered in their second to fourth year of BHSc and first to second year of MHSc in 2022.

The UJ had a total number of 163 students of which 105 were registered under the Bachelor of Health Science in Chiropractic qualification and 58 were registered under the Master of Health Science in Chiropractic.

The DUT had a total number of 201 students of which 138 were registered under the Bachelor of Health Sciences in Chiropractic, 34 were registered under the Master of Health Science in Chiropractic and 29 were registered under the Master of Technology in Chiropractic.

3.4 PERMISSIONS

A letter requesting permission to distribute the survey to registered Chiropractic students at both DUT and UJ (Appendix A) was emailed to the Head of Department and research departments of both universities. Once permission was granted from both universities (Appendices B and C), the researcher distributed the survey via the online link to the class representatives of each year of study for email distribution.

3.5 PARTICIPANT RECRUITMENT

The Heads of Department of both the UJ and the DUT were approached via email (Appendix A) to distribute the documentation to the registered Chiropractic students. The researcher emailed the pre-survey notification (Appendix D) and the QuestionPro survey link containing the letter of information (Appendix E), consent form (Appendix F) and the final questionnaire (Appendix G) to the class representatives for bulk distribution to the students via a single email.

3.6 SAMPLING

3.6.1 Sampling Size

The sample size aimed to have a minimum of 92 participants from the DUT and 75 participants from UJ. There was no maximum limit on participants. Appendix H includes the necessary calculations and reasoning for the sample size needed by the research statistician (Strydom 2022).

3.6.2 Sample Characteristics

The inclusion and exclusion criteria for the participants was outlined.

3.6.2.1 Inclusion Criteria

- The participant had to be over 18 years of age.
- The participate had to be willing to participate and complete the informed consent form (Appendix F).
- The participant needed to be a registered Chiropractic student at UJ/DUT in their second to sixth year of study in 2022.

3.6.2.2 Exclusion Criteria

- Any participant who participated in the pilot study and focus group.

3.6.3 Measurement Tools

The data for this study were collected using an online questionnaire (Appendix G) which was administered through QuestionPro® (Question Pro Inc, Austin, USA). The questionnaire included questions related to the students' mental health and how the SARS-CoV-2 pandemic affected their mental health and various aspects of their life. The questionnaire was adapted from a questionnaire used in a study by Moghe, Kotecha and Patil (2020) (Appendix I).

The questionnaire was divided into various sections to obtain the necessary data from the study. The sections for the questionnaire include demographic data (Section A), social impact (Section B), personal impact (Section C), psychological impact (Section D) and academic impact (Section E).

Table 3.1. Questionnaire reference list

Section	Heading	References
A	Demographic data	(Macaskill 2013; Hjorth et al. 2016; Moghe, Kotecha and Patil 2020)
B	Social impact	(Betsch *et al.* 2020; Moghe, Kotecha and Patil 2020)
C	Personal impact	(Moghe, Kotecha and Patil 2020)
D	Psychological impact	(Moghe, Kotecha and Patil 2020)
E	Academic impact	(Gupta and Goplani 2020; Tadesse and Muluye 2020; Chaturvedi, Vishwakarma and Singh 2021)

3.7 RESEARCH PROCEDURE

3.7.1 Focus Group

A focus group consists of a group of professionals who meet to discuss the topic of importance, of which, in this case, the questionnaire developed for this study was discussed. The inclusion of a focus group ensures the reliability of the research tool and aided in content validity. The focus group also supported in identifying important areas that were not included in the questionnaire (Sim and Waterfield 2019).

The focus group evaluated the questions and ensured that there was ease of understanding, with no language and format/layout errors. All members of the focus group were encouraged to make suggestions and recommendations around the topic. The questionnaire (Appendix

G) was critically analysed in order to ensure a comprehensive format be reached (Appendix J).

The focus group consisted of:

- A qualified Chiropractor.
- The researcher.
- The research supervisors.
- A lecturer in the Faculty of Health Sciences.
- Two Chiropractic master's student knowledgeable in questionnaire-based research (one from the UJ and one from the DUT).

3.7.1.1 Procedure for the Focus Group

The focus group was conducted as follows:

- A date and time were set for the focus group to meet on Microsoft Teams.
- The participants were contacted and asked whether they would be part of the focus group.
- The participants were welcomed to the focus group upon logging onto Microsoft Teams and were required to read the letter of information (Appendix K), the confidentiality agreement (Appendix L) and informed consent (Appendix M).
- The participants were then afforded the opportunity to ask any questions regarding the focus group procedures and were given time to sign and complete the informed consent (Appendix M) and confidentiality agreement (Appendix L). By signing the confidentiality agreement, the participants agreed to keep any discussions within the focus group confidential.
- The focus group then discussed the questionnaire, which was video recorded. A transcript was then made from the recording and all data were stored securely under password protection.
- The researcher then read the questions aloud before the group and asked the members to discuss the relevance of the question to the aims and objectives of the study, as well as deciding whether the questions are understandable. The focus group was then given the opportunity to agree, disagree or be undecided about the inclusion of questions in the questionnaire.
- For the questions to be included or excluded, the group was required to be unanimous in their agreement to include or exclude questions. If participants were indecisive about the relevance or inclusion of the question, it went to a simple vote with a majority, or the question was deferred for purposes of being reviewed by the researcher.

- Thereafter, the participants were thanked for their time.

3.7.1.2 Inclusion Criteria for the Focus Group

- Participants had to be 18 years of age and older.

3.7.1.3 Exclusion Criteria for the Focus Group

- Participants who were not willing to sign informed consent and confidentiality form.

3.7.2 Pilot Study

A pilot study is a small-scale study of which is done for the purpose to evaluate the specificity, sensitivity and feasibility of a study before it is done on a larger scale (In 2017). This ensured the validity of the different sections and questions of the research tool. Feedback from pilot studies assisted to improve the questionnaire.

During the pilot study, the questionnaire was completed by three Chiropractic students who read the letter of information (Appendix N) and completed the informed consent (Appendix O).

3.7.2.1 Procedure for the Pilot Study

The pilot study was conducted as follows:

- Once provisional ethical clearance was received, the pilot study was conducted.
- Three Chiropractic students, one from the UJ and two from the DUT, who met the inclusion criteria and exclusion criteria for the pilot study, were asked to participate.
- These students then completed the questionnaire after they were asked to read the information letter (Appendix O) and complete the informed consent form (Appendix M).
- After completing the questionnaire, the students completed an evaluation form in relation to the questionnaire (Appendix J).
- Feedback from the pilot study was then used to improve the questionnaire. Questions were reconstructed to be more specific, to improve the grammar and make the questions easier to understand. Additional necessary questions were added, and unnecessary questions were removed.

3.7.2.2 Inclusion Criteria for the Pilot Study

- Participants were required to be 18 years of age and older.
- Reading of a letter of information (Appendix N) and completion of the informed consent form (Appendix O) by the participant.

3.7.2.3 Exclusion Criteria for the Pilot Study

- Any participants who were unwilling to sign the required documents for the pilot study indicating that they are willing and voluntarily participating.

3.7.3 Main Study

Once the study was ethically approved by the DUT's Institutional Research Ethics Committee (ethics reference number: IREC 217/22) (Appendix P), the researcher contacted the Heads of Department' of the UJ and the DUT (Appendix A) to distribute the surveys to the student class representatives, who then distributed it to the students. The questionnaire (Appendix G) was distributed via an online QuestionPro® survey link.

The letter of information (Appendix E) and informed consent form (Appendix F) were included in the start of the survey as a pre-survey notification. The pre-survey notification provided the Chiropractors with information regarding the survey, emphasising its importance and inviting them to participate. The pre-survey notification is of vital importance in promoting participation and allows for a longer version of the questionnaire to be used so that more data can be collected (Todd *et al.* 2018).

The first question of the questionnaire required the participants to provide consent to participate. Once the participants selected "Yes" then the remaining questionnaire was made available; however, if the participants selected "No" then they were not allowed to proceed with the questionnaire.

The administrator for "QuestionPro®" at the DUT was contacted by the researcher to enable access to "QuestionPro®". The "validated setting" was also enabled to ensure that the participants gave consent before answering the questionnaire and to ensure that all the questions were answered in each section before proceeding to the next section. If the participant attempted to proceed with the next section without answering a question, a message would inform them to answer the question before proceeding. These questions were marked with an asterisk.

The Anti-Ballot Box Stuffing (ABBS) feature on "QuestionPro®" settings were activated to prevent a student from completing the survey more than once. A unique response ID was assigned to each participant so that when they submitted the final question and completed the questionnaire, digital cookies were saved on their browser so that if they tried to access it again, then the system would send the participant an error message. This forbid the participants taking multiple surveys; however, if the participants did not complete the survey, they were still able to access the same link and continue with the questionnaire.

3.8 ETHICAL CONSIDERATIONS

The ethical concerns related to the study comprised of:

- IREC approval (Appendix P), which was obtained prior to the data collection process was commenced (IREC approval reference number: IREC 217/22).
- Each participant was required to sign the informed consent form (Appendix F) prior to commencing the questionnaire.
- The participants' names were not included in the questionnaire to ensure anonymity and confidentiality of the participant. The questionnaire (Appendix G) was coded using an unique response ID. Privacy was guaranteed through the participants' email addresses only being accessible by the student class representatives. The students' answers to the questionnaire were converted into data to ensure anonymity and confidentiality.
- The participants were not coerced into participating in the study and the participation in the questionnaire was done without the researcher present to ensure autonomy. It was also ensured that the participation of the students in the study was voluntary.
- All participants were treated with respect and equally to ensure justice.
- Beneficence was ensured by the addition of mental health helplines at the end of the questionnaire.
- Non-maleficence was ensured during the research procedure. The participants were not harmed in any way during the course of the study and the completion of the questionnaires did not impede the academic time of the students. The data were only accessible to the researcher, supervisor and statistician and will be adequately deleted after five years of storage at DUT.

3.9 DATA ANALYSIS

In an email communication method on the 7th April 2023, the research statistician, Mr Z. Strydom, sent the data analysis to the researcher. Statistical analysis was achieved using the Microsoft Excel Spreadsheet Software (Microsoft Corporation 2018). The demographics of the participants were described using frequency tables, bar charts and pie charts. The social, personal, psychological, and academic impact were described using frequency tables, bar graphs and pie charts. Further analysis was done to compare the different impacts and to determine if there was a relationship between each impact and the demographic data. The data were then summarised using means, ranges, and standard deviations. Regression results and correlation matrices were calculated to help determine the interaction between the question responses.

3.10 CONCLUSION

Chapter Three outlined the research methodology used in this study. It described the methods of sampling and statistical techniques used to analyse the data. It also describes the development of the questionnaire and the ethical considerations. The subsequent chapter, Chapter Four, will present the results of this study.

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

This chapter consists of the results and statistical breakdown of the data compiled from the questionnaire of this study. The study aimed to determine what effect the SARS-CoV-2 pandemic had on the mental health of the Chiropractic students in South Africa.

4.2 SAMPLE SIZE AND RESPONSE RATE

The data were collected from registered Chiropractic students who met the inclusion and exclusion criteria and were between their second year of study and master's degree. This data were then analysed. The total number of registered Chiropractic students in the 2022 academic year was 364 students (N=364). This consisted of 163 students registered at the UJ and 201 students registered at the DUT. A total number of 188 students completed the survey, which generated a 51.65% rate. Separately, the total number of the DUT students who completed the survey was 119 and the total number of the UJ students who completed the survey was 69. This generated a response rate of 59.2% of the DUT students and 42.3% of the UJ students.

4.3 THE DEMOGRAPHICS OF CHIROPRACTIC STUDENTS IN SOUTH AFRICA

The first section of the survey focused on the demographic characteristics of the Chiropractic students in South Africa, as well as which university they attended and in what area they stayed during lockdown.

4.3.1 Age

The results shown in **Figure 4.1** display a positively skewed distribution. It shows that 19.68% (n=37) of students were 21 years of age, followed by 18.62% (*n*=35) of students which were 22 years of age. The students aged 20 years made up 15.43% (*n*=29), while the students aged 23 years made up 11.17% (*n*=21). Chiropractic students aged 25 years (*n*=17) made up 9.04% and the students aged 24 years (*n*=13) made up 6.91%. The youngest students, aged

19 years, made up 5.32% (*n*=10) of the total students (*n*=188). The students who were 27 years old made up 3.72% (*n*=7), while students who were 29 years old made up 3.19% (*n*=6). There were five students 26 years old and made up 2.66% (*n*=5). An equal proportion of students aged 28 years and 30 years made up 1.6% (*n*=3) of the total number of students who responded (*n*=188). The lowest percentage of 0.53% (*n*=1) was recorded for both students aged 32 years and 37 years.

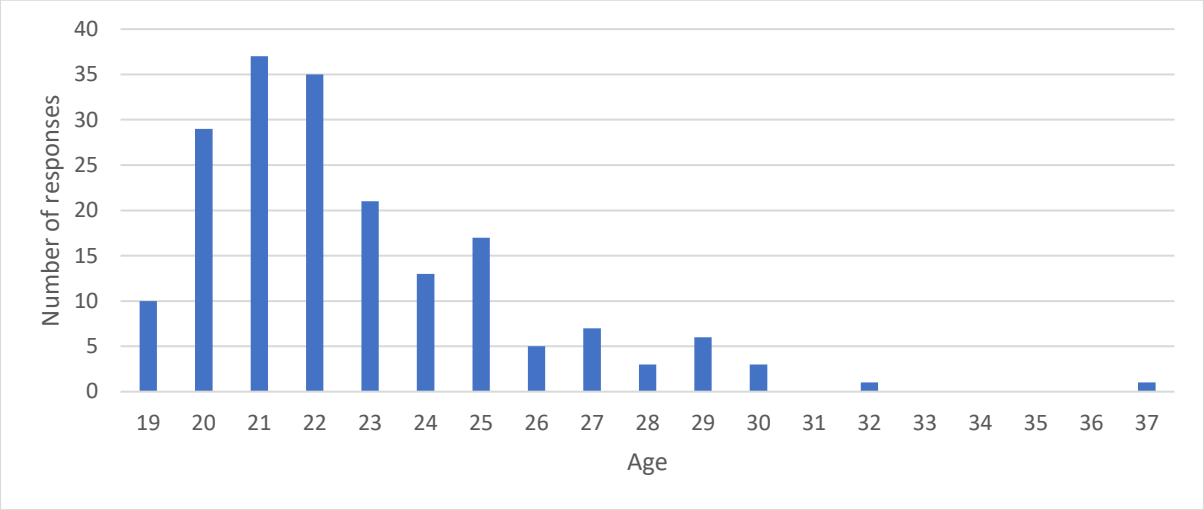

Figure 4.1: Bar graph distribution of responses by age of Chiropractic students (*n*=188)

4.3.2 Sex

Out of the 188 responses, 59.57% (*n*= 112) of students were female, 39.36% (*n*=74) of students were male and 1.06% (*n*=2) of students identified as other, signifying to neither be male or female. There is a relatively even split between males and females and an immaterial number of “Other”, meaning that this small sample may not be indicative of the entire population (**Figure 4.2**).

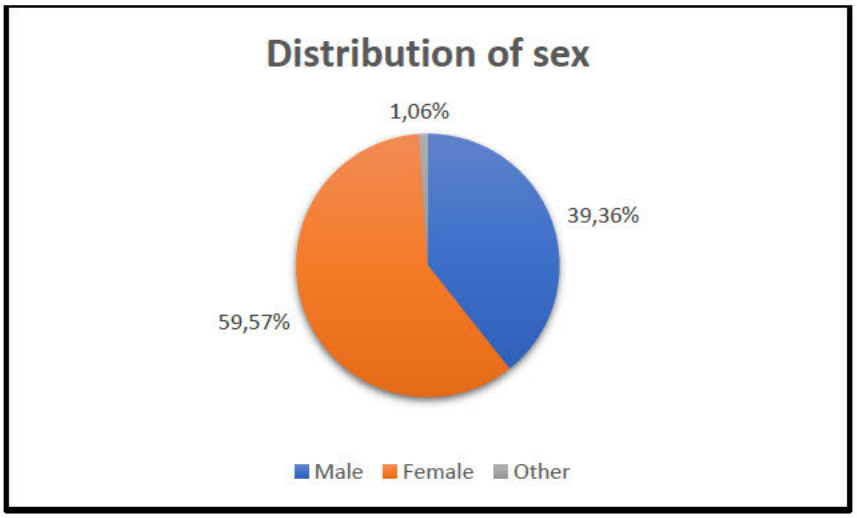

Figure 4.2: Pie chart distribution of sex of Chiropractic students (*n*=188)

4.3.3 Ethnicity

The data pertaining to ethnicity was relatively spread (**Figure 4.3**). Out of 188 responses, 49.47% (*n*=93) of students selected "White", 26.06% (*n*=49) of students selected "Asian", 13.30% (*n*=25) of students selected "Black" and 11.17% (*n*=21) of students selected "Coloured". There was a fifth option to select "Other" if a student did not fall into the above categories. However, 0% of students selected this option and, hence, no statistical analysis can be drawn from this.

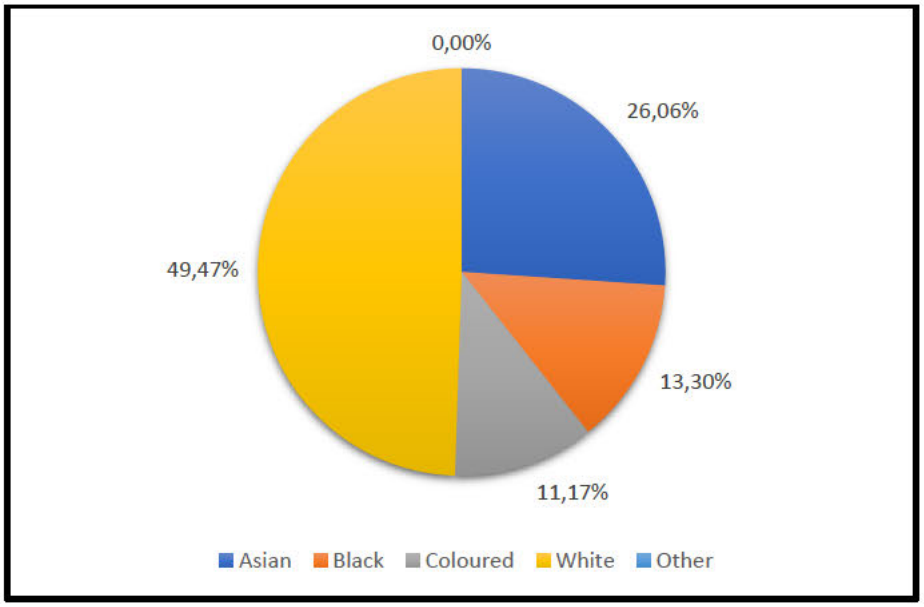

Figure 4.3: Pie chart distribution of ethnicity of Chiropractic students (*n*=188)

4.3.4 Year of Study

The students were required to select their year of study in the Chiropractic programme. The data were relatively spread (**Figure 4.4)**. There was an equal percentage of 26% (*n*=49; *n*=48) of students in both third and fourth year. The students in second year made up 24% (*n*=45) and students in sixth year or above made up 15% (*n*=17). The lowest percentage represented the students in fifth year and made up 9% (*n*=17).

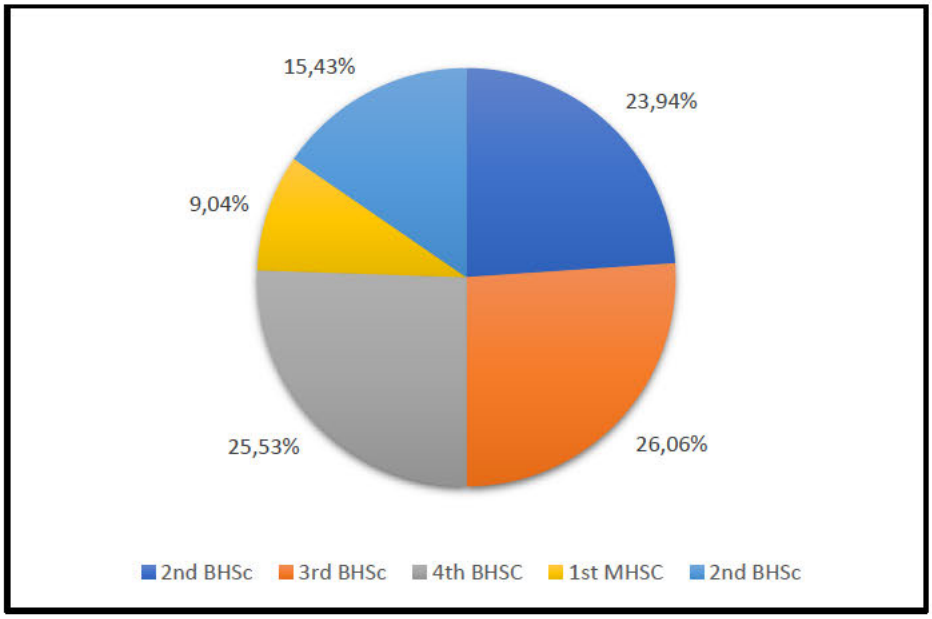

Figure 4.4: Pie chart distribution of year of study of Chiropractic students (*n*=188)

4.3.5 Region of Residence

The distribution of the number of urban students was relatively skewed. Only 7% (*n*=13) was made up by students in rural areas, while 93% (*n*=175) of students stayed in urban areas (**Figure 4.5**).

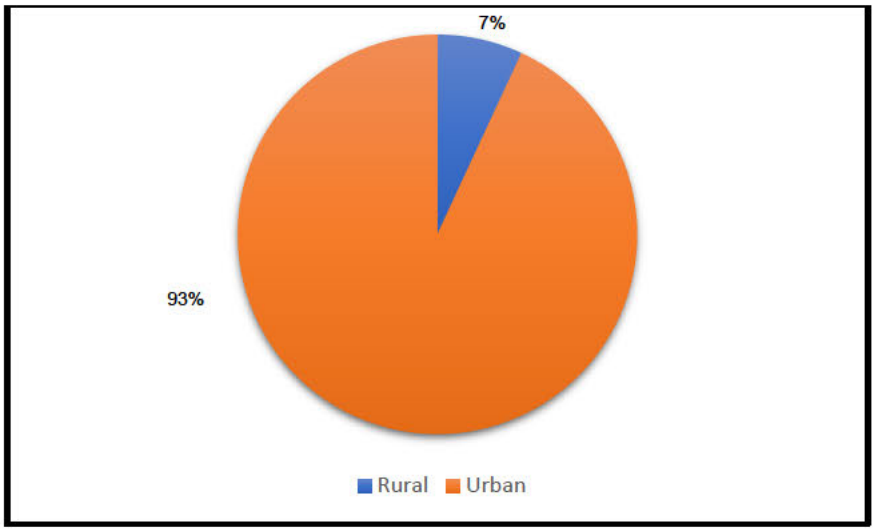

Figure 4.5: Pie chart distribution of region of residence of Chiropractic students (*n*=188)

4.3.6 Attending University

Figure 4.6 shows that the data are relatively skewed in favour of the DUT but there was still a large the UJ representation. This means that conclusions about the UJ would carry some weight but the relatively low number should be considered when analysing the data. The DUT made up a percentage of 63% (*n*=119), while the UJ only made up 37% (*n*=69) of responses.

