Associations between Mental Health, Social Cognition, and COVID-19 Stress among South African University Students

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Declaration

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, cited, and references.

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Abstract

The COVID-19 pandemic has contributed to widespread psychosocial distress, observed in the unprecedented rise in symptoms of common mental disorders (CMDs), including depression, anxiety and post-traumatic stress disorder (PTSD). This surge in mental health complications has been reported across all populations globally, most notably among university students, who are already a vulnerable cohort to CMDs, including PTSD. As integral socio-cognitive mechanisms of emotional regulation and interpersonal functioning, cognitive and affective empathy may potentially protect against or aggravate symptoms of CMDs, including PTSD, respectively. However, there is a scarcity of South African literature exploring this relationship, and relatively few South African studies have investigated students' mental health in the context of the COVID-19 pandemic. The current study employed a descriptive, cross-sectional design and aimed at evaluating the relationship between sociodemographic variables, pandemic-related-stress and exposure, mental health and cognitive and affective empathy, and explore the potentially moderating role of empathy. 534 undergraduate and postgraduate students from the University of Cape Town (UCT) were recruited using convenience sampling to participate in an online survey. Participants were administered a brief demographic questionnaire, the Kessler Psychological Distress Scale (K-10), the Beck Depression Inventory-Second edition (BDI-II), the Beck Anxiety Inventory (BAI), PTSD-Checklist for DSM-5 (PCL-5), the Pandemic Stress Questionnaire (PSQ) and the Interpersonal Reactivity Index (IRI). Overall, the results showed that female biological sex, self-reported history of psychological diagnosis, and earlier year of study were significant sociodemographic predictors of higher symptoms of CMDs, including PTSD. Furthermore, the results showed positive associations between mental health outcomes and affective empathy, and further provided significant evidence of the potentially moderating role of affective and cognitive empathy in the relationship between pandemic-related stress and exposure and mental health outcomes. These findings contribute to the current research gap on empathy and mental health in South Africa and provide further insight into the role of cognitive and affective empathy in relation to mental health in the context of stressful environmental factors. Further research should be conducted to explore additional factors and mechanisms that could explain individual mental health and social cognition in relation to stressful environmental factors.

Introduction

The novel coronavirus disease 2019 (COVID-19) spread rapidly in early 2020, and it was declared a pandemic by the World Health Organisation in March the same year (Li et al., 2020). Thus, countries globally, including South Africa, began enforcing restrictions on the movement of civilians in the form of nationwide lockdowns and stay-at-home measures to alleviate the increased burdens on their healthcare systems (Atalan, 2020a; Stiegler & Bouchard, 2020). While the implementation of the lockdowns effectively curbed the spread of the virus (Atalan, 2020a), they resulted in unintended negative effects on individuals' lives, including occupational, academic, financial, interpersonal and social consequences (Kujawa et al., 2020). These consequences, including social isolation and the reduction of in-person social contact, contributed to an unprecedented rise in symptoms of common mental disorders (CMDs), such as depression, anxiety and post-traumatic stress disorder (PTSD), in the general and university student populations (Liu et al., 2020; Naidoo & Cartwright, 2022; Wang et al., 2020). Some authors have even alluded to the potential existence of another pandemic, one of 'mental suffering' (Stein & Wessely, 2022).

While this rise in symptoms of CMDS, including PTSD, is expected in stressful situations (Huremović, 2019a), young adults and university students are already particularly vulnerable to internalising disorders. If left untreated, this could result in clinically significant symptoms and pervasive negative effects in their lives (Bantjes et al., 2019; Bantjes et al., 2022; Huremović, 2019a). Moreover, for South African university students, the continuous and unpredictable stress and disruptions brought by the COVID-19 pandemic and the lockdowns, residing in a social context that is prone to trauma exposure, places them at a greater risk for negative mental health outcomes (Naidoo & Cartwright, 2022; Visser & Law-van Wyk, 2021).

Cognitive and affective empathy are important socio-cognitive mechanisms for both interpersonal functioning and emotional regulation and have both been shown to potentially buffer and aggravate the appearance of symptoms of CMDs, including PTSD (Shamay-Tsoory, 2011a). While numerous international studies have investigated the relationship between dispositional empathy and symptoms of CMDs, including PTSD (Mazza et al., 2015; Winters et al., 2023), this area of research remains largely under-studied in South Africa. Given that the pandemic has contributed to a myriad of individual and interpersonal distress, and negatively affected social relationships (Kujawa et al., 2020), it is worthwhile to investigate how empathic traits, in relation to this exposure to these pandemic-related

stressors, may have protected or aggravated negative mental health outcomes for South African university students.

Therefore, this study aims to investigate student mental health and social cognition during the COVID-19 pandemic lockdown, specifically by evaluating the relationship between pandemic-related stress and exposure and mental health, and further investigate the potentially moderating role of dispositional empathy. To the author's knowledge, this is the first South African study to investigate the relationship between mental health outcomes and dispositional empathy among young adults and university students. Therefore, this study aspires to provide more knowledge into the socio-cognitive factors associated with mental health in young adults and university students.

Psychosocial Consequences of the COVID-19 Pandemic

The COVID-19 pandemic brought negative occupational, academic, social and financial consequences to individuals globally (Atalan, 2020; Nachega et al., 2021; Xie et al., 2021). This was partly due to the mass social distancing measures enforced, resulting in the cessation of 'normal life' as we know it. Extreme shocks to the economy and disruptions to social life were felt by countries globally as leaders and epidemiologists scrambled to contain the spread of the virus, dispel misinformation, and reassure the public (Rubin & Wessely, 2020; Usher et al., 2020). Public and private sector organisations began implementing remote work (Sandoval-Reyes et al., 2021; Wang et al., 2021), with some executing retrenchments to their workforce (Aidoo et al., 2021; Salvati, 2021; Sandoval-Reyes et al., 2021; Wang et al., 2021). Schools and tertiary institutions closed or moved to online learning (Engzell et al., 2021), public events such as religious gatherings, graduation ceremonies, concerts and sporting events were postponed or cancelled (Hemmonsbey et al., 2021; Lee, 2020; Nauright et al., 2020; Quadri, 2020). Furthermore, non-essential businesses such as on-premises dining at restaurants, bars and fitness centres were restricted or closed (Dube et al., 2021; Koh, 2020; Mutz & Gerke, 2021). In some countries, such as in South Africa, in addition to the aforementioned consequences, rates of unemployment and food insecurity rose sharply during the pandemic (Onwughalu & Ojakorotu, 2020), and the negative effects of the pandemic persist even post-lockdown as the economy struggles to recover (Ede & Jili, 2021; Leach et al., 2021).

Public health emergencies are known to negatively affect mental health, causing a rise in CMDs (Wang & Wang, 2021). Studies of previous disease outbreaks, such as the 2004 Severe Acute Respiratory Syndrome (SARS) outbreak, the 2014 Ebola outbreak, and the 2015 Middle East Respiratory Syndrome (MERS) outbreak, reported a rapid rise in symptoms of CMDs during these public health emergencies (Huremović, 2019b; Lee et al., 2018; Peng et al., 2010; Qiu et al., 2018; Shultz et al., 2015; Yoon et al., 2016). This was not only attributed to the physiological threat of disease but also due to the negative social effects and economic ramifications resulting from the outbreaks (Huremović, 2019a). Similarly, during the COVID-19 pandemic, a rapid rise in symptoms of CMDs was reported among individuals directly affected by the outbreak (e.g., sickness and quarantine, and the death of a loved one; Hossain et al., 2020; Wallace et al., 2020). A rapid rise in symptoms of CMDs was also detected among individuals experiencing occupation stress and burnout, job insecurity and financial difficulty, interpersonal strain and disruptions to social relationships (Ganson et al., 2021; Posel et al., 2021a; Ruengorn et al., 2021; Siddique et al., 2021; Van Der Feltz-Cornelis et al., 2020). Furthermore, studies showed that populations who were already vulnerable to mental health complications [e.g., people in low-and-middle-income countries (LMICs), females, university students and young adults, people in quarantine and those residing in areas with high rates of COVID-19 infections] were at an even greater risk of mental health consequences brought by the pandemic compared to other populations (Alzueta et al., 2023; Porter et al., 2021; Prowse et al., 2021a; Zhang et al., 2021). In contrast, some studies found no significant difference between pre-COVID-19 rates of CMDs and rates detected during the pandemic (Hafstad et al., 2021; Hamm et al., 2020; van der Velden et al., 2020). Two possible explanations include: (1) some of the mental health studies conducted during the pandemic were cross-sectional, and due to the circumstances, studies on the mental health of university students were mostly online self-report surveys (Hawes et al., 2022; Liyanage et al., 2021; Wang et al., 2021), and therefore could not causally determine the pandemic's influence on symptoms of CMDs; (2) positive coping mechanisms and the availability of social support structures could have enabled some individuals to become resilient and better adapted to the pandemic and its associated stressors (Jones et al., 2021; Prowse et al., 2021b; Quilez-Robres et al., 2021; Sommerlad et al., 2022).

Contrary to international studies, the mental health impact of the COVID-19 pandemic was rarely studied in South Africa, with a few published self-report studies conducted on healthcare workers and the general population (De Man et al., 2022; Kim et al.,

2022a; Nguse & Wassenaar, 2021; Posel et al., 2021; Rwafa-Ponela et al., 2022). Altogether, these studies found that fear of COVID-19 infection, pre-existing mental illness, job loss and financial insecurity were associated with an increased likelihood of negative mental health outcomes. Given the high risk of COVID-19 infection in South Africa's population, the country's ailing mental health system, and the socioeconomic burden brought to the country during the pandemic, these findings though concerning, were not surprising (Mbunge, 2020; Nguse & Wassenaar, 2021; Pulliam et al., 2022)

Huremovic (2019a) notes that psychological distress and symptoms of CMDs are normal or expected in an otherwise unpredictable and stressful living situation. However, the pandemic is a unique phenomenon, being a pervasive disaster at a social level, but also impeding individuals' ability to draw on social support systems to build resilience and cope with its debilitating impact (Stein & Wessely, 2022). The persistent feelings of uncertainty, as the pandemic and the lockdowns dragged on, the breakdown of social support structures, constant uncontrollable stressors, and the unpredictable nature of the pandemic and its lockdowns may have further heightened feelings of uncertainty, anxiety and fear, which has contributed to negative widespread social behaviours such as the creation of dangerous conspiracy theories, discrimination, and panic buying (Miller, 2020; Rubin & Wessely, 2020; Usher et al., 2020). In July 2021, South Africa, in particular, experienced widespread socio-political unrest, potentially exposing individuals and communities to trauma, racial and ethnic violence, loss of livelihood and even halting the COVID-19 vaccination programme (Vhumbunu, 2021). This complex co-occurrence of individual and social-level factors may have made individuals more susceptible to experiencing clinically significant symptoms of CMDs (Chirumbolo et al., 2021; Huremović, 2019a).

Evidently, the COVID-19 pandemic and its lockdowns affected individuals' social, interpersonal, academic and professional lives, bringing mental health and well-being into sharp focus (McHugh et al., 2021). Moreover, the mental health of university students was regarded as being of particular concern, given their preexisting vulnerability to mental health complications (McLafferty et al., 2021), the anxiety about their academics and future occupational prospects due to the disruptions brought by the pandemic (Son et al., 2020). South African university students could be at an even greater risk of heightened mental health complications given the existing challenges of this social context, exacerbated by the pandemic and the lockdowns (Naidoo & Cartwright, 2022). Therefore, it is integral to further

investigate the mental health and psychological well-being of this cohort in the context of the pandemic.

Mental Health among South African University Students

Student mental health pre-COVID-19

Common mental disorders (CMDs) are mental health conditions characterised by symptoms of depression and/or anxiety (Krueger, 1999). In response to potentially harmful and stressful life situations, individuals may experience psychological distress, which is an emotionally, cognitively and/or biologically discomforting mental state (Ridner, 2004).

Major Depressive Disorder, or depression, is a common mood disorder among young adults (Weitzmann, 2004). It is characterised by persistent sadness and hopelessness, loss of interest in activities, and physical symptoms such as motor agitation. In severe cases, suicidality may also present as a symptom (APA, 2013). Anxiety as a disorder involves an excessive focus on an anticipated threat (Kogan et al., 2016). Similarly, the DSM-5 defines Generalised Anxiety Disorder (GAD) as a common and serious form of anxiety, characterised by excessive worry about daily situations (APA, 2013). Other associated psychophysiological symptoms include difficulty falling asleep and concentrating, irritability and muscle tension (Adwas et al., 2019).

Within-individual co-occurrence of depression and anxiety symptoms is relatively common (Curran et al., 2020; Hoeflich et al., 2023; Konac et al., 2021). Researchers postulate that certain internalising symptoms (e.g., helplessness, worry, hopelessness) overlap and act as bridges in the interplay between depression, anxiety and stress, while biological and environmental factors such as being female and an early childhood occurrence of these disorders may also elevate the risk of comorbidity later in life (Saha et al., 2021; Van der Bergh et al., 2021).

Internationally, university students are widely regarded as being at an elevated risk of CMDs compared to the general population (Aqeel et al., 2022). Additionally, mental health among this population has been on the decline in recent years (Hoeflich et al., 2023). A 10-year longitudinal study conducted in the United States of America (USA) found rates of depression and suicidality to have increased among university students during this time period (Lipson et al., 2019). Similarly, Rousseau et al. (2020) reported statistically significant yearly increases from 2016 to 2019 in the prevalence and severity of symptoms of depression

and suicidality among South African university students. Regarding anxiety, studies in Hong Kong and South America reported a relatively high prevalence of mild to severe anxiety symptoms in university student samples (Dias Lopes et al., 2020; Lipson et al., 2019; Lun et al., 2018), and similar results were found in South African samples (Bantjes et al., 2016; Van der Walt et al., 2020). In addition, high rates of comorbid depression and anxiety were reported among university students globally (Falade et al., 2020; Walters et al., 2018), including among South African university students (Bantjes et al., 2016; Makhubela, 2021; Van der Walt et al., 2020).

Internationally, several predictors, or risk factors, of CMDs among university students were reported in the literature, with female students, sexual minorities, and students who are younger and/or in earlier years of study being at an increased likelihood of CMDs (Auerbach et al., 2019); Mofatteh, 2021). Furthermore, academic stress, ineffective coping mechanisms, low social support, and lifestyle factors such as substance abuse, lack of physical exercise and poor sleep, were also major correlates of CMDs (Adawalla et al., 2020; Mall et al., 2018; Mamun et al., 2019; Moffateh, 2021; Ribeiro et al., 2018). For South African university students, childhood maltreatment, having a low socio-economic status, residing in an urban area, and belonging to a racially marginalised group have also been cited as predictors of CMDs (Ajaero et al., 2018; Myers et al., 2021). Due to university students' pre-existing vulnerability to CMDs, it is worthwhile to consider how the added challenges brought by the pandemic may have affected their psychological well-being and mental health.

Student mental health during the COVID-19 pandemic

The COVID-19 pandemic and its lockdowns have undoubtedly negatively impacted the mental health and psychological well-being of university students globally (e.g., Haliburton et al 2021; Liu et al., 2020). In response to the threat brought by the virus, universities and tertiary institutions put in place measures to reduce contact and exposure to the virus by moving to remote learning and cancelling live graduation ceremonies (Engzell et al., 2021; Lee, 2020). While these measures reduced exposure to the virus, some students felt frustration and disappointment by the cessation of live graduation ceremonies (Kee, 2021). Furthermore, remote learning resulted in a cascade of issues for students, including increased workload and expectations, breakdown of routine, loneliness and social isolation from peers, reduced social support and limited access to campus mental health services, interpersonal strain in their familial relationships, and difficulty maintaining a balance between academics,

domestic duties and work for employed students (Halliburton et al., 2021; Kujawa et al., 2020; Lee et al., 2021; Loades et al., 2020; Salimi et al., 2023). In addition to these issues, South African university students faced a myriad of challenges including limited access to education resources and technological devices for online learning, financial challenges and reduced financial aid, uncertainty about the future and unemployment after graduation in light of the country's extremely high youth unemployment rate (Badat, 2020; Chauke & Chinyakata, 2020; Gittings et al., 2021; Mpungose, 2020; Naidoo & Cartwright, 2022; Singaram et al., 2022).

These challenges experienced by university students resulted in increased rates of CMDs during the pandemic, with relatively high prevalence of moderate to severe symptoms of depression, anxiety and stress being reported in both high-income countries and low-and-middle-income countries (Islam et al., 2020; Liyanage et al., 2021; Lopes & Nihei, 2021; Simegn et al., 2021; Simonsson et al., 2021; Wang et al., 2020). Similarly, South African studies reported concerning rates and severity of CMDs among university students during the pandemic (Kim et al., 2022; Laher et al., 2021; Posel et al., 2021b; Simegn et al., 2021). A study by Hamza et al. (2021) found that university students without preexisting psychological diagnoses of CMDs were at an even greater risk of experiencing severe psychological distress during the pandemic compared to a clinical sample. Similar results of significant increases in the rates and severity of CMDs among university students before and after the onset of the pandemic have been reported in the United Kingdom and Bangladesh (Islam et al., 2020; Savage et al., 2020). Conversely, a recent study conducted by Bantjes et al. (2023) comparing two public South African universities found that increases in CMDs reported during the COVID-19 pandemic were not significantly different from yearly increases in pre-COVID years. However, the study found that rates of CMDs at these institutions were still significantly higher than the general population. It is important to note that this is the only South African study comparing pre- and during-COVID-19 rates and severity of CMDs, while there are no published South African studies to date that have compared rates of CMDs for university students after the lockdowns.

Additionally, the COVID-19 pandemic has also seen a rapid rise in symptoms of PTSD, in the general and university student populations (Liu et al., 2020; Tang et al., 2020). PTSD can be defined as caused by an unusually frightening event, outside the normal range of human experience (Belrose et al., 2018). The DSM-5 states that although psychological distress is expected and common following a traumatic or stressful event, some individuals

may present with more dissociative and externalising symptoms, rather than anxiety or fear (APA, 2013). Therefore, PTSD is organised into 5 symptom clusters, namely: a) direct exposure to a traumatic event such as death or injury, b) intrusions, such as involuntary distressing memories and flashbacks of the traumatic event, c) avoidance of memories and stimuli of the event, such as people and places d) negative changes in mood and cognition, such as self-blame and diminished interest in activities, e) marked changes in behaviour and arousal following the traumatic event, such as hypervigilance and sleep problems (APA, 2013). According to the DSM-5, PTSD is highly comorbid with depression and anxiety (APA, 2013), and this has been observed in a few studies including among university students (Marthoenis et al., 2019; Nichter et al., 2019; Quan et al., 2023; Robinson & Deane, 2022; Zalta et al., 2021).

It is well-established that natural and man-made disasters may have negative mental health implications, increasing individuals' susceptibility to CMDs, including PTSD (Brown et al., 2023; Inoue et al., 2019; Makwana, 2019). Studies conducted during previous disease outbreaks have also found elevated levels of PTSD following the onset of the outbreaks (Lee et al., 2018; Qiu et al., 2021; Vyas et al., 2016), and the same phenomenon has also been observed in studies conducted during the COVID-19 pandemic across various populations, including among young adults and university students (Carmassi et al., 2020; Chen et al., 2023a; Forte et al., 2020a; Greene et al., 2023; Tang et al., 2020). A study conducted in the USA among young adults from April to May 2020 found that 31.8% of the sample reported high levels of PTSD symptoms. This study also found that individuals who reported higher loneliness and worry about COVID-19 had a significantly higher likelihood of meeting the clinical cut-offs for symptoms of PTSD, including depression and anxiety (Liu et al., 2020). However, a study conducted by Williamson et al. (2023) in the USA during the pandemic found that the quality of family relationships moderated the relationship between home disruptions and PTSD symptoms, meaning that healthy interpersonal relations and social support may be a protective factor against PTSD caused by interpersonal conflict. However, this study also found that this relationship was greater for depression and anxiety symptoms, compared to PTSD.

Compared to the plethora of international studies, research examining rates of PTSD among university students during the pandemic in South Africa is rare, with only one published study which has specifically investigated rates of PTSD among the general adult population during the pandemic (Nzimande et al., 2022). Nonetheless, this study found that

35.4% of the sample met the cut-off for extreme post-traumatic stress symptoms according to the self-report measure used in the study (Conybeare et al., 2012). This study further reported that symptoms of post-traumatic stress were significantly higher among participants who are younger, female, have low social support, felt socially isolated and perceived COVID-19 to have had a high negative impact on their lives.