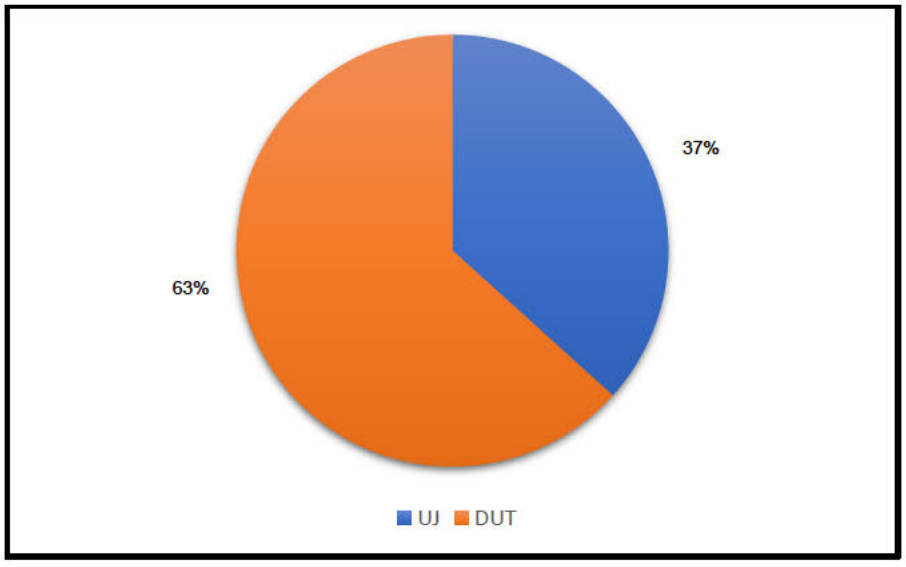

Figure 4.6: Pie chart distribution of attending university of Chiropractic students (*n*=188)

4.4 SOCIAL IMPACT

The next section of the questionnaire required students to answer questions based on their social interactions and experiences during the pandemic. The questions focused on isolation, social media, the SARS-CoV-2 vaccine, social distancing, and hygiene practices.

4.4.1 The University Mandate

A percentage of 55.32% (*n*=104) of students reported access to campus not being negatively impacted by the vaccine mandate, but there was still a large percentage of 44% (*n*=83) who were negatively impacted. Only one (*n*=1) student identified that their university did not have a vaccine mandate in place; however, this single outlier might not have provided accurate information (**Figure 4.7**).

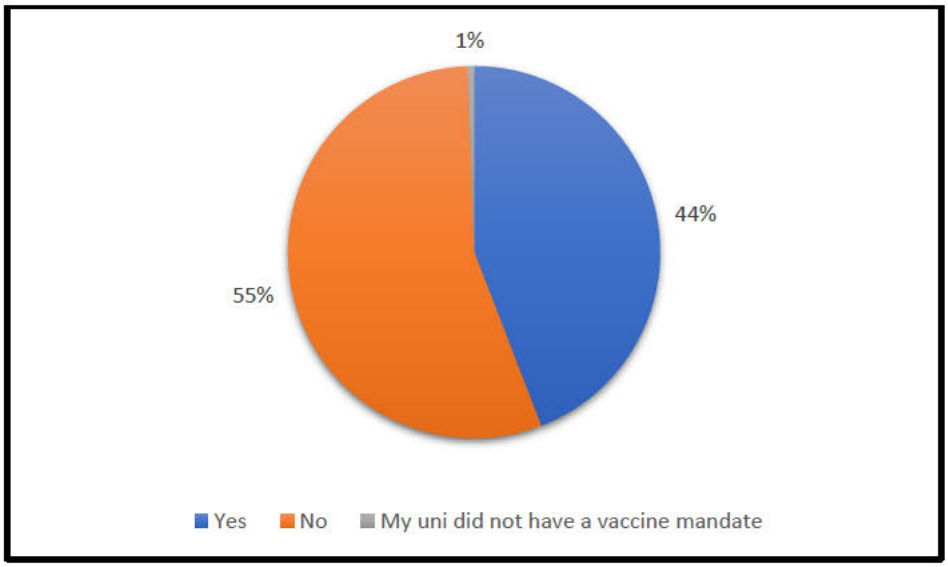

Figure 4.7: Pie chart distribution of the university mandate and its impact on the access of students to campus (*n*=188)

4.4.2 Wearing a Mask

The highest percentage of 40.43% (*n*=67) of students agreed to feeling uneasy when an individual was not wearing a mask around them. The students who felt neutral towards the statement made up a percentage of 23.40% (*n*=44). The third highest percentage of 19.68% (*n*=37) of participants strongly agreed to feeling uneasy when an individual was not wearing a mask. The students who disagreed with the question made up a percentage of 10.64% (*n*=20) and students who strongly disagreed made up a percentage of 5.85% (*n*=11). The results highlight that the majority of people either agreed or strongly agreed to feeling uneasy (**Figure 4.8**).

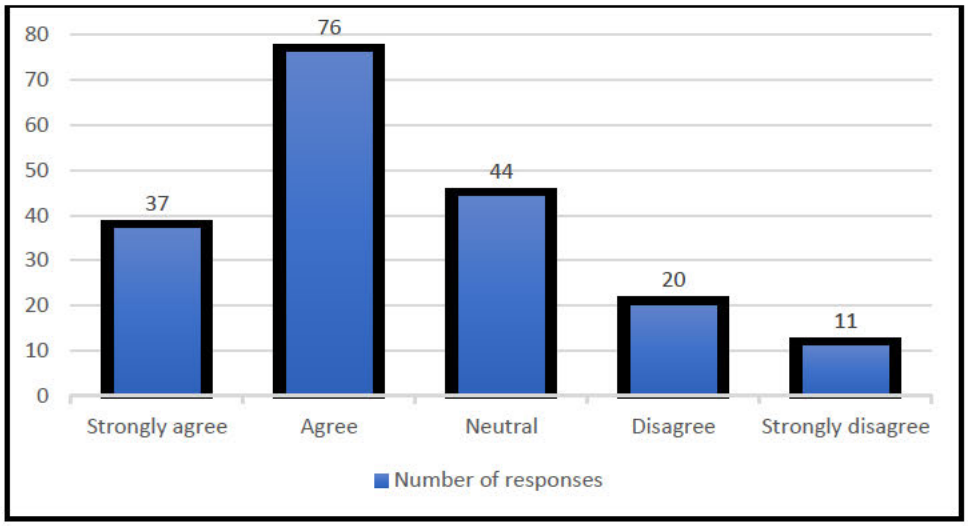

Figure 4.8: Bar graph distribution of students who felt uneasy when an individual did not wear a mask (*n*=188)

4.4.3 Social Distancing Rules in the Institution

A percentage of 48.40% (*n*=91) of students agreed that appropriate social distancing rules were implemented at their relevant university. A further 12,23% (*n*=23) of students strongly agreed to the statement, highlighting that majority of the students agreed or strongly agreed to question ten. The second highest percentage of 23.40% (*n*=44), consisted of students were neutral towards the question. The students who disagreed made up a percentage of 8.51% (*n*=16) and students who strongly disagreed made up a percentage of 7.45% (*n*=14). The data (**Figure 4.9**) conclude that, out of the two universities, most students felt that appropriate social distancing rules were in place; however, a large number of people were neutral which leaves the disagreement skew, relatively inconclusive that few people did not think appropriate rules were in place.

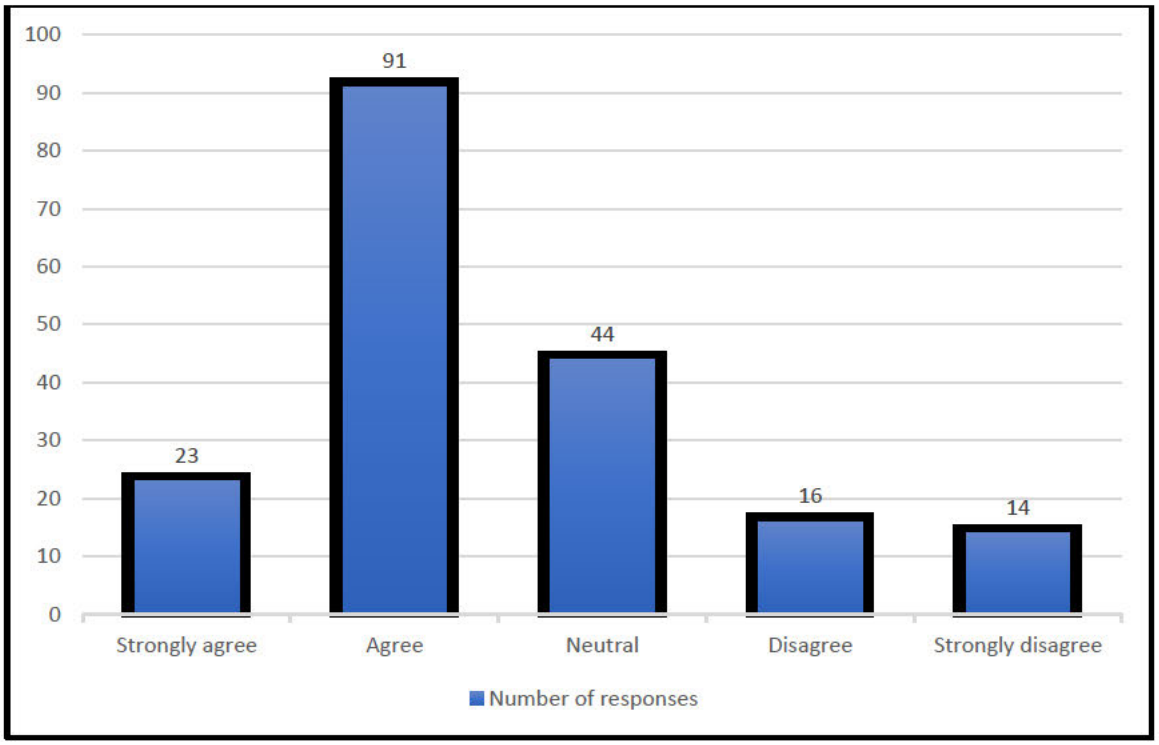

Figure 4.9: Bar graph distribution of social distancing rules in the institution (*n*=188)

4.4.4 Social Media

The highest percentage of students strongly agreed to spending more time on social media made up 46.81% (*n*=88), followed by 34.04% (*n*=64) agreed to spending more time on social media. We can hence conclude that almost everyone spent more time on social media. **Figure 4.10** shows that 12.23% (*n*=23) of students were neutral towards the question. A small percentage of less than 8% (*n*=15) of students did not agree to spending more time on social media. Only 4.26% (*n*=8) of students disagreed and 2.66% (*n*=5) of students strongly disagreed to the question.

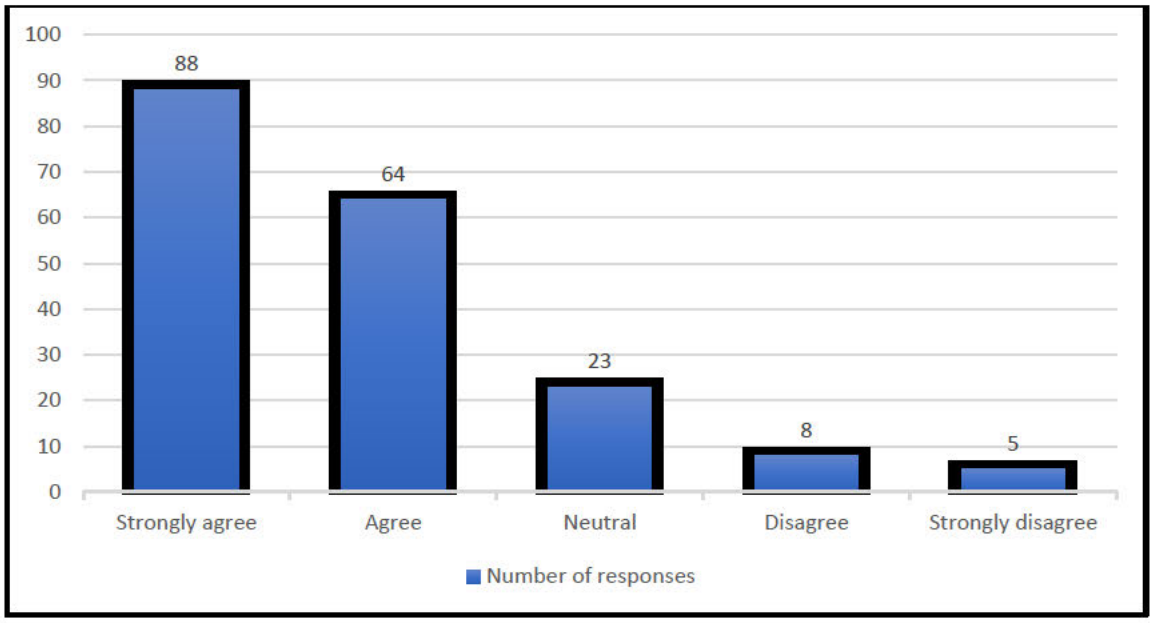

Figure 4.10: Bar graph distribution of social media usage during the SARS-CoV-2 pandemic (*n*=188)

4.4.5 Conflict Experienced During Lockdown

The majority of students felt that they sometimes experienced conflict which made up a percentage of 56.91% (*n*=107). A significant portion never experienced conflict which made up a percentage of 23.94% (*n*=45). Students who experienced conflict very often made up a percentage of 16.49% (*n*=31). Only a few students stayed by themselves during lockdown which made up a percentage of 2.66% (*n*=5) (**Figure 4.11**).

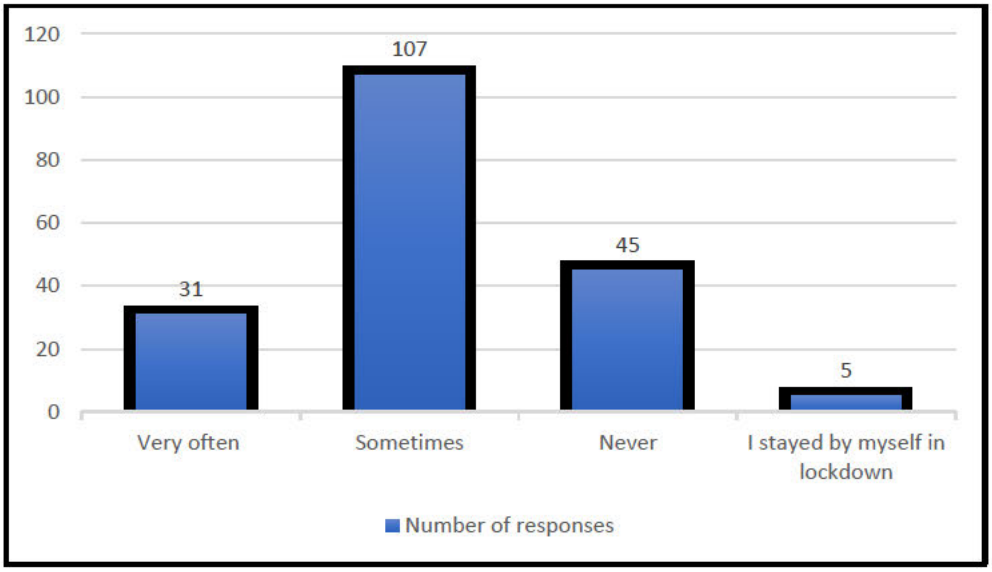

Figure 4.11: Bar graph distribution of social conflict experienced during lockdown (*n*=188)

4.5 PERSONAL IMPACT

The next section of the questionnaire required students to answer questions based on their personal experiences during the pandemic. The questions focused on productivity, sleeping patterns, personal responsibilities, financial burdens, physical exercise, and grief.

4.5.1 Productivity

The majority, 69% (*n*=122), of students felt that their overall productivity was negatively impacted whereas 31% (*n*=59) of students felt that their overall productivity was not negatively impacted (**Figure 4.12**).

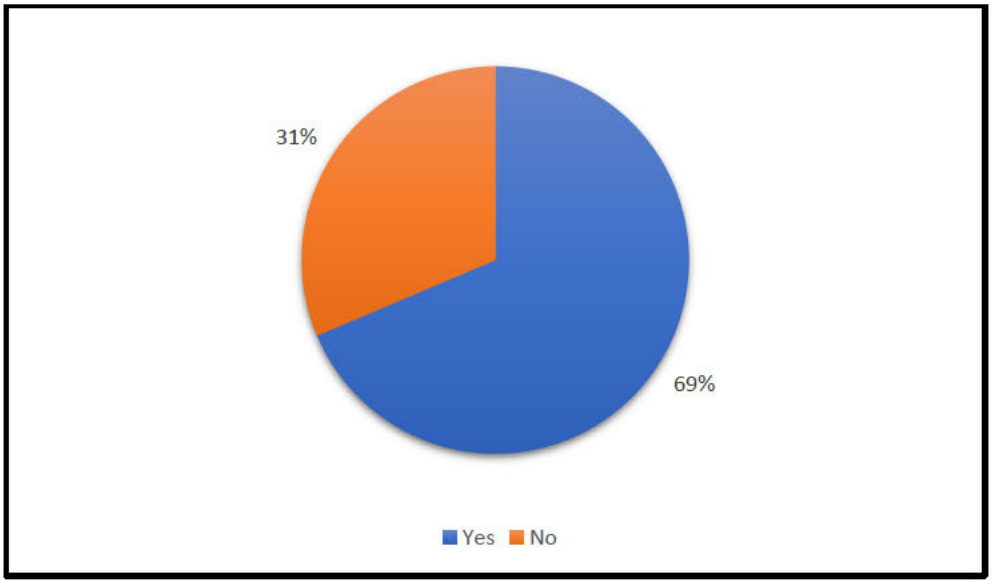

Figure 4.12: Pie chart distribution of productivity during the SARS-CoV-2 pandemic (*n*=188)

4.5.2 Sleeping Patterns

Only 20.74% (*n*=39) of students felt that their sleeping patterns remained unchanged during the pandemic. While 18.62% (*n*=35) of students slept less than normal and 60.64% (*n*=114) of students slept more than normal during the SARS-CoV-2 pandemic (**Figure 4.13**).

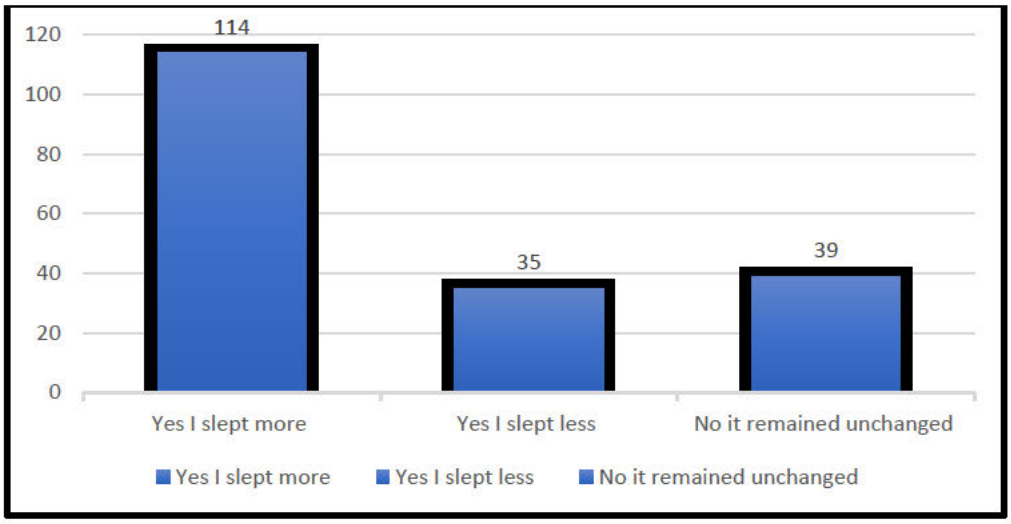

Figure 4.13: Bar graph distribution of sleeping patterns of the students during the SARS-CoV-2 pandemic (*n*=188)

4.5.3 Personal Responsibilities

The majority, 72% (*n*=136), of students agreed to having more responsibilities, and the remaining 28% (*n*=52) of students did not have more personal responsibilities (**Figure 4.14**).

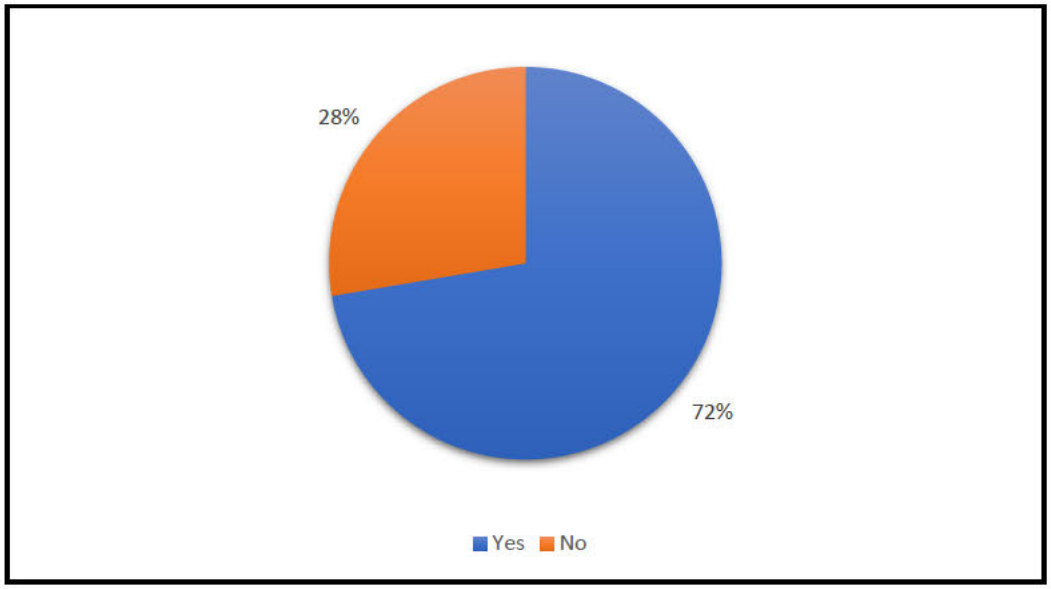

Figure 4.14: Bar graph distribution of personal responsibilities during lockdown (*n*=188)

4.5.4 Loss of a Friend/Family Member During the SARS-CoV-2 Pandemic

Figure 4.15 shows that 58% (*n*=109) of students did not experience loss, while and 42% (*n*=79) of the students did lose someone during the pandemic.