Although previous research supports the role of prior trauma on psychological well-being, this concept may require some minor adjustment in the case of the COVID-19 pandemic, which has been an ongoing and unpredictable phenomenon (Lahav, 2020; Tang et al., 2020). A study by Liao et al. (2021) conducted in China among university students found that 29.7% of the sample presented with moderate to high levels of delayed-onset PTSD, whereby a minimum of 6 months passed before the traumatic events and the presentation of symptoms. The study also found the PTSD symptoms to be significantly higher among females, undergraduate students and COVID-19 survivors. To measure delayed-onset PTSD, this study used the Impacts of Events Scale-Revised (Weiss & Marmar, 1997), which has been utilised in epidemiological settings and among student samples during the pandemic as well (Creamer et al., 2003; Tang et al., 2020; Tomaszek & Muchacka-Cymerman, 2022). However, the IES-R corresponds to the PTSD symptoms as stated in the DSM-IV and not the more recent DSM-5, compared to other self-report measures of PTSD symptoms (Weiss & Marmar, 1997). The DSM-IV conceptualises PTSD as a fear-based anxiety disorder organised trauma into symptoms of intrusion, avoidance and hyperarousal and being caused by a single event (compared to the DSM-5 which has five symptom clusters in the DSM-5, expanding to include dysphoric symptoms, negative behaviours, emotions and cognitions (Friedman et al., 2011; Kilpatrick et al., 2013).

Additionally, some PTSD studies conducted during the COVID-19 pandemic used self-report measures (Blevins et al., 2015a; Weathers et al., 1994), measuring PTSD symptoms over 1-6 months, as stated in the DSM-IV and DSM-5. However, this criterion may not be suitable for measuring PTSD symptoms in the context of the COVID-19 pandemic which lasted for more than 2 years. Kaseda et al. (2020) support the adjustment of PTSD diagnosis in the context of COVID-19 survivors, who although may not meet the entire symptom profile for clinical PTSD diagnosis, do experience PTSD-like symptoms which result in functional impairment. Other researchers have adapted existing self-report PTSD measures for use in the context of the pandemic (Forte et al., 2020a; Tang et al., 2020), although these newly adapted tools have rarely been used outside their social contexts.

Although some authors have argued for the consideration of the COVID-19 pandemic as a type of trauma (Kira et al., 2021c), it is important to note that the pandemic does not fit the clinical criteria to be considered a traumatic event (Stein & Wessely, 2022). However, it also cannot be ignored that the pandemic has been a pervasive, ongoing, unpredictable and psychosocially stressful phenomenon (Lahav, 2020; Rubin & Wessely, 2020; Tang et al., 2020). Negative individual experiences such as the death of a loved one, joblessness and homelessness may have been experienced with anger and shock by individuals (Cipolletta et al., 2022). These severe stressors, although not meeting traditional DSM criteria for a PTSD diagnosis, may also been accompanied by CMDs (Stein & Wessely, 2022). Additionally, interpersonal conflicts, such as domestic and intimate partner violence, and widespread social unrest may have also resulted in instances of traumatic events (Campbell, 2020; Piquero et al., 2021; Rubin & Wessely, 2020), and these traumatic events have also been reported in South Africa (Vhumbunu, 2021; Zsilavecz et al., 2020).

Moreover, these traumatic experiences already occur frequently in South Africa's volatile socio-political context and high occurrence of crime, and sexual and gender-based violence (Breetzke & Edelstein, 2019; Mazorodze, 2020). South African universities are also known for frequent protest action, which usually involves clashes with law enforcement, potentially exposing students to psychological trauma (Brits et al., 2019; Czerniewicz et al., 2019). Furthermore, at the outbreak of the pandemic, many university students, particularly international students, suddenly found themselves stranded and homeless following the abrupt closure of university residences (Mncube et al., 2021). Such instances of unpredictable and constant exposure to trauma and distress have led to the development of Complex PTSD and Continuous Traumatic Stress (CTS).

CTS was initially introduced by Gillian Straker and The Sanctuaries Counselling Team to explain the psychological trauma experienced by individuals who were oppressed and persecuted by the South African apartheid regime (Straker, 2013). Contrary to PTSD's focus on past trauma, CTS refers to situations where individuals face ongoing, pervasive, and unpredictable threat(s), experiencing hypervigilance and anticipatory anxiety (Eagle & Kaminer, 2013; Kaminer et al., 2018a). Such psychological trauma occurs in environments of constant civil unrest, community violence and crime (Stevens et al., 2013; Straker, 2013). However, there have been debates in the literature about whether CTS should be medicalised as a psychological disorder, with advocates citing the need for treatment and intervention, while opponents caution against the potential risk of stigmatising large sections of the

population (Straker, 2013). Nonetheless, it is clear from both sides of the argument that the experience of psychological trauma, particularly in volatile social contexts, should be viewed more holistically encompassing both individual-level and social-level trauma and stressors (Straker, 2013).

To illustrate this complex co-occurrence of individual and social trauma, a recent study by Lahav (2020) in Israel during the COVID-19 pandemic found that individuals continuously exposed to political violence (i.e., CTS), in addition to pandemic-related stress, were more likely to experience higher psychological distress and PTSD compared to individuals whose trauma ends and those with no history of traumatic exposure. In South Africa, an article by Kaminer and colleagues (2018) about 3 case studies of South African women who experienced various forms of violence and trauma, noted that these individuals experienced PTSD-like symptoms, but that the stimulus was a present and ongoing threat in their external environment. However, CTS largely remains unstudied in the literature, although several recommendations have been written about its use in clinical settings (Eagle & Kaminer, 2013; Kaminer et al., 2018a; Straker, 2013), and a scale has been developed to measure the construct, although it is rarely used outside its social context (Goral et al., 2021).

Similar to CTS, complex PTSD (C-PTSD) was developed as a means to explain and potentially treat the PTSD-like symptoms found in individuals who have experienced prolonged and repeated trauma in abusive interpersonal relationships (Herman, 1992). Although C-PTSD is not a formal psychiatric diagnosis in the DSM-5, it was recently included in the International Classification of Diseases (ICD-11; World Health Organisation, 2020). C-PTSD is widely studied in the literature across various populations and psychological interventions have been recommended for its treatment (Barbieri et al., 2019; Cloitre et al., 2019; Hyland et al., 2021; Karatzias et al., 2019). A recent study By Kira and colleagues (2021a) conducted in Syria during the pandemic investigated whether CTS conceptualised as type III trauma variants (i.e., lifetime discrimination, childhood trauma and adversity, ongoing civil conflict, ongoing community violence, and exposure to chronic life-threatening illness) and pandemic-related stressors would predict C-PTSD and PTSD. Contrary to type I and type II trauma (which view trauma as a single past event, and a series of past related events, respectively) type III models trauma as a complex intersection of prolonged intrapersonal, interpersonal, intergroup trauma, with potentially debilitating mental health outcomes (Kira et al., 2021a, 2021b, 2021d).

The study by Kira and colleagues found that COVID-19-related stressors and type III trauma (specifically discrimination and childhood trauma) were key predictors for C-PTSD and PTSD symptoms for this sample. This means that multi-dimensional trauma and COVID-19-related stressors are key predictors of adverse mental health outcomes.

Overall psychological well-being and social cognition

Evidently, the pandemic had a rather unique and debilitating impact on the overall psychological well-being of university students globally, including in South Africa (Liu et al., 2020; Liyanage et al., 2021; Visser & Law-van Wyk, 2021). This expected but worrying phenomenon occurred in an already psychologically vulnerable population, due to the high presence of comorbid CMDs, including PTSD, and the additional individual and social stressors brought by the pandemic (Bantjes et al., 2016; Bantjes et al., 2019; Naidoo & Cartwright, 2022). Moreover, PTSD, as a psychological condition, occupied a debatable role, calling for the need to view psychological trauma experienced during the pandemic as a multifaceted construct, particularly in volatile social contexts. Altogether, the potential occurrence of CMDs, including PTSD emphasises the need to view individual trauma and pandemic-related stressors not merely as unrelated events, but to conceptualise all as existing in a complex and intertwined network influencing overall individual mental health and interpersonal relationships (Kira et al., 2022).

Social cognition, such as dispositional empathy, occupies a crucial role as a facilitator of interpersonal functional and social relationships (Shamay-Tsoory, 2011), many of which have been disrupted and negatively impacted by the pandemic (Kujawa et al., 2020). Moreover, empathy is known to play a crucial role in mental health and psychological well-being (Decety & Jackson, 2006; Winters et al., 2023). Therefore, to provide a more holistic and comprehensive analysis of overall psychological well-being, it is important to consider the role of empathy in individual mental health.

Dispositional Empathy

While there are numerous definitions for empathy, scholars generally conceptualise it as an individual's ability to understand another's emotions, feelings and thoughts (Shamay-Tsoory, 2011b; Smith, 2006). Cognitive empathy involves understanding another person's perspective, which encompasses being able to recognise and understand their thoughts and emotions. Affective or emotional empathy involves the spontaneous reaction to another person's emotional state, and the subsequent sharing of that emotional state while maintaining a *self/other* distinction (Decety & Jackson, 2006; Decety, 2015; Shamay-Tsoory, 2011b; Smith, 2006). Although there are numerous debates about whether empathy should be measured as a trait or situational construct (Cuff et al., 2016a; Fabi et al., 2019; Powell & Roberts, 2017), self-report questionnaires typically measure empathy as a multidimensional trait construct, examining one's general disposition to experience cognitive and affective empathy (Baron-Cohen & Wheelwright, 2004; Davis, 1980a; Reniers et al., 2011).

Both cognitive and affective empathy are supported by underlying and overlapping socio-emotional and cognitive processes, all of which work together to form an empathic response (Guhn et al., 2020; Schreiter et al., 2013; Shamay-Tsoory, 2011b). Cognitive empathy is related to *perspective-taking* which involves the ability to adopt another person's viewpoint (Davis, 1980), and *Theory of Mind (ToM),* which is the ability to 'mentalise' by understanding another person's thoughts, feelings and intentions, and using this knowledge to infer their behaviour (Blair, 2005; Shamay-Tsoory, 2011b). Affective empathy is related to *empathic concern*, which is the compassion and care felt towards another person, and *personal distress*, which is the feeling of discomfort and stress experienced from awareness of another person's negative experience (Davis, 1980; Schreiter et al., 2013). Affective empathy is also related to *emotional contagion*, which is the automatic emotional arousal and 'mimicking' of another person's emotional state, such as contagious crying in infants (Decety & Jackson, 2006; Shamay-Tsoory, 2011b).

While *perspective-taking* is generally acknowledged to be an important evolutionary and developmental process for cognitive empathy and overall interpersonal communication (Decety & Jackson, 2006; Lamm et al., 2007; Shamay-Tsoory, 2011b), *empathic concern* and *personal distress* are considered to have both positive and negative affective and interpersonal consequences, respectively (Schreiter et al., 2013; Shamay-Tsoory, 2011b). The dissociation of these processes for affective empathy can be observed in the altruistic and

prosocial behaviour associated with *empathic concern* (Decety & Jackson, 2006), while *personal distress* is posited to limit the protective *self/other distinction*, thus increasing *emotional contagion,* and reducing helping behaviour, thereby potentially jeopardising the adaptive response of *empathic concern* (Decety & Lamm, 2011; Eisenberg et al., 2010). Neurologically, affective empathy and its associated processes are regulated by brain areas responsible for various functions including emotional regulation, perception, action and the recognition of shared pain (Preston, 2007; Shamay-Tsoory, 2011b). On the other hand, cognitive empathy is regulated by higher-order executive functioning processes (including *ToM* and *perspective-taking*) located in brain regions responsible for self-reflection, and mentalising which is the ability to reflect on and make inferences about others' emotions, actions, and beliefs (Shamay-Tsoory et al., 2009; Shamay-Tsoory, 2011b). Therefore, the influence of these underlying processes has prompted the development of theories in the field of social neuroscience to explain the interplay between cognitive and affective empathy, including their relationship to internalising disorders.

Models of empathy and its relationship to internalising disorders

Several models have been developed to explain the functions and interplay between cognitive and affective empathy, including the *Perception-Action Model*, which in summary, defines empathy as a process whereby an observer shares and experiences another person's emotions (through affective empathy), as a result of identifying and recognising the other person's emotions (through cognitive empathy) (Preston & De Waal, 2002; Preston, 2007). Similarly, *Simulation Theory* posits that we understand other people's emotions by 'putting ourselves in their shoes' (Gordon & Cruz, 2003; Gordon, 1995), and has been supported by evidence from the study of mirror neurons (Gallese et al., 2007; Jeon, 2020; Rameson & Lieberman, 2009). Similarly, Hoffman's Theory of moral development conceptualises empathy as a predominantly affective process, essential for altruistic behaviour (Hoffman, 1979). According to Hoffman, empathic distress, similar to *personal distress*, occupies a crucial role in mirroring other people's emotional distress, while the cognitive aspect of empathy, through behaviour such as role-taking, may be useful to put one in another's situation i.e., *perspective-taking* (Eisenberg & Morris, 2001; Hoffman, 1979).

Due to the theorised functions of empathy, researchers postulate that affective and cognitive empathy dimensions may have a double dissociation with CMDS, including PTSD, acting as potential risk and protective factors, respectively (Mazza et al., 2015; Winters et al.,

2023; Zeng et al., 2021a). Affective empathy, being governed by *personal distress* and *empathic concern*, may risk emotional contagion, thus aggravating the negative emotional response to stress, potentially disrupting interpersonal functioning (Decety & Lamm, 2011; Eisenberg et al., 2010; Shamay-Tsoory, Simone G., 2011). Cognitive empathy, being governed by *perspective-taking*, may protect against that negative emotional response (Gambin & Sharp, 2018; Wang et al., 2021; Wright et al., 2018; Zeng et al., 2021a).

Neurologically, depression has been linked to the activation of brain regions responsible for *perspective-taking* when engaging in cognitive empathy tasks, while affective empathy has been associated with the activation of brain regions responsible for responding to environmental response and emotional recognition (Winters et al., 2023). A self-report study by Gambin and Sharp (2018) found that anxiety was positively associated with affective empathy, and negatively associated with cognitive empathy. Another recent self-report study by Zhang et al. (2020) among university students found that high depression symptoms were associated with low *perspective-taking* scores while high *personal distress* scores were observed in participants with both low and high levels of depression. Finally, Bohler et al. (2021) reported similar results regarding anxiety, further stating that scores on empathy dimensions and their associations with anxiety were significantly lower among male university students compared to female students. Regarding stress exposure, Wright et al. (2018) found that affective empathy heightened the negative psychological effects of bystander cyberbullying (i.e., witnessing a stressful event) on depression symptoms, although this moderation was not observed for anxiety. Although all these results are mixed, they provide evidence that cognitive and affective empathy could potentially be protective and risk factors in the relationship between CMDs and stress exposure.

Regarding PTSD, studies investigating the relationship (within the general population and samples of university students) between this psychiatric disorder and empathy are limited and often produce mixed results. Nonetheless, a systematic review by Couette et al. (2020) found that high levels of PTSD symptoms were associated with higher affective empathy, although the literature on cognitive empathy reported mixed results. A recent study by Wendt et al. (2020) found that people with high empathy scores reported more symptoms of PTSD, indicating a higher risk of psychological trauma for people with greater emotional sensitivity. A neuroscientific study by Mazza et al. (2016) administered the Multifaceted Empathy Task to a sample of individuals affected by the L'Aquila earthquake of 2009. Results showed that when engaging in cognitive empathy tasks, individuals with clinical levels of PTSD

symptoms showed greater activation in the medial frontal gyrus and left inferior frontal gyrus (brain regions responsible for cognitive empathy) compared to controls, as well greater activation in the right insula (a brain region responsible for affective empathy) when engaging in affective empathy tasks.

Interestingly, these results are similar to the neurological activation observed in people with CMDs, suggesting that although PTSD has a different symptomology from CMDs, it may also be governed by similar underlying socio-cognitive processes. Studies conducted in the context of the COVID-19 pandemic have reported similar results, whereby Zeng et al. (2021) reported that high affective empathy aggravated the relationship between COVID-19 fear and exposure and stress. Baliyan et al. (2020) reported cognitive empathy in individuals with high distress scores, suggesting a potential buffering effect of cognitive empathy in the relationship between stress exposure to the pandemic and stress response. Therefore, given the psychosocially stressful nature of the COVID-19 pandemic, the inherent vulnerability of university students to CMDs, including PTSD, and the potential risk and protective role of affective and cognitive empathy, respectively, it is essential that these factors should be explored together to provide a holistic perspective into the overall psychological well-being and mental health of South African university students.

Rationale, Objectives, and Hypotheses

Since its outbreak in early 2020, the COVID-19 pandemic has contributed to a great deal of physical and mental suffering globally (Stein & Wessely, 2022). The lockdowns, employed by governments in the interest of public health, effectively curbed the spread of disease, yet disrupted 'normal life' at the individual and broader social level (Atalan, 2020b; Usher et al., 2020). People's ability to connect socially was limited, thereby interrupting social relationships and acquiring avenues for social support during that distressing time (Cooper et al., 2021; Tepeli Temiz & Elsharnouby, 2022). Amidst these new social conditions, individuals had to navigate the threat of death and disease, while still adjusting to the 'new normal' and adapting to the unpredictable nature of the pandemic (Hossain et al., 2020a). This uncertainty and constant distress has undoubtedly contributed to widespread psychological suffering, and the mental heath repercussions of the pandemic have been documented globally (Forte et al., 2020a; Porter et al., 2021; Zeng et al., 2021a; Zhang et al., 2021).

University students, a population which consists of emerging adults at critical points in their careers, have encountered numerous barriers to their education during the pandemic, creating anxiety about future occupational prospects (Son et al., 2020). This has contributed to the rapid rise in symptoms of CMDs, including PTSD, globally (Islam et al., 2020; Liu et al., 2020; Savage et al., 2020; Wang et al., 2020). South African university students are no exception to this phenomenon (Laher et al., 2021), being a cohort that is already vulnerable to psychological distress and mental illness (Makhubela, 2021b), facing a myriad of additional challenges, including resource limitations, socio-economic distress, and the constant threat of trauma (Mncube et al., 2021; Naidoo & Cartwright, 2022). Although this rise is expected, it is nonetheless worrying given the current treatment gap in student mental health services and the low uptake of these services by university students in the country (Bantjes et al., 2020).

Social cognition, such as dispositional empathy, has been regarded as an important facilitator of interpersonal functioning and social relationships (Shamay-Tsoory, 2011). Specifically, affective and cognitive empathy are known to have potentially risk and protective roles, respectively, in relation to CMDs, including PTSD, therefore occupying an important role in overall psychological well-being (Couette et al., 2020; Gambin & Sharp, 2018; Winters et al., 2023). Given this potential to aggravate or mitigate psychological distress, it is important to determine the role of empathy in light of pandemic-related stress.

In South Africa, while there are a few published studies, providing valuable insight into the mental health of university students during the pandemic, they have mostly focused on CMDs (Bantjes et al., 2023; Graham & Eloff, 2022; Laher et al., 2021; Makhubela, 2021b; Visser & Law-van Wyk, 2021), and almost none have included PTSD. Moreover, there is only one published investigating how different kinds of pandemic-related stress (e.g., physical health, educational, financial, interpersonal) may affect the mental health of university students (Visser & Law-van Wyk, 2021), which is important to consider given the pervasive influence of the pandemic in all spheres of life. Investigating these different pandemic-related sources of distress could provide more insight into students' resilience and their ability to cope in times of uncertainty and distress. Furthermore, to date, there is a scarcity of published studies in South Africa investigating the risk and protective role of affective and cognitive empathy in relation to CMDs, including PTSD, among young adults and university students.

Based on the above literature, the study aims to investigate student mental health and social cognition in the context of the COVID-19 pandemic. Specifically, this study will evaluate the relationship between pandemic-related stress and mental health outcomes including the role of sociodemographic characteristics and investigate the potentially moderating role of dispositional empathy (see Figure 1). To thoroughly account for the multiple factors associated with mental health, the study will include individual-level variables, which are sociodemographic characteristics (i.e., biological sex, history of psychological diagnosis, level of study and the time of survey), and affective and cognitive empathy, all of which have been associated with mental health outcomes in the literature. The individual-level variables will be investigated in light of pandemic-related stress and exposure to determine their association with mental health outcomes. Multiple indicators of mental health will be used to provide a more holistic analysis of psychological well-being, thereby showing how psychological well-being regarding the pandemic is influenced by multiple factors. (Brooks et al., 2020; Kira et al., 2022; Lahav, 2020; Stein & Wessely, 2022).

The study objectives are to:

a) Describe the presence and severity of general psychological distress, depression, anxiety and PTSD symptoms and empathy, including pandemic-related stress and exposure as experienced by South African university students.