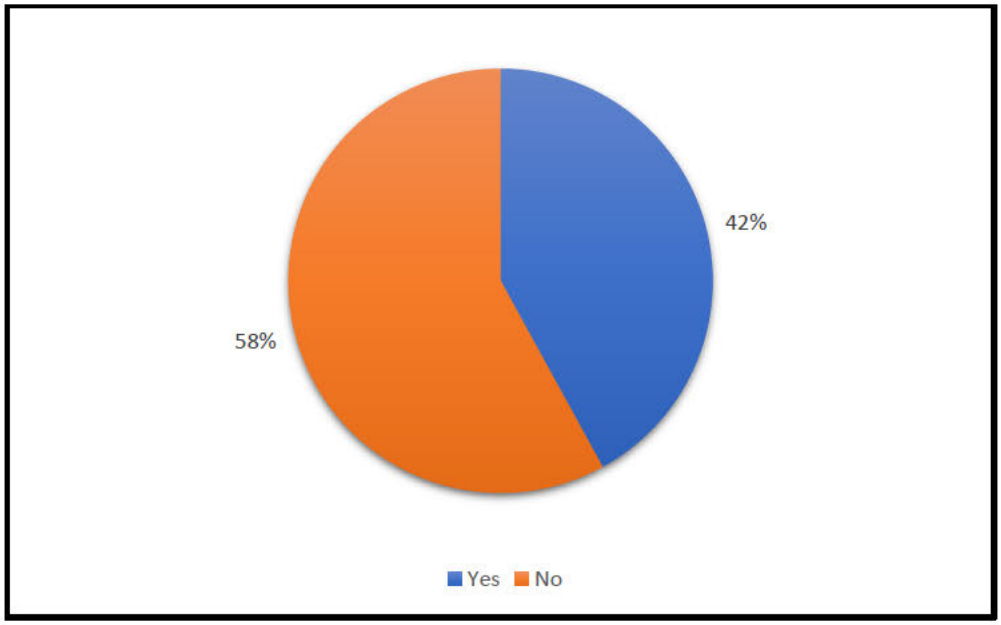

Figure 4.15: Pie chart distribution of loss of a family member/ friend of the students during the pandemic (*n*=188)

4.5.5 Financial Difficulty During Lockdown

A percentage of 57% (*n*=108) of students did not have any financial difficulties while the remaining 43% (*n*=80) of the students admitted to having financial difficulties (**Figure 4.16**).

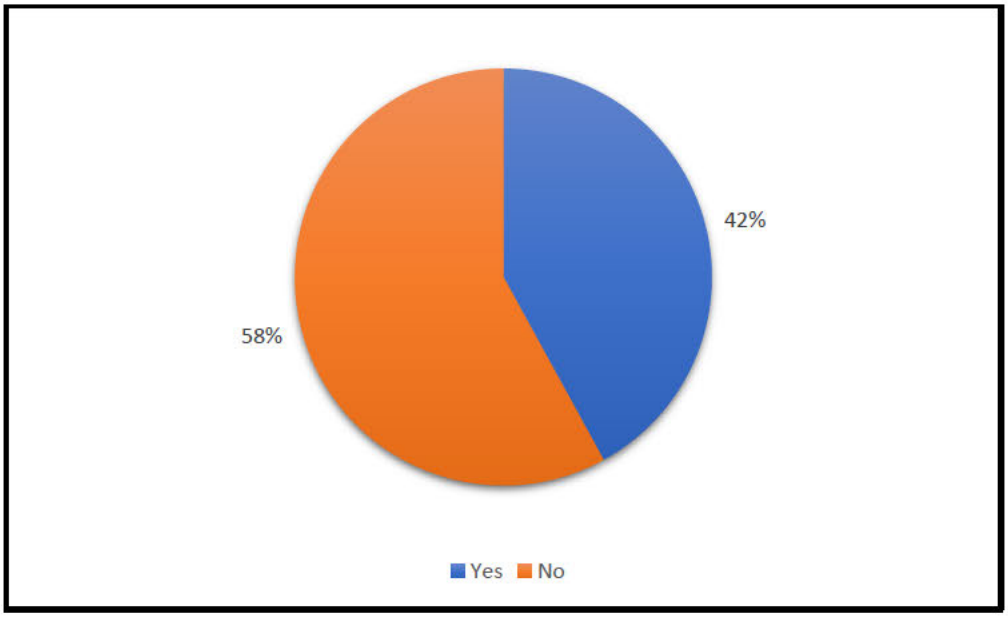

Figure 4.16: Pie chart distribution of financial difficulties during the pandemic (*n*=188)

4.5.6 Fitness Workout Regime

Half of the students, 50% (*n*=94), admitted to exercising less during the pandemic. The remaining students were roughly equally split up with 23.94% (*n*=45) exercising more during the pandemic and 26.06% (*n*=49) remaining unchanged (**Figure 4.17**).

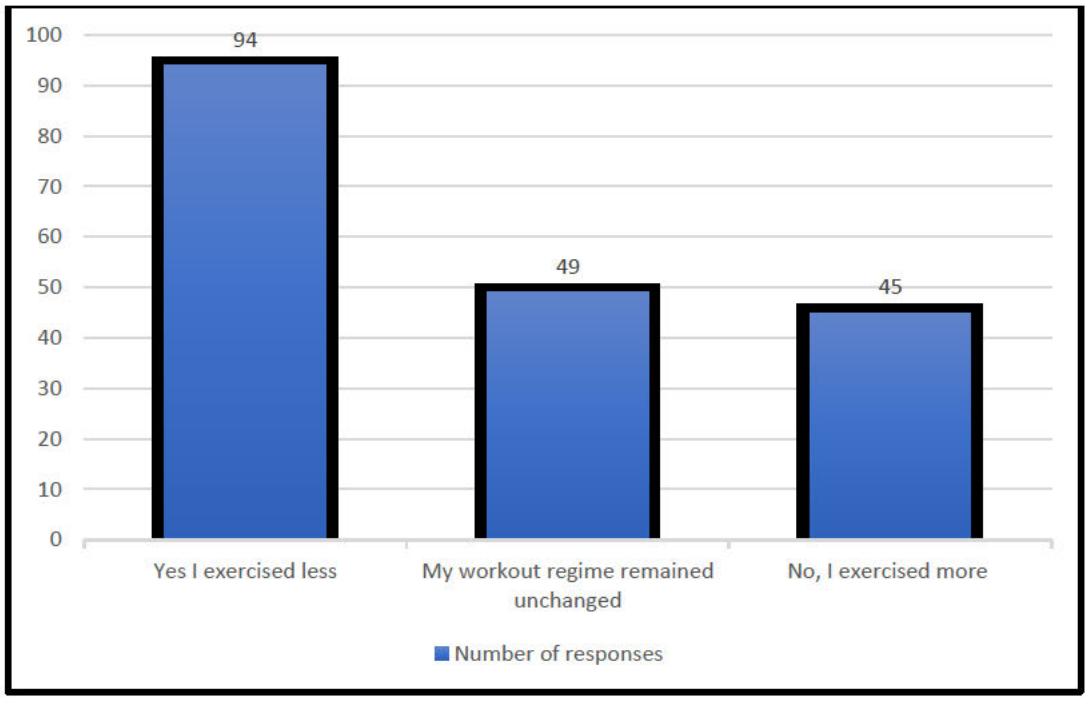

Figure 4.17: Bar graph distribution of fitness workout regime of the students during the pandemic (*n*=188)

4.6 PSYCHOLOGICAL IMPACT

The next section of the questionnaire required students to answer questions based on their personal experiences during the pandemic. The questions focused on productivity, sleeping patterns, personal responsibilities, financial burdens, physical exercise, and grief.

4.6.1 Anxiety

The highest percentage of 59.57% (*n*=112) of students sometimes felt anxious, while only 7.89% (*n*=15) of students never felt anxious. A percentage 17.55% (n=33) of students often felt anxious and a similar percentage of 14.89% (*n*=28) of students always felt anxious (**Figure 4.18**).

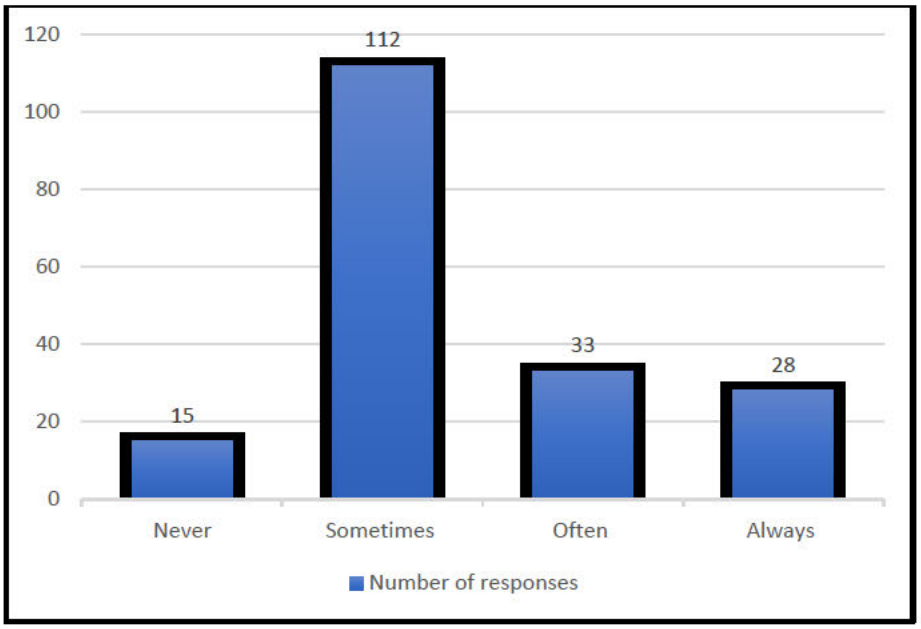

Figure 4.18: Bar graph distribution of anxiety of the students during lockdown (*n*=188)

4.6.2 Periods of Low Mood

A larger percentage of 47.87% (*n*=90) of students sometimes experienced more periods of low mood than usual. A percentage of 15.96% (*n*=30) of students made up reported to never experience periods of low mood as opposed to a lower percentage of students in question nineteen who never felt anxious. A low percentage of 13.83% (*n*=26) of students reported to always experience periods of low mood than usual and only 22.34% (*n*=42) of students reported to often experience periods of low mood (**Figure 4.19**).

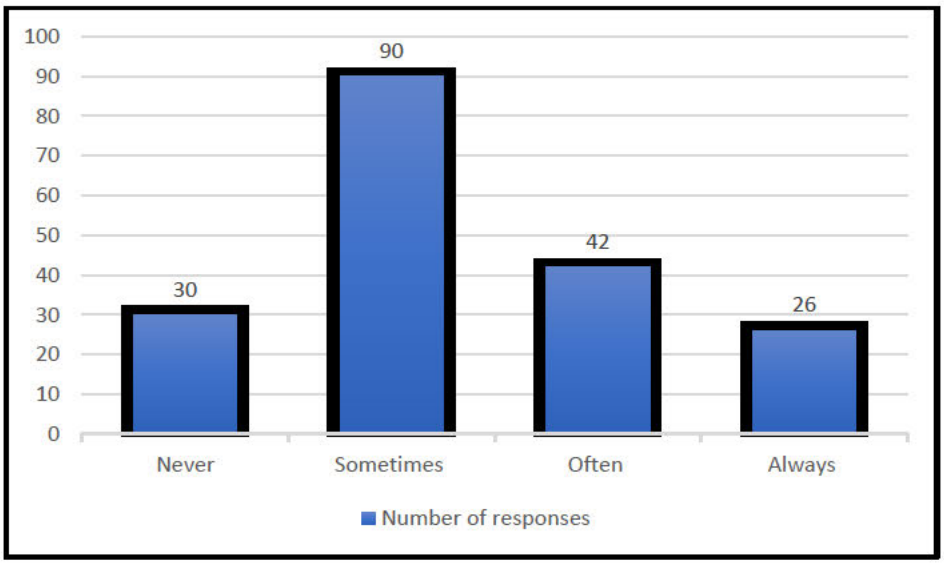

Figure 4.19: Bar graph distribution of periods of low mood of students during lockdown (*n*=188)

4.6.3 Control of Thoughts

A percentage of 45.21% (*n*=85) of students sometimes struggled to control their thoughts more than usual and 24.47% (*n*=46) of students never struggled to control their thoughts more than usual. The remaining 11.17% students always struggled (*n*=21) and 19.15% (*n*=36) struggled often (**Figure 4.20**).

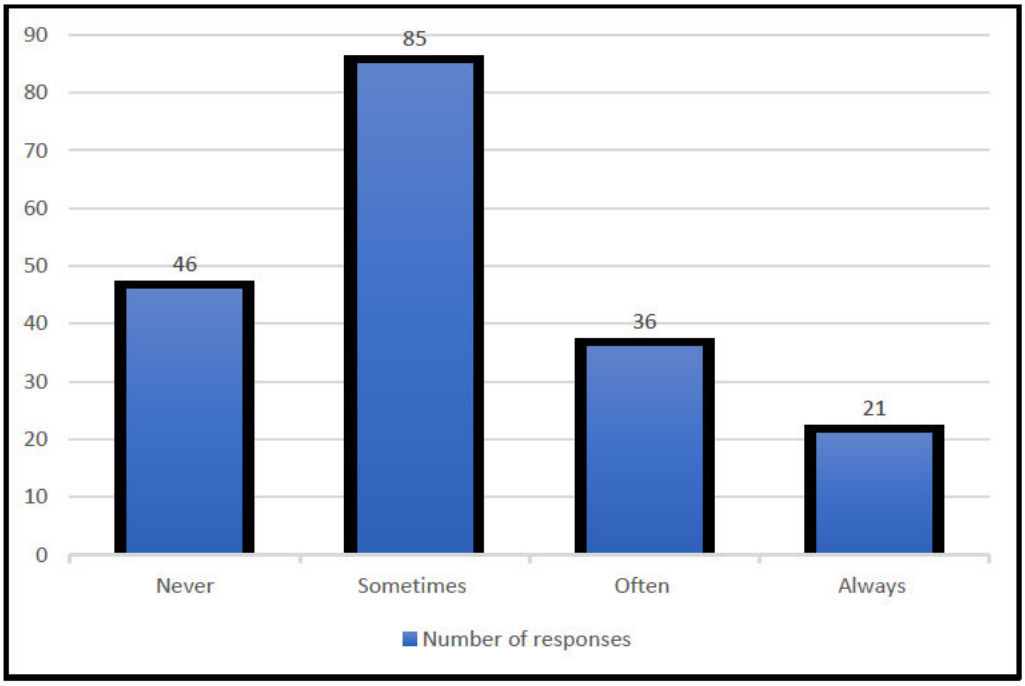

Figure 4.20: Bar graph distribution of control of thoughts of the students during lockdown (*n*=188)

4.6.4 Withdrawal from People

Almost half of the students, specifically 47.87% (*n*=90), sometimes withdrew from people. A further 22.87% (*n*=43) of students often withdrew from people and 19.68% (*n*=37) of students never withdrew from people. A low percentage of 9.57% (*n*=18) of students always withdrew from people during lockdown (**Figure 4.22**).

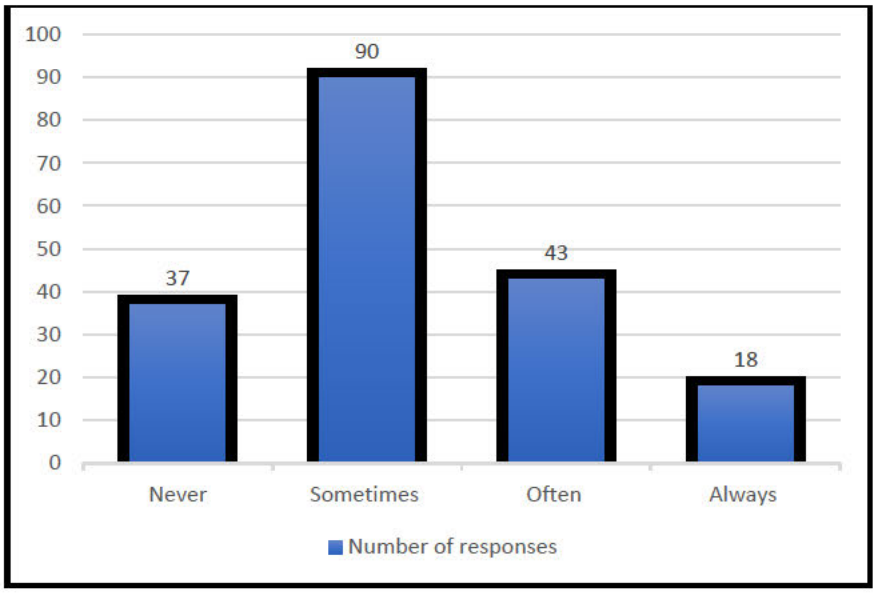

Figure 4.21: Bar graph distribution of withdrawal of students from people during lockdown (*n*=188)

4.6.5 Motivation

Figure 4.22 shows that 42.55% (*n*=80) of the students sometimes felt less motivated, while 32.45% (*n*=61) of students often felt less motivated. Out of the remaining students, 15.96% (*n*=30) of students always felt less motivated and 9.04% (*n*=17) of students never felt motivated.

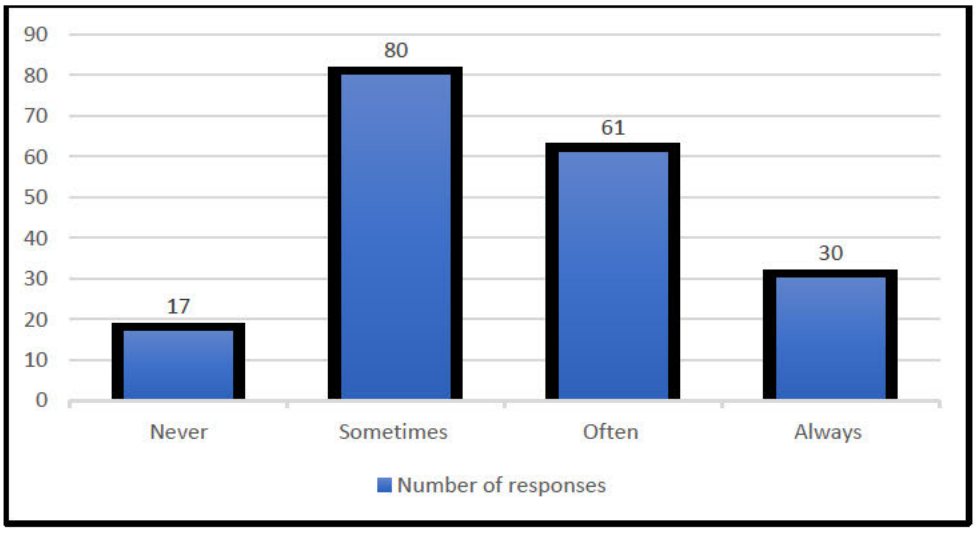

Figure 4.22: Bar graph distribution of the motivation of students to do tasks during lockdown (*n*=188)

4.6.6 Concentration

A percentage of 40.43% (*n*=76) of students only sometimes found it difficult to concentrate and 32.45% (*n*=61) of students often felt it difficult to concentrate. Out of the remaining students, 17.02% (*n*=32) of students always found it difficult to concentrate and 10.11% (*n*=19) of students never found it difficult to concentrate (**Figure 4.23**).

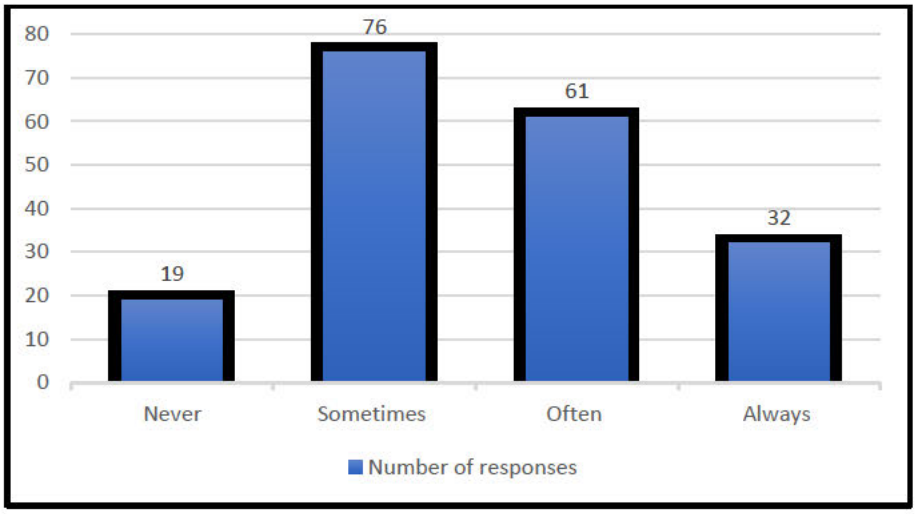

Figure 4.23: Bar graph distribution of the ability of the students to concentrate during lockdown (*n*=188)

4.6.7 Alcohol Consumption

The majority of the students, 53.30% (*n*=119), selected to have "never" consumed more alcohol than usual during lockdown. A further 22.34% (*n*=42) of students only sometimes consumed more alcohol. Of the remaining students, 8.51% (*n*=16) often consumed more alcohol and 5.85% (*n*=11) always consumed more alcohol (**Figure 2.24**).

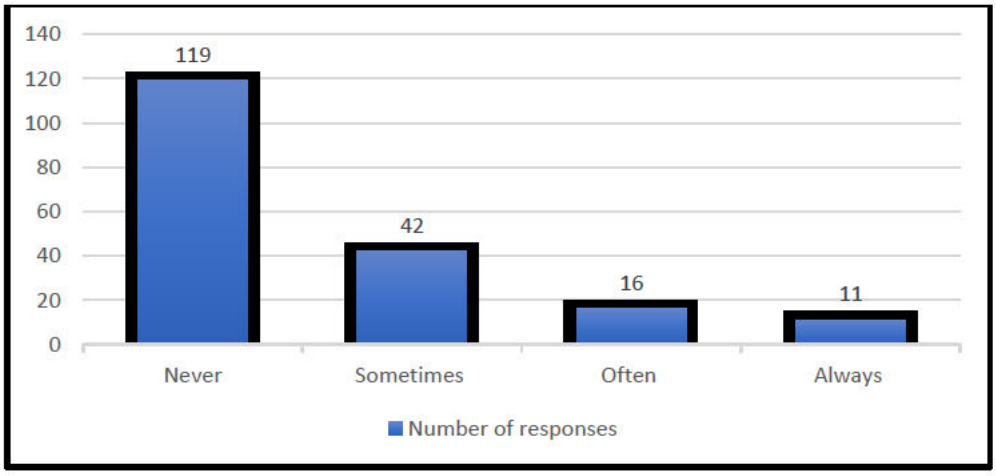

Figure 4.24: Bar graph distribution of alcohol consumption of the students during lockdown (*n*=188)

4.6.8 Cigarette Consumption

The majority of the students, 81.91% (*n*=154), never consumed more cigarettes than usual. A further 7.45% (*n*=14) of students only sometimes consumed more cigarettes than usual. Of the remaining students, 6.91% (*n*=13) often consumed more cigarettes and 3.72% (*n*=7) always consumed more cigarettes (**Figure 4.25**).