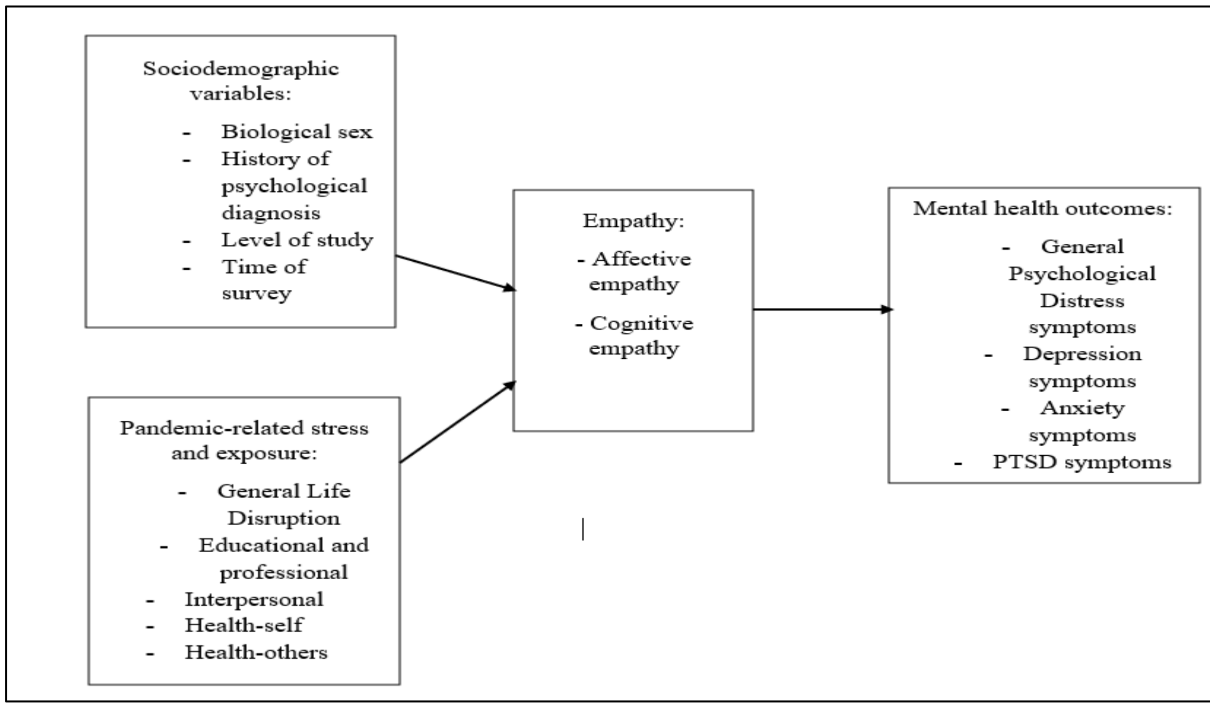
b) Explore the relationship between sociodemographic variables, pandemic-related stress and exposure, and mental health (i.e., depressive, anxiety and PTSD symptoms), and unpack the potentially moderating role of dispositional empathy (i.e., cognitive and affective empathy) in this relation.

Based on literature, the following hypotheses are proposed:

1) Symptoms of general psychological distress, depression, anxiety and PTSD will be higher among females, first-year and senior students, students reporting a history of psychological diagnoses and students who participated in the survey during the lockdown.
2) There will be a double dissociation with affective empathy and cognitive empathy, whereby they are positively and negatively associated with depression, anxiety, and PTSD symptoms, respectively.
3) The relationship between pandemic-related stress and mental health outcomes will be moderated by dispositional empathy through double dissociation

Figure 1

Proposed moderation model



Note. Pandemic-related stress and exposure corresponds to the dimensions of the Pandemic-Stress-Questionnaire (Kujawa et al., 2020).

Method

Design and Setting

The study featured a descriptive, cross-sectional design to investigate student mental health and one aspect of social cognition, namely dispositional empathy, during and after the COVID-19 pandemic lockdown. It did so specifically by evaluating the relationship between pandemic-related stress and exposure and several sociodemographic and mental health variables. The sociodemographic variables are biological sex, history of psychological diagnosis, level of study, and time of survey. The mental health variables are general psychological distress, as well as depressive, anxiety and PTSD symptoms. Pandemic-related stress and exposure is operationalised according to the 6 subscales of the Pandemic Stress Questionnaire (Kujawa et al., 2020) further elaborated below. Finally, the dispositional empathy variables are cognitive and affective empathy.

The study was conducted between October 2021 and August 2022 in three rounds of data collection. The first round of data collection commenced in October 2021, followed by the second round in March 2022, and the final round in August 2022. Recruitment platforms included SurveyMonkey and the UCT Department of Student Affairs (DSA).

Participants

Sample

A total of 534 students from the University of Cape Town participated in this online study, with the majority being female (n=429; 80%). A priori power analysis using G* Power software [version 3.1; (Faul et al., 2009)] indicated that the minimum sample size to yield a statistical power of at least .95 with an alpha of .05 and a medium effect size (Cohen's d=.50) is 160. The research design employed convenience sampling, recruiting students using the UCT Department of Psychology's Student Research and Participation Programme (SRPP) platform to recruit students from the department, and the Department of Student Affairs (DSA) research invitations platform to recruit students from across the university. Students who completed their surveys were entered into a raffle to win one of two R250 Takealot vouchers.

Eligibility Criteria

To participate in the study, participants needed to fulfil the following requirements: a) registered UCT student, b) have an electronic device (e.g., laptop/desktop or smartphone) with a stable internet connection. Furthermore, only students between the ages of 18-24 were recruited given the high likelihood of psychological distress and CMDs in this age group (Liyanage et al., 2021; Tang et al., 2020; Zhang et al., 2021).

Materials

Demographic questionnaire

A brief demographic questionnaire was administered to collect basic demographic information (e.g., sex, age, year of study, history of psychological diagnoses; see Appendix A). Information collected from this questionnaire was used to determine eligibility for participation. Sociodemographic items would also be included later in the analyses.

Kessler Psychological Distress Scale (K-10).

The K-10 is a 10-item self-report questionnaire evaluating general, non-specific psychological distress in both clinical and non-clinical samples (Kessler et al., 2002). The items are scored on a 5-point Likert scale from 1 (*none of the time*) to 5 (*all of the time*), with higher scores indicating increased severity of psychological distress. According to Kessler and colleagues (2002), the cut-off scores of the K-10 are < 20 (likely to be well), 20-24 (mild mental disorder), 25-29 (moderate mental disorder), and 30 and above (severe mental disorder). The K-10 reported good psychometric properties in the original study (α = .91; Kessler et., 2002). The K-10 also reported good psychometric properties among South African samples with overall Cronbach's α's = .84 (Andersen et al., 2011; Hoffman., et al., 2022a), including among South African university students with overall Cronbach's α = .91 (Van Niekerk & van Gent, 2021a).

Beck Depression Inventory-Second edition (BDI-II)

The BDI-II is a 21-item self-report measure of the severity of depressive symptoms for use in both clinical and non-clinical samples (Beck et al., 1996). The items are scored on a 4-point Likert scale from 0-3, where participants are asked to choose the response which best describes how they felt in the previous 2 weeks, with higher scores indicating more severe depressive symptoms. According to Beck and colleagues (1996), the cut-off scores of the BDI-II are 0-13, minimal depression; 14-19, mild depression; 20-28, moderate depression; and 29-63, severe depression. Additionally, item number 9 on the BDI measures suicidal ideation. The BDI-II reported good psychometric properties in the original publication and subsequent validation studies with overall Cronbach's α = .88-.95 (Beck et al., 1996; García-Batista et al., 2018; Park et al., 2020), as well as in South African university students with overall Cronbach's α = .84-.92 (Makhubela & Mashegoane, 2016; Naidoo, 2019).

Beck Anxiety Inventory (BAI)

The BAI is a 21-item self-report measure of anxiety symptoms for use in clinical and non-clinical samples (Beck et al., 1988). The items measure the cognitive, physiological and emotional symptoms of anxiety. The items are scored on a 4-point Likert scale from 0 (*not at all*) to 3 (*severely-could barely stand it*), with higher scores indicating more severe anxiety symptoms. According to Beck and colleagues (1988), the cut-off scores of the BAI are 0-21 (low anxiety), 22-35 (moderate anxiety), and 36 and higher (potentially concerning levels of anxiety). The BAI has reported good psychometric properties in the original publication and subsequent validation studies with overall Cronbach's α's = .89-.93 (Beck et al., 1988; Toledano-Toledano et al., 2020; Vizioli & Pagano, 2022), including in South African university students with overall Cronbach's α = .92 (Steele & Edwards, 2008).

PTSD Checklist for DSM-5 (PCL-5)

The PCL-5 is a 20-item self-report measure of the presence and severity of PTSD symptoms (i.e., PTSD caseness and non-caseness) as determined by the DSM-5 (Weathers et al., 2013). The PCL-5 encompasses 4 subscales, which correspond to the four symptom clusters of the DSM-5, namely *re-experiencing*, *avoidance*, *negative cognitions*, and *hyperarousal*. The items are scored on a 5-point Likert scale from 0 (*not at all*) to 4 (*extremely*), with total scores ranging from 0 to 80 and higher scores indicating greater severity of PTSD symptoms.

To determine a provisional PTSD diagnosis and the severity of symptoms using the PCL-5, the developers have recommended applying the DSM-5 diagnostic guidelines (i.e.,

the endorsement of a score of 2 or higher on at least 1 item from re-experiencing, 1 item from avoidance, 2 items from negative cognitions and 2 items from hyperarousal, then apply a cut-off score of 31-33, where individuals scoring above this score meet the clinical criteria (Blevins et al., 2015b; Weathers et al., 2013).

However, some research has suggested summing the scores from all 20 items and applying a cut-off score of 31-33 as recommended by the developers is sufficient for a provisional PTSD diagnosis and to determine the severity of symptoms (Blevins et al., 2015b; Bovin et al., 2016; Krüger-Gottschalk et al., 2017).

The PCL-5 has reported good psychometric properties in previous studies with overall Cronbach's α's = .94-.96 (Blevins et al., 2015b; Bovin et al., 2016) including in South African samples with overall Cronbach's α's = .95-.97 (Kagee et al., 2022; Makhubela, 2018). For this student sample, PCL-5 reported good to excellent internal consistency (Overall scale α = .94).

Pandemic Stress Questionnaire (PSQ)

The PSQ is a recently developed 25-item questionnaire designed to measure perceived exposure to COVID-19 stress-related events, and the severity of these events (Kujawa et al., 2020; Appendix F). The questionnaire is comprised of 6 subscales: *financial* (3 items), *interpersonal* (5 items), *general life disruption* (6 items*), health-others* (3 items), *health-self* (4 items), and *education/professional goals* (3 items) Participants indicate if the event happened to them by selecting either "Yes" or "No". If a participant selects "Yes", they rate the perceived severity of impact on a 5-point Likert scale from 1 (*not bad at all*) to 5 (*extremely bad*). Higher scores indicate more severe perceived exposure to COVID-19 stress-related events. The PSQ total events and severity has yielded good psychometric properties (α = .72 and .79, respectively), and concurrent validity with the Perceived Stress Scale (r = .41 and .42, respectively; Kujawa et al., 2020). Following recommendations from the developers for a briefer version of the scale, item 16 from the *interpersonal* subscale "I experienced racism or discrimination due to the coronavirus pandemic." was not included in the questionnaire for this study, resulting in a final 24-item questionnaire.

The Interpersonal Reactivity Index (IRI)

The IRI is a 28-item self-report measure of dispositional empathy (Davis, 1980b). The IRI is comprised of 4 subscales which measure cognitive empathy (i.e., *fantasy* and *perspective-taking*) and affective empathy (*empathic concern* and *personal distress*). The items are scored on a 5-point Likert scale from 0 (*does not describe me well*) to 4 (*describes very well*), with higher scores indicating higher dispositional empathy. The IRI has yielded good psychometric properties with overall Cronbach's α = .77 and subscale α's between .62-.77 (Diotaiuti et al., 2021; Grevenstein, 2020), including among South African university students with overall Cronbach's α = .72-.84 (Barnfather & Amod, 2012; Mokgotla, 2011). In the present study, the IRI yielded excellent psychometric properties (overall scale α = .81).

Procedure

Ethical Considerations

The current study adhered strictly to the guidelines contained in the Declaration of Helsinki (World Medical Association, 2013). Ethical approval was granted by the Research Ethics Committee of the UCT's Department of Psychology to advertise the study to students within the department. Further ethical approval to advertise to students across campus was granted by the DSA (PSY2021-050; see Appendices H & I).

Survey procedure

The survey was assembled on SurveyMonkey, then advertised to Psychology students on the SRPP site, and later advertised on the DSA research invitations email platform. In both methods of advertising, students were able to access the link to the survey on the study advert (see Appendix J). Upon entry into the survey, participants were given information about the purpose of the study and asked to complete an informed consent form (see Appendix K). Once consent was given, participants were required to complete the questionnaires in the following sequence: demographic questionnaire, K-10, BDI-II, BAI, PCL-5, PSQ, and finally the IRI. The survey took approximately 30 minutes for each participant to complete. Once the questionnaires were completed, participants were thanked for their participation and debriefed (see Appendix L). Participants who completed all questionnaires were entered into a raffle to win one of two R250 Takealot vouchers-those who won the raffle were contacted and awarded their prize. Thereafter, all survey responses were de-identified and data cleaning commenced.

Data Management and Analysis

Data cleaning and missing data

RStudio (R Foundation for Statistical Computing, 2020) was used for all data cleaning and analysis. No missing data were identified for the sociodemographic variables and the BDI items, participants were more likely to complete these items as they appeared earlier in the survey. However, the BAI recorded 16 observations with missing data points, the K-10 recorded 22 observations with missing data points, the PCL-5 recorded 36 observations with missing data points, and the PSQ recorded 53 observations with missing data points. The data is likely missing at random, where the reason for the data being missing is likely due to information relating to the nature of the data of the study (Pedersen et al., 2017). Since this study employs the use of self-report questionnaires, asking individuals about sensitive information relating to their experience of the COVID-19 pandemic, their mental state and empathic traits, participants may deliberately omit their responses.

Since the PSQ required a categorical ‘yes’ or ‘no’ endorsement from the participants (as opposed to a Likert scale response), no data imputation was applied to this questionnaire. For empathy, only 160 participants completed the IRI, therefore, missing data points were not imputed, to not drastically alter the data.

Since multiple imputation can produce biased results, particularly for datasets with more than 20% missing values (Lee & Huber Jr, 2021; Madley-Dowd et al., 2019), the data were not imputed nor transformed. Although this would affect the estimates, the number of observations met the power analysis requirements for the secondary analyses [i.e., hierarchical linear regression and structural equation modelling (SEM)]

Descriptive statistics

First, descriptive statistics on the continuous variables (i.e., mental health outcomes and empathy) were conducted to explore the data and to determine whether the test assumptions for the parametric tests were met. Shapiro-Wilk tests were conducted on all continuous variables to determine if the data were normally distributed. To assess the homogeneity of variance, Levene’s tests were conducted to compare sub-group sizes between all continuous variables and sociodemographic variables (i.e., biological sex, history of psychological diagnosis, level of study, and time of survey). Regarding multivariate normality, all continuous variables produced significant Shapiro-Wilk test results, indicating that the data were not normally distributed (Shapiro & Wilk, 1965). With the exception of

level of study, homogeneity of variance was not violated by the categorical variables on their outcome variables (see Appendix M). Residual plots and boxplots were further examined to visualise and determine any further violations of the assumptions and identify possible outliers. Since the assumptions were violated, non-parametric tests (i.e., Mann-Whitney U tests and Kruskal-Wallis tests were conducted to explore the first objective of the study).

Outliers (usually >3 *SD* from the mean) were not adjusted as they were regarded to reflect the true performance of the participants. Furthermore, removing or adjusting outliers in psychological research may risk producing type 1 error (Bakker & Wicherts, 2014), hence they were left unadjusted in this study.

Inferential statistics

Secondly, a series of independent samples t-tests (Mann-Whitney U tests) and Kruskal-Wallis tests were conducted to determine between-group differences according to the mental health variables. The Bonferonni correction was applied to protect against inflated type 1 error due to multiple pairwise comparisons. For post-hoc analysis, Vargha and Delaney *A* was computed, which is usually recommended as the effect size estimate for Mann-Whitney *U* tests (Vargha & Delaney, 2000)The effect thresholds for Vargha and Delaney *A* are: small, >= 0.56; medium, >= 0.64; large, >= 0.71. The effect size estimate computed for the Kruskal-Wallis tests is epsilon-squared, which is less sensitive to violation of assumptions (Liu, 2022). Epsilon-squared is interpreted as: 0.00 < 0.01 – Very weak; 0.01 < 0.04 – Weak; 0.04 < 0.16 – Moderate; 0.16 < 0.36 - Relatively strong; 0.36 < 0.64 – Strong; 0.64 < 1.00 - Very strong (Rea & Parker, 2014).

Thirdly, a series of hierarchical multiple linear regression models were computed to explore associations between pandemic-related stress and exposure, sociodemographic variables and dispositional empathy with the mental health outcomes. Furthermore, moderation models were computed for the mental health outcomes with the best-performing core regression models to assess to what extent their relationship to sociodemographic variables was influenced by dispositional empathy. All assumptions were upheld unless otherwise stated. Prior to the regression analysis, frequency distributions and residual plots were examined to determine whether there were influential cases in the outcome variables, and Shapiro-Wilk tests were conducted to assess the normality of the data (see Appendix M). Pearson correlation matrices were computed between the mental health variables, empathy dimensions, sociodemographic variables and pandemic-related variables (Appendix O). The

Pearson correlation is still relatively robust with large samples, even with non-normal distribution of the data (Bishara & Hittner, 2012)

Lastly, structural equation modelling (SEM) using path analysis was conducted to assess the causal influence of the pandemic-related stress and exposure and sociodemographic variables, and the moderating roles of empathy on the mental health outcomes. The R package lavaan was used to conduct the analysis (Rosseel, 2012) To assess the models, chi-square, root mean square error of approximation (RMSEA), comparative fit index, (CFI), Tucker-Lewis Index (TLI) and standardised root mean square residual (SRMR) were calculated. Good model fit is represented as a non-significant chi-square statistic, RMSEA <=.05, CFI >=.95, TLI >=.95 and SRMR <=.08 (Brown, T. A., 2015; Flora & Curran, 2004; Hu & Bentler, 1999; Kline, 2016). Given that chi-squared is influenced by sample size, Byrne (2016) suggested accepting a model when the CFI >=.90 and <=.95, and the RMSEA is <=.08 and the SRMR is <=.05.

The remainder of the Results section is organized according to the study objectives, which were:

a) Describe the presence and severity of general psychological distress, depression, anxiety and PTSD symptoms and empathy, including pandemic-related stress and exposure as experienced by South African university students.
b) Explore the relationship between sociodemographic variables, pandemic-related stress and exposure, and mental health (i.e., depressive, anxiety and PTSD symptoms), and unpack the potentially moderating role of dispositional empathy (i.e., cognitive and affective empathy) in this relation.

Results

Objective 1

The first objective of the study was to describe the mental health outcomes, empathy and pandemic-related stress and exposure by sociodemographic variables (i.e., biological sex, history of psychological diagnosis, level of study and time of survey)

Sample characteristics

Sex differences according to mental health outcomes and empathy. Table 1 presents the descriptive statistics of the full sample for biological sex according to the mental health outcomes (i.e., K-10, BDI-II, BAI and PCL-5 scores) and empathy (i.e., IRI affective empathy and IRI cognitive empathy). For each of these variables, Mann-Whitney U tests with Bonferroni corrections were computed to compare sex differences in the sample. As expected, there were significant sex differences across all mental health variables, associated with small to medium effects. The results showed that female participants reported significantly higher symptoms of general psychological distress, depression, anxiety, and PTSD compared to male participants (see Table 1 and Figure 2).

Regarding empathy, as expected, there were significant sex differences in affective empathy, although this was associated with very small effects. The results showed that overall, female participants reported significantly higher affective empathy compared to male participants. However, there were no significant sex differences in cognitive empathy (see Table 2 and Figure 3). It should be noted that the number of participants who completed the IRI was only 177 compared to the full sample (N=554).

Table 1

Results showing biological sex differences according to mental health outcomes and empathy dimensions (N=534)

Variable	Biological Sex		*U*		*VDA*	
	Female (*n*=431)	Male (*n*=102)	Value	*p*	Value	95% CI
K10	27.89 (8.75)	22.78 (8.10)	27 356	<.001	.622	[.562, .679)
BDI-II	31.15 (10.08)	27.50 (10.87)	26 618	<.001	.605	[.544, .665]
BAI	36.27 (13.22)	28.42 (13.72)	27 819	<.001	.633	[.576, .692]
PCL-5	34.05 (18.99)	25.88 (18.33)	23 903	<.001	.544	[.482, 608]
Affective empathy	43.85 (6.52)	39.03 (7.06)	2 689	<.001	.061	[.040, .088]
Cognitive empathy	44.09 (6.30)	42.38 (6.01)	2 264	.147	.052	[.032, .074]

Note. Means are presented with standard deviations in parentheses. The adjusted p-value using the Bonferroni correction for this set of comparisons is .0489. Furthermore, Vargha-Delaney A (VDA) was computed as a measure of effect size for each pairwise comparison with the confidence intervals for each effect size. K10=K10 scores; BDI = Beck Depression Inventory scores; BAI = Beck Anxiety Inventory scores; PCL-5 = PTSD-Checklist for DSM-5 scores; Overall empathy = Overall IRI scores; Affective Empathy = IRI empathic concern and personal distress scores; IRI Cognitive Empathy = IRI fantasy and perspective-taking scores.

Figure 2

Mental health outcomes by biological sex

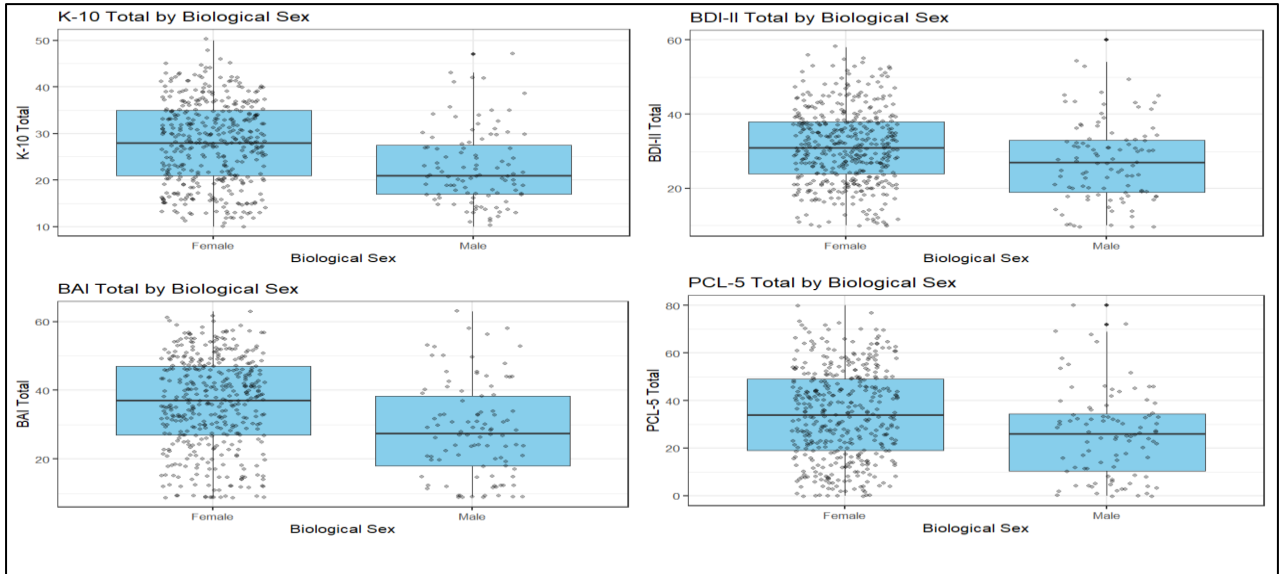
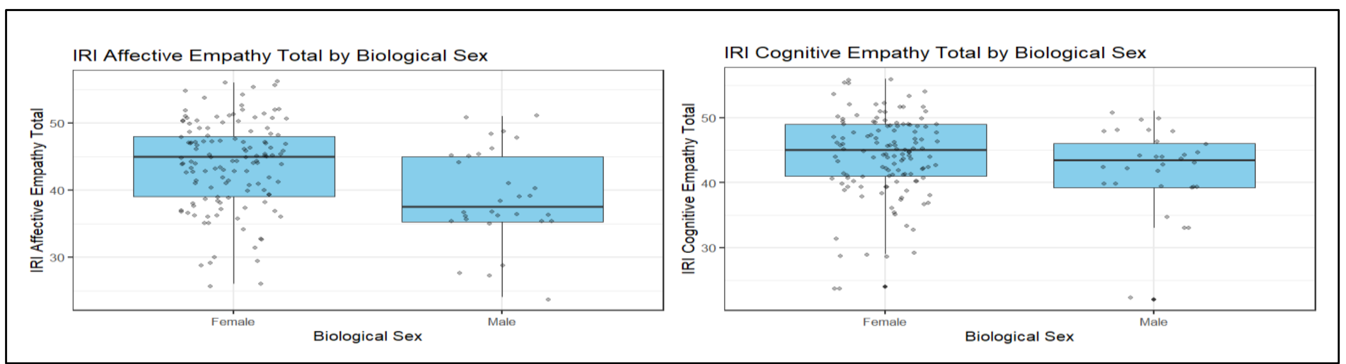


Figure 3

Empathy dimensions by biological sex



History of psychological diagnosis and differences in mental health outcomes. Table 2 presents the descriptive statistics of the full sample according to history of psychological diagnosis (recorded as 'yes' and 'no'). Mann-Whitney *U* tests were computed to compare current mental health outcomes as measured by the K-10, BDI-II, BAI and PCL-5, to any self-reported history of psychological diagnosis. Bonferroni correction was applied to correct for multiple pairwise comparisons. As expected, there were significant between-group differences across all mental health outcomes, associated with medium to large effects. These results show that overall, participants with a history of psychological diagnosis reported significantly higher symptoms of psychological distress, depression, anxiety and PTSD (see Table 2 and Figure 4)

Table 2

Results for previous psychological diagnosis along mental health outcomes (N=533)

Variable	History of Psychological Diagnosis		*U*		*VDA*	
	Yes (*n*=132)	No (*n*=401)	Value	*p*	Value	95% CI
K10	31.39 (8.15)	25.39 (8.58)	33 962	<.001	.642	[.587, .693]
BDI-II	36.21 (10.64)	28.56 (9.50)	37 221	<.001	.703	[.649, .756]
BAI	42.27 (12.06)	32.28 (13.26)	35 512	<.001	.671	[.617, .722]
PCL-5	39.04 (18.73)	30.04 (18.64)	30 005	<.001	.567	[.510, 625]

Time of survey and mental health outcomes. Table 3 presents the descriptive statistics of the full sample according to the time of the survey, recorded as ‘During Lockdown’ and ‘After Lockdown’ (i.e., during and after the nationwide COVID-19 lockdown, respectively). Mann-Whitney *U* tests were computed, and Bonferroni correction was applied to correct for multiple pairwise comparisons. Contrary to the study predictions, , there were no significant differences in symptoms of general psychological distress, depression, anxiety and PTSD between participants who completed the survey during the lockdown and after the lockdown (see Table 3 and Figure 4).

Table 3

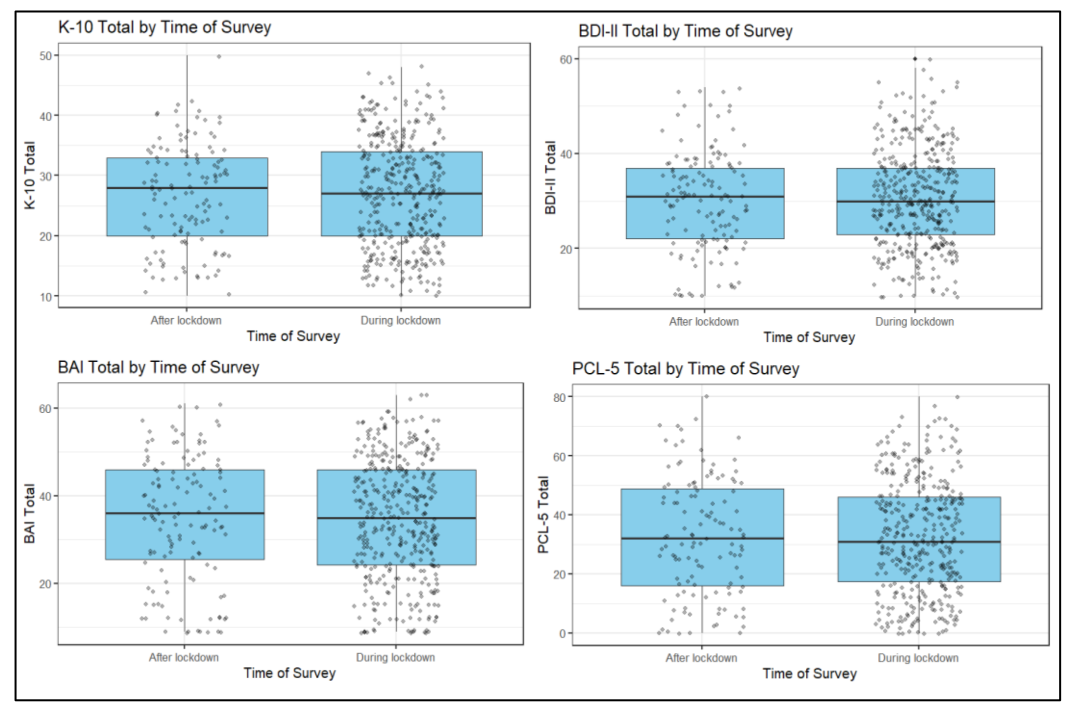
Results for time of survey along mental health outcomes

Variable	Time of survey		*U*		*VDA*	
	During lockdown (n=396)	After Lockdown (n=137)	Value	*p*	Value	95% CI
K10	26.65 (8.52)	26.98 (8.98)	23 991	.78	.442	[.389, .500]
BDI-II	30.13 (10.56)	30.56 (10.26)	26 843	.85	.495	[.436, .548]
BAI	34.64 (14.31)	34.79 (13.45)	25 392	.95	.468	[.410, .528]
PCL-5	32.64 (19.78)	32.43 (18.93)	23 004	.96	.424	[.365, 481]

Note. Time of survey was categorised as During Lockdown and After Lockdown which recorded responses before and after 4 April 2021 i.e., the date the National State of Disaster was lifted by the South African government.

Figure 4

Mental health outcomes according to the time of survey



Mental health outcomes and empathy differences according to level of study. Table 4 shows the results from the series of Kruskal-Wallis tests comparing mental health outcomes and empathy across the different levels of study. ‘Level of study’ was organised into four categories, namely first year, second year, third year, fourth year plus, and postgraduate. Fourth year plus was added as a category to a) include Humanities students who were still pursuing their undergraduate degree past the minimum three years of study at UCT, and b) accommodate students from other faculties who pursue longer undergraduate degrees. Kruskal-Wallis tests were computed for the mental health outcomes and empathy, and Bonferroni correction was applied to correct for multiple pairwise comparisons. Overall, as level of study increases, there is a decline in reported mental health outcomes across all the measures. However, this pattern was not observed with empathy variables. Furthermore, results detected significant differences across levels of study in the K-10 and BDI-II scores (i.e., symptoms of general psychological distress and depression), although with small effects. To determine which academic groups presented significantly higher/lower scores, Dunn’s test was computed, conducting multiple pairwise comparisons across all the groups for both outcome variables (Dinno, 2015). For the K-10, results from Dunn’s test found no significant group differences, according to the adjusted p-value, while the unadjusted p-value showed significant differences between first years and fourth year plus, first years and postgraduate, and postgraduate and second year students. For the BDI-II, results from Dunn’s test detected no significant group differences (according to the adjusted p-value), while the unadjusted p-value found significant differences between fourth year plus and second years (see Appendix N). These results show that students in their earlier years of study score higher on the K-10 and BDI-II, thereby having more severe symptoms of general psychological distress and depression compared to senior students.

It should be noted that while the Bonferroni correction is a robust estimate, it has been criticised for being extremely conservative, potentially contributing to multiple false-negatives (VanderWeele & Mathur, 2019). Therefore, it can be deduced that while the omnibus Kruskal-Wallis tests found significant group differences, which were further indicated by the unadjusted Dunn’s test p-value, these differences may marginal and should be interpreted with caution.

Table 4

Results for the Kruskal-Wallis tests comparing mental health outcomes and empathy dimensions by level of study

Variable	Level of study					$\chi2$ (df=4)	p	ESE	
	First year (n=193)	Second year (n=143)	Third year (n=118)	Fourth year Plus (n=48)	Postgraduate (n=31)			Value	95% CI
K10	27.84 (8.44)	27.65 (8.61)	26.07 (9.36)	25.24 (9.60)	23.48 (8.51)	9.93	.04	.019	[.008, .053]
BDI-II	31.07 (9.79)	31.71 (10.14)	29.38 (10.40)	29.21 (11.92)	26.77 (10.78)	9.71	.04	.019	[.007, .054]
BAI	35.87 (12.64)	35.84 (13.30)	33.19 (14.91)	32.77 (14.03)	31.84 (15.35)	4.58	.33	.009	[.003, .041]
PCL-5	33.13 (18.91)	34.45 (18.52)	31.93 (19.54)	27.67 (18.91)	28.76 (21.35)	6.34	.18	.012	[.004, .046]
Affective empathy	43.34 (6.82)	43.14 (7.33)	41.36 (6.62)	43.67 (6.24)	45.50 (6.60)	3.29	.51	.006	[.002, .033]
Cognitive empathy	43.62 (6.15)	43.41 (7.36)	43.83 (5.26)	44.75 (5.24)	45.67 (6.86)	1.46	.83	.003	[.001, .025]

Note. $\chi2$ = Kruskal-Wallis chi-squared test statistic. Fourth year Plus represents Humanities students who are in their undergraduate degree past the minimum third year of study, including students from other faculties. ESE=effect size estimate, which for these Kruskal-Wallis tests was epsilon-squared.

Figure 5

Mental health outcomes by level of study

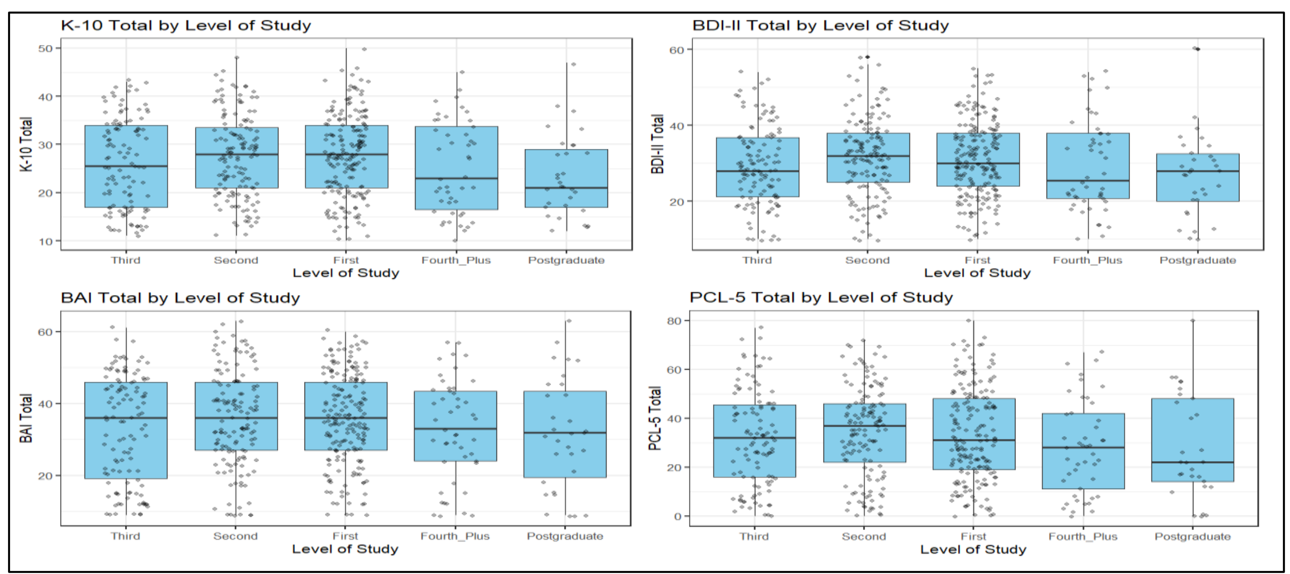
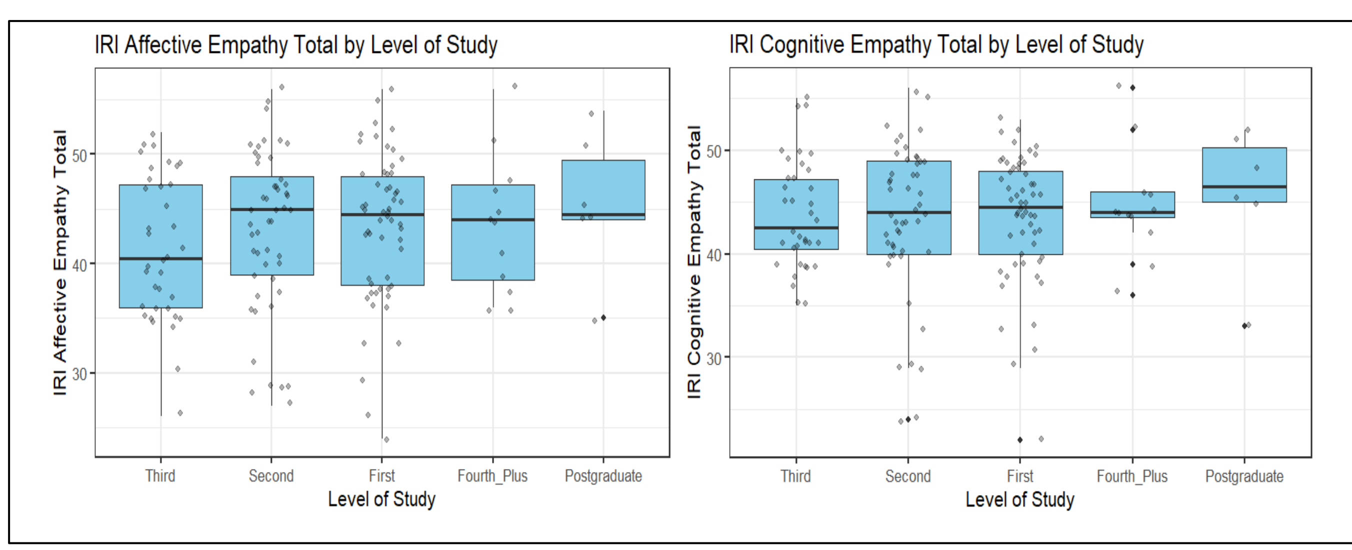


Figure 6

Empathy dimensions by level of study

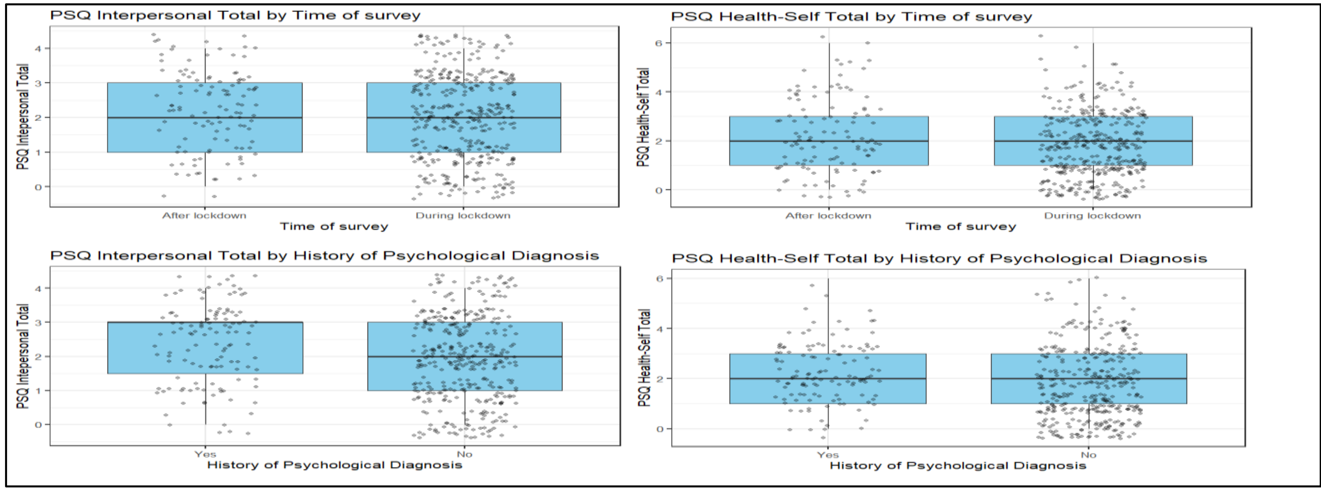


Associations between pandemic-related stress, sociodemographic and other participant variables. Finally, non-parametric tests were computed to compare the degree of reported pandemic-related stress and exposure across sociodemographic variables (i.e., biological sex, history of psychological diagnosis and level of study). Pandemic-related stress and exposure is organised according to the 5 subscales of the PSQ. It should be noted that while for this study, pandemic-related stress and exposure is a predictor variable, it is vital to determine if there are any sociodemographic group differences regarding pandemic-related stress and exposure. To determine any significant sociodemographic group differences, Mann-Whitney *U* tests were used for the binary sociodemographic variables (i.e., biological sex, history of psychological diagnosis and time of survey) and Kruskal-Wallis tests were computed for level of study. The full results can be found in Appendix O.

The Mann-Whitney *U* tests showed significant between-group differences regarding history of psychological diagnosis and PSQ Interpersonal and Health-self subscales. Visual inspection of the distributions shows that while people with a history of psychological diagnosis reported higher interpersonal pandemic-related stress and exposure compared to people without a history of psychological diagnosis, the mean group scores for the PSQ health-self subscale were very similar (see Figure 7). Regarding time of survey, significant group differences were detected in the PSQ Interpersonal and Health-self subscale, although the mean group scores were similar for both group in each subscale. No significant group differences were observed for biological sex and level of study regarding pandemic-related stress and exposure.

Figure 7

PSQ interpersonal and health-self scores by time of survey and history of psychological diagnosis



In summary, the results from the non-parametric tests show that regarding biological sex, female participants reported significantly higher symptoms of general psychological distress, depression, anxiety and PTSD, compared to male participants. Furthermore, female participants reported significantly higher affective empathy compared to male participants, while cognitive empathy was non-significant.

Regarding, history of psychological diagnosis, the results show that participants who have stated a history of psychological diagnosis reported significantly higher symptoms of general psychological distress, depression, anxiety and PTSD scores, compared to participants with no history of psychological diagnosis.