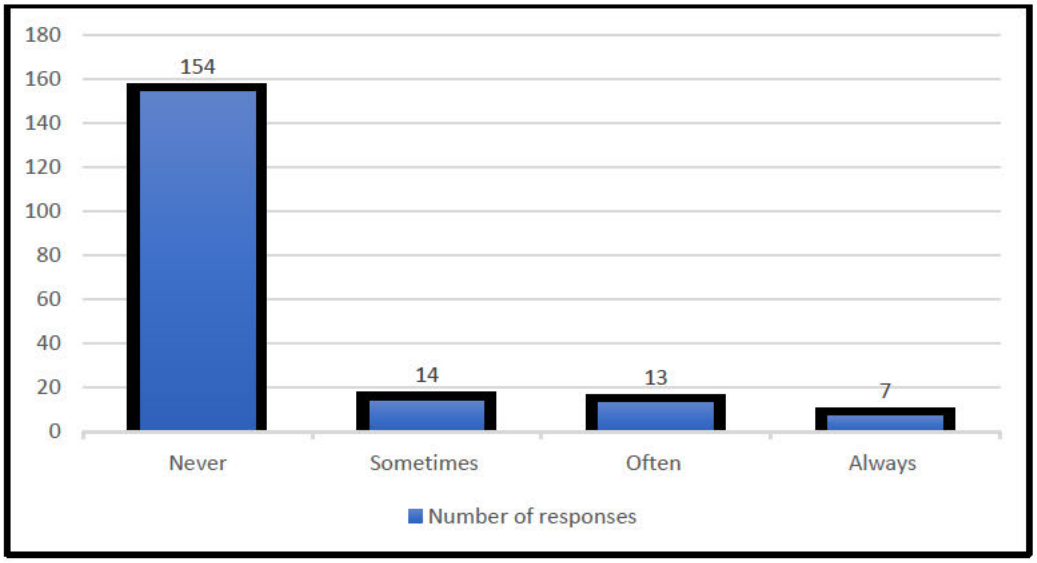

Figure 4.25: Bar graph distribution of cigarette consumption of the students during lockdown (*n*=188)

4.7 ACADEMIC IMPACT

The next section of the questionnaire required students to answer questions based on their academic experiences during the pandemic. The questions focused on practical skills, academic marks, time spent on work during lockdown, attendance in online lectures, internet connectivity, progress during isolation, access to data and e-learning devices.

4.7.1 Access to E-Learning Devices

Almost all students, specifically 97.34% (*n*=183), had access to e-learning devices, while only 2.66% (*n*=5) of students did not have access to e-learning devices (**Figure 4.26**).

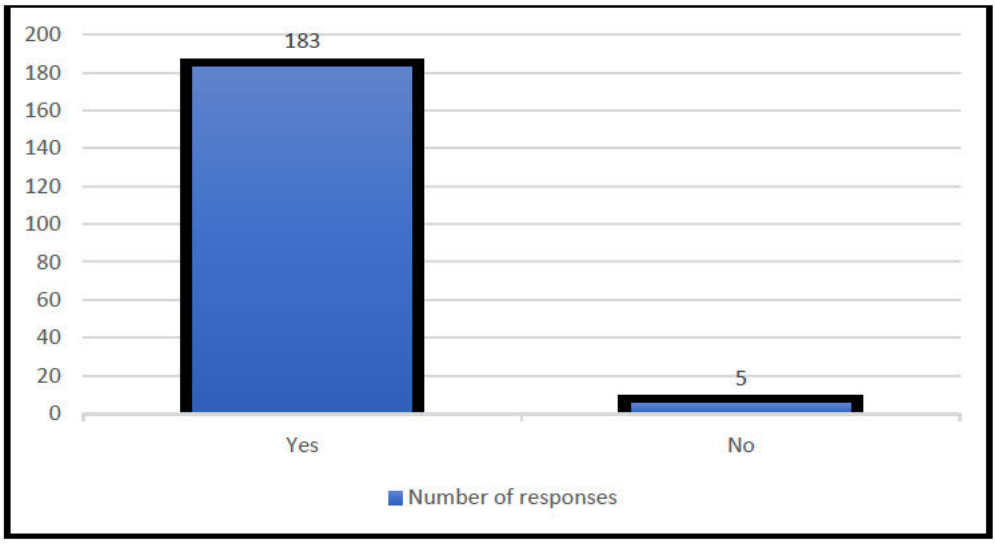

Figure 4.26: Bar graph distribution of access of students to e-learning devices (*n*=188)

4.7.2 Supply of Data from University

The majority of the students, 69.15% (*n*=130), had data supplied to them and found that it was a sufficient amount. A further 27.66% (*n*=52) of students also had data supplied to them but found that it was not a sufficient amount. The remaining 3.19% (*n*=6) of students did not have data supplied to them (**Figure 4.27**).

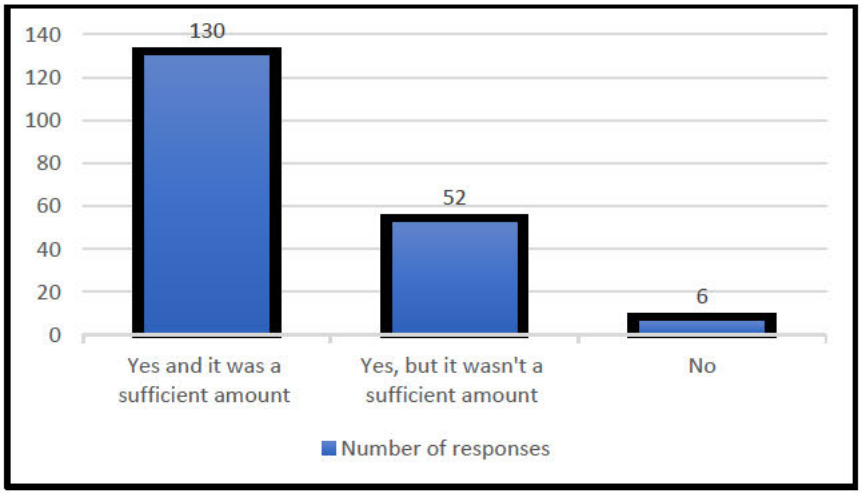

Figure 4.27: Bar graph distribution of the supply of data from the university to the students (*n*=188)

4.7.3 Access to Internet Connectivity

Most students, specifically 85.51% (*n*=157), had access to internet connectivity while the remaining 16.49% (*n*=31) of students did not have access to internet connectivity (**Figure 4.28**).

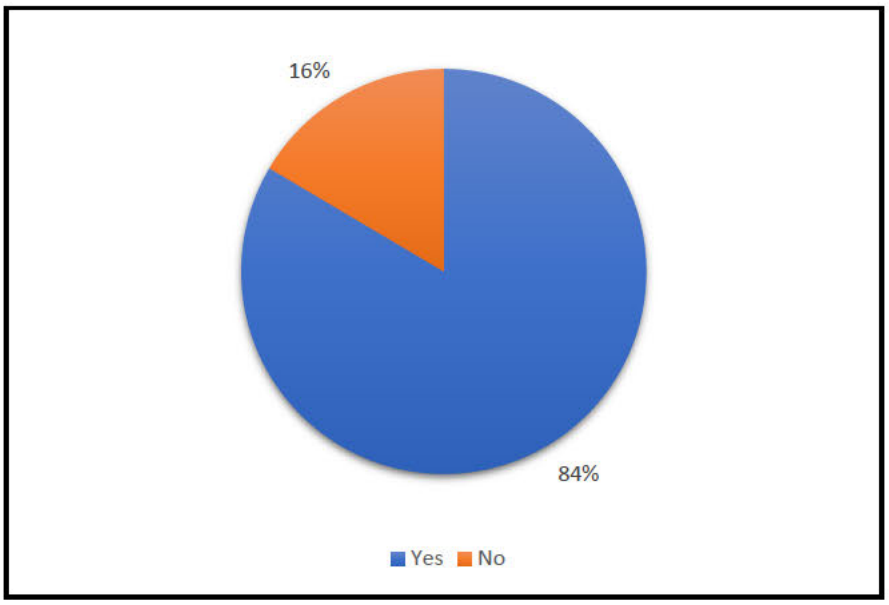

Figure 4.28: Pie chart distribution of the students' access to internet connectivity during lockdown (*n*=188)

4.7.4 Attendance in Online Lectures

The majority 57.45% (*n*=108) of students felt that their online attendance was not negatively affected and the remaining 42.55% (*n*=80) of students felt that their attendance was negatively affected (**Figure 4.29**).

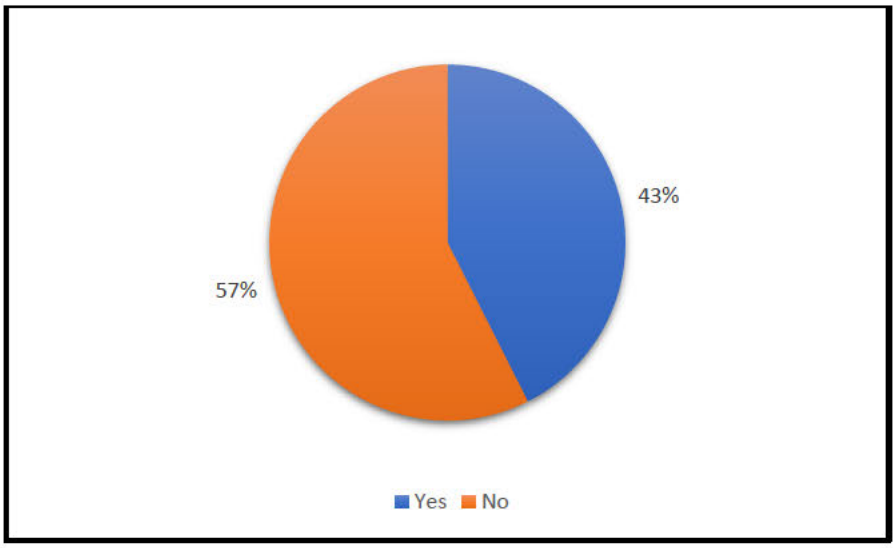

Figure 4.29: Pie chart distribution of the impact of the attendance in online lectures and tests during lockdown (*n*=188)

4.7.5 Impact on Practical Skills

A large percentage, 76.60% (*n*=144), of the students felt that their practical skills were negatively impacted by the pandemic; while the remaining 23.40% (*n*=44) of students felt that their practical skills were not negatively impacted by the pandemic (**Figure 4.30**).

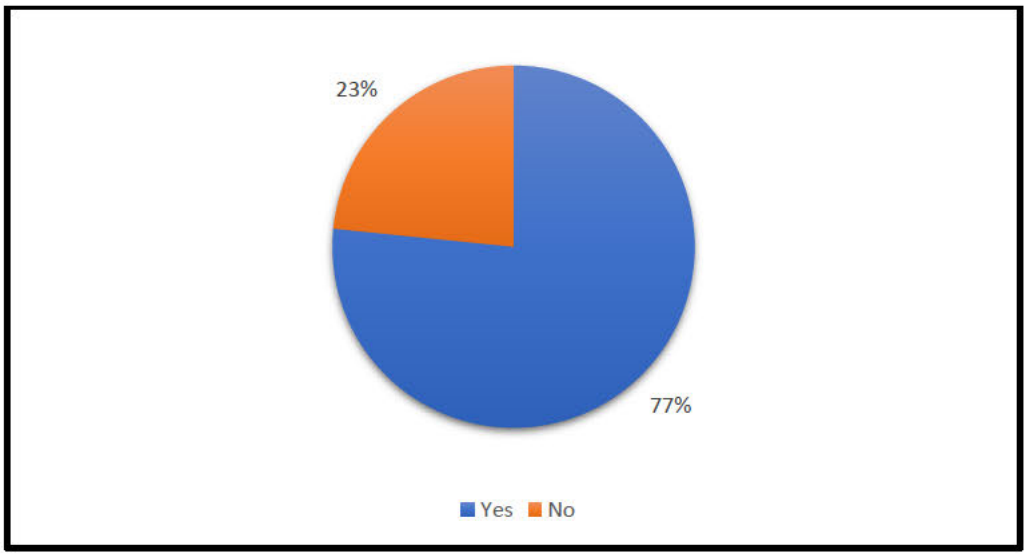

Figure 4.30: Pie chart distribution of the impact of the pandemic on practical skills (*n*=188)

4.7.6 Types of Practical Skills Impacted

Question 33 was a follow up from question 32. The participants who had answered yes to question 32 were required to answer this question and were able to choose more than one option of which skill or skills they felt was negatively impacted. The skill that was most voted for by the students was patient-interaction skills (*n*=116), closely followed by diagnostic skills (*n*=111) and then palpation skills (*n*=82) (**Figure 4.31**).

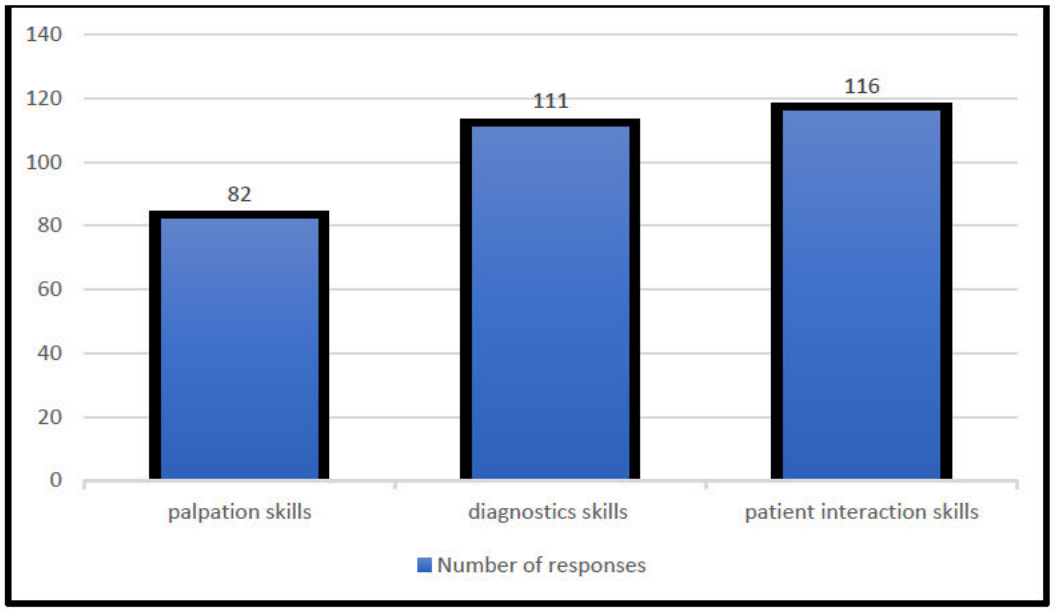

Figure 4.31: Bar graph distribution of types of practical skills that were affected among students (*n*=188)

4.7.7 Impact on Academic Marks

The majority of the students' marks were impacted after lockdown, with 43.62% (*n*=82) having had their academic marks worsen (**Figure 4.32**). A remaining 35.64% (*n*=67) of students had their marks unchanged and only 20.745% (*n*=39) had improved their marks.

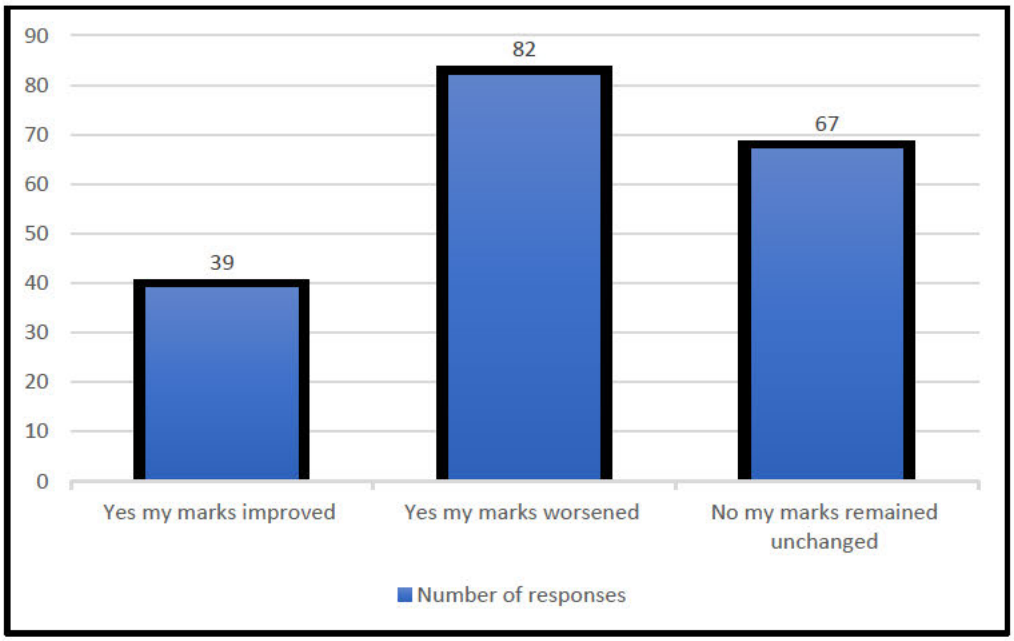

Figure 4.32: Bar graph distribution of the impact of the students' academic marks on return to campus after lockdown (*n*=188)

4.7.8 Progress in University Work During Isolation

The majority of the students, 68% (*n*=128), felt that isolation hampered their progress in their university work. The remaining 32% (*n*=60) of students felt that isolation did not hamper their progress in university work (**Figure 4.33**).

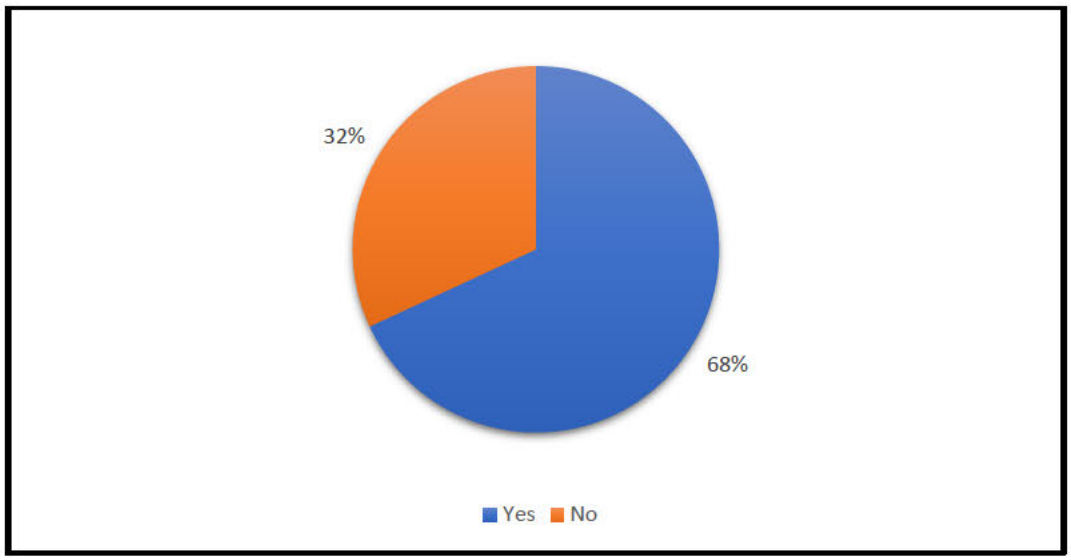

Figure 4.33: Pie chart distribution of the need for isolation and whether the students felt it hampered their progress in university work (*n*=188)

4.7.9 Time Spent on Work During Lockdown

Figure 4.34 shows that the highest percentage of students, 28.72% (*n*=54), spent two to three hours a day on work and 26.06% (*n*=49) of students spent three to four hours a day on work. Only 21.28% (*n*=40) of students spent more than five hours a day on work, while 18.62% (*n*=35) of students spent one to two hours a day on work and 5.32% (*n*=10) of students spent less than one hour on work a day.

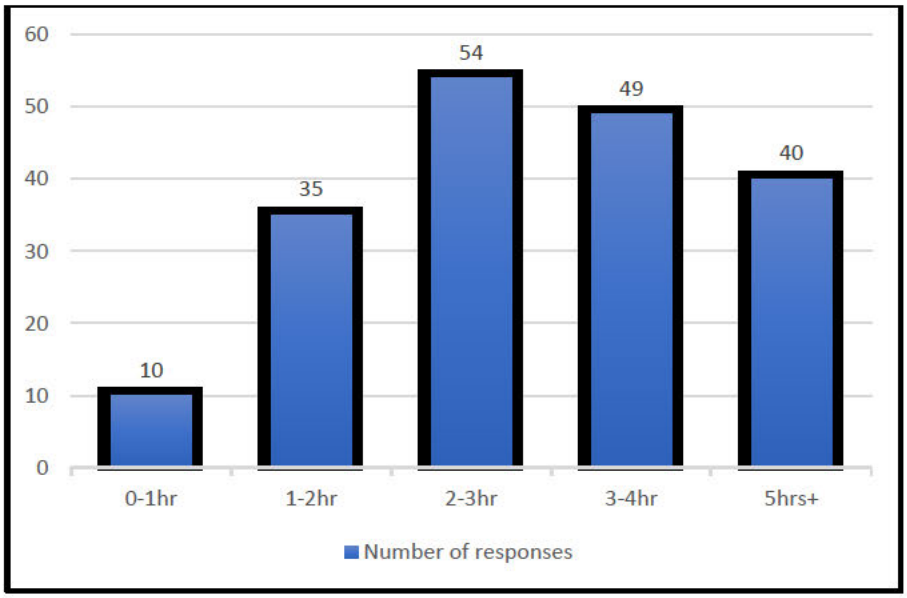

Figure 4.34: Bar graph distribution of total time per day spent on work (*n*=188)

4.8 DEMOGRAPHIC, SOCIAL, PERSONAL, PSYCHOLOGICAL AND ACADEMIC IMPACT ANALYSIS

In an email communication method on the 7th April 2023, the statistician, Mr Z. Strydom, indicated that in order to examine the social, personal, psychological, and academic impact of SARS-CoV-2 on Chiropractic students, two different statistical analyses were performed.

Multiple linear regression was used to determine the strength and direction of the relationship between the variables measured in the questionnaire. This statistical technique was chosen because it can be used on continuous or categorical data, and it models the relationship between two or more variables. To further examine the strength and direction of the relationship between questions a Pearson correlation was performed (Strydom 2023).

4.8.1 Social Impact Analysis

Multiple linear regression analysis was performed on questions 11 and 8, 9, 14, 15, 19, 20, 21, 22, 23, 24, 29, 30 (**Table 4.1, Table 4.2,** and **Table 4.3**) to determine if question 11 is significantly related to other questions. Overall, the regression is significant (R^2= 0.27, F (12, 175) =5.51, p<0.00).

More specifically, question 11 was significantly related to questions 8 (β=-0.28; *p*=0.04), 9 (β=0.15; *p*=0.012), 14 (β=0.21; *p*=0.012), 20 (β=-0.27; *p*=0.015) and 24 (β=-0.28; p<0.00).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.4**). There was a weak to very weak,

positive correlation between question 11 and 29 (r=0.146), 30 (r=0.14), 9 (r=0.24), 14 (r=0.21) and 15 (r=0.18). There was a weak to a very weak, negative correlation between question 11 and 8 (r=0.27), 19 (r=0.13), 20 (r=0.27), 21 (r=0.18) and 22 (r=0.10).

Table 4.1: Regression statistics for question 11

Multiple R	0,5235347
R Square	0,2740886
Adjusted R Square	0,2243118
Standard Error	0,8685218
Observations	188

Table 4.2: ANOVA for question 11

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	49,843298	4,1536081	5,5063535	0.000
Residual	175	132,00777	0,7543301		
Total	187	181,85106			

Table 4.3: P-value analysis of question 11

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.811	0.236	3.435	0.001	0.345	1.277	0.345	1.277
Q29	0.193	0.129	1.496	0.136	-0.062	0.448	-0.062	0.448
Q30	0.279	0.198	1.413	0.159	-0.111	0.669	-0.111	0.669
Q8	-0.284	0.137	-2.071	0.040	-0.555	-0.013	-0.555	-0.013
Q9	0.153	0.060	2.540	0.012	0.034	0.271	0.034	0.271
Q14	0.212	0.084	2.530	0.012	0.046	0.377	0.046	0.377
Q15	0.288	0.148	1.952	0.052	-0.003	0.580	-0.003	0.580
Q19	0.131	0.105	1.241	0.216	-0.077	0.338	-0.077	0.338
Q20	-0.266	0.109	-2.449	0.015	-0.481	-0.052	-0.481	-0.052
Q21	0.012	0.092	0.129	0.897	-0.170	0.194	-0.170	0.194
Q22	0.074	0.087	0.852	0.396	-0.097	0.245	-0.097	0.245
Q23	0.091	0.105	0.861	0.391	-0.117	0.298	-0.117	0.298
Q24	-0.280	0.094	-2.967	0.003	-0.466	-0.094	-0.466	-0.094

Table 4.4: Correlation analysis of question 11

	Q29	Q30	Q8	Q9	Q14	Q15	Q19	Q20	Q21	Q22
Q11	0.147	0.140	-0.265	0.239	0.210	0.186	-0.127	-0.271	-0.177	-0.102

4.8.2 Personal Impact Analysis

Multiple linear regression analysis was performed on questions 13 and 7, 14, 17, 19, 20, 21, 22, 23, 24, 31 and 34 (**Table 4.5, Table 4.6,** and **Table 4.7**) to determine if question 14 is significantly related to other questions. Overall, the regression is significant (R^2=0.41, F (11, 176) =10.9, p<0.00).

More specifically, question 13 was significantly related to questions 7 (β=0.42; p<0.00), 14 (β=0.26; p<0.00), 17 (β=0.29; p<0.00), and 24 (β=-0.37; *p*=0.02).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.8**). There was a moderate, positive correlation between question 13 and 7 (r=0.42). There was a weak to very weak, positive correlation between question 13 and 14 (r=0.26), 17 (r=0.29) and 31 (r=0.22). There was a weak to a very weak, negative correlation between question 13 and 19 (r=-0.23), 20 (r=-0.27), 21 (r=-0.24), 22, (r=-0.21), 23 (r=-0.37), 24 (r=-0.37), 31 (r=-0.22) and 34 (r=-0.02).

Table 4.5: Regression analysis of question 13

Multiple R	0,637405195
R Square	0,406285383
Adjusted R Square	0,36917822
Standard Error	0,369551078
Observations	188

Table 4.6: ANOVA of question 13

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	16,44807474	1,495279522	10,94897438	0.000
Residual	176	24,03596782	0,136567999		
Total	187	40,48404255			

Table 4.7: P-value analysis of question 13

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.272	0.108	2.527	0.012	0.060	0.484	0.060	0.484
Q14	0.134	0.037	3.643	0.000	0.061	0.207	0.061	0.207
Q7	0.372	0.060	6.218	0.000	0.254	0.490	0.254	0.490
Q17	0.184	0.058	3.160	0.002	0.069	0.299	0.069	0.299
Q19	-0.025	0.044	-0.564	0.574	-0.113	0.063	-0.113	0.063
Q20	0.011	0.047	0.233	0.816	-0.081	0.103	-0.081	0.103
Q21	-0.010	0.040	-0.264	0.792	-0.089	0.068	-0.089	0.068
Q22	0.018	0.037	0.491	0.624	-0.055	0.091	-0.055	0.091
Q23	-0.052	0.045	-1.155	0.250	-0.140	0.037	-0.140	0.037
Q24	-0.092	0.040	-2.292	0.023	-0.172	-0.013	-0.172	-0.013
Q31	0.073	0.058	1.263	0.208	-0.041	0.187	-0.041	0.187
Q34	-0.061	0.038	-1.579	0.116	-0.137	0.015	-0.137	0.015

Table 4.8: Correlation analysis of question 13

	Q14	Q7	Q17	Q19	Q20	Q21	Q22	Q23	Q24	Q31	Q34
Q13	0.261	0.427	0.292	-0.235	-0.276	-0.244	-0.210	-0.376	-0.374	0.226	-0.029

Multiple linear regression analysis was performed on questions 14 and 11, 13, 15, 18, 21, 23 and 34 (**Table 4.9, Table 4.10,** and **Table 4.11**) to determine if question 14 is significantly related to other questions. Overall, the regression is significant (R^2= 0.22, F (7, 180) =7.13, p<0.00).

More specifically, question 14 was significantly related to questions 13 (β=0.26; *p*=0.008), 18 (β=0.21; *p*=0.03), and 34 (β=0.24; *p*=0.001).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.12**). There was a weak to very weak, positive correlation between question 14 and 11 (r=0.21), 13 (r=0.26), 15 (r=0.17), 18 (r=0.21) and 34 (r=0.24). There was a weak to a very weak, negative correlation between question 14 and 21 (r=-0.19) and 23 (r=-0.28).

Table 4.9: Regression statistics for question 14

Multiple R	0,46586576
R Square	0,217030906
Adjusted R Square	0,186582108
Standard Error	0,731693885
Observations	188

Table 4.10: ANOVA for question 14

	df	*SS*	*MS*	*F*	*Significance F*
Regression	7	26,71211774	3,816016819	7,127733098	0.000
Residual	180	96,3676695	0,535375942		
Total	187	123,0797872			

Table 4.11: *P*-value analysis for question 14

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.193	0.193	1.000	0.319	-0.187	0.573	-0.187	0.573
Q11	0.089	0.056	1.580	0.116	-0.022	0.201	-0.022	0.201
Q13	0.330	0.125	2.648	0.009	0.084	0.577	0.084	0.577
Q15	0.176	0.124	1.420	0.157	-0.069	0.420	-0.069	0.420
Q18	0.145	0.067	2.172	0.031	0.013	0.277	0.013	0.277
Q21	-0.033	0.066	-0.494	0.622	-0.164	0.098	-0.164	0.098
Q23	-0.107	0.074	-1.447	0.150	-0.253	0.039	-0.253	0.039
Q34	0.244	0.073	3.325	0.001	0.099	0.389	0.099	0.389

Table 4.12: Correlation analysis for question 14

	Q11	Q13	Q15	Q18	Q21	Q23	Q34
Q14	0.210	0.261	0.173	0.212	-0.194	-0.285	0.243

Multiple linear regression analysis was performed on questions 15 and 11, 12, 13, 14, 17 and 26 (**Table 4.13, Table 4.14,** and **Table 4.15**) to determine if question 14 is significantly related to other questions. Overall, the regression is significant (R^2= 0.09, F (6, 181) =3.24, *p*=0.004).

More specifically, question 15 was significantly related to questions 26 (β=0.15; *p*=0.045).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.16**). There was a weak to very weak, positive correlation between question 15 and 11 (r=0.18), 12 (r=0.10), 13 (r=0.15), 14 (r=0.17), 17 (r=0.11) and 26 (r=0.15).

Table 4.13: Regression analysis of question 15

Multiple R	0,311735
R Square	0,097179
Adjusted R Square	0,067251
Standard Error	0,433165
Observations	188

Table 4.14: ANOVA of question 15

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	3,655581	0,609264	3,247115	0,004691
Residual	181	33,96144	0,187632		
Total	187	37,61702			

Table 4.15: *P*-value analysis of question 15

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.023	0.076	0.308	0.758	-0.127	0.174	-0.127	0.174
Q11	0.063	0.033	1.883	0.061	-0.003	0.128	-0.003	0.128
Q12	0.070	0.046	1.514	0.132	-0.021	0.162	-0.021	0.162
Q13	0.043	0.075	0.570	0.569	-0.105	0.191	-0.105	0.191
Q14	0.073	0.042	1.736	0.084	-0.010	0.156	-0.010	0.156
Q26	0.087	0.043	2.009	0.046	0.002	0.172	0.002	0.172
Q17	0.065	0.069	0.948	0.344	-0.070	0.200	-0.070	0.200

Table 4.16: Correlation analysis of question 15

	Q11	Q12	Q13	Q14	Q26	Q17
Q15	0.186	0.100	0.160	0.173	0.158	0.114

4.8.3 Psychological Impact Analysis

Multiple linear regression analysis was performed on questions 19 and 9, 13, 17, 18, 20, 21, 23, 25 and 26. (**Table 4.17, Table 4.18,** and **Table 4.19**) to determine if question 19 is significantly related to other questions. Overall, the regression is significant (R^2= 0.49, F (9, 178) =19.29, p<0.00).

More specifically, question 19 was significantly related to questions 20 (β=0.65; p<0.00), 21 (β=0.52; *p*=0.023), and 25 (β=0.15; *p*=0.03)

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.20**). There was a relatively strong, positive correlation between question 19 and 20 (r=0.65) and 21 (r=0.52). There was a moderate, positive correlation between question 19 and 23 (r=0.43). There was a weak to a very weak, negative correlation between question 19 and 9 (r=-0.19), 13 (r=-0.23), 17 (r=-0.22), 18 (r=-0.21) and 26 (r=-0.04).

Table 4.17: Regression analysis of question 19

Multiple R	0,70268092
R Square	0,49376047
Adjusted R Square	0,46816409
Standard Error	0,61008727
Observations	188

Table 4.18: ANOVA of question 19

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	64,6195883	7,17995426	19,2902456	0.000
Residual	178	66,2527521	0,37220647		
Total	187	130,87234			

Table 4:19: *P*-value analysis of question 19

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.708	0.168	4.226	0.000	0.377	1.038	0.377	1.038
Q9	-0.076	0.041	-1.832	0.069	-0.158	0.006	-0.158	0.006
Q17	-0.082	0.096	-0.856	0.393	-0.272	0.107	-0.272	0.107
Q18	-0.073	0.057	-1.282	0.201	-0.185	0.039	-0.185	0.039
Q25	0.121	0.056	2.159	0.032	0.010	0.231	0.010	0.231
Q26	-0.035	0.066	-0.531	0.596	-0.165	0.095	-0.165	0.095
Q13	-0.071	0.107	-0.658	0.512	-0.282	0.141	-0.282	0.141
Q20	0.414	0.067	6.212	0.000	0.283	0.546	0.283	0.546
Q21	0.143	0.063	2.289	0.023	0.020	0.267	0.020	0.267
Q23	0.088	0.064	1.381	0.169	-0.038	0.214	-0.038	0.214

Table 4.20: Correlation analysis of question 19

	Q13	Q9	Q17	Q18	Q25	Q26	Q13	Q20	Q21	Q23
Q19	-0.235	-0.195	-0.226	-0.216	0.159	-0.042	-0.235	0.653	0.527	0.436

Multiple linear regression analysis was performed on questions 20 and 2, 11, 12, 13, 14, 16, 17, 18, 21, 22, 23, 24, and 26 (**Table 4.21, Table 4.22,** and **Table 4.23**) to determine if question 20 is significantly related to other questions. Overall, the regression is significant (R^2= 0.53, F (14, 173) =14.07, p<0.00).

More specifically, question 20 was significantly related to questions 11 (β=-0.27; *p*=0.02.), 14 (β=-0.09; *p*=0.037), 18 (β=-0.19; *p*=0.037), 21 (β=0.60; p<0.00), 22 (β=0.47; p<0.00) and 23 (β=0.506; *p*=0.04).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.24**). There was a relatively strong, positive correlation between question 20 and 21 (r=0.60), 22 (r=), 23 (r=0.48) and 24 (r=0.46). There was a weak to very weak, positive correlation between question 20 and 2 (r=0.28) and 25 (r=0.05). There was a weak to a very weak, negative correlation between question 20 and 11 (r=-0.27), 12 (r=-0.23), 13 (r=-0.27), 14 (r=-0.09), 16 (r=-0.12), 17 (r=-0.09), 18 (r=-0.19) and 26 (r=-0.09).

Table 4.21: Regression analysis of question 20

Multiple R	0,730117255
R Square	0,533071206
Adjusted R Square	0,495285061
Standard Error	0,645152582
Observations	188

Table 4.22: ANOVA of question 20

	df	*SS*	*MS*	*F*	*Significance F*
Regression	14	82,2063852	5,871884657	14,10758373	0.000
Residual	173	72,00638076	0,416221854		
Total	187	154,212766			

Table 4.23: *P*-value analysis of question 20

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.388	0.232	1.674	0.096	-0.069	0.845	-0.069	0.845
Q14	0.138	0.066	2.099	0.037	0.008	0.268	0.008	0.268
Q16	0.100	0.102	0.982	0.327	-0.101	0.302	-0.101	0.302
Q17	-0.089	0.105	-0.847	0.398	-0.295	0.118	-0.295	0.118
Q18	-0.129	0.062	-2.095	0.038	-0.250	-0.007	-0.250	-0.007
Q25	0.049	0.061	0.803	0.423	-0.071	0.169	-0.071	0.169
Q26	-0.097	0.071	-1.363	0.175	-0.238	0.044	-0.238	0.044
Q2	0.134	0.103	1.298	0.196	-0.070	0.338	-0.070	0.338
Q11	-0.115	0.052	-2.213	0.028	-0.217	-0.012	-0.217	-0.012
Q12	-0.077	0.072	-1.064	0.289	-0.219	0.066	-0.219	0.066
Q13	-0.047	0.120	-0.389	0.698	-0.283	0.190	-0.283	0.190
Q21	0.335	0.064	5.250	0.000	0.209	0.461	0.209	0.461
Q22	0.215	0.064	3.357	0.001	0.088	0.341	0.088	0.341
Q23	0.158	0.077	2.046	0.042	0.006	0.310	0.006	0.310
Q24	0.111	0.073	1.534	0.127	-0.032	0.255	-0.032	0.255

Table 4.24: Correlation analysis of question 20

	Q14	Q16	Q17	Q18	Q25	Q26	Q2	Q11	Q12	Q13	Q21	Q22	Q23	Q24
Q20	-0.098	-0.120	-0.246	-0.196	0.058	-0.098	0.284	-0.271	-0.232	-0.276	0.604	0.477	0.507	0.462

Multiple linear regression analysis was performed on questions 21 and 2, 12, 13, 14, 16, 19, 20, 22, 23, 24, 25, and 26 (**Table 4.25, Table 4.26,** and **Table 4.27**) to determine if question 21 is significantly related to other questions. Overall, the regression is significant (R^2= 0.46, F (12, 175) =12.44, p<0.00).

More specifically, question 21 was significantly related to questions 12 (β=-0.24; *p*=0.03), 19 (β=0.52; *p*=0.015) and 20 (β=0.60; p<0.00).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.28**). There was a relatively strong, positive correlation between question 21 and 19 (r=0.52) and 20 (r=0.60). There was a weak to very weak, positive correlation between question 21 and 2 (r=0.24), 22 (r=0.42), 23 (r=0.45), 24 (r=0.34) and 25 (r=0.07). There was a weak to a very weak, negative correlation between question 21 and 12 (r=-0.24), 13 (r=-0.24), 14 (r=-0.19), 16 (r=-0.19), 16 (r=-0.12), and 26 (r=-0.05).

Table 4.25: Regression analysis of question 21

Multiple R	0,67855429
R Square	0,46043592
Adjusted R Square	0,42343724
Standard Error	0,70357753
Observations	188

Table 4.26: ANOVA of question 21

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	73,9244562	6,16037135	12,444658	0.000
Residual	175	86,6287353	0,49502134		
Total	187	160,553191			

Table 4.27: *P*-value analysis of question 21

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.508	0.226	2.254	0.025	0.063	0.954	0.063	0.954
Q25	0.011	0.067	0.164	0.870	-0.121	0.143	-0.121	0.143
Q26	-0.045	0.076	-0.592	0.554	-0.195	0.105	-0.195	0.105
Q12	-0.165	0.078	-2.110	0.036	-0.320	-0.011	-0.320	-0.011
Q13	-0.050	0.127	-0.392	0.695	-0.301	0.201	-0.301	0.201
Q14	-0.094	0.068	-1.375	0.171	-0.228	0.041	-0.228	0.041
Q16	-0.173	0.111	-1.562	0.120	-0.391	0.045	-0.391	0.045
Q19	0.207	0.085	2.449	0.015	0.040	0.374	0.040	0.374
Q20	0.330	0.085	3.868	0.000	0.162	0.499	0.162	0.499
Q22	0.113	0.070	1.613	0.109	-0.025	0.252	-0.025	0.252
Q23	0.142	0.084	1.686	0.093	-0.024	0.309	-0.024	0.309
Q24	-0.052	0.078	-0.662	0.509	-0.206	0.102	-0.206	0.102
Q2	0.030	0.112	0.265	0.792	-0.192	0.252	-0.192	0.252

Table 4.28: Correlation analysis of question 21

	Q25	Q26	Q12	Q13	Q14	Q16	Q19	Q20	Q22	Q23	Q24	Q2
Q21	0.071	-0.056	-0.250	-0.244	-0.194	-0.193	0.527	0.604	0.429	0.455	0.350	0.241

Multiple linear regression analysis was performed on questions 22 and 2, 9, 11, 13, 19, 20, 21, 22, 23, and 24 (**Table 4.29, Table 4.30,** and **Table 4.31**) to determine if question 22 is significantly related to other questions. Overall, the regression is significant (R^2= 0.299, F (9, 178) =8.465, p<0.00).

More specifically, question 22 was significantly related to question 20 (β=0.47; *p*=0.02).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.32**). There was a moderate, positive correlation between question 22 and 20 (r=0.47) and 21 (r=0.42), 23 (r=0.40). There was a weak to very weak, positive correlation between question 22 and 2 (r=0.24), and 24 (r=0.33). There was a weak to a very weak, negative correlation between question 22 and 9 (r=-0.04), 11 (r=-0.10), and 13 (r=-0.20).

Table 4.29: Regression analysis of question 22

Multiple R	0,54747356
R Square	0,2997273
Adjusted R Square	0,26432025
Standard Error	0,74904736
Observations	188

Table 4.30: ANOVA of question 22

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9	42,7462147	4,74957941	8,46518781	0.000
Residual	178	99,8708066	0,56107195		
Total	187	142,617021			

Table 4.31: *P*-Value analysis of question 22

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.19	0.21	0.93	0.35	-0.21	0.60	-0.21	0.60
Q9	0.04	0.05	0.66	0.51	-0.07	0.14	-0.07	0.14
Q11	0.04	0.06	0.67	0.50	-0.08	0.16	-0.08	0.16
Q2	0.17	0.12	1.43	0.16	-0.06	0.39	-0.06	0.39
Q19	0.08	0.09	0.93	0.35	-0.09	0.26	-0.09	0.26
Q20	0.21	0.09	2.31	0.02	0.03	0.40	0.03	0.40
Q21	0.15	0.08	1.87	0.06	-0.01	0.30	-0.01	0.30
Q13	-0.06	0.13	-0.43	0.67	-0.32	0.20	-0.32	0.20
Q23	0.14	0.09	1.59	0.11	-0.03	0.31	-0.03	0.31
Q24	0.05	0.08	0.54	0.59	-0.12	0.21	-0.12	0.21

Table 4.32: Correlation analysis of question 22

	Q9	Q11	Q2	Q19	Q20	Q21	Q13	Q23	Q24
Q22	-0.044	-0.102	0.242	0.399	0.477	0.429	-0.210	0.408	0.332

Multiple linear regression analysis was performed on questions 23 and 2, 11, 13, 14, 18, 19, 20, 21, 22, 25 and 26 (**Table 4.33, Table 4.34,** and **Table 4.35**) to determine if question 23 is

significantly related to other questions. Overall, the regression is significant (R^2= 0.39, F (11, 176) =10.48, p<0.00).

More specifically, question 22 was significantly related to question 13 (β=-0.37; *p*=0.003), 14 (β=-0.28; *p*=0.03) and 20 (β=0.50; *p*=0.019).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.36**). There was a moderate, positive correlation between question 23 and 20 (r=0.50), 19 (r=0.43), 22 (r=0.44), and 21 (r=0.45). There was a weak to very weak, positive correlation between question 23 and 2 (r=0.24), and 25 (r=0.01). There was a weak to a very weak, negative correlation between question 22 and 11 (r=-0.19), 13 (r=-0.37), 14 (r=-0.28) and 26 (r=-0.03).