Regarding level of study, there were significant group differences in symptoms of general psychological distress and depression, although post-hoc pairwise comparisons found that these differences may be marginal. Finally, regarding pandemic-related stress and exposure, the results showed that participants with a history of psychological diagnosis reported significantly higher exposure to interpersonal pandemic-related stress and exposure compared to participants without a history of psychological diagnosis. Significant results were also reported for history of psychological diagnosis and PSQ Health-self, and time of survey and PSQ Interpersonal and PSQ Health-self, although the mean group scores were similar for these tests. No other significant sociodemographic group differences were observed for the PSQ subscales.

Although the non-parametric tests were not specifically testing the first hypothesis, the results are largely in line with the predictions that female participants, participants with a history of psychological diagnosis and first-year students will experience significantly higher symptoms of general psychological distress, depression, anxiety, and PTSD. Surprisingly, there were few sociodemographic group differences in any of the PSQ subscales measuring pandemic-related stress and exposure.

Objective 2

The second objective of the study has 2 sub-aims: a) explore the relationship between sociodemographic variables, pandemic-related stress and exposure and mental health outcomes, b) investigate the potentially moderating role of dispositional empathy.

Hypothesis 1

The first hypothesis predicted that symptoms of general psychological distress, depression, anxiety and PTSD will be higher among female participants, first-year and senior students, people who have a history of psychological diagnosis and students who participated in the survey during the lockdown. This hypothesis was tested using a series of hierarchical linear regressions, first entering the sociodemographic and pandemic-related stress and exposure variables, followed by affective and cognitive empathy. Intercorrelation matrices were inspected to assist with deciding which variables to include in the regression analysis (see Appendix P).

Based on the literature, the results of the non-parametric tests and the correlation analysis, the following 8 predictors were chosen for inclusion in the hierarchical regressions: biological sex, history of psychological diagnosis, level of study, PSQ General Life Disruption, PSQ Interpersonal, PSQ Educational-Professional, IRI affective empathy, and IRI cognitive empathy. The number of predictors was also reduced to a maximum of eight in consideration of the reduced sample size for the IRI measure.

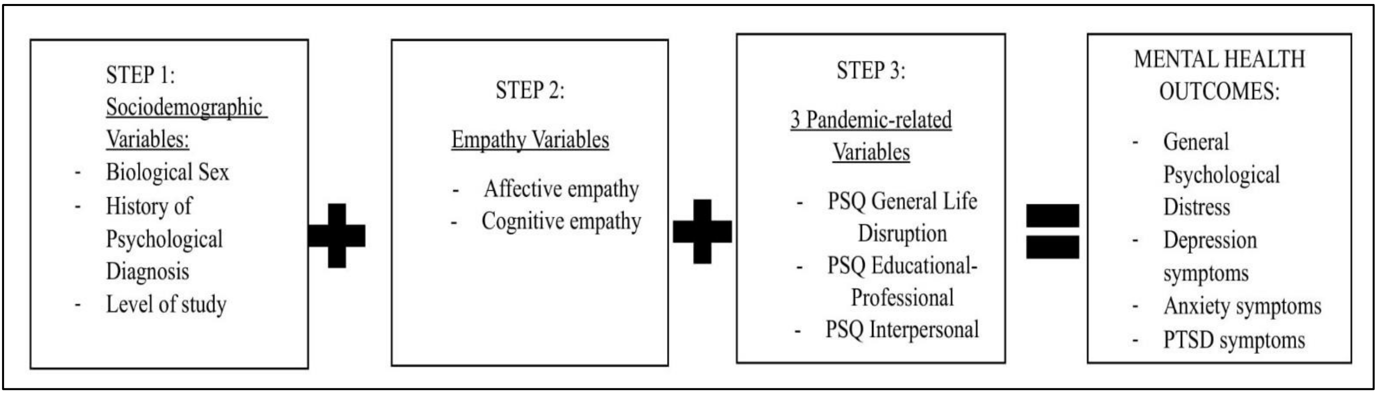
Time of survey was omitted due to the consistent non-significant results and similar group means obtained in the non-parametric tests, and the non-significant results obtained in the correlation analysis. PSQ Financial, PSQ Health-others and PSQ Health-self were also omitted based on the non-parametric results, and to avoid multicollinearity based on the correlation analysis results. Furthermore, PSQ Health-self recorded a low number of ‘yes’ endorsements (see Appendix for full scale item frequencies). The remaining PSQ subscales

(i.e., General Life Disruption, Interpersonal and Educational-Professional) were included based on the literature, and the moderate associations observed in the correlation analysis.

The regression analyses followed a 3-step approach outlined in Figure 9 below. First, the sociodemographic variables (i.e., biological sex, history of psychological diagnosis, and level of study) were entered into the model as independent variables to determine how they were individually associated with each mental health outcome. Next, cognitive and affective empathy were added to the model, and lastly, the 3 chosen pandemic-related predictors were added to the final regression model. In mental health research, subject variables (such as biological sex, education level, and secondary individual characteristics) are usually earlier in regressions, followed by any environmental factors (Banna et al., 2022; Boelen, 2021; Hosen et al., 2021; Paz et al., 2020). A similar approach was taken in this study, and this particular sequencing of the variables aimed to determine whether sociodemographic and empathy variables (i.e., individual-level variables) would continue to predict mental health outcomes even after adding specific pandemic-related variables (i.e., environmental factors). The sequencing of variables for this analysis was also informed by similar studies on mental health and dispositional empathy conducted before and during the COVID-19 pandemic (Hubbard et al., 2021; Sheldon et al., 2021a; Vo et al., 2023). Assumptions were upheld unless otherwise stated (see Appendix Q for regression model diagnostics)

Figure 8

Sequencing of variables for regression models



Model 1-3: Predicting performance on the K-10 scores. The K-10 hierarchical regression model with sociodemographic variables was statistically significant, explaining 13.83% of the variance in K-10 scores F (6, 504) = 14.64, p < .001, with male biological sex, no self-reported history of psychological diagnosis and postgraduate level of study yielding significant results. In Step 2, cognitive and affective empathy were added, resulting in an additional 3.24% of the variance in K-10 scores, with only cognitive empathy yielding significant results. Finally, in step 3 of the K-10 regressions, the inclusion of the 3 pandemic-related variables provided a substantial addition of 8% of the variance and all were significant. In the third K-10 model, only male biological sex, postgraduate level of study, no self-reported history of psychological diagnosis, and the 3 PSQ subscales maintained their significance in predicting general psychological distress. Overall, the third K-10 model accounted for 25.01% of the variance in K-10 scores F (11, 147) = 5.81, p<.001.

Model 4-6: Predicting performance for the BDI-II scores. The BDI-II hierarchical regression model with sociodemographic variables was statistically significant, explaining 12.59% of the variance in BDI-II scores F (6, 526) = 13.77, p<.001, with male biological sex, no self-reported history of psychological diagnosis, second and postgraduate level of study yielding significant results. Next, the empathy variables, IRI affective and cognitive empathy were entered in step 2 of the regression, resulting in a .09% decrease in the variance of BDI-II scores and no statistical significance from the empathy the variables. Finally, the 3 pandemic-related predictors (i.e., PSQ General Life Disruption, PSQ Interpersonal and PSQ Education-Professional) were entered into the model, accounting for an additional 5.93% of the variance in BDI-II scores and all were significant. In the third BDI-II model, only no self-reported history of psychological diagnosis and the 3 pandemic-related predictors maintained statistical significance. Overall, the third model explained 18.52% of the variance in BDI-II scores F (11, 147) = 4.26, p<.001.

Table 5

Hierarchical regression results for K-10 scores

Variable	B	95% CI for B		SE B	*β*	R^2	ΔR^2
		LL	UL				
Step 1						14.84	13.83***
Constant	31.32***	29.34	33.30	1.01	0.00***		
Biological Sex_Male	-4.06***	-5.89	-2.23	0.93	-1.59***		
History of Psychological Diagnosis_None	-5.88***	-7.56	-4.21	0.85	-2.51***		
Level of study_First	1.70	-0.24	3.64	0.99	0.63		
Level of study_Second	1.69	-0.36	3.74	1.04	0.59		
Level of study_Fourth Plus	-0.93	-3.76	1.90	1.44	-0.23		
Level of study_Postgraduate	-3.37*	-6.66	-0.08	1.68	-0.73*		

Step 2						21.27	17.07***
Constant	15.81**	5.18	26.44	5.38	0.00**		
Biological Sex_Male	-3.02	-6.51	0.46	1.76	-1.10		
History of Psychological Diagnosis_None	-5.24***	-8.27	-2.21	1.53	-2.20***		
Level of study_First	2.49	-0.97	5.95	1.75	0.92		
Level of study_Second	2.14	1.42	5.71	1.80	0.76		
Level of study_Fourth Plus	0.19	-5.20	5.58	2.73	0.05		
Level of study_Postgraduate	-6.56	-13.83	0.71	3.68	-1.15		
IRI Affective empathy	0.06	-0.17	0.29	0.12	0.31		
IRI Cognitive empathy	0.28*	0.04	0.52	0.12	1.46*		

Step 3						30.31	25.10***
Constant	16.10**	5.54	26.65	5.34	0.00**		
Biological Sex_Male	-3.70*	-7.04	-0.36	1.70	-1.34*		
History of Psychological Diagnosis_None	-4.92**	-7.85	-1.99	1.48	-2.03**		
Level of study_First	2.05	-1.29	5.39	1.69	0.74		
Level of study_Second	2.76	-0.65	6.17	1.72	0.98		
Level of study_Fourth Plus	-0.95	-6.30	4.39	2.71	-0.22		
Level of study_Postgraduate	-4.91	-11.94	2.11	3.55	-0.85		
IRI Affective empathy	0.01	-0.22	0.23	0.11	0.03		
IRI Cognitive empathy	0.19	-2.67	0.43	0.12	0.97		
PSQ General Life Disruption	-1.51*	-2.67	-0.34	0.59	-1.57**		
PSQ Interpersonal	1.79*	0.39	3.19	0.71	1.55**		

PSQ Educational & Professional	2.13**	0.79	3.45	0.68	1.92**

Note. B=unstandarised estimate; β=standardised estimate; ΔR^2 =Adjusted R^2. * $p < .05$. ** $p < .01$. *** $p < .001$

Table 6

Hierarchical regression results for BDI-scores

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						13.38	12.59***
Constant	35.77***	33.48	38.06	1.16	0.00***		
Biological Sex_Male	-2.35*	-4.48	-0.24	1.07	-0.92*		
History of Psychological Diagnosis_None	-7.75***	-9.68	-5.81	0.98	-3.29***		
Level of study_First	1.58	-0.63	3.80	1.12	0.59		
Level of study_Second	2.46*	0.09	4.82	1.20	0.86*		
Level of study_Fourth Plus	-0.48	-3.73	2.77	1.65	-0.12		
Level of study_Postgraduate	-3.89*	-7.74	-0.04	1.96	-0.83*		

Step 2						16.93	12.50***
Constant	29.69***	16.57	42.80	6.64	0.000***		
Biological Sex_Male	-0.58	-4.89	3.72	2.18	-0.21		
History of Psychological Diagnosis_None	-8.36***	-12.09	-4.62	1.89	-3.51***		
Level of study_First	2.75	-1.51	7.02	2.12	1.01		
Level of study_Second	3.19	-1.21	7.59	2.23	1.14		
Level of study_Fourth Plus	0.87	-5.78	7.53	3.37	0.21		
Level of study_Postgraduate	-6.14	-15.12	2.83	4.54	-1.08		
IRI Affective empathy	-0.08	-0.36	0.21	0.14	0.42		
IRI Cognitive empathy	0.22	-0.08	0.52	0.15	1.16		

Step 3						24.19	18.52***
Constant	29.49***	16.26	42.72	6.69	0.00***		
Biological Sex_Male	-1.30	-5.49	2.88	2.12	-0.47		
History of Psychological Diagnosis_None	-7.94***	-11.60	-4.27	1.86	-3.28***		
Level of study_First	2.32	-1.88	6.51	2.12	0.84		
Level of study_Second	3.87	-0.40	8.15	2.16	1.37		
Level of study_Fourth Plus	-0.41	-7.12	6.29	3.39	-0.09		
Level of study_Postgraduate	-4.48	-13.29	4.33	4.46	-0.77		
IRI Affective empathy	-0.13	-0.41	0.15	0.14	-0.71		
IRI Cognitive empathy	0.13	-0.17	0.43	0.15	0.64		
PSQ General Life Disruption	-1.50*	-2.96	-0.04	0.74	-1.56*		
PSQ Interpersonal	2.07*	0.32	3.83	0.89	1.79*		

PSQ Educational & Professional	2.20*	0.52	3.88	0.85	1.98*

Note. B=unstandarised estimate; β=standardised estimate; ΔR^2 =Adjusted R^2. *$p < .05$. **$p < .01$. ***$p < .001$

Model 7-9: Predicting performance for BAI scores. The BAI hierarchical regression model with sociodemographic variables was statistically significant, accounting for 14.12% of the variance in BAI scores $F(6, 510) = 15.13$, $p<.001$, with male biological sex and no self-reported history of psychological diagnosis yielding significant results. In step 2, the empathy predictors (i.e., IRI affective and cognitive empathy) were entered, resulting in a 0.81% decrease in the variance of BAI scores, and no statistical significance from the empathy variables. Lastly, the 3 pandemic-related predictors were entered into the model, explaining an additional 2.05% of the variance in BAI scores, with no statistical significance from the pandemic-related variables. In the third BAI model, only male biological sex and no self-reported history of psychological diagnosis remained significant predictors of BAI-II scores. Overall, the third model explained 15.36% of the variance in BAI scores $F(11, 147) = 3.61$, $p<.001$.

Model 10-12: Predicting performance for PCL-5 scores. The PCL-5 hierarchical regression model with sociodemographic variables was statistically significant, explaining 7.15% of the variance in PCL-5 scores $F(4, 490) = 7.37$, $p<.001$, with male biological sex and no self-reported history of psychological diagnosis yielding significant results. Next, the empathy predictors (i.e., IRI affective and cognitive empathy) were entered into step 2 of the model, explaining an additional 4.13% of the variance in PCL-5 scores and no statistical significance from the empathy variables. Finally, the 3 pandemic-related predictors were entered into step 3 of the model, accounting for an additional 7.18% of the variance in PCL-5 scores, with PSQ Interpersonal and PSQ Educational & Professional yielding statistically significant results. In the third model, only male biological sex, and PSQ Interpersonal and PSQ Educational-Professional remained significant predictors of PCL-5 scores. Overall, the third model explained 18.46% of the variance in PCL-5 scores $F(11, 147) = 4.25$, $p<.001$.

Table 7

Hierarchical regression results for BAI scores

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						15.13	14.12***
Constant	41.75***	38.71	44.79	1.55	0.00***		
Biological Sex_Male	-6.29***	-9.09	-3.48	1.43	-2.45***		
History of Psychological Diagnosis_None	-9.67***	-12.24	-7.09	1.30	-4.11***		
Level of study_First	2.62	-0.34	5.59	1.51	0.97		
Level of study_Second	2.83	-0.31	5.97	1.60	0.99		
Level of study_Fourth Plus	-0.60	-4.91	3.72	2.19	-0.15		
Level of study_Postgraduate	-2.68	-7.74	2.38	2.58	-0.58		

Step 2						17.70	13.31***
Constant	30.34***	13.84	46.84	8.35	0.00***		
Biological Sex_Male	-7.38**	-12.79	-1.96	2.74	-2.69**		
History of Psychological Diagnosis_None	-7.00**	-11.71	-2.30	2.38	-2.94**		
Level of study_First	3.68	-1.69	9.05	2.71	1.35		
Level of study_Second	2.32	-3.21	7.86	2.80	0.83		
Level of study_Fourth Plus	2.07	-6.30	10.44	4.24	0.49		
Level of study_Postgraduate	-7.00	-18.80	3.78	2.38	-1.31		
IRI Affective empathy	-0.06	-.41	0.30	0.18	-0.30		
IRI Cognitive empathy	0.30	-0.08	0.68	0.19	1.58		

Step 3						21.25	15.36
Constant	28.85**	11.81	45.89	8.62	0.00**		
Biological Sex_Male	-7.96**	-13.35	-2.56	2.73	-2.88**		
History of Psychological Diagnosis_None	-6.43**	-11.56	-1.70	2.39	-2.66**		
Level of study_First	3.39	-2.01	8.79	3.73	1.23		
Level of study_Second	2.97	-2.53	8.48	2.79	1.05		
Level of study_Fourth Plus	0.81	-7.82	9.45	5.74	0.18		
Level of study_Postgraduate	-6.38	-17.73	4.96	-1.11	-1.10		
IRI Affective empathy	-0.11	-0.47	0.26	0.18	-0.58		
IRI Cognitive empathy	0.22	-0.17	0.92	0.20	1.10		
PSQ General Life Disruption	-0.96	-2.84	0.92	0.95	-1.00		
PSQ Interpersonal	2.16	-0.10	4.42	1.14	1.87		

PSQ Educational & Professional	1.62	-0.54	3.78	1.09	1.46

Note. B=unstandarised estimate; β=standardised estimate; ΔR^2 =Adjusted R^2. * $p < .05$. **$p < .01$. ***$p < .001$

Table 8

Hierarchical regression results for PCL-5 scores

Variable	B	95% CI for B		SE B	*β*	R^2	ΔR^2
		LL	UL				
Step 1						8.27	7.15***
Constant	40.33***	35.82	44.85	2.29	0.00***		
Biological Sex_Male	-6.48**	-10.66	-2.30	2.13	-2.52**		
History of Psychological Diagnosis_None	-9.54***	-13.34	-5.74	1.93	-4.08***		
Level of study_First	1.21	-3.22	5.64	1.21	0.44		
Level of study_Second	2.69	-1.99	7.36	2.38	0.93		
Level of study_Fourth Plus	-4.15	-10.59	2.29	3.28	-1.05		
Level of study_Postgraduate	-4.52	-12.15	3.11	3.88	-0.96		
Step 2						15.77	11.28***
Constant	18.95	-4.57	42.47	11.90	0.00		

Biological Sex_Male	-9.76*	-17.48	-2.04	3.91	-3.56*		
History of Psychological Diagnosis_None	-5.58	-12.28	1.13	3.39	-2.34		
Level of study_First	2.03	-5.62	9.69	3.87	0.75		
Level of study_Second	4.22	-3.68	12.11	3.99	1.50		
Level of study_Fourth Plus	-9.23	-21.17	2.70	6.04	-2.18		
Level of study_Postgraduate	-13.17	-29.27	2.92	8.14	-2.30		
IRI Affective empathy	0.11	-0.41	0.62	0.26	0.58		
IRI Cognitive empathy	0.37	-0.16	0.91	0.27	1.96		
Step 3						24.13	18.46***
Constant	13.01	-10.56	36.57	11.93	0.00		
Biological Sex_Male	-11.29**	-18.75	-3.84	3.77	-4.09**		

History of Psychological Diagnosis_None	-4.75	-11.29	1.79	3.31	1.96
Level of study_First	2.34	-1.75	13.48	3.78	0.85
Level of study_Second	5.86	-1.29	13.48	3.85	2.08
Level of study_Fourth Plus	-9.69	-21.64	2.26	6.04	-2.19
Level of study_Postgraduate	-9.74	-25.43	5.96	7.94	-1.68
IRI Affective empathy	-0.06	-0.56	0.44	0.25	-0.33
IRI Cognitive empathy	0.30	0.24	0.84	0.27	1.50
PSQ General Life Disruption	-0.69	-3.29	1.91	1.32	-0.71
PSQ Interpersonal	3.31*	0.18	6.43	1.58	2.86*
PSQ Educational & Professional	4.36**	1.36	7.35	1.51	3.93**

Note. B=unstandarised estimate; β=standardised estimate; ΔR^2 =Adjusted R^2. *$p < .05$. **$p < .01$. ***$p < .001$

In summary, the results from the regression models testing the first hypothesis show that across all mental health outcome variables, biological sex, followed by the pandemic-related predictors (particularly PSQ Interpersonal), and history of psychological diagnosis are important predictors of mental health outcomes. The results regarding biological sex are in line with hypothesis 1, whereby male participants scored significantly lower on mental health measures, while female participants scored significantly higher as initially predicted. Furthermore, the results show that participants without a history of psychological diagnosis scored significantly lower on mental health measures compared to people with a history of diagnosis, which is also in line with the initial predictions. Finally, the results also show that students in their earlier years of study (in this case second year) scored significantly higher on mental health outcomes while students in senior years of study (i.e., postgraduate) scored significantly lower.

Hypotheses 2 and 3

The second and third hypotheses of the study predicted that the relationship between pandemic-related stress and mental health outcomes will be moderated by dispositional empathy, specifically, there will be a double dissociation, whereby affective empathy positively moderates the relationship between pandemic-related stress and mental health outcomes, while cognitive empathy negatively moderates the relationship between pandemic-related stress and mental health outcomes. Together, these hypotheses aim to determine whether dispositional empathy is a significant facilitator of mental health outcomes in relation to pandemic-related stress and exposure.