Table 4.33: Regression analysis of question 23

Multiple R	0,62918986
R Square	0,39587988
Adjusted R Square	0,35812237
Standard Error	0,69437511
Observations	188

Table 4.34: ANOVA of question 23

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	55,6084888	5,05531716	10,4847991	0.000
Residual	176	84,8595963	0,4821568		
Total	187	140,468085			

Table 4.35: *P*-value of question 23

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.004	0.160	6.275	0.000	0.688	1.320	0.688	1.320
Q11	-0.017	0.055	-0.307	0.759	-0.126	0.092	-0.126	0.092
Q14	-0.148	0.069	-2.146	0.033	-0.284	-0.012	-0.284	-0.012
Q18	-0.045	0.067	-0.665	0.507	-0.177	0.088	-0.177	0.088
Q25	-0.013	0.066	-0.203	0.839	-0.143	0.116	-0.143	0.116
Q26	0.044	0.074	0.586	0.559	-0.103	0.191	-0.103	0.191
Q2	0.145	0.109	1.333	0.184	-0.070	0.360	-0.070	0.360
Q13	-0.352	0.119	-2.947	0.004	-0.587	-0.116	-0.587	-0.116
Q19	0.093	0.085	1.092	0.276	-0.075	0.260	-0.075	0.260
Q20	0.205	0.087	2.352	0.020	0.033	0.376	0.033	0.376
Q21	0.112	0.073	1.533	0.127	-0.032	0.255	-0.032	0.255
Q22	0.135	0.070	1.930	0.055	-0.003	0.273	-0.003	0.273

Table 4.36: Correlation analysis of question 23

	Q11	Q14	Q18	Q25	Q26	Q2	Q13	Q19	Q20	Q21	Q22
Q23	-0.195	-0.285	-0.172	0.020	-0.038	0.240	-0.376	0.436	0.507	0.455	0.408

Multiple linear regression analysis was performed on questions 24 and 2, 11, 13, 14, 18, 19, 20, 21, 22 and 23 (**Table 4.37, Table 4.38,** and **Table 4.39**) to determine if question 24 is significantly related to other questions. Overall, the regression is significant (R^2= 0.46, F (10, 177) =15.17, p<0.00).

More specifically, question 24 was significantly related to question 11 (β=-0.29; *p*=0.008), 13 (β=-0.37; *p*=0.007) and 23 (β=0.61; p<0.00).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.40**). There was a moderate to strong, positive correlation between question 24 and 20 (r=0.46), and 23 (r=0.61). There was a weak to very weak, positive correlation between question 24 and 2 (r=0.21), 19 (r=0.36), 21 (r=0.34) and 22 (r=0.33). There was a weak to a very weak, negative correlation between question 24 and 11 (r=-0.29), 13 (r=-0.37), 14 (r=-0.15), and 18 (r=-0.11).

Table 4.37: Regression analysis of question 24

Multiple R	0,67944341
R Square	0,46164335
Adjusted R Square	0,43122772
Standard Error	0,67146346
Observations	188

Table 4.38: ANOVA of question 24

	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	68,4312605	6,84312605	15,1778331	0.000
Residual	177	79,8027821	0,45086318		
Total	187	148,234043			

Table 4.39: *P*-value analysis of question 24

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.746	0.168	4.441	0.000	0.415	1.078	0.415	1.078
Q11	-0.142	0.053	-2.667	0.008	-0.247	-0.037	-0.247	-0.037
Q14	0.087	0.067	1.289	0.199	-0.046	0.220	-0.046	0.220
Q18	-0.014	0.064	-0.215	0.830	-0.140	0.112	-0.140	0.112
Q13	-0.316	0.117	-2.694	0.008	-0.547	-0.084	-0.547	-0.084
Q2	0.069	0.103	0.672	0.502	-0.134	0.273	-0.134	0.273
Q19	0.018	0.081	0.228	0.820	-0.141	0.178	-0.141	0.178
Q20	0.114	0.085	1.335	0.184	-0.054	0.282	-0.054	0.282
Q21	-0.022	0.071	-0.312	0.755	-0.162	0.118	-0.162	0.118
Q22	0.043	0.068	0.636	0.526	-0.091	0.178	-0.091	0.178
Q23	0.478	0.073	6.570	0.000	0.335	0.622	0.335	0.622

Table 4.40: Correlation analysis of question 24

	Q11	Q14	Q18	Q13	Q2	Q19	Q20	Q21	Q22	Q23
Q24	-0.297	-0.153	-0.120	-0.374	0.219	0.361	0.462	0.350	0.332	0.619

4.8.4 Academic Impact Analysis

Multiple linear regression analysis was performed on questions 7 and 13, 29, 30, 33a, 34, 35 (**Table 4.41, Table 4.42,** and **Table 4.43**) to determine if question 7 is significantly related to other questions. Overall, the regression is significant (R^2= 0.24, F (6, 181) =9.79, p<0.00).

More specifically, question 7 was significantly related to questions 13 (β=0.42; p<0.00), 29 (β=0.09; *p*=0.02), and 30 (β=-0.11; *p*=0.02).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.44**). There was a moderate, positive correlation between question 7 and 13 (r=0.43). There was a weak to very weak, positive correlation between question 7 and 29 (r=0.09), 33a (r=0.15), 34 (r=0.04) and 35 (r=0.20). There was a weak to a very weak, negative correlation between question 7 and question 30 (r=-0.11).

Table 4.41: Regression analysis of question 7

Multiple R	0,495152
R Square	0,2451755
Adjusted R Square	0,2201537
Standard Error	0,41274839
Observations	188

Table 4.42: ANOVA of question 7

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	10,0156802	1,66928003	9,79847337	0.000
Residual	181	30,8353836	0,17036124		
Total	187	40,8510638			

Table 4.43: *P*-value analysis of question 7

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.053	0.088	0.605	0.546	-0.120	0.226	-0.120	0.226
Q13	0.418	0.070	5.939	0.000	0.279	0.557	0.279	0.557
Q29	0.146	0.062	2.338	0.021	0.023	0.269	0.023	0.269
Q30	-0.200	0.089	-2.251	0.026	-0.374	-0.025	-0.374	-0.025
Q33 a	0.074	0.063	1.169	0.244	-0.051	0.199	-0.051	0.199
Q34	0.042	0.042	0.999	0.319	-0.041	0.124	-0.041	0.124
Q35	0.016	0.028	0.557	0.578	-0.040	0.072	-0.040	0.072

Table 4.44: Correlation analysis of question 7

	Q13	Q29	Q30	Q33 a	Q34	Q35
Q7	0.427	0.097	-0.120	0.157	0.048	0.210

Multiple linear regression analysis was performed on questions 31 and 27, 29, 30, 32 and 35 (**Table 4.45, Table 4.46,** and **Table 4.47**) to determine if question 7 is significantly related to other questions. Overall, the regression is significant (R^2= 0.15, F (5, 182) =6.42, p<0.00).

More specifically, question 31 was significantly related to questions 27 (β=0.07; *p*=0.03), 30 (β=-0.19.; *p*=0.004), 32 (β=0.21; *p*=0.02), and 35 (β=0.22; p<0.00).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.48**). There was a weak to very weak, positive correlation between question 31 and 32 (r=0.21), question 27 (r=0.07) and 35 (r=0.22). There was a weak to a very weak, negative correlation between question 31 and 29 (r=-0.08) and 30 (r=-0.19).

Table 4.45: Regression analysis of question 31

Multiple R	0,387463
R Square	0,150128
Adjusted R Square	0,126779
Standard Error	0,463254
Observations	188

Table 4.46: ANOVA of question 31

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	6,8994812	1,3798962	6,42995898	1,5817E-05
Residual	182	39,057966	0,2146042		
Total	187	45,957447			

Table 4.47: *P*-value analysis of question 31

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.318	0.081	3.918	0.000	0.158	0.478	0.158	0.478
Q27	0.456	0.217	2.102	0.037	0.028	0.885	0.028	0.885
Q29	-0.085	0.069	-1.236	0.218	-0.221	0.051	-0.221	0.051
Q30	-0.283	0.099	-2.855	0.005	-0.479	-0.088	-0.479	-0.088
Q32	0.186	0.080	2.318	0.022	0.028	0.344	0.028	0.344
Q35	0.115	0.030	3.821	0.000	0.056	0.175	0.056	0.175

Table 4.48: Correlation analysis of question 31

	Q27	Q29	Q30	Q32	Q35
Q31	0.072	-0.081	-0.198	0.214	0.227

Multiple linear regression analysis was performed on questions 32 and 8, 9, 10, 19, 22 and 31 (**Table 4.49, Table 4.50,** and **Table 4.51**) to determine if question 32 is significantly related to other questions. Overall, the regression is significant (R^2= 0.07, F (6, 181) =2.51, *p*=0.02).

More specifically, question 32 was significantly related to questions 19 (β=-0.19; *p*=0.04) and 31 (β=0.21; *p*=0.04).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.52**). There was a weak to very weak, positive correlation between question 32 and 9 (r=0.08), question 10 (r=0.09) and 31 (r=0.21). There was a weak to a very weak, negative correlation between question 32 and 8 (r=-0.008), 19 (r=-0.19) and 22 (r=-0.15).

Table 4.49: Regression analysis of question 32

Multiple R	0,27742787
R Square	0,07696622
Adjusted R Square	0,04636842
Standard Error	0,41457028
Observations	188

Table 4.50: ANOVA of question 32

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	2,59392539	0,4323209	2,51541642	0,02311912
Residual	181	31,1082023	0,17186852		
Total	187	33,7021277			

Table 4.51: *P*-Value analysis of question 32

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.219	0.109	2.012	0.046	0.004	0.434	0.004	0.434
Q8	0.013	0.062	0.214	0.831	-0.109	0.135	-0.109	0.135
Q9	0.018	0.029	0.642	0.522	-0.038	0.075	-0.038	0.075
Q10	0.036	0.029	1.243	0.216	-0.021	0.094	-0.021	0.094
Q22	-0.026	0.038	-0.693	0.489	-0.102	0.049	-0.102	0.049
Q19	-0.082	0.040	-2.031	0.044	-0.162	-0.002	-0.162	-0.002
Q31	0.128	0.062	2.063	0.041	0.006	0.250	0.006	0.250

Table 4.52: Correlation analysis of question 32

	Q8	Q9	Q10	Q22	Q19	Q31
Q32	-0,891%	8,677%	9,493%	-15,377%	-19,915%	21,409%

Multiple linear regression analysis was performed on questions 34 and 6, 11, 14, 19, 25, 29 and 30 (**Table 4.53, Table 4.54,** and **Table 4.55**) to determine if question 34 is significantly related to other questions. Overall, the regression is significant (R^2= 0.14, F (7, 180) =4.29, p<0.00).

More specifically, question 34 was significantly related to questions 6 (β=0.19; *p*=0.003), 14 (β=0.24; *p*=0.007), 25 (β=-0.15; *p*=0.04) and 29 (β=-0.15; *p*=0.01).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.56**). There was a weak to very weak, positive correlation between question 34 and 6 (r=0.19), question 11 (r=0.06) and 14 (r=0.24). There was a weak to a very weak, negative correlation between question 32 and 19 (r=-0.07), 25 (r=-0.15), 29 (r=-0.15) and 30 (r=-0.07).

Table 4.53: Regression analysis of question 34

Multiple R	0,3783389
R Square	0,1431404
Adjusted R Square	0,109818
Standard Error	0,6962353
Observations	188

Table 4.54: ANOVA of question 34

	df	*SS*	*MS*	*F*	*Significance F*
Regression	7	14,575952	2,0822789	4,2956302	0,0002034
Residual	180	87,253835	0,4847435		
Total	187	101,82979			

Table 4.55: *P*-value analysis of question 34

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.981	0.136	7.217	0.000	0.712	1.249	0.712	1.249
Q29	-0.258	0.106	-2.434	0.016	-0.466	-0.049	-0.466	-0.049
Q30	0.086	0.156	0.550	0.583	-0.221	0.393	-0.221	0.393
Q6	0.322	0.110	2.934	0.004	0.105	0.538	0.105	0.538
Q11	0.027	0.055	0.491	0.624	-0.081	0.134	-0.081	0.134
Q14	0.180	0.066	2.711	0.007	0.049	0.310	0.049	0.310
Q19	-0.014	0.063	-0.227	0.821	-0.138	0.110	-0.138	0.110
Q25	-0.126	0.061	-2.053	0.042	-0.247	-0.005	-0.247	-0.005

Table 4.56: Correlation analysis of question 34

	Q29	Q30	Q6	Q11	Q14	Q19	Q25
Q34	-0.155	-0.070	0.199	0.067	0.243	-0.078	-0.156

Multiple linear regression analysis was performed on questions 35 and 7, 11, 14, 23, 24, 27, 29, 30, 31, 33a (**Table 4.57, Table 4.58,** and **Table 4.59**) to determine if question 24 is significantly related to other questions. Overall, the regression is significant (R^2= 0.2, F (10, 177) =4.5, p<0.00).

More specifically, question 35 was significantly related to question 7 (β=0.20; *p*=0.04), 27 (β=-0.19; *p*=0.003) and 23 (β=-0.13; *p*=0.001).

A further Pearson correlation analysis was performed to determine the strength and direction of relationships between the above questions (**Table 4.60**). There was a weak to very weak, positive correlation between question 35 and 7 (r=0.20), 11 (r=0.17), 14 (r=0.12), 29 (r=0.16), 30 (r=0.09), 31 (r=0.22) and 33a (r=0.20). There was a weak to a very weak, negative correlation between question 35 and 23 (r=-0.13), 24 (r=-0.18), 27 (r=-0.19).

Table 4.57: Regression Analysis of question 35

Multiple R	0,451046
R Square	0,203442
Adjusted R Square	0,158439
Standard Error	1,070985
Observations	188

Table 4.58: ANOVA of question 35

	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	51,85182	5,185182	4,5206131	0.000
Residual	177	203,0205	1,1470086		
Total	187	254,8723			

Table 4.59: *P*-value analysis for question 35

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.763	0.280	6.291	0.000	1.210	2.316	1.210	2.316
Q29	0.276	0.163	1.692	0.092	-0.046	0.597	-0.046	0.597
Q30	0.388	0.239	1.625	0.106	-0.083	0.860	-0.083	0.860
Q11	0.066	0.087	0.752	0.453	-0.107	0.238	-0.107	0.238
Q23	0.027	0.120	0.224	0.823	-0.210	0.264	-0.210	0.264
Q7	0.356	0.176	2.029	0.044	0.010	0.703	0.010	0.703
Q14	0.098	0.104	0.939	0.349	-0.108	0.303	-0.108	0.303
Q24	-0.108	0.119	-0.906	0.366	-0.343	0.127	-0.343	0.127
Q27	-1.496	0.499	-3.001	0.003	-2.480	-0.512	-2.480	-0.512
Q31	0.546	0.169	3.234	0.001	0.213	0.879	0.213	0.879
Q33 a	0.229	0.166	1.375	0.171	-0.100	0.557	-0.100	0.557

Table 4:60: Correlation analysis of question 35

	Q29	Q30	Q11	Q23	Q7	Q14	Q24	Q27	Q31	Q33 a
Q35	0.160	0.096	0.174	-0.137	0.210	0.127	-0.184	-0.198	0.227	0.200

4.8.5 Analysis of Time Spent on Studying and Academic Marks

Students who spent less than three hours on work were more likely to have their marks worsen (**Table 4.61**). Only 20% of students who spent less than one hour a day on work had their marks improved, whereas 40% had their marks worsen. Similarly, 60% of students who spent between one to two hours on work a day had their marks worsen.

Table 4.61: Time spent on studying during the pandemic versus the academic marks on return to campus

	Q35					
	Option	**0**	**1**	**2**	**3**	**4**
Q34	**Mapping**	0-1hr	1-2hr	2-3hr	3-4hr	5hrs+
Option	**Mapping**					
0	Yes my marks improved	2	5	7	12	13
1	Yes my marks worsened	4	21	26	18	13
2	No my marks remained unchanged	4	9	21	19	14
	Percentage					
	Yes my marks improved	20%	14%	13%	24%	33%
	Yes my marks worsened	40%	60%	48%	37%	33%
	No my marks remained unchanged	40%	26%	39%	39%	35%

4.9 CONCLUSION

This chapter outlined the data collected from the Chiropractic students in South Africa. The data presents the social, psychological, personal, and academic impact of the SARS-CoV-2 pandemic on the mental health of the Chiropractic students in South Africa. Additionally, the chapter also explored the comparison and influence of each impact on each other was explored.

CHAPTER FIVE

DISCUSSION

5.1 INTRODUCTION

This research study has investigated the effects of the SARS-CoV-2 pandemic on the mental health of Chiropractic students in SA. This chapter includes a discussion of the results that were presented in the previous chapter. This includes the demographics of the Chiropractic students in South Africa and the social, personal, psychological, and academic impact of the SARS-CoV-2 pandemic on the mental health of Chiropractic students in SA.

5.2 SAMPLE SIZE AND RESPONSE RATE

In 2022, 364 Chiropractic students were registered to study Chiropractic in SA. This consisted of 163 students registered at the UJ and the 201 students registered at DUT. Out of the 364 students, 188 completed the survey which equates to a response rate of 51.66%.

The DUT had a response rate of 59.2% and the UJ had a response rate of 42.3%. The higher response rate from the DUT was more likely due to the direct access of the researcher to the students and personal relationships with peers, as the researcher was a student at the DUT.

5.3 DEMOGRAPHICS

The age results were evenly distributed, with the majority of the students ranging from 19 to 25 years of age. The study involved second year students and above, which explains why no students reported to be younger than 19 years of age. This is an expected result as a high percentage of students normally start studying a degree directly after high school, or a year or two after matriculating. The remaining students who were greater than, and including, the age of 25 years of age came to a percentage of 22.87%. This is also an expected result as some students may be studying their second degree or have taken longer than expected to finish the course and may have had to repeat some levels.

The results showed a higher percentage of female participation (59.57%), in comparison to male participation (39.36%). Only two students identified as “other” which made up a percentage of 1.06%. A study by O ‘Connor and Yelverton (2022) also assessed the effect that SARS-CoV-2 had on Chiropractic students in South Africa and also had a higher

percentage (71.9%) of female responses compared to male responses (25%). Furthermore, in an email communication on the11th May 2023, Head of Chiropractic Department at the UJ, Dr Ismail, indicated that the percentage of registered female students in relation to registered male students is relatively higher, and in 2022, only 25.62% of registered students at the UJ were male, whereas 74.38% were female. In an email communication method on 29th March 2023, Prabashnee Kiston, indicated that the DUT also reported a higher percentage of registered female Chiropractic students (54.7%) compared to registered male students (45.3%). This aligns with previous research in Chiropractic education in South Africa and the overall higher enrolment of females in universities.

The participants represented diverse ethnic backgrounds, reflecting South Africa's multicultural society. The study included Asian, Black, Coloured and White participants, spread out amounts the years. This was an expected result as South Africa has a wide diversity of ethnic groups. Additionally, the responses from each year of study were also relatively well distributed. The majority of the responses came from the students in third and fourth year, which is expected, as there were more students registered for the Bachelor of Health Science programme in comparison to those registered for the Master of Health Science programme, as mentioned in Chapter Three.

A study by Mlambo (2018) found that there was a rapid growth in urban populations in South Africa and so it would be expected that the majority of student would be staying in urban locations. This trend was seen in the results, where 97% of students reported to be staying in urban areas, in line with the urbanisation trend in South Africa.

The rural analysis identified that 62% of students living in rural areas felt that their progress in university work was hampered during the pandemic. This was determined by dividing the number of students in rural areas who felt that their progress was hampered (*n*=8) over the number of students in rural areas (*n*=13), multiplied by 100. The urban analysis identified that 69% of students living in urban areas felt that their progress in university work was hampered. This was determined by dividing the number of students in urban areas who felt that their progress was hampered (*n*=120) over the number of students in rural areas (*n*=175), multiplied by 100. The percentage of responses were relatively similar between urban and rural settlements. Hence, it is inconclusive whether the bias between rural and urban settlements is present. As such, it can be concluded that, for the purposes of this research, the bias was not present.

As mentioned in Chapter Four, the majority of the responses came from students at DUT. This result is typical considering that the lead researcher was a student at the DUT and had personal relationships with the majority of the students.

5.4 SOCIAL IMPACT

The SARS-CoV-2 pandemic seemed to have a social impact on the students in the current study. First, the majority of students reported feeling uneasy when in close proximity to people not wearing masks. This could be due to the WHO guidelines that stated that wearing masks was important to limit transmission of SARS-CoV-2, which sometimes resulted in people who chose not to wear masks being "socially punished" (Betsch *et al.* 2020).

Secondly, the majority of students reported experiencing increased conflict on occasion during the lockdown period. The practice of social distancing during the pandemic necessitated household members spending extended periods together, often within limited personal space. This may have created a home environment that had significant potential for conflict, as family members found themselves in close proximity for extended hours within a confined physical setting, all the while navigating through a stressful situation (Behar-Zusman 2020). An environment with high levels of family conflict can potentially be toxic, acting as a stressor that worsens the negative effects of major stressful life events (Avison 2010).

Third, the highest percentage (55.32%) of students reported access to campus not being negatively impacted by the vaccine, but a large percentage (44%) of students were negatively impacted. One could assume that the majority of students who were unaffected most likely used the vaccine, and it could be inferred that the majority, if not all, of the students who were affected did not adhere to the university vaccine mandate, unless they were affected in some other capacity.

Fourthly, the findings of the current study revealed that students spent more time than usual on social media. Chaturvedi *et al.* (2021) conducted a study that also found a significant increase in social media usage among the majority of their respondents during the pandemic. They further discovered that students used social media platforms as a stress reliever. A similar study found that most of the younger respondents who used social media during the pandemic used it for learning and knowledge, in a social support manner, for sharing pandemic updates, for coping strategies, and seeking information on the current state of the pandemic (Saud *et al.* 2020). Nevertheless, despite the benefits of social media, a study found that the excessive utilisation of social media during the pandemic resulted in more adverse mental health outcomes, specifically an increase in depression (Haddad *et al.* 2021).

Fifth, most students from both universities felt that appropriate social distancing rules were in place. The South African government had very strict guidelines to promote social distancing

and to prevent the spread of the virus, which included mask wearing, physical distancing rules, maximum venue capacities and alcohol sanitisers (Dzobo *et al.* 2022).

The SARS-CoV-2 pandemic majorly impacted students in the social context. Namely, the majority of students expressed that they experienced discomfort when they came into close proximity to individuals not wearing masks which was emphasised by WHO as a necessary guideline to abide to. Those who chose not to wear masks also potentially faced social repercussions as a consequence. Additionally, students also reported experiencing more conflicts than usual in the household setting. Families were subjected to spending more time with each other while some families were additionally suffering from financial and emotional burdens caused by the pandemic. This led to stressful residential environments and impacts on individual's well-being.

5.5 PERSONAL IMPACT

The SARS-CoV-2 pandemic seems to have had an impact on various aspects of personal functioning. The overall productivity of the majority of students was reduced. There are a number of factors that could have contributed to this lower productivity. A study on employees working from home found that social isolation, interference of family life and distracting working environments all led to a decrease in work productivity (Galanti *et al.* 2021). Students in the current study reported to having more personal household responsibilities during the pandemic (such as meal prepping, washing dishes or clothes, and/or cleaning up around the house). The pandemic seemed to create scenarios in which academic and familial responsibilities clashed, with students needing to undergo a change in their study and work routine. Students who have had to live with their parents or move back in with their parents during the pandemic, might have been exposed to new challenges which may have impacted them negatively. Every student faced unique challenges, such as varying parental education levels, crowded living conditions, limited access to computers or functional devices, inadequate internet connectivity, and language disparities between teaching and the languages spoken by parents or siblings (Fisher *et al.* 2020). Students had to not only deal with academic-related responsibilities but also may have had to deal with home responsibilities, such as interpersonal conflicts and financial troubles (Zainal *et al.* 2022)

Students sleep also seemed to be impacted by the pandemic, with most students reporting an increase in their sleeping hours. A number of studies found sleep time increased during lockdown (Li *et al.* 2020; Marelli *et al.* 2021; Voitsidis *et al.* 2020). A study by Trakada *et al.* (2020) highlighted that younger individuals, younger than 25 years of age, reported to have longer sleeping hours compared to the respondents aged 45 to 54 years. The evidence also

pointed out that those in a higher education level, secondary and tertiary education, reported to have slept more. A possible reason of increased sleep may be attributed to high rates of depression during the pandemic. Depression is known to cause symptoms of fatigue, difficulty sleeping or oversleeping (National Institute of Mental Health 2023). Contrary to this, the study also noted that findings in Brazil revealed a decline in the duration of sleep, which was believed to be attributed to heightened fear and anxiety stemming from the significant number of SARS-CoV-2 cases and deaths in the country (Trakada *et al.* 2020).

A considerable percentage of students needed to cope with a death of someone close to them during the pandemic. In a qualitative study conducted on individuals who had a family member or friend affected by SARS-COV-2, it was discovered that those who experienced the loss of a loved one were more prone to experiencing symptoms of both depression and anxiety (Khubchandani *et al.* 2022). Interestingly, a study found that there were slightly higher rates of suicide in younger individuals compared to pre-SARS-COV-2 times (Goto *et al.* 2022).

Even though the majority of students' families did not encounter financial difficulties during the pandemic, a large number (43%) still did. A study done in South Africa described how the SARS-CoV-2 pandemic worsened the financial position of South Africans (Burger *et al.* 2021). The reduction of domestic leisure travel, combined with a reduction in business travel and the need to adhere to SARS-CoV-2 health and safety protocols resulted in significant financial setbacks for South African local businesses. This led to businesses having to downsize, retrench workers, reduce their prices, and increase their marketing expenses (Rogerson *et al.* 2020). These instances may have been the reason for the reduction in some students' households.

Physical activity was also affected by the pandemic with approximately half of the participants acknowledging a decrease in their physical activity levels, and interestingly one quarter reporting an increase. Perhaps the reasons for a more sedentary lifestyle may have been due to the disruptions to daily routines, constraints to outdoor activities, the closure of gyms and parks, mental fatigue, and diminished social interaction, which can impact gym partnerships and motivation (Di Renzo *et al.* 2020; Rodgers 2020; Robertson *et al.* 2021). Increased levels of activity may be attributed to boredom during lockdown or as a coping mechanism, reducing the stress related to the pandemic (Brand *et al.* 2020).

5.6 PSYCHOLOGICAL IMPACT

A trend was seen in this section of the questionnaire, in which the majority of the participants selected "sometimes" as their answer in questions 19 to 24. This highlights a possible bias

that may have occurred, where participants were more likely to select an average answer rather than an extreme answer.

The majority of students indicated to have experienced the following during lockdown more than usual:

- Felt more anxious.
- Struggled more to control their thoughts.
- Withdrew from people.
- Had less motivation to do tasks.
- Found it more difficult to concentrate.

University students have been identified as being at risk of mental health problems, prior to and during the pandemic. Multiple studies have highlighted the high levels of mental health issues in university students compared to the general population (Denovan *et al.* 2017; Mortier *et al.* 2018; Tran *et al.* 2017; Williams *et al.* 2018). The results from this current study reported that 92.02% of the Chiropractic respondents experienced some level of anxiety during the pandemic. This is a far higher percentage than a previous study done in South Africa prior to the pandemic where only 20.8% of students reported to have generalised anxiety disorder at least once in their lifetime (Bantjes *et al.* 2019).

Research conducted on students during the pandemic in Pretoria, SA, identified a third of the participants to have experienced psychological challenges during lockdown, with 22.1% of students describing the experience as traumatic. Almost half of the students (45.6%) experienced anxiety and 35% experienced depression (Visser and Wyk 2021).

The results of this study are similar to a study of university students, attending private and public universities in Bangladesh, which found that 97% of the participants experienced some degree of anxiety during the outbreak of the pandemic (Dhar *et al.* 2020). A further study found that among the students at a university in Pakistan, 34% suffered with moderate-severe anxiety and 24% of students suffered from moderately severe to severe depression (Salman *et al.* 2020). Furthermore, it was found that 29.8% of students participating in a survey at a university in Malaysia reported varied levels of anxiety (Sundarasen *et al.* 2020). Research conducted in Egypt found that students showed signs of psychological symptoms, with 70.5% suffering from anxiety, 53.6% suffering from depression and 47.8% suffering from stress (Ghazawy *et al.* 2021). A study in China also found that 24.9% of students suffered from anxiety (Cao *et al.* 2020). The study identified certain stressors that were linked to those suffering from anxiety, such as economic stressors, academic delays, and effects on daily life, as well as also identified social support as a factor that reduced the chances of having anxiety.

Regarding substance use, the majority of students did not consume more alcohol or smoke more cigarettes than usual. However, 36.7% of students reported increased alcohol consumption, and 18.08% acknowledged smoking more cigarettes compared to their usual patterns. This finding raises a concern of where the students were purchasing the alcohol and cigarettes, due to the alcohol and smoking ban set by the government in South Africa during lockdown. A study found that some South Africans were able to purchase cigarettes, as well as alcohol. Those who had access to cigarettes were also more likely to have access to alcohol (Egbe *et al.* 2022). Among individuals who escalated their alcohol consumption during the pandemic, Chodkiewicz *et al.* (2020) found that a significant proportion had engaged in heavy drinking prior to its onset and experienced more severe mental health issues. These individuals seemingly relied on substances as a familiar coping mechanism to mitigate stress. Consequently, their overall mental well-being was compromised, particularly in terms of their daily functioning and manifestation of depressive symptoms (Chodkiewicz *et al.* 2020).

The participants in the current study who reported experiencing heightened anxiety during the lockdown period were also more inclined to indicate increased occurrences of low mood and difficulties in controlling their thoughts compared to their usual state. Moreover, those who experienced more frequent episodes of low mood were also more likely to admit struggling with thought control and lacking motivation to perform tasks compared to their typical levels. Additionally, the study revealed a correlation between students who faced challenges in concentration and a decrease in motivation for task completion.

5.7 ACADEMIC IMPACT

According to the findings, a significant number of students experienced a disturbance in their academic progress while in isolation. This finding is similar to a study conducted on employees working from home during the pandemic which found a large majority of participants reported a decrease in productivity rate (Morikawa 2020; Kitagawa *et al.* 2021). A study by Birmingham *et al.* (2021) found that 90.5% of students found it difficult to focus on their schoolwork and 91% of students struggled to find motivation to study. Although a level of stress can be beneficial in enhancing students' learning ability and motivation, too much stress can negatively affect students' academic performance, leading to decreased academic marks (Haines 1996).

The Department of Higher Education urged all South African universities to assist students with electronic devices and data during the pandemic, but one study found that not all universities did so, leaving some students without data or devices (Maphalala *et al.* 2021). However, the majority of students in this current study expressed satisfaction with the amount

of data provided by their respective universities, considering it to be sufficient. Additionally, most students reported having access to internet connectivity, enabling them to participate in online classes and assessments.

The SARS-CoV-2 pandemic led to a decline in patient volumes and limitations on the available treatment options (Davies and Browning 2021). Around three-quarters of the students in this current study felt that the pandemic had adversely affected their practical skills. Among the affected practical skills, patient interaction skills (*n*=116) were identified as the most impacted, followed by diagnostic skills (*n*=111) and palpation skills (*n*=82). This finding is similar to a study conducted by Lollobrigida *et al.* (2020) which concluded that distance learning was not a suitable substitute for practical clinical training, which forms the core foundation of medical education. To mitigate the disadvantages to students during the pandemic, while maintaining training programme quality, universities such as the UJ and the DUT adjusted their clinical requirements by reducing the target required to graduate (O'Connor and Yelverton 2022). This change in curriculum can however be concerning for the profession. The reduction in practical requirements has led to a reduction in overall practical exposure in their Chiropractic training which could impact the quality of the graduating Chiropractors.

The majority of students experienced a negative impact on their academic marks due to the pandemic, but about a third of students did not feel that their marks were affected at all. It seems that, in general, most students prefer face-to-face learning in comparison to online learning (Aguilera-Hermida 2020; Nasution *et al.* 2021); this may be one of the reasons why students' marks decreased. Another possible reason could be the psychological impact of the pandemic on the students. As stated, there were many psychological effects from the pandemic, one of them being a lack of motivation. Mahdavi *et al.* (2023) discovered that students with lower academic motivation, were less likely to achieve academically in their education. In addition, those students with more appropriate mental health are more likely have a higher level of motivation to achieve academically, which in turn will improve their performance.

The current results have also shown that the time dedicated to work per day during the lockdown was distributed across various categories, with two to three hours (28.72%) and three to four hours (26.06%) being the most commonly chosen options. The students' marks after returning to campus were relative to the time that they spent on work during the pandemic. Students who spent less amount of time on work (less than three hours a day) were more likely to have their marks worsen. However, students who spent more than five hours a day on work were more as likely to have their marks improve, rather than worsen.

The hours spent on work per day was relatively low compared to the face-to-face contact time that the students would have experienced if the pandemic did not occur. According to the first semester timetables for Chiropractic students at DUT, each year should spend an average of six hours per day on work (Durban University of Technology 2023). Similarly, the course at the UJ is also full time and requires an average of six hours of work per day. This highlights that students did not adhere to the adequate study or work time per module. The students may have found it difficult to adapt to the change in schedule when returning to campus after spending the low number of hours on work during the pandemic. Kapasia *et al*. (2020) also found that the majority of students (54.3%) reported spending less time on studying compared to their usual routine.

This study found that students faced challenges in their academic progress during isolation. Working from home had a direct correlation to decreased productivity. Students had difficulty focusing on schoolwork and finding motivation to study. Although students reported having access to electronic devices and enough data for online learning, practical skills, especially patient interaction, and diagnostic skills, were negatively impacted by distance learning. The majority of students also experienced a decrease in academic marks, possibly due to a preference for face-to-face learning and pandemic-related psychological effects. Students who spent less time on work during the pandemic had their marks decrease, while those who spent more time had mixed outcomes. Non-compliance with the recommended study time may have contributed to that decline in academic marks.

5.8 CONCLUSION

Chapter Five has included the discussion of the results. The following chapter will discuss the conclusion, limitations, and recommendations of the study.

CHAPTER SIX

CONCLUSION

6.1 INTRODUCTION

This chapter outlines the conclusions, limitations, and recommendations of this study. The chapter starts with the conclusion of this research study and relates it to the study aim. After the research conclusion, the limitations that were experienced during the investigation are addressed, followed by the recommendations that could be used for further research on similar studies.

6.2 CONCLUSION

This study provided insights into the demographics of the participants, including their age, gender, ethnic background, and academic level, which were consistent with typical characteristics of university students in SA. The social impact of the pandemic was evident, with students expressing discomfort around individuals not wearing masks and experiencing conflicts due to prolonged periods spent with household members in limited personal space. The personal impact of the pandemic was also evident, affecting students' general productivity, additional household responsibilities and conflicts, loss of loved ones, financial difficulties, reduced physical activity, and increased reliance on social media. These challenges had negative implications for mental health, with participants reporting heightened levels of anxiety, difficulties in thought control, decreased motivation, and difficulties in concentration.

The study also highlighted the impact of the pandemic on students' academic progress, with challenges in focusing on schoolwork and finding motivation to study. Practical skills in healthcare education were adversely affected by distance learning, and adjustments were made by some universities to mitigate the impact. The majority of students experienced a decline in academic marks, potentially influenced by a preference for face-to-face learning and pandemic-related psychological effects. Non-compliance with recommended study time may have contributed to the decline.

In conclusion, this study showed that Chiropractic students' social, personal, psychological, and academic functioning were affected by the SARS-CoV-2 pandemic in various ways. These

findings underscore the need for further research and support to address the well-being of students as they continue to cope with the after effects of the pandemic.

6.3 LIMITATIONS

The limitations of the study include:

i. It can be difficult to generalise results to all Chiropractic students because of the small sample size, and with the majority of the respondents being from the DUT.
ii. A trend was noticed in the answers to the section on psychological impact. The trend depicted that students were more likely to have selected “sometimes” as their answer over deciding an extreme. A bias may have occurred in this section.
iii. The majority of students selected “sometimes” as their answer in questions 19 to 24. This could also be related to the stigma still surrounding mental health with students not answering truthfully.
iv. The study was conducted a few months after SARS-CoV-2 instead of directly after, this could affect issues like memory recall.

6.4 RECOMMENDATIONS

The following recommendations are made for future studies:

i. A larger sample size should be used in future studies to reform the data.
ii. Future studies should compare a different population group (i.e., physiotherapists, medical students, and homeopaths) to Chiropractors.
iii. Qualitative studies can be done to compare senior students and junior students. A qualitative study will allow the researcher to explore the psychological impacts and experiences of the students in more depth.
iv. A study can be done that explores the impact that SARS-CoV-2 had on the self-perception of quality of Chiropractors who graduated during this time.
v. A follow up study can be done post-SARS-CoV-2 to assess the difference, if any.

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APPENDICES

APPENDIX A: LETTER ASKING FOR PERMISSION FROM DUT AND UJ

LETTER OF INFORMATION

Title of the Research Study: The effects of Covid-19 on the mental health of Chiropractic students in South Africa

Principal Investigator/s/researcher: Danica Strydom, BHSc Chiropractic

Co-Investigator/s/supervisor/s: Dr D Varatharajullu (MTech: Chiropractic; PhD: Health Science), Co-supervisor: Dr Kirsten Van Heerdan (BSc (hons), MA, DPhil)

Brief Introduction and Purpose of the Study: Mental health incorporates the emotional, psychological and social well-being of an individual. It impacts how individuals think, feel, and act. It can also impact the way we handle stress, relate to others, and make decisions. A good mental health allows a person to think, feel and react in positive ways that promote healthy living, and the opposite is true for poor mental health. The COVID-19 pandemic was thought to have a major influence on mental health, especially during the higher levels of lockdown. The pandemic also disrupted the delivery of tertiary education, affecting the lives of students. The adaptation to the pandemic created emotional, psychological, and social disturbances which ultimately affects an individual's mental health. This study, with your permission, will look at the mental health of Chiropractic students in South Africa and the effect that the pandemic had on their mental health. The pandemic affected the education process of these students which will inevitably affect their development as a future Chiropractor. Mental health plays an important role in the treatment and long-term care that a practitioner has to offer to their patients.

Outline of the Procedures: Registered Chiropractic students at the University of Johannesburg and Durban University of Technology will be asked to participate. After reading the letter of information and signing the informed consent form, the participants will be sent an

online questionnaire to complete that would take about 10 minutes of the participants' time. The completed questionnaires will be collected, and data will be drawn from it. Participants will include Chiropractic students that are registered between their second and sixth year of studies. Participants that will not be included are participant's that did not complete the consent form or were a part of the focus group or pilot study.

Risks or Discomforts to the Participant: There are no risks or discomforts to the participant involved in this study.

Benefits: This study will demonstrate a better understanding of how the Chiropractic students' mental health was affected as a result of covid, thus allowing for provision to be made for those students affected and for an intervention to be made before they graduate.

Reason/s why the Participant May Be Withdrawn from the Study: There will be no consequences for the participant should they choose to withdrawn.

Remuneration: No remuneration will be given to participants.

Costs of the Study: There will be no cost involved to participate in this study.

Confidentiality: All answers are confidential and will not be linked to your participation. The informed consent and questionnaires will be coded to ensure that no questionnaire can be linked to you. The questionnaire will be analysed by a statistician and all information will only be used for research purposes. After a period of 5 years the data collected will be destroyed.

Research-related Injury: There are no risk of research-related injuries in this study.

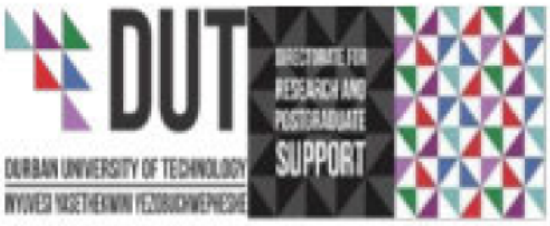
Ethically: No participant will be excluded from this study based on their race, culture, or gender. Participating in this study is voluntary and the participant can choose to withdraw at any time during the study. The wellbeing of the participant is important, no harm will be done by this study. Participants can complete the questionnaire on their own time, therefore not impeding on teaching time. Ethics approval was obtained before the commencement of data collection.

Request of permission: Permission to conduct the study at DUT/UJ and approach Chiropractic students to take part in this study is therefore being requested.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Danica Strydom- 0760351912), my supervisors (Desiree Varatharajullu- desireev@dut.ac.za / or 031 373 2533 or Dr Kirsten Van Heerdan- 031 312 7960) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Dr Lingasano.

APPENDIX B: DUT PERMISSION LETTER



Directorate for Research and Postgraduate Support
Durban University of Technology
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Fax: 031-3732946

25 October 2022

Ms Danica Strydom
c/o Department of Chiropractic
Faculty of Health Sciences
Durban University of Technology

Dear Ms Strydom

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Gatekeeper Permission** for you to conduct your research "The effect of the COVID-19 pandemic on the mental health of chiropractic students in South Africa" at the Durban University of Technology. **Kindly note that this letter must be issued to the IREC for approval before you commence data collection**.

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kind regards.
Yours sincerely

MS V GOVENDER
ACTING-DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

APPENDIX C: UJ PERMISSION LETTER

19 October 2022

Danica Strydom
Durban University of Technology (DUT)

Dear Danica Strydom

PERMISSION TO CONDUCT RESEARCH AT THE UNIVERSITY OF JOHANNESBURG

The request for the project titled *The effect of the COVID-19 pandemic on the mental health of chiropractic students in South Africa* refers. Permission is granted to conduct this study at the University of Johannesburg (UJ).

Please note that the granting of permission does not make it mandatory for UJ students and/or staff to participate in the study. As the reseacher/applicant, you will need to engage with potential participants to obtain their consent to participate in the study.

Should you require assistance in distributing the survey to UJ students and/or staff, kindly send a brief description of your study together with the link to where participants can access the survery to tdewet@uj.ac.za, copying hemalij@uj.ac.za and rloots@uj.ac.za.

Sincerely

Dr Ndivhuwo Luruli
Executive Director: Research and Innovation
Email: nmluruli@uj.ac.za

APPENDIX D: PRE-SURVEY NOTIFICATION

Dear valued Chiropractic student

Over the past two years, universities had to adapt to the global pandemic by changing the delivery of information. Students had to quickly familiarize themselves with these changes and adapt in such a short time. For many, this period impacted their mental health and ability to keep up with their university work leading to burnouts and immense amounts of stress.

In order to gain further insight into this effect, I would like to invite you to participate in a survey entitled: **"The effects of COVID-19 on the mental health of Chiropractic students in South Africa"** which forms part of my master's degree at the Durban University of Technology. Your participation will help ensure that the survey will provide up to date information about effects of SARS-COV-2 on the mental health of your fellow Chiropractic colleagues.

Should you agree to participate, you will find the link to the survey at the bottom of this email notification containing clear instructions. Your participation in this survey is important and will be greatly appreciated.

Kind regards

Danica Strydom

APPENDIX E: INFORMATION LETTER FOR THE MAIN STUDY

LETTER OF INFORMATION

Dear Chiropractic Student

Welcome to my study. Thank you for agreeing to participate in this study

Title of the Research Study: The effects of Covid-19 on the mental health of Chiropractic students in SA

Principal Investigator/s/researcher: Danica Strydom, BHSc Chiropractic

Co-Investigator/s/supervisor/s: Supervisor: Dr D Varatharajullu (MTech: Chiropractic; PhD: Health Science), Co-supervisor: Dr Kirsten Van Heerdan (BSc (hons), MA, DPhil)

Brief Introduction and Purpose of the Study: Mental health incorporates the emotional, psychological and social well-being of an individual. It impacts how individuals think, feel, and act. It can also impact the way we handle stress, relate to others, and make decisions. A good mental health allows a person to think, feel and react in positive ways that promote healthy living, and the opposite is true for poor mental health. The COVID pandemic was thought to have a major influence on mental health, especially during the higher levels of lockdown. The pandemic also disrupted the delivery of tertiary education, affecting the lives of students. The adaptation to the pandemic created emotional, psychological, and social disturbances which ultimately affects an individual's mental health. This study, with your permission, will look at the mental health of Chiropractic students in South Africa and the effect that the pandemic had on their mental health. The pandemic affected the education process of these students which will inevitably affect their development as a future Chiropractor. Mental health plays an important role in the treatment and long-term care that a practitioner has to offer to their patients.

Outline of the Procedures: Registered Chiropractic students at the University of Johannesburg and Durban University of Technology, such as yourself and your fellow colleagues, will be asked to participate. After reading the information letter and signing the informed consent form, you will be sent an online questionnaire to complete that would take

about 10 minutes and can be done in your own time. The completed questionnaires will be collected, and data will be drawn from it.

Risks or Discomforts: There are no risks or discomforts to you if you are involved in this study.

Benefits: This study will demonstrate a better understanding of how you and your fellow Chiropractic students' mental health was affected as a result of covid, thus allowing for provision to be made for those students affected and for interventions (such as academic and mental health workshops) to be made before you graduate.

Remuneration: There will be no remuneration if you are involved in this study.

Costs of the Study: There will be no cost if you are involved in this study.

Confidentiality: All answers are confidential and will not be linked to your participation. The informed consent and questionnaires will be coded to ensure that no questionnaire can be linked to you. The questionnaire will be analysed by a statistician and all information will only be used for research purposes. After a period of 5 years the data collected will be destroyed.

Research-related Injury: There are no risk of research-related injuries in this study.