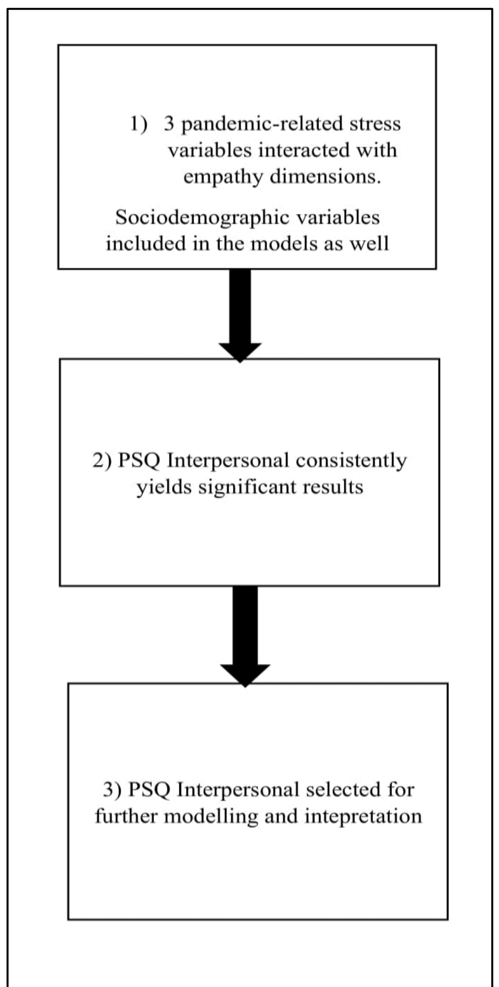
The K-10 and PCL-5 were chosen as mental health outcomes in two moderation models, respectively. The former was chosen given that it includes elements of depressive and anxiety symptoms (Kessler et al., 2002), and the latter given it is a measure of trauma (Weathers et al., 2013). The steps for moderation followed guidelines by Baron and Kenny (1986), Edward and Lambert (2007), and the SEM procedures followed guidelines by Kline (2015) and Sardesmukh and Vandenburg (2017).

Moderation models for the K-10 and PCL-5. Each model tested the interaction between the 3 pandemic-related stress predictors and empathy, whereby cognitive and affective empathy were modelled separately and together for each mode. The purpose of this sequencing was to determine how each empathy variable would be associated with the pandemic-related variables individually, and what influence they would have when modelled

together. The remaining sociodemographic predictors (i.e., biological sex, level of study and history of psychological diagnosis) were included in the models as well.

Figure 9

Diagram showing stages of moderation analysis for K-10 and PCL-5

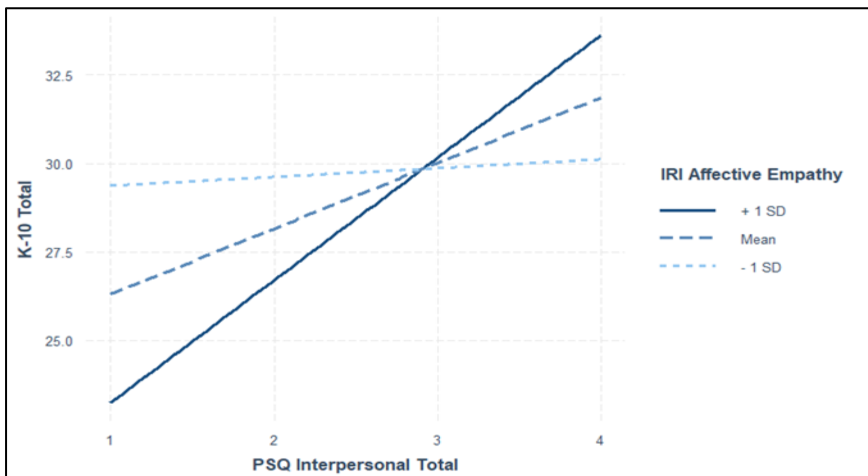


Models 13-15: K-10 moderation models. For the K-10, only PSQ Interpersonal showed significant interactions with affective and cognitive empathy when both variables were modelled separately (Affective empathy: B= 0.27, SE= 0.08, p <.01; Cognitive empathy: B= 0.21, SE= 0.09, p<.01). Furthermore, only affective empathy maintained a significant interaction when both empathy dimensions were included in the same model (B= 0.23, SE= 0.11, p <.05). In other words, regarding PSQ Interpersonal for the K-10, only IRI affective empathy remained a significant moderator, while IRI cognitive empathy was only significant when modelled alone and not together with affective empathy. This can be further interpreted as affective empathy having a stronger (moderating role) in the relationship between interpersonal pandemic-related stress and exposure and symptoms of general

psychological distress, while cognitive empathy loses its ability to moderate this relationship when affective empathy is also included. Figure 10 below visualises the interaction between PSQ Interpersonal and IRI affective empathy in predicting K-10 scores.

Figure 10

Graph showing the interaction between PSQ Interpersonal and IRI affective empathy for the K-10



Note. IRI affective empathy was modelled as a continuous variable. +1SD = IRI affective empathy scores more than 1 standard deviation above the mean (i.e., high IRI affective empathy). -1 SD = less than 1 standard deviation below the mean (i.e., low IRI affective empathy).

Models 16-18: PCL-5 moderation models. For the PCL-5, a significant interaction between PSQ Interpersonal and IRI affective empathy was observed in the model interacting only affective empathy ($B = .64$, $SE = 0.20$, $p < .05$), and when both empathy dimensions were included in the same model ($B = .74$, $SE = 0.24$, $p < .05$). All other models produced non-significant interactions. These results mean that in the relationship between PSQ Interpersonal and PCL-5, IRI affective empathy was a significant moderator only when modelled together with IRI cognitive empathy. In other words, contrary to the K-10 moderation, both affective and cognitive are required in order for at least one of them (in this case affective empathy) to become a moderator.

Table 9

Moderation analysis of the K-10 and PSQ Interpersonal

Variable	Model 1			Model 2			Model 3		
	B	β	SE	B	β	SE	B	β	SE
Constant	45.03***	0.00***	10.84	38.98**	0.00**	11.74	48.26***	0.00***	12.37
Biological Sex_Male	-3.17	-1.14	1.65	-3.60*	-1.30*	1.67	-3.21	-1.16	-3.21
History of Psychological Diagnosis_None	-4.59**	-1.89**	1.44	-4.81**	-1.99**	1.46	-4.60**	-1.89**	-4.60
Level of study_First	1.89	.68	1.64	1.92	.69	1.67	1.87	.67	1.87
Level of study_Second	2.90	1.03	1.68	2.35	.83	1.71	2.76	.97	2.75
Level of study_Fourth Plus	-1.02	-.23	2.63	-1.24	-.28	2.67	-1.10	-.25	-1.10
Level of study_Postgraduate	-5.11	-.88	3.46	-6.22	-1.05	3.56	-5.48	-.93	3.53

IRI Affective empathy	-.79**	-1.66**	.28	.03	.14	.11	-.68	-1.17	.35
IRI Cognitive empathy	-.27*	-1.34*	.12	-.37	-.78	.28	.09	.16	.58
PSQ General Life Disruption	-1.17*	-1.19*	.58	-1.48*	-1.53*	.58	-1.20*	-1.11*	4.45
PSQ Interpersonal	-9.70*	-1.50*	3.84	-7.09	-1.04	4.12	-10.93*	-1.47*	.66
PSQ Educational & Professional	2.27***	2.04***	.66	2.25**	2.02**	.67	2.29***	2.06***	.11
PSQ Interpersonal * IRI Affective empathy	.27**	1.81**	.08	-	-	-	.23*	1.28*	.11
PSQ Interpersonal * IRI Cognitive empathy				.21*	1.32*	.09	.06	.33	
R^2	34.47			32.52			34.60		
ΔR^2	29.08			26.97			28.74		

Table 10

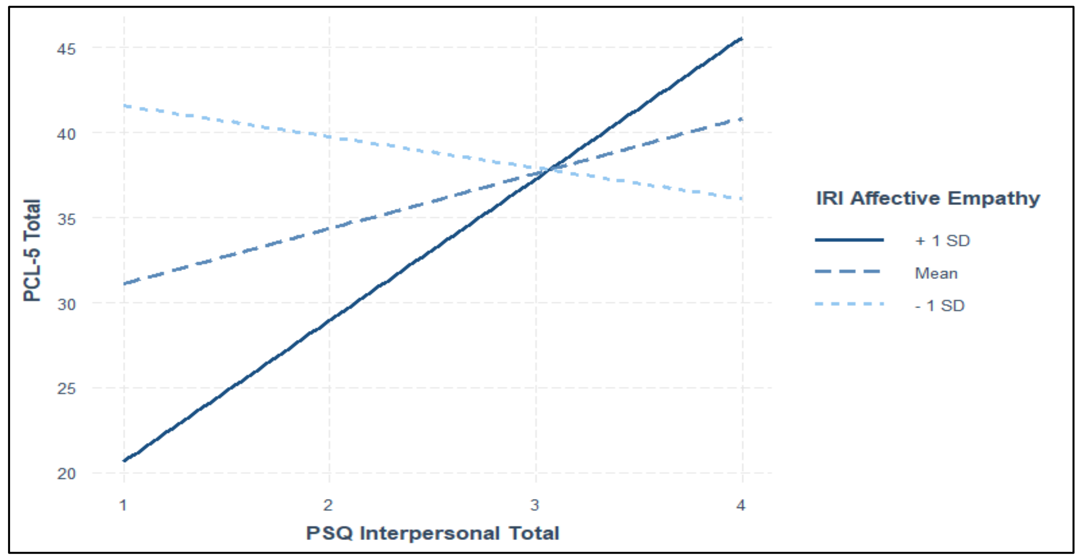
Moderation analysis showing interactions between PSQ Interpersonal and dispositional empathy in predicting PCL outcome

Variable		Model 1		Model 2				Model 3	
	B	β	SE	B	β	SE	B	β	SE
Constant	82.27***	0.00***	24.08	43.98	0.00	26.47	73.29**	0.00**	27.47
Biological Sex_Male	-10.03**	-3.61**	3.67	-11.16	-4.04**	3.76**	-9/93**	-3.57**	3.68
History of Psychological Diagnosis_None	-3.96	-1.63	3.21	-4.60	-1.90	3.30	-3.93	1.62	3.21
Level of study_First	1.95	.70	3.66	2.16	0.78	3.77	2.00	.72	3.67
Level of study_Second	6.20	2.20	3.73	5.31	1.87	3.87	-3.93	2.31	3.78
Level of study_Fourth Plus	-9.85	-2.23	5.85	-10.07	-2.27	6.04	-9.64	-2.17	5.87
Level of study_Postgraduate	-10.21	-1.76	7.69	-11.50	-1.95	8.03	-9.19	-1.55	7.85

IRI Affective empathy	-1.96**	-4.12**	.83	-.03	-.18	.25	-2.26**	-3.90**	.77
IRI Cognitive empathy	.49	2.41	.27	-.46	-.98	.64	.99	1.68	.78
PSQ General Life Disruption	.13	.13	1.30	-.64	-.67	1.31	.23	.23	1.31
PSQ Interpersonal	-24.22**	-3.75**	8.53	-8.71	-1.28	9.31	-20.83*	-2.79*	9.88
PSQ Educational & Professional	4.71**	4.23**	1.47	4.53	4.07**	1.51**	4.65**	4.18**	1.48
PSQ Interpersonal * IRI Affective empathy	.64**	4.34**	.20	-	-	.21	.74**	4.06**	.24
PSQ Interpersonal * IRI Cognitive empathy				.28	1.79		-.17	-.91	.25
R^2	29.56			25.01			31.24		
ΔR^2	23.25			18.85			22.95		

Figure 11

Graph showing the interaction between PSQ Interpersonal and IRI affective empathy for the PCL-5



Figures 9 and 10 visualise the interaction for the K-10 and PCL-5, respectively. For both mental health outcome measures, participants who have high IRI affective empathy will have low K-10 and PCL-5 scores before or at a PSQ Interpersonal score of ~3. However, participants with a high IRI affective empathy score will also produce high K-10 and PCL-5 scores when their PSQ Interpersonal score exceeds 3. Conversely, participants with a low IRI affective empathy will produce a higher K-10 and PCL-5 score before or at a PSQ Interpersonal score of ~ 3, and they will produce lower K-10 and PCL-5 scores at a higher PSQ Interpersonal score. This means that at more extreme scores of PSQ Interpersonal (i.e., between 3 and 4), individuals with high IRI affective empathy produce higher K-10 and PCL-5 scores (i.e., these participants will have greater severity in general psychological distress and PTSD symptoms), while participants with low affective empathy will produce lower K-10 and PCL-5 scores at higher PSQ Interpersonal scores.

Moreover, these results show that dispositional empathy functions differently in general psychological distress compared to trauma exposure. This phenomenon is observed where in predicting K-10 scores, affective empathy remains a significant moderator with or without cognitive empathy, while the latter is only a significant moderator without affective empathy. However, regarding PCL-5 scores, affective empathy is only a significant moderator when it is modelled alongside cognitive empathy. In other words, when predicting

PCL-5 scores, affective empathy requires cognitive empathy to become a significant moderator.

The results confirm hypothesis 2 (i.e., greater pandemic-related stress and exposure is associated with higher symptoms of general psychological distress and PTSD). These results also support the prediction that affective empathy and mental health outcomes are positively associated. From these results, participants with high affective empathy have lower psychological distress and PTSD symptoms at lower levels of interpersonal pandemic-related stress. This means that although they have high affective empathy (therefore, being at a greater risk of negative emotional processes such as *personal distress* and *emotional contagion*), this cohort of individuals can cope with some exposure to interpersonal pandemic-related stress and exposure. However, at higher scores of interpersonal pandemic-related stress and exposure, this cohort of participants will have worse mental health outcomes, as initially predicted.

Interestingly, participants with low affective empathy (who should in theory be less prone to experiencing the negative emotional processes associated with affective empathy), score much higher on the K-10 and PCL-5, showing worse mental health outcomes, even at low levels of interpersonal pandemic-related stress and exposure. However, this cohort will have better mental health outcomes at high levels of interpersonal pandemic-related stress

These results provide new insight into the function and manifestation of affective empathy, potentially indicating that affective empathy may occupy a dual role, whereby the double dissociation usually observed with cognitive empathy is also present within affective empathy alone (as observed in the K-10 moderation model). These results also show that high affective empathy can potentially protect against negative mental health outcomes even with some exposure to negative environmental stimuli (in this case interpersonal pandemic-related stress).

Path analysis models for the K-10 and PCL-5

Finally, SEM using path analysis was computed to determine the impact of pandemic-related stress and exposure and sociodemographic predictors on mental health outcomes, and further examine the moderating role of empathy observed in the hierarchical regressions. The path analyses for both the K-10 and PCL-5 are outlined below:

For this model, the exogenous variables are biological sex, level of study, history of psychological diagnosis, PSQ General Life Disruption, PSQ Educational Professional, PSQ

Interpersonal. The endogenous variable for each path analysis is the mental health outcome (i.e., K-10 and PCL-5), including the indirect paths with affective empathy and cognitive empathy. The model specification for both mental health outcomes was: the main regression model predicting mental health outcome from the chosen predictors; a regression model for affective empathy, with its predictors being biological sex and PSQ Interpersonal, and a regression model for cognitive empathy with its predictor being only biological.

K-10 path analysis model. The initial model showed good overall fit with the data (X^2 = 14.980; *df*=12; *p* =.243; RMSEA = 0.04 (90% CI: 0.000, 0.095); CFI = .969; TLI =. 947; SRMR=.044). However, the indirect paths for both affective and cognitive empathy, including the total effect, did not yield significant results. The following direct effects were significant for the K-10 Total: PSQ Interpersonal (*B* = 1.39, *SE* = 0.56, *p*<.05), PSQ Educational-and-Professional (*B* = 2.30, *SE* = 0.67, *p*<.05), PSQ General Life Disruption (*B*= -1.58, *SE*= 0.65, *p*<.05), biological sex (*B* = 3.00, *SE* = 1.25, *p*<.05), History of Psychological Diagnosis (*B* = -5.26, *SE* = 1.47, *p*<.05). While direct paths for level of study, affective and cognitive empathy were not significant.

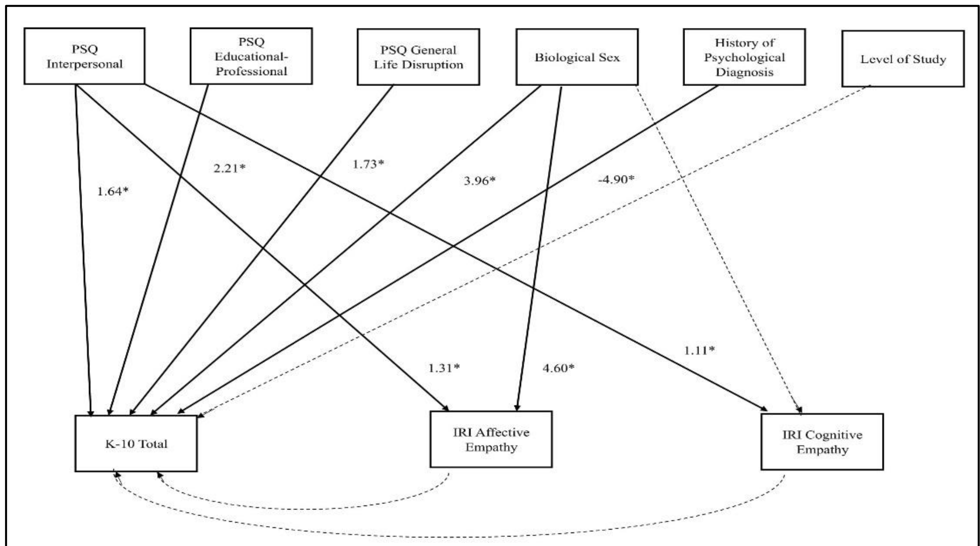
Regarding, the direct paths for affective empathy, both PSQ Interpersonal and Biological sex yielded significant results (*B* = 1.39, *SE* = 0.56, *p*<.05; *B* = 3.00, *SE* = 1.25, *p*<.05). Biological sex was also a significant direct path for cognitive empathy *B* = 3.00, *SE* = 1.25, *p*<.05). These results indicate that affective and cognitive empathy are significantly predicted by biological sex and PSQ Interpersonal. However, these empathy paths do not causally predict K-10 total, meaning there is no causal relationship from PSQ Interpersonal and biological sex through affective and cognitive empathy to K-10 total. The indirect paths remain independent from the main effect.

A second model was built including a path from PSQ Interpersonal to cognitive empathy (see Figure 12). No other changes were made to the model. The model showed good fit with the data (X^2 = 7.195; *df* = 12; *p* = .516; RMSEA = 0.000 (90% CI: 0.000, 0.087); CFI = 1.000; TLI = 1.022; SRMR = .034), although the indirect paths for affective and cognitive empathy, and the total effect, did not yield significant results. The following direct effects were significant for the K-10 Total: PSQ Interpersonal (*B* = 1.64, *SE* = 0.74, *p*<.05), PSQ Educational-and-Professional (*B* = 2.21, *SE* = 0.67, *p*<.05), PSQ General Life Disruption (*B* = -1.73, *SE* = 0.54, *p*<.05), biological sex (*B* = 3.96, *SE* = 1.65, *p*<.05), history of psychological diagnosis (*B* = -4.90, *SE* = 1.42, *p*<.05). The direct paths for affective empathy

maintained their significance (PSQ Interpersonal: *B* = 1.31, *SE* = 0.65, *p*<.05; biological sex: *B* = 4.60, *SE* = 1.71, *p*<.05). For cognitive empathy, the PSQ Interpersonal path yielded significance (*B* = 1.11, *SE* = 0.54, *p*<.05), while biological sex was no longer significant in this model. The results from this model show that while affective and cognitive empathy are predicted by biological sex and PSQ Interpersonal, these paths do not causally predict K-10 total.

Figure 12

Path analysis model of associations between sociodemographic, pandemic-related, empathy variables, and K-10 outcome



Note. The path analysis shows associations between sociodemographic variables (i.e., biological sex, history of psychological diagnosis and level of study), pandemic-related variables (i.e., PSQ General Life Disruption, PSQ Educational-Professional, PSQ Interpersonal), and empathy variables (i.e., affective empathy and cognitive empathy). The dashed-lines indicate insignificant paths and the solid lines indicate significant paths.
**p* < .05. ****p* < .001.

PCL path analysis. The path analysis for the PCL-5 included the same sociodemographic, pandemic-related and empathy variables as the K-10 path analysis. The main difference in the PCL-5 path analysis was the inclusion of cognitive empathy as a predictor for affective empathy in the model specification. This was done because the previous regression moderation models showed that in predicting PCL-5 scores, affective empathy was only significant when cognitive empathy was modelled with it, indicating a

potential dependence of affective empathy on cognitive empathy. To test if cognitive empathy occupied an important role in relation to affective empathy, it was included as its predictor.

The initial model showed acceptable overall fit with the data (X^2 = 17.488; *df* = 12; *p* = .132; RMSEA = 0.054 (90% CI: 0.000, 0.105); CFI = .935; TLI = .887; SRMR = .048). The indirect paths for both affective and cognitive empathy, including the total effect, did not yield significant results. The following direct effects were significant for the PCL-5 Total: PSQ Interpersonal (*B* = 1.33, *SE* = 0.60, *p*<.05), biological sex (*B* = 3.05, *SE* = 1.18, *p*<.05), History of Psychological Diagnosis (*B* = -7.26, *SE* = 3.64, *p*<.05).

Regarding, the direct paths for affective empathy regression, both PSQ Interpersonal and Biological sex yielded significant results (*B* = 1.33, *SE* = 0.60, *p*<.05; *B* = 3.05, *SE* = 1.88, *p*<.05). Biological sex was also a significant direct path for cognitive empathy *B* = 3.05, *SE* = 1.88, *p*<.05). These results confirm that affective and cognitive empathy are significantly predicted by biological sex and PSQ Interpersonal. However, these paths do not causally predict PCL-5 total. In other words, there is no causal relationship from PSQ Interpersonal and biological sex through affective and cognitive empathy to PCL-5 total. The indirect paths remain independent from the main effect.

A second PCL model was built including a path from PSQ Interpersonal to cognitive empathy (see Figure 13). No other changes were made to the model. The model showed good fit with the data (X^2 = 12.641; *df* = 12; *p* =.396; RMSEA = 0.018 (90% CI: 0.000, 0.084); CFI = .992; TLI =.987; SRMR = .042), although the indirect paths for affective and cognitive empathy, and the total effect, did not yield significant results. The following direct effects were significant for the PCL Total: PSQ Interpersonal (*B* = 1.05, *SE* = 0.48, *p*<.05), PSQ Educational-and-Professional (*B* = 4.65, *SE* = 1.67, *p*<.001), biological sex (*B* = 2.96, *SE* = 1.12, *p*<.001), history of psychological diagnosis (*B* = -7.32, *SE* = 3.65, *p*<.05).

The direct paths for affective empathy maintained their significance (PSQ Interpersonal: *B* = 1.05, *SE* = 0.48, *p*<.05; biological sex: *B* = 2.96, *SE* = 1.12, *p*<.001). For cognitive empathy, PSQ Interpersonal yielded significant results (*B* = 1.05, *SE* = 0.48, *p*<.05), and biological sex also maintained its significance (*B* = 2.95, *SE* = 1.13, *p*<.001).

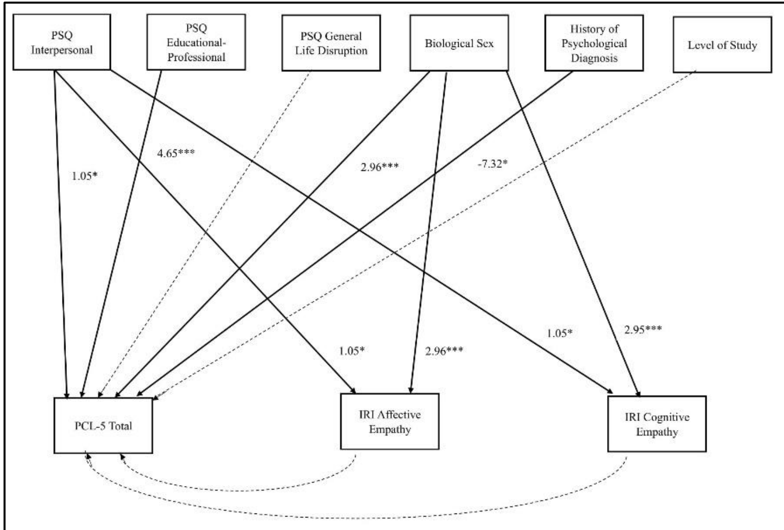
In summary, the results from the path analyses show that there is a direct relationship between pandemic-related stress and exposure (PSQ Interpersonal, PSQ General Life Disruption, and PSQ-Educational-Professional) and mental health outcomes as measured by

the K-10 and PCL-5. Regarding the sociodemographic variables, biological sex and history of psychological diagnosis remain significant predictors of both K-10 and PCL-5 total.

The results from the path analysis also indicate that biological sex and PSQ Interpersonal have a direct relationship on both affective and cognitive empathy. However, there is no indirect path from PSQ Interpersonal and biological sex, through affective and cognitive empathy, to mental health outcomes. This means that although biological sex and PSQ Interpersonal are directly related to affective and cognitive empathy, affective and cognitive empathy do not transfer that initial effect onto mental health outcomes.

Figure 13

Path analysis model of associations between sociodemographic, pandemic-related, empathy variables, and PCL-5 outcome



Note. The path analysis shows associations between sociodemographic variables (i.e., biological sex, history of psychological diagnosis and level of study), pandemic-related variables (i.e., PSQ General Life Disruption, PSQ Educational-Professional, PSQ Interpersonal), and empathy variables (i.e., affective empathy and cognitive empathy). The dashed-lines indicate insignificant paths and the solid lines indicate significant paths.
$^{*}p < .05$. $^{***}p < .001$.

Discussion

This study aimed to investigate students' mental health and social cognition in the context of the COVID-19 pandemic. The study had two objectives. First, it sought to describe the presence and severity of mental health outcomes, including dispositional empathy and pandemic-related stress and exposure by sociodemographic variables (i.e., biological sex, history of psychological diagnosis and time of survey). Second, the study sought to explore the relationship between pandemic-related stress and exposure and mental health outcomes (i.e., depression, anxiety and PTSD symptoms), and unpack the potentially moderating role of dispositional empathy (i.e., cognitive and affective empathy) in this relation.

The study accomplished the aim and its two objectives by testing three hypotheses. The first hypothesis predicted that symptoms of general psychological distress, depression, anxiety and PTSD symptoms will be higher among female participants, students in their earlier and later years of study, students who have a self-reported history of psychological diagnosis and students who participated in the survey during the lockdown. The second hypothesis predicted that there will be a double dissociation regarding affective and cognitive empathy, specifically that they will be positively and negatively associated with depression, anxiety and PTSD symptoms, respectively. The third hypothesis predicted that the relationship between pandemic-related stress and exposure and mental health outcomes will be moderated by dispositional empathy through double dissociation. To the author's knowledge, this is the first South African study to investigate the relationship between mental health and dispositional empathy among young adults and university students in the context of the COVID-19 pandemic.

The chapter will begin by discussing the results from the first objective and the first hypothesis, relating to the non-parametric tests and hierarchical linear regressions, respectively, examining mental health outcomes and pandemic-related stress and exposure by sociodemographic variables. Next, the chapter will discuss the results from the second objective and second hypothesis of the study relating to the hierarchical linear regressions, tests for moderation, and path analyses which aimed to determine mental health outcomes in relation to pandemic-related stress and exposure, explore the double dissociation between cognitive and affective empathy and pandemic-related stress and exposure, and finally discuss the hierarchical linear regressions and path analyses examining the potentially moderating role of dispositional empathy in the association between pandemic-related stress

and exposure and mental health outcomes. Finally, the chapter will address the study limitations, suggestions for future research and the clinical significance of the study.

Student Mental Health and Associations between Sociodemographic Variables and Mental Health Outcomes

The first hypothesis of the study predicted that mental health outcomes i.e., general psychological distress, depression, anxiety and PTSD symptoms (measured using the K-10, BDI-II, BAI, and PCL-5, respectively) would be higher among sociodemographic variables of interest (i.e., female students, students with a self-reported history of psychological diagnosis, earlier level of study and students who completed the survey during the COVID-19 lockdown). This hypothesis was investigated using non-parametric tests (i.e., Mann-Whitney *U* tests and Kruskal-Wallis tests), thereafter, hierarchical linear regressions further explored the associations between the sociodemographic variables of interest and each mental health outcome. The results from those tests are discussed below.

Sex differences

Mental health outcomes. The results from the Mann-Whitney *U* tests showed that female students scored significantly higher than male students for general psychological distress, depression, anxiety, and PTSD symptoms. Furthermore, results from the hierarchical linear regressions consistently showed that male students, in particular, scored significantly lower on each mental health outcome measure. Sex differences relating to mental health outcomes among university students are well-known in the literature, and similar findings have been reported in international and South African studies including during the COVID-19 pandemic (Hawes et al., 2022; Liu et al., 2020; Wang et al., 2020). Studies conducted during the COVID-19 pandemic in Canada and China among university students reported that female students reported significantly higher symptoms of general psychological distress than male students (Chang et al., 2022; Gong et al., 2021). Regarding depression, studies conducted in universities in Italy and France have also reported significantly higher depression symptoms among female students compared to male students (Kokou-Kpolou et al., 2021; Romeo et al., 2021). Similarly, studies conducted in China and Croatia have reported significantly higher anxiety symptoms among female students compared to male students (Milić et al., 2024; Ramón-Arbués et al., 2020; Wenjuan et al., 2020; Zhang et al., 2023), while similar sex differences have also been observed for PTSD symptoms among university students in China and the USA (Chen et al., 2023b; Christiansen & Berke, 2020;

Liu et al., 2020). Similarly, sex differences in mental health among university students have also been observed in South African studies, with female students reporting higher and more severe symptoms of CMDs, including PTSD, compared to male students (Lewis et al., 2021a; Makhubela, 2021a; Padmanabhanunni, 2020; Van der Walt et al., 2020)

Possible explanations for sex differences. The vulnerability-stress model is a conceptual framework which could explain why female individuals are more likely to experience mental health problems compared to male individuals (Hyde & Mezulis, 2020a). The vulnerability-stress model incorporates multiple contributing risk factors to depression, including biological (e.g., genetic, puberty, hormones), affective (e.g., temperament), and cognitive (e.g., rumination), including sociocultural factors such as the influence of the media and gender inequality. The influence of genetics and biology on mental health is well-established in the literature (Bangasser & Cuarenta, 2021; Kendall et al., 2021; Merikangas & Almasy, 2020; Vetter et al., 2021; Zhao et al., 2020), for example, a recent study showed that females possess genetic markers which predispose them to symptoms of depression and higher suicidality compared to males (Kang et al., 2020). Neurobiological factors linked to anxiety and PTSD symptoms include a more sustained amygdala response and heightened activity in the hypothalamus-pituitary axis (HPA-axis) in female individuals compared to male individuals (Fonkoue et al., 2020; Swaab & Bao, 2020).

Hyde and Mezulli (2020) support the role of biological risk factors for female individuals, and further posit that compared to male individuals, the former are more likely to present with negative affect, negative cognitions about stressful life events and their self-image, rumination and co-rumination i.e., repeated negative thinking about one's emotions with another person. Hyde and Mezzuli (2020) further argue that compared to male individuals, female individuals are more likely to experience interpersonal stressors and traumatic events, such as sexual assault, while sociocultural factors such as gender inequality may reinforce systems of power which favour men over women. The latter is particularly concerning given South Africa's disturbingly high rates of GBV (Enaifoghe et al., 2021), including among university students (Finchilescu & Dugard, 2021)

However, while some emerging research shows the protective role of androgyny and masculinity against mental disorders and mental health complications (Esteban-Gonzalo et al., 2021; Luo & Sahakian, 2022), contrary to the prevailing literature, some studies have found symptoms of CMDs, including PTSD, to be more prevalent and severe among male students compared to female students (Gao et al., 2020; Zhang et al., 2023). Similarly, a

recent comparative study conducted in South Africa found no evidence of sex differences in anxiety symptoms between male and female participants (Tadi et al., 2022). Furthermore, although the findings in this study suggest female individuals are more likely to report higher symptoms of CMDs, including PTSD, males may be also at risk, given their high exposure to trauma reports internationally and in South Africa (Malvaso et al., 2022; Stevenson et al., 2023).

Socio-psychological explanations could elucidate these contradictory findings. Repressive social ideals of masculinity may prevent the acknowledgement of psychological trauma, thus preventing the cognitive and affective processing of trauma, and further prohibit men from seeking mental health services (Christiansen & Berke, 2020; Silvestrini & Chen, 2023). Furthermore, due to mental health stigma, men are less likely to report mental health symptoms and seek psychological support compared to women (Chatmon, 2020; Silvestrini & Chen, 2023). The latter is unfortunately observed in the high rate of suicidality among male individuals compared to female individuals internationally and in South Africa (Beghi et al., 2021; King et al., 2020; Stack, 2021). Therefore, although female students have reported higher symptoms of CMDs, including PTSD, the ratio and severity of mental disorders among male students may be under-represented.

History of psychological diagnosis

The results from the Mann-Whitney *U* tests showed that students with a self-reported history of psychological diagnosis scored significantly higher for general psychological distress, depression, anxiety and PTSD symptoms compared to students with no self-reported history of psychological diagnosis. Furthermore, results from the hierarchical linear regressions consistently showed that students with no self-reported history of psychological diagnosis scored significantly lower on each mental health outcome measure. The influence of a history of psychological diagnosis on future mental health outcomes has been well-documented in the literature (Sheldon et al., 2021b), and similar results have been observed during the COVID-19 pandemic (Goularte et al., 2021; Wang et al., 2020). Studies conducted in China and the USA during the pandemic found that university students with a history of psychological conditions were more likely to experience higher symptoms of CMDs, including PTSD, compared to students without a history (Cao et al., 2020; Conrad et al., 2021; Hyun et al., 2021; Xu et al., 2021). Furthermore, a study conducted in the USA found that students who were diagnosed with depression or anxiety before the pandemic reported

more severe symptoms during the pandemic (Zimmermann et al., 2021). On the contrary, Holingue et al. (2020) found that the absence of a history of psychological diagnosis was a risk factor for symptoms of CMDs, including PTSD.

It should be noted that to date, there are no South African studies which have examined the influence of a history of psychological diagnosis on the current mental health outcomes of university students in the context of the COVID-19 pandemic. Only one study has compared pre- and during-COVID-19 rates of mental health outcomes among university students, reporting no significant difference during these time intervals, although the rates reported at these institutions were still higher than the rates reported in the general adult population (Bantjes et al., 2023). Furthermore, in the current study, it should be noted that although *time of survey* (i.e., completing the survey during or after the COVID-19 nationwide lockdown) was included in the non-parametric analysis, this variable was omitted from the hierarchical linear regressions after producing non-significant results in the non-parametric results. This step was undertaken to include only variables with statistically reliable results in further modelling.

Possible explanations for the role of history of psychological diagnosis on mental health outcomes

Several factors predispose individuals with a history of psychological conditions to future mental health complications (Hassel et al., 2011), including the influential roles of genetics and biological sex discussed previously. Neuroscientific studies have shown that cognitive impairments related to the dysregulation of the HPA-axis and DMN activity, and an imbalance of Gamma-aminobutyric acid (GABA) activity in the prefrontal cortex of people with an MDD diagnosis can predispose them to future psychological conditions, comorbidity, and recurring psychological conditions (Beblo et al., 2011; Brady & Sinha, 2005; Li et al., 2021; Marchetti et al., 2012). However, much neuroscientific research concerning comorbidity and the role of psychological history on future mental health outcomes is mixed (Arias et al., 2020; Fullana et al., 2020; Shackman & Fox, 2021), thus further research should be conducted to investigate the complicated and overlapping symptoms associated with comorbidity (Balogh et al., 2021; Schoenberg, 2020).

Several environmental factors may put individuals with a history of psychological diagnosis at risk of future mental health complications, including hostile family dynamics, stressful and traumatic life events, academic challenges, and economic challenges (Cerdá et

al., 2010). The COVID-19 pandemic was a unique phenomenon, having a pervasive impact on society, and is regarded as having long-lasting social effects (Atalan, 2020b). Authors posit that feelings of fear, panic, and anxiety experienced because of the impact of the COVID-19 pandemic may be worse for individuals with pre-existing mental health complications or a history of psychological diagnoses, potentially further impairing their daily functioning and cognition (Chatterjee & Mukherjee, 2020; Yang et al., 2020). Moreover, the social distancing measures may have reduced networks of social support and halted access to mental health services such as counselling, medication provision and hospitalisations (Murphy et al., 2021; Neelam et al., 2021). Furthermore, the physical threats of the pandemic, such as a COVID-19 diagnosis to oneself or a loved one, may have further deteriorated their mental health (Hossain et al., 2020b). Therefore, it is useful to examine the role of psychological history on symptoms of CMDs, including PTSD, and consider potential factors which may predispose individuals to future mental health complications.

Level of study

The results from the Kruska-Wallis tests showed significant level of study group differences regarding general psychological distress and depression symptoms. Furthermore, results from the hierarchical linear regressions showed that postgraduate students reported significantly lower general psychological distress and depression symptoms, and second-year students reported significantly higher depression symptoms. Taken all together, these results indicate that symptoms of general psychological distress and PTSD of students in their earlier years of study (i.e., second-year students) were significantly greater than students in their senior years of study, while senior students faired better mental health outcomes than students in junior years of study.

The results concerning the mental health outcomes of students in earlier years of study are in line with the study hypothesis, while results concerning students in later years of study are contradictory to the study predictions. Studies have shown that among university students, an earlier year of study may be a risk factor for mental health outcomes (Sheldon et al., 2021c). A study conducted in Spain during the COVID-19 pandemic reported depression and anxiety symptoms to be higher among undergraduate students compared to postgraduate students (Blanco et al., 2021). Similar results were observed in Canada (King et al., 2023), and the United Kingdom (Duffy et al., 2020). Similar to the results found in this study, better mental health outcomes for postgraduate students compared to undergraduate students have been reported in the UK (Chen & Lucock, 2022), while a recent study in China reported that

postgraduate students with continued supervisor and peer support during the pandemic scored lower on depression and anxiety symptoms than students with no academic and peer support (Liang et al., 2021). However, contrary to this study's findings, a study in China found graduate students to be at a higher risk of depression and anxiety symptoms than undergraduate students (Zhou et al., 2021).

There is a scarcity of South African studies specifically comparing the mental health outcomes of university students across different levels of study during the COVID-19 pandemic. One quantitative study conducted on a sample of South African university students found that year of study did not significantly influence emotional well-being, although the study also found that students most vulnerable to experiencing discomfort during the pandemic, academic struggles and feeling socially isolated were first-year students, students from disadvantaged backgrounds and students with inefficient coping strategies (Visser & Law-van Wyk, 2021).

South African university students are already a vulnerable cohort to mental health complications and comorbidity of psychological conditions (Bantjes et al., 2016; Bantjes et al., 2023). Furthermore, the uptake of mental health services in universities by students is low, with some institutions struggling to address the mental health needs of the majority of students, particularly during the COVID-19 pandemic (Bantjes et al., 2020; Padmanabhanunni, 2020). An in-depth qualitative study by Laher et al. (2021) on South African university students found that resource limitations, interpersonal strain, loneliness and isolation were experiences which negatively impacted their psychological well-being. Furthermore, for these students, social support from family and peers, and the provision of counselling services and study resources by the university were regarded as important for their psychological well-being.

Moreover, while research specifically on the mental health of South African undergraduate students is common (Bantjes et al., 2019; Graham & Eloff, 2022; Makhubela, 2021a; Rousseau et al., 2021; Wagner et al., 2022), to date there are only two published studies in South Africa which have specifically investigated the mental health of postgraduate students (Janse van Vuuren et al., 2021; Sengane & Havenga, 2018). Postgraduate students encounter unique personal, academic and occupational challenges and stresses, including financial and funding issues, research-related challenges, employment workload and joblessness, family responsibilities, career-related stress and anxiety and meeting the requirements for their professions (Guthrie et al., 2018; Milicev et al., 2023). Therefore,

although prevailing international literature and the findings of this study show better mental health outcomes for postgraduate students, the constant demands may result in stress, diminishing work-life balance and psychological well-being (Moss et al., 2022)

In summary, these findings from the first hypothesis provide further evidence of the continued decline in the mental health of South African university students (Makhubela, 2021c). Specifically, students who are female, have a self-reported history of psychological diagnosis, and in their earlier years of study are at a greater risk of mental health complications. Although these results were expected, based on the literature, they are even more concerning given the mental health vulnerability of South African university students.

The relationship between dispositional empathy and mental health

The second hypothesis of the study predicted that there would be a double dissociation between dispositional empathy and mental health outcomes. Specifically, this hypothesis predicted a positive association between affective empathy and mental health outcomes and a negative association between cognitive empathy and mental health outcomes. To test this, hierarchical linear regressions examined the relationship between affective and cognitive empathy and each mental health outcome. The results from those analyses are discussed below.

Regression analysis showed that in line with the study hypothesis, affective empathy showed significant positive relationships with general psychological distress and PTSD symptoms in the regression models. However, at odds with the study hypothesis, cognitive empathy only yielded a significant positive relationship with the general psychological distress, rather than an inverse relationship as initially predicted. Research has found evidence of a positive relationship between affective empathy and mental health outcomes relating to CMDs, including PTSD (Couette et al., 2020; Ding et al., 2023; Gambin & Sharp, 2018; Guhn et al., 2020). A study by Zhang et al. (2021) in a sample of university students in China found evidence for a positive relationship between affective empathy and symptoms of depression. Regarding anxiety, a study by Bohler et al. (2021) on a sample of university students from the USA also reported a positive relationship between affective empathy and symptoms of anxiety. Regarding PTSD, a study by Wendt et al. (2021) found that individuals with high empathy also recorded high symptoms of PTSD. Neurological evidence for this relation is reported in studies showing the activation of brain regions responsible for affective empathy in individuals with depression and PTSD symptoms (Mazza et al., 2015; Winters et

al., 2023). However, contrary to this study's findings, research has often reported a negative relationship between cognitive empathy and mental health outcomes (Alvi et al., 2023; Guhn et al., 2020; Shamay-Tsoory, 2011; Yan et al., 2021), with only one published study reporting a positive relationship between cognitive empathy and general psychological distress (Nagamine et al., 2018).