Ethically: Your participation will not be excluded from this study based on your race, culture, or gender. Participating in this study is voluntary and you can choose to withdraw at any time during the study. Your wellbeing is important, no harm will be done by this study. You can complete the questionnaire on your own time, therefore not impeding on teaching time. Ethics approval was obtained before the commencement of data collection.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Danica Strydom- 0760351912), my supervisors (Desiree Varatharajullu- desireev@dut.ac.za / or 031 373 2533 or Dr Kirsten Van Heerdan- 031 312 7960) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Dr Lingasano.

APPENDIX F: CONSENT FORM FOR THE MAIN STUDY

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Ms Danica Strydom about the nature, conduct, benefits, and risks of this study- Research Ethics Clearance Number: _____.
- I have also received, read, and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymous processed into a study report
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	Date	Time	Signature

I, Danica Strydom herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Danica Strydom		
Full name of Researcher	Date	Signature
_____	_____	_____
Full name of Witness (if applicable)	Date	Signature
_____	_____	_____
Full name of Witness (if applicable)	Date	Signature

APPENDIX G: QUESTIONNAIRE

- ☐ When answering this questionnaire, I agree to answer the questions based on the impact that the SARS-COV-2 pandemic had on my mental health and not on any associated stressful events that may have occurred during the pandemic (i.e. KZN looting)
- ☐ I give consent to this questionnaire and for my answers to be used for research purposes

Section A: Demographic data

1. Age: _____
2. Sex:
   - ☐ Male
   - ☐ Female
   - ☐ Other: _____
3. Ethnicity
   - ☐ Asian
   - ☐ Black
   - ☐ Coloured
   - ☐ White
   - ☐ Other: _____
4. Year of study
   - ☐ 2nd
   - ☐ 3rd
   - ☐ 4th
   - ☐ 5th
   - ☐ 6th and above
5. Region of residence that you stayed in lockdown
   - ☐ Rural
   - ☐ Urban
6. Which university do you attend?
   - ☐ University of Johannesburg
   - ☐ Durban University of Technology

Section B: Social Impact

7. The need for isolation hampered my progress in university work	Yes		No		
8. The university vaccine mandate negatively impacted my access to campus	Yes	No	My university did not have a vaccine mandate policy in place		
9. I felt uneasy when an individual near me did not wear a mask	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
10. Appropriate social distancing rules were implemented in my tertiary institution	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
11. I spent more time than usual on social media during the SARS-COV-2 pandemic	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
12. I experienced conflict with the people that I stayed with during lockdown	Very often	Sometimes	Never	I stayed by myself during lockdown	

Section C: Personal Impact

13. My overall productivity was negatively impacted by the SARS-COV-2 pandemic	Yes	No	
14. My sleeping pattern was affected by SARS-COV-2 pandemic	Yes, I slept more	Yes, I slept less	No, it remained unchanged
15. I had more personal responsibilities around the house during lockdown (i.e. doing chores, working)	Yes	No	
16. I lost a family member or someone close to me during the SARS-COV-2 pandemic	Yes	No	
17. My family struggled financially during the pandemic lockdown	Yes	No	
18. My fitness workout regime was negatively affected by the SARS-COV-2 pandemic	Yes, I exercised less	My workout regime remained unchanged	No, I exercised more

Section D: Psychological Impact

19. I felt more anxious than usual during lockdown	Never	Sometimes	Often	Always
20. I experienced more periods of low mood than usual	Never	Sometimes	Often	Always
21. I struggled more than usual to control my thoughts	Never	Sometimes	Often	Always
22. I withdrew from people	Never	Sometimes	Often	Always
23. I had less motivation than usual to do tasks	Never	Sometimes	Often	Always
24. I found it more difficult than usual to concentrate	Never	Sometimes	Often	Always
25. I drank more alcohol than usual	Never	Sometimes	Often	Always
26. I smoked more cigarettes than usual	Never	Sometimes	Often	Always

Section E: Academic Impact

27. I had access to e-learning devices during lockdown	Yes		No		
28. If you answered yes to the previous question, what devices did you have access to?	Smartphone		Laptop		Tablet
29. My university supplied me with data	Yes, and it was a sufficient amount		Yes, but it was not a sufficient amount		No
30. I had access to internet connectivity to be able to attend live online classes and actively engage without difficulty	Yes		No		
31. Lockdown negatively impacted my attendance in online lectures and tests	Yes		No		
32. I think that the SARS-CoV-2 pandemic had a negative impact on my practical skills	Yes		No		
33. If you answered yes to the previous question, which of your practical skills were negatively affected?	Palpation skills		Diagnostic skills		Patient interaction skills
34. My academic marks were impacted when I returned to campus after lockdown	Yes, my marks improved		Yes, my marks worsened		No, my marks remained unchanged
35. I spent __ hrs a day on work during lockdown	0-1hr	1-2hr	2-3hr	3-4hr	5hr+

<u>Mental health helplines</u>

DUT counselling contact number	031 373 2266
UJ counselling contact number	011 559 4555
National Mental Health Information Line	0800 567 567
Mental Health Society	011 614 9890
Mental Health Info Centre	0800 600 411; 021 938 9229

APPENDIX H: SAMPLE SIZE CALCULATIONS BY THE STATISTICIAN

Email from Mr Z. Strydom:

There are multiple ways in which one can statistically approach determining sample size, but given the nature of the research the following are discussed:

Demographic spread:

The purpose of this method would be to determine sufficient information can be extracted from the data to conclude on each of the different demographic areas.

Given the nature of the research, there are 4 demographic classes namely gender, ethnicity, year of study, and urban/rural classification. The number of options for each of these categories is 2, 6, 5 and 2. There is also another demographic continuous variable in the form of age. This would lead to 120 different participants being required without accounting for the age buckets.

Given the margin for error in selection and the representativeness of the entire population of 364 individuals, this approach to determining the sample size would be impractical and unfeasible and as such would lead to far too many individuals being required for the study.

To combat this problem statistical methods such as interpolation, cross correlation of variables and various extraction techniques will be suitable to ensure enough information on each demographic variable is extracted. These would be sufficient for the purpose of the study and so no further problems can be seen.

But the question still remains as to what sample size should be required. An approach widely used in the biostatistics field is that of Cochran's Formula which is discussed below as a sufficient alternative.

Cochran's Formula Approach:

The Cochran formula allows you to calculate an ideal sample size given a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population.

It is formulated as follows Necessary sample size = [(z-score)^2 x p x (1-p)] / (margin of error) ^2

This is where p represents the (estimated) proportion of the population which has the attribute in question. In this case the attribute is that a person's mental health has been negatively affected by SARS-COV-2. Under this statisticians view it is rather reasonable to assume an

underestimate of *p*=50% is reasonable given the severity of the pandemic and related studies done thereon. Research across multiple studies shows that the value could be higher than this, but the lower bounds of these studies are being used here for prudency in value. As such with a confidence level of 95% (i.e. a z-score of 1.96) and a margin for error of 5% (standard for most biology related studies), the sample size with the above formula is calculated to be 384.16. But this value is higher than the population sample and as such an adjustment must be made to account for the smaller population as Cochran's is considered a bad approach with smaller samples.

Modified Cochran's Formula:

In this case the above formula has been adapted to allow for smaller sample sizes where:

Necessary sample size = n = n(0)/ [1 + (n(0) -1)/N] where N is the population size and n(0) is the value from Cochran's formula described above. With this approach the value required is such that n = 187 individuals (rounded).

Given this, 187 individuals is a much more realistic estimate, the only other thing that can be accounted for is access to individuals. Although this 187 is an ideal estimate, other techniques such as re-sampling can be used to acquire a higher set of results if needed. So allowing for any difficulty of collection of data, anomalies and other complexities, a 10% margin should be allowed to determine a minimum required sample.

As such it is this statisticians view that a minimum sample of 168 individuals would be required to make this research sample representative of the whole population. While the aim should be a sample of 187, a value of 168 can be worked with.

Given the split individuals in the universities, this will require a sample of 92 from DUT and 75 from UJ.

Let me know if any further clarifications are required on the above or if anything else is required.

Kind Regards

Zalin Strydom

PwC | Actuarial, Risk and Quants | Associate Office: 021 529 2575 | Mobile: 0763903778 Email: zalin.strydom@pwc.com PricewaterhouseCoopers 5 Silo Square, V&A Waterfront, Cape Town, 8002 http://www.pwc.com/za

APPENDIX I: PERMISSION TO USE QUESTIONNAIRE

Danica Strydom <danicastrydom939@gmail.com> Feb 14, 2022, 5:17 PM
to kam.appsci@coep.ac.in, Desiree

Dear Dr Kshipra Moghe

I trust that this email finds you well.

My name is Danica Strydom, a masters chiropractic student (MHSc: Chiropractic) currently studying at Durban University of Technology, South Africa.

This year I will be completing my research dissertation which is titled: "*The effect of Covid-19 on the mental health of Chiropractic students in South Africa*". My research topic and concept paper has been approved and I am now moving onto my methodology.

While drafting my topic, I came across your study, titled: "Covid-19 and Mental Health: A Study of it's Impact on Students", and found it to be very useful to my research. I write this email to you to request permission to use your questionnaire as a guideline for my study. I have attached a request form to this email to give further insight to my topic.

Kind regards
Danica Strydom

Request to use Que...

Kshipra M. via coepac.onmicrosoft.com Mar 8, 2022, 1:39 PM
to disha.kotecha@gmail.com, manjushapatil99@gmail.com, me

Dear Danica,

Thank you for connecting with me. I am sorry for responding so late. I can share a brief description about the factors we used to design the questionnaire. PFA the pdf for the same. This is what our questionnaire basically comprised of.
I hope this helps you.

Also, consider this mail as a permission to use our paper for reference for your study. All the very best.

Warm regards,

Kshipra V. Moghe, Ph.D (Psychology)
Asst. Professor-Psychology & Consulting Psychologist
Department of Applied Sciences

Portfolios:
Centre Head: "मित्र" CoEP Wellness Centre
Faculty Advisor- Impressions 2019 2020 2021
Overall Coordinator-Liberal Learning Courses (LLC)

From: Danica Strydom <danicastrydom939@gmail.com>
Sent: Sunday, February 20, 2022 4:59 PM
To: Kshipra M. <kam.appsci@coep.ac.in>
Subject: Re: Questionnaire

College of Engineering Pune (CoEP)
Maharashtra, INDIA
Office Landline: 020-25507109
Mobile: 9822746461

Full Member- National Academy of Psychology (NAOP) (2019-2023)
http://www.coep.org.in/mycoep/kamappscicoepacin
https://www.linkedin.com/in/kshipra-moghe-313169a3/
https://www.researchgate.net/profile/Kshipra_Moghe
Orchid ID: https://orcid.org/0000-0001-6220-4533

Think. Believe. Do.

Demographic details:

Age
Gender
Background
Nuclear/Joint Family
Social Spectrum
Qualifications
Work status

Social impact of COVID - 19- Questions focused on:	**Responses**
Suffient information about COVID - 19	Strongly agree/Agree/Partially Agree/ Disagree/ Strongly Disagree
Social distancing	
Lockdown-implementation	
Lockdown-effectiveness	
Introducing Unlock 1.0	
COVID 19 and social barriers	
News/media- safety awareness	
Level of awareness regarding mental health during COVID-19	Very High/ High/ More than before/low/very low
Personal impact of COVID-19- Questions focused on:	**Responses**
Progress towards goals	Strongly agree/Agree/Partially Agree/ Disagree/ Strongly Disagree
Concern about healthcare	
Procrastination	
Keeping engaged	
Overall productivity	
New routine	
Sleeping pattern	same as earlier/ more than earlier/ less than earlier/ no workout

Would you reach out to a mental health professional if any of the above issues exists Yes/No

Workout regime	more consious/ somewhat/same/less than earlier/ not at all
Psychological impact of COVID-19- Questions focused on:	**Responses**
Feelings of uncertainity	10 points scale (10% to 100%)
Feelings of helplessness	
Irritability, restlessness and outbursts	
Overall health concerns	
Indulgence in intoxicants	
Indulgence in online activities	
If following increased during COVID-19- Symptoms focused on:	Responses
Anxiety episodes- e.g. Rapid heart rate/ sweating etc.	Very low/low/more than before/ high/ very high
Panic episodes- e.g. Trembling/throat dryness etc.	
Thoughts- e.g. Over thinking/ going in loops etc.	
Fear- e.g. Crying spells/ losing control etc.	
Physiological symptoms- e.g. Appetite/ water intake etc.	
Paranoid- e.g. Mistrust/ preoccupation etc.	
Hypochondria- e.g. Feeling fatigued/ imagining the worst etc.	
Depression- e.g. Feeling empty/ guilty/ irritable etc.	
Intoxication- e.g. Social withdrawal/ changed appearance etc.	
Intoxication- e.g. Repetitive speech/ forgetting important events/ confused etc.	

APPENDIX J: QUESTIONNAIRE EVALUATION FORM

1. What is your opinion of the subject presented in this questionnaire? (Please mark the most appropriate box)

1.1 Extremely interesting

1.2 Interesting

1.3 Average

1.4 Boring

1.5 Very boring

2. Do you think the topics raised in this questionnaire were adequately covered?

2.1 Yes

2.2 No

3. How would you describe the instructions accompanying each of the questions? (Please mark one box only)

3.1 Very clear

3.2 Clear

3.3 Adequate

3.4 Unclear

3.5 Needs revising

4. Do you think the questionnaire is too long?

4.1 Yes

4.2 No

5. What is your opinion of the wording of the questionnaire? (Please mark the appropriate box/es)

5.1 The meaning of all questions is absolutely clear

5.2 The meaning of most questions is clear

5.3 There is too much medical jargon

5.4 The questionnaire needs to be revised because it is unclear

If you had any difficulty answering any question/s, please write the number/s of the question/s in the space below with a suggestion on how the question/s can be improved? Thank you for your most valuable time in helping me with my research project.

APPENDIX K: LETTER OF INFORMATION FOR THE FOCUS GROUP

LETTER OF INFORMATION: FOCUS GROUP

Welcome to my study. Thank you for agreeing to participate in this study

Title of the Research Study: The effects of Covid-19 on the mental health of Chiropractic students in SA

Principal Investigator/s/researcher: Danica Strydom, BHSc Chiropractic

Co-Investigator/s/supervisor/s: Supervisor: Dr D Varatharajullu (MTech: Chiropractic; PhD: Health Science), Co-supervisor: Dr Kirsten Van Heerdan (BSc (hons), MA, DPhil)

Brief Introduction and Purpose of the Study: Mental health incorporates the emotional, psychological and social well-being of an individual. It impacts how individuals think, feel, and act. It can also impact the way we handle stress, relate to others, and make decisions. A good mental health allows a person to think, feel and react in positive ways that promote healthy living, and the opposite is true for poor mental health. The COVID pandemic was thought to have a major influence on mental health, especially during the higher levels of lockdown. The pandemic also disrupted the delivery of tertiary education, affecting the lives of students. The adaptation to the pandemic created emotional, psychological, and social disturbances which ultimately affects an individual's mental health. This study, with your permission, will look at the mental health of Chiropractic students in South Africa and the effect that the pandemic had on their mental health. The pandemic affected the education process of these students which will inevitably affect their development as a future Chiropractor. Mental health plays an important role in the treatment and long-term care that a practitioner has to offer to their patients.

Outline of the Procedures: After you have been, asked to participate in the focus group, you will assess the questionnaire and make the necessary comments to ensure the validity and reliability of the questionnaire.

Risks or Discomforts: There are no risks or discomforts to you if you are involved in this study.

Benefits: This study will demonstrate a better understanding of Chiropractic students' mental health was affected as a result of covid, thus allowing for provision to be made for those students affected and for interventions (such as academic and mental health workshops) to be made before they graduate.

Remuneration: There will be no remuneration if you are involved in this study.

Costs of the Study: There will be no cost if you are involved in this study.

Research-related Injury: There are no risk of research-related injuries in this study

Ethically: Your participation will not be excluded from this study based on your race, culture, or gender. Participating in this study is voluntary and you can choose to withdraw at any time during the study. Your wellbeing is important, no harm will be done by this study. You can complete the questionnaire on your own time, therefore not impeding on teaching time. Ethics approval was obtained before the commencement of data collection.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Danica Strydom- 0760351912), my supervisors (Desiree Varatharajullu- desireev@dut.ac.za / or 031 373 2533 or Dr Kirsten Van Heerdan- 031 312 7960) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Dr Lingasano.

APPENDIX L: CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT

IMPORTANT NOTICE: This form is to be read and filled in by every member participating in the focus group, before the meeting convenes.

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: FOCUS GROUP

1. All information contained in the research documents and any information discussed during the focus group meeting must be kept private and confidential. This is especially binding to any information that may identify any of the participants in the expert group.

2. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this expert group.

3. The information from this focus group will be made public in terms of a dissertation and/or journal publication, which will in no way identify any of the participants involved in this expert group.

4. The returned questionnaires will be coded and kept anonymous in the research process.

5. All data generated from this expert group will be kept for five years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement. Please print in block letters:

FOCUS GROUP MEMBER: _____ SIGNATURE: _____

WITNESS NAME: _____ SIGNATURE: _____

RESEARCHER'S NAME: _____ SIGNATURE: _____

SUPERVISOR'S NAME: _____ SIGNATURE: _____

APPENDIX M: CONSENT FORM FOR THE FOCUS GROUP

CONSENT

Statement of Agreement to Participate in the Focus Group Study:

- I hereby confirm that I have been informed by the researcher, Danica Strydom, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	Date	Time	Signature/ Right Thumbprint

I, Danica Strydom herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Danica Strydom

_____	_____	_____
Full Name of Researcher	Date	Signature
_____	_____	_____
Full Name of Witness (If applicable)	Date	Signature
_____	_____	_____
Full Name of Legal Guardian (If applicable)	Date	Signature

APPENDIX N: LETTER OF INFORMATION FOR THE PILOT STUDY

LETTER OF INFORMATION: PILOT STUDY

Dear participant. I wish to welcome you to my pilot study and thank you for your co-operation.

Title of the Research Study: The effects of Covid-19 on the mental health of Chiropractic students in SA

Principal Investigator/s/researcher: Danica Strydom, BHSc Chiropractic

Co-Investigator/s/supervisor/s: Supervisor: Dr D Varatharajullu (MTech: Chiropractic; PhD: Health Science), Co-supervisor: Dr Kirsten Van Heerdan (BSc (hons), MA, DPhil)

Brief Introduction and Purpose of the Study: Mental health incorporates the emotional, psychological and social well-being of an individual. It impacts how individuals think, feel, and act. It can also impact the way we handle stress, relate to others, and make decisions. A good mental health allows a person to think, feel and react in positive ways that promote healthy living, and the opposite is true for poor mental health. The COVID pandemic was thought to have a major influence on mental health, especially during the higher levels of lockdown. The pandemic also disrupted the delivery of tertiary education, affecting the lives of students. The adaptation to the pandemic created emotional, psychological, and social disturbances which ultimately affects an individual's mental health. This study, with your permission, will look at the mental health of Chiropractic students in South Africa and the effect that the pandemic had on their mental health. The pandemic affected the education process of these students which will inevitably affect their development as a future Chiropractor. Mental health plays an important role in the treatment and long-term care that a practitioner has to offer to their patients.

Outline of the Procedures: Registered Chiropractic students at the University of Johannesburg and Durban University of Technology will be asked to participate. After reading the information letter and signing the informed consent form, the participants will be sent an online questionnaire to complete that would take about 10 minutes of the participants' time. The completed questionnaires will be collected, and data will be drawn from it. Participants will include Chiropractic students that are registered between their second and sixth year of studies. Participants that will not be included are participant's that did not complete the consent form or were a part of the focus group or pilot study.

Risks or Discomforts to the Participant: There are no risks or discomforts to your participation in this study.

Benefits: This study will demonstrate a better understanding of how you and your fellow Chiropractic students' mental health was affected as a result of covid, thus allowing for provision to be made for those students affected and for an intervention to be made before they graduate.

Reason/s why the Participant May Be Withdrawn from the Study: There will be no consequences should you choose to withdrawn.

Remuneration: No remuneration will be given for your participation.

Costs of the Study: There will be no cost involved for you to participate in this study.

Confidentiality: All answers are confidential and will not be linked to your participation. The informed consent and questionnaires will be coded to ensure that no questionnaire can be linked to you. The questionnaire will be analysed by a statistician and all information will only be used for research purposes. After a period of 5 years the data collected will be destroyed.

Research-related Injury: There are no risk of research-related injuries in this study.

Ethically: Your participation will not be excluded from this study based on your race, culture, or gender. Participating in this study is voluntary and you can choose to withdraw at any time during the study. Your wellbeing is important, no harm will be done by this study. You can complete the questionnaire on your own time, therefore not impeding on teaching time. Ethics approval was obtained before the commencement of data collection.

Confidentiality: All answers are confidential and will not be linked to your participation. The informed consent and questionnaires will be coded to ensure that no questionnaire can be linked to you. The questionnaire will be analysed by a statistician and all information will only be used for research purposes. After a period of 5 years the data collected will be destroyed.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Danica Strydom- 0760351912), my supervisors (Desiree Varatharajullu- desireev@dut.ac.za / or 031 373 2533 or Dr Kirsten Van Heerdan- 031 312 7960) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Dr Lingasano.

APPENDIX O: INFORMED CONSENT FOR THE PILOT STUDY

Statement of Agreement to Participate in the Focus Group Study:

- I hereby confirm that I have been informed by the researcher, Danica Strydom, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: IREC 217/22
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature/ Right Thumbprint**

I, Danica Strydom herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Danica Strydom

Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

APPENDIX P: IREC ETHICS CLEARANCE LETTER

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: irecchair@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

14 November 2022

Ms D Strydom
Epernay Flat 14
190 Botanical Gardens Road
Musgrave
Durban
4001

Dear Ms Strydom

The effect of the COVID-19 pandemic on the mental health of chiropractic students in South Africa
Ethical Clearance number IREC 217/22

The DUT-Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the DUT-IREC acknowledges receipt of your gatekeeper permission letters.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the DUT-IREC according to the DUT-IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the DUT-IREC as outlined in the DUT-IREC SOP's.

Yours Sincerely

Prof J K Adam
Chairperson: DUT-IREC

APPENDIX Q: PROFESSIONAL LETTER FROM EDITOR

Helen Bond

IMPELA EDITING SERVICES

impelaediting@gmail.com

079 395 5873

14 June 2023

CERTIFICATE

Danica Strydom

Dear Danica

Thank you for using Impela Editing Services to edit your Master's dissertation entitled "*The effect of the Covid-19 pandemic on the mental health of the Chiropractic students in South Africa*".

I have proofread for errors of grammar, punctuation, spelling, syntax and typing mistakes. I have formatted your work and checked the references (this means checking the formatting). I believe your work to be error free.

PLEASE NOTE: Impela Editing accepts no fault if an author makes changes to a document after a certificate has been issued.

I wish you the very best in your submission.

Kind regards

Helen Bond (Bachelor of Arts, HDE)