Possible explanations for the relationship between dispositional empathy and mental health outcomes

The prevailing evidence of a positive and inverse relationship between mental health outcomes and affective and cognitive empathy, respectively, has prompted researchers to posit the potential risk and protective roles of both empathy dimensions in relation to mental health outcomes, respectively (Shamay-Tsoory, 2015; Winters et al., 2023; Yan et al., 2021). As a risk factor, excessive *emotional contagion* and *personal distress*, observed in individuals with high affective empathy, may impair an individual's ability to separate their negative experiences and emotions from those of others (Decety & Jackson, 2006; Lamm et al., 2007; Schreiter et al., 2013). As a protective factor, excessive *perspective-taking* and *Theory of Mind*, may heighten an individual's ability to adopt another person's point of view, while still maintaining the *self/other* distinction, apply self-reflection on their emotions and behaviours, and make inferences about another individual's psychological and behavioural states (Blair, 2005; Shamay-Tsoory, 2011). Therefore, high affective empathy may heighten an individual's emotional sensitivity, thereby increasing their likelihood of emotional and psychological distress (Shamay-Tsoory, 2011; Yan et al., 2021), while cognitive empathy, through higher-order executive functioning, may protect against a negative emotional response (Wright et al., 2018; Zeng et al., 2021b). The next section further explores the role of empathy as a potential moderator in the relationship between pandemic-related stress and exposure and mental health outcomes.

Associations between pandemic-related stress and exposure, dispositional empathy and mental health outcomes

Finally, the third hypothesis of the study predicted that the relationship between pandemic-related stress and exposure would be moderated by affective and cognitive empathy through double dissociation. To test this, moderation analysis was conducted by computing hierarchical linear regressions with interaction terms for pandemic-related stress and exposure and both empathy dimensions with general psychological distress and PTSD symptoms.

Lastly, SEM using path analysis assessed the direct causal relationship between the exogenous variables (i.e., sociodemographic variables and pandemic-related stress and exposure) and the endogenous variables (i.e., general psychological distress and PTSD symptoms and the indirect affective and cognitive empathy paths). In both sets of analysis, pandemic-related stress and exposure was measured by the general life disruption, interpersonal and educational-professional subscales of the PSQ. The results from those analyses are discussed below.

Pandemic-related stress and exposure

The results from the hierarchical linear regressions showed that the 3 pandemic-related stress variables were significant predictors of both general psychological distress and PTSD symptoms. Specifically, a significant positive relationship was observed between PSQ Interpersonal and PSQ Educational-Professional and mental health outcomes, while a significant inverse relationship was observed between PSQ General Life Disruption and general psychological distress symptoms. These results were confirmed in the path analysis, providing evidence for a potential causal relationship between pandemic-related stress and exposure and mental health outcomes. The path analysis further showed that all three pandemic-related stress variables were significant predictors of general psychological distress symptoms, while only PSQ Interpersonal and PSQ Educational-Professional were significant predictors of PTSD symptoms.

Kujawa et al. (2020), the developers of the PSQ, reported similar results regarding pandemic-related stress and depression and anxiety symptoms, and studies conducted in South Korea and the USA which also used the PSQ reported similar results (Park et al., 2023; Venanzi et al., 2022). No published studies have used the PSQ with a trauma exposure measure. However, two adapted pandemic-stress and exposure questionnaires found

significant positive associations between pandemic-related stress and symptoms of PTSD (Forte et al., 2020b; Nowicki et al., 2020). Furthermore, Kurlo et al. (2021) developed the COVID-19 Students Stress Questionnaire and reported significant positive associations between pandemic-related stress and depression and anxiety symptoms. A population-based study conducted on UK adults also found significant positive associations between pandemic-related stress and depression, anxiety and PTSD outcomes (Shevlin et al., 2020). There are very few South African studies which have specifically used developed pandemic-related stress questionnaires or developed their own, although these questionnaires are not validated (Laher et al., 2021; Olawale et al., 2021; Van Niekerk & van Gent, 2021b). However, one study reported that students who experienced high levels of discomfort during the pandemic reported significantly higher emotional difficulties (Visser & Law-van Wyk, 2021). The next section explores possible reasons for the relationship between pandemic-related stress and mental health outcomes.

Pandemic-related stress and mental health outcomes

The COVID-19 pandemic disrupted the academic, professional and social lives of university students globally (Copeland et al., 2021). A study by Wang et al. (2020) on a sample of university students from the USA found that reasons for increased stress and anxiety among students included the transition to e-learning and online classes, academic performance, postponement of graduation, fear of contagion for themselves and their loved ones, uncertainty over future employment prospects, home dynamics and social isolation. In addition to these challenges, South African university students have also had to struggle with load-shedding, resource limitations and lack of access to mental health services (Eloff, 2021; Makgahlela et al., 2021; Ojo & Onwuegbuzie, 2020; Olawale et al., 2021). The impact of these challenges on South African students' mental health is evident in the increased symptoms of depression, anxiety and PTSD reported during the pandemic (Bantjes et al., 2023; Padmanabhanunni, 2020). Moreover, students have reported the role of social support and positive interpersonal relationships as protective mechanisms for their mental health and psychological well-being during the pandemic (Huang et al., 2021; Szkody et al., 2021). The next section discussed the role of social cognition, particularly dispositional empathy, as potential moderators in the relationship between pandemic-related stress and exposure and mental health outcomes.

The moderating role of dispositional empathy

The results from the hierarchical linear regressions showed that both affective and cognitive empathy significantly moderated the relationship between pandemic-related stress (PSQ Interpersonal) and symptoms of general psychological distress symptoms. The results further showed that affective empathy significantly moderated the relationship between PSQ Interpersonal and PTSD symptoms. Further inspection of the moderation analysis indicated that students with higher affective empathy reported higher general psychological distress and PTSD symptoms at higher levels of PSQ Interpersonal (i.e., interpersonal pandemic-related stress) while students with lower affective empathy reported lower general psychological distress and PTSD symptoms at lower levels of interpersonal pandemic-related stress. This means that students with high affective empathy initially fared better in mental health outcomes compared to students with lower affective empathy. However, at high exposure to negative environmental stimuli (i.e., interpersonal pandemic-related stress), high affective empathy was associated with higher mental health complications compared to students with low affective empathy. The relationship between dispositional empathy and mental health among university students has rarely been explored in the context of the pandemic. However, Zeng et al. (2021) reported that among university students, high affective empathy significantly moderated the relationship between high exposure to pandemic-related stress and mental health outcomes. Baliyan et al. (2021) also reported low cognitive empathy in adults with higher psychological distress and high exposure to pandemic-related stress. Possible explanations for these results are discussed below.

Potential overlap of cognitive and affective empathy

These results provide evidence that the relationship between mental health outcomes and dispositional empathy may depend on the level of environmental stress experienced by individuals. A recent study conducted in China found that individuals with high altruism reported significantly higher symptoms of depression and anxiety compared to individuals with lower altruism (Feng et al., 2020). Empathy is regarded as an important premise and driver for altruistic pro-social behaviour (Cipriani, 2022). Therefore, Feng et al. (2020) further argued that high altruism may be a risk factor for mental health complications, where individuals with high empathic traits cannot perform altruistic behaviour during the pandemic and the lockdown, thus negatively affecting their mental health.

Although research mainly shows a negative relationship between cognitive empathy and mental health outcomes (Gambin & Sharp, 2018; Winters et al., 2023; Zhang et al., 2021), research also shows that stress may heighten attention to environmental stressors and thereby may also be related to high cognitive empathy (Nitschke & Bartz, 2023). This may explain the positive relationship observed between cognitive empathy and K-10 outcome. A systematic review by Nitschke & Bartz (2023) suggested that for individuals under stressful environmental conditions, high affective empathy may aggravate their psychological distress when they witness the negative emotions or experiences of loved ones. However, their mental health may not be as affected in the presence of strangers, even though they may have high empathic traits. This suggests that regarding empathy, the emotional significance of the interpersonal relationship may determine the level of psychological distress experienced by the individuals (Ferguson et al., 2021; Kimmig et al., 2021).

For students with high affective empathy, exposure to low levels of interpersonal pandemic-related stress was not detrimental to their mental health. However, this cohort of highly empathic students also experienced worse mental health outcomes at greater exposure to interpersonal pandemic-related stress. In other words, in this sample, high affective empathy was only a potential risk factor at high levels of interpersonal pandemic-related stress, while high affective empathy was also a potential protective factor against mental health complications at low levels of interpersonal pandemic-related stress.

In summary, it is evident that compared to cognitive empathy, affective empathy was a more influential moderator in the relationship between interpersonal pandemic-related stress and mental health outcomes. Although there is no clear evidence of a double dissociation, as the study initially predicted, the results obtained in this study provide insight into the potentially overlapping functions of affective and cognitive empathy in the relationship between stressful environmental situations and mental health outcomes.

Limitations and suggestions for future research

This study is not without its limitations. Firstly, this was an exploratory, descriptive, cross-sectional study, therefore, it cannot be confirmed if the mental health and empathy outcomes observed in the study are causally related to pandemic-related stress and exposure (Neelam et al., 2021). Moreover, there was no temporal precedence in the variables, which covaried as independent variables in the models (Winters et al., 2023). Therefore, future researchers should consider longitudinal designs, specifically measuring mental health and

empathy outcomes at different intervals to determine whether empathy alters mental health outcomes (Zhang et al., 2021).

Secondly, the regression analysis showed that much of the variance was not explained by the variables incorporated into the models. Therefore, in addition to the sociodemographic variables, empathy dimensions, environmental factors and mental health outcomes investigated in this study, future studies may consider incorporating other behavioural factors such as resilience, lifestyle and sleep to construct a more comprehensive model of the risk and protective factors influencing student mental health during stressful times (Lewis et al., 2021b; Ungar & Theron, 2020). Moreover, future researchers may consider incorporating the study aims, objectives and hypotheses into existing theoretical frameworks, such as Bronfenbrenner's ecological systems theory and the vulnerability-stress model, both which have been used to explain mental health outcomes experienced in the context of the pandemic (Bronfenbrenner, 2000; Hennein et al., 2021; Hyde & Mezulis, 2020b; Sharma et al., 2020). A theoretical framework may explain how these variables and complex systems of influence interact and influence overall psychological well-being (Ungar & Theron, 2020). Moreover, a theoretical framework may provide a more holistic explanation of mental health outcomes in relation to individual-level sociodemographic variables and environmental stressors, and further unpack the potentially moderating role of potential risk and protective factors such as dispositional empathy.

Thirdly, another key limitation is instrumentation. The K-10 is often used as a mental health screening tool in public health settings (Silva et al., 2021), measuring 'non-specific' general psychological distress and psychological discomfort, encompassing depression and anxiety symptoms, in response to a stressful life situation (Kessler et al., 2002). Although the factor structure of the K-10 has been validated among South African university students (Hoffman et al., 2022b), depression and anxiety are often comorbid and present with overlapping symptoms (Curran et al., 2020; Hoeflich et al., 2023; Konac et al., 2021). Therefore, future researchers should investigate how depression and anxiety are related independently related to dispositional empathy.

Lastly, the study employed a convenience sampling approach, being limited to university students at UCT. Therefore, the results obtained cannot be generalised to the rest of the South African university student and adult populations. This is especially concerning considering the mental health data gap in the African context (Ng et al., 2020). South African

university students are already vulnerable to mental health complications (Makhubela, 2021a), while mental health disease prevalence is common in the general population (Kim et al., 2022b). Therefore, future research should consider more student-oriented and population-based studies to close the mental health data-gap in the continent, thereby providing crucial evidence from which to inform interventions to mitigate mental health challenges (Kaminer et al., 2018b).

Summary and Conclusion

This study is, to the author's knowledge, the first South African study to investigate the relationship between mental health outcomes and dispositional empathy among young adults and university students in the context of the COVID-19 pandemic. Regarding sociodemographic variables, the study showed that female biological sex, self-reported history of psychological diagnosis, and earlier year of study were significant predictors of mental health outcomes. Specifically, individuals with these traits reported higher symptoms of CMDs, including PTSD. Furthermore, this study confirmed findings from the literature concerning the positive relationship between affective empathy and mental health outcomes. Contrary to the literature and the study predictions, the results in this study showed a positive relationship between cognitive empathy and mental health outcomes. Although these findings relating to empathy do not provide evidence for double dissociation, they provide more insight into the potentially overlapping functions of cognitive and affective empathy in relation to mental health outcomes. Lastly, the study found that interpersonal pandemic-relates stress was significantly positively associated with mental health outcomes (i.e., general psychological distress and PTSD symptoms). Furthermore, although affective and cognitive empathy were significant moderators in the relationship between interpersonal pandemic-related stress and mental health outcomes, a significant indirect causal relationship from interpersonal pandemic-related stress through dispositional empathy to mental health outcomes cannot be drawn. Thus, further investigation into the complex relationship between social cognition and mental health, in the context of stressful environmental factors is vital.

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Appendix A

Demographic questionnaire

1. Please state your name and surname:

____

2. Please state your student number:

____

3. Please provide your preferred email address:

____

4. Are you above the age of 18?

YES

NO

5. What is your biological sex?

FEMALE

MALE

OTHER

Please specify your gender identity:

____

6. Do you have a previous or present psychiatric diagnosis?

YES

NO

If YES, please provide the diagnosis:

____

7. What level of undergraduate study are you e.g., first year, second year, third year, final year?

____

Please click on “next” to begin the study

NEXT

Appendix B

K-10

	These questions concern how you have been feeling over the past 30 days. Tick a box below each question that best represents how you have been.	None of the time	A little of the time	Some of the time	Most of the time	All of the time
1.	During the last 30 days, about how often did you feel tired for no good reason?	1	2	3	4	5
2.	During the last 30 days, about how often did you feen nervous?	1	2	3	4	5
3.	During the least 30 days, about how often did you feel so nervous that nothing could calm you down?	1	2	3	4	5
4.	During the last 30 days, about how often did you feel hopeless?	1	2	3	4	5
5.	During the last 30 days, about how often did you feel restless or fidgety?	1	2	3	4	5
6.	During the last 30 days, about how often did you feel so restless you could not sit still?	1	2	3	4	5
7.	During the last 30 days, about how often did you feel depressed?	1	2	3	4	5
8.	During the last 30 days, about how often did you feel everything was an effort?	1	2	3	4	5
9.	During the last 30 days, about how often did you feel so sad that nothing could cheer you up?	1	2	3	4	5
10.	During the last 30 days, about how often did you feel worthless?	1	2	3	4	5

Appendix C

BDI-II

The questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Patten) or Item 18 (Changes in Appetite).

1. Sadness

0 I do not feel sad.

1 I feel sad much of the time.

2 I am sad all the time.

3 I am so sad or unhappy than I can’t stand it.

2. Pessimism

0 I am not discouraged about my future.

1 I feel more discouraged about my future than I used to be.

2 I do not expect things to work out for me.

3 I feel my future if hopeless and will only get worse.

3. Past Failure

0 I do not feel like a failure.

1 I have failed more than I should have.

2 As I look back, I see a lot of failures.

3 I feel I am a total failure as a person.

4. Loss of Pleasure

0 I get as much pleasure as ever did from the things I enjoy.

1 I don’t enjoy things as much as I used to.

2 I get very little pleasure from the things I used to enjoy.

3 I cant’ get any pleasure from the things I used to enjoy.

5. Guilty Feelings

0 I don’t feel particularly guilty.

1 I feel guilty over many things I have done or should have done,

2 I feel quite guilty most of the time.

3 I feel guilty all of the time.

6. Punishment Feelings

0 I don't' feel I am being punished.

1 I feel I may be punished.

2 I expected to be punished.

3 I feel I am punished.

7. Self-Dislike

0 I feel the same about myself as ever.

1 I have lost confidence in myself.

2 I am disappointed in myself.

3 I dislike myself.

8. Self-Criticalness

0 I don't criticise or blame myself more than usual.

1 I am more critical of myself than I used to be.

2 I criticise myself for all of my faults.

3 I blame myself for everything bad that happens.

9. Suicidal Thoughts of Wishes

0 I don't have any thoughts of killing myself.

1 I have thoughts of killing myself but I would not carry them out.

2 I would like to kill myself.

3 I would kill myself if I have the chance.

10. Crying

0 I don't cry anymore than I used to.

1 I cry more than I used to.

2 I cry over every little thing.

3 I feel like crying, but I can't.

11. Agitation

0 I am no more restless or wound up than usual.

1 I feel more restless or wound up than usual.

2 I am so restless or agitated that it's hard to stay still.

3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

0 I have not lost interest in other people or activities.

1 I am less interested in other people or things than before.

2 I have lost most of my interest in other people or things

3 It's hard to get interested in anything.

13. Indecisiveness

0 I make decisions about as well as ever.

1 I find it more difficult to make decisions than usual.

2 I have much greater difficulty in making decisions than I used to.

3 I have trouble making any decision.

14. Worthlessness

0 I do not feel I am worthless.

1 I don't consider myself as worthwhile and useful as I used to.

2 I feel more worthless as compared to other people

3 I feel utterly worthless.

15. Loss of Energy

0 I have as much energy as ever.

1 I have less energy than I used to have.

2 I don't have enough energy to do very much.

3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern

0 I have not experienced any changes in my sleeping pattern.

1a I sleep somewhat more than usual.

1b I sleep somewhat less than usual.

2a I sleep a lot more than usual.

2b I sleep a lot less than usual.

3a I sleep most of the day.

3b I wake up 1-2 hours early and can't get back to sleep.

17. Irritability

0 I am no more irritable than usual.

1 I am more irritable than usual.

2 I am much more irritable than usual.

3 I am irritable all the time.

18. Changes in Appetite

0 I have not experienced any changes in my appetite.

1a My appetite is somewhat less than usual.

1b My appetite is somewhat greater than usual.

2a My appetite is much less than before.

2b My appetite is much greater than usual.

3a I have no appetite at all.

3b I crave food all the time.

19. Concentration Difficulty

0 I can concentrate as well as ever.

1 I can’t concentrate as well as usual.

2 It’s hard to keep my mind on anything for very long.

3 I find I can’t concentrate on anything.

20. Tiredness or Fatigue

0 I am no more tired or fatigues than usual.

1 I get more tied or fatigues to do a lot of the things I used to do.

2 I am too tired or fatigued to do a lot of the things I used to do.

3 I am too tired or fatigues to do most of the things I used to do.

21. Loss of Interest in Sex

0 I have not notices any recent change in interest in sex.

1 I am less interested in sex than I used to be.

2 I am much less interested in sex now.

3 I have lost interest in sex completely.

Appendix D

BAI

Below is a list of common symptoms of anxiety. Please read carefully each item on the list. Indicate how much you have been bothered by that symptom **over the past month**, including today, by indicating in the corresponding space.		Not at all	Mildly-but it	Moderately-it	Severely-it bothered me a lot
1.	Numbness or tingling	0	1	2	3
2.	Feeling hot	0	1	2	3
3.	Wobbliness in the legs	0	1	2	3
24 1.	Unable to relax	0	1	2	3
5.	Fear of the worst happening	0	1	2	3
6.	Dizzy or light-headed	0	1	2	3
7.	Heart-pounding or racing	0	1	2	3
8.	Unsteady	0	1	2	3
9.	Terrified	0	1	2	3
10.	Nervous	0	1	2	3
11.	Feelings of choking	0	1	2	3
12.	Hands trembling	0	1	2	3
13.	Shaky	0	1	2	3
14.	Fear of losing control	0	1	2	3
15.	Difficulty breathing	0	1	2	3
16.	Fear of dying	0	1	2	3
17.	Scared	0	1	2	3
18.	Indigestion or discomfort in abdomen	0	1	2	3

19.	Faint	0	1	2	3
20.	Face flushed	0	1	2	3
21.	Sweating (not due to heat)	0	1	2	3

Appendix E

PCL-5

Instructions: Below is a list of problems that people sometimes have in response to a very stressful experience. Please read each problem carefully and then circle one of the numbers to the right to indicate how much you have been bothered by that problem <u>in the past month</u>.

In the past month, how much were you bothered by:		Not at all	A little bit	Moderately	Quite a bit	Extremely
1.	Repeated, disturbing, and unwanted memories of the stressful experience?	0	1	2	3	4
2.	Repeated, disturbing dreams of the stressful experience?	0	1	2	3	4
3.	Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	0	1	2	3	4
4.	Feeling very upset when something reminded you of the stressful experience?	0	1	2	3	4
5.	Having strong physical reactions when something reminded you of the stressful experience (for example, heart pounding, trouble breathing, sweating)?	0	1	2	3	4
6.	Avoiding memories, thoughts or feelings related to the stressful experience?	0	1	2	3	4
7.	Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	0	1	2	3	4
8.	Trouble remembering important parts of the stressful experience?	0	1	2	3	4
9.	Happening strong negative beliefs about yourself, other people, of the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	0	1	2	3	4
10.	Blaming yourself or someone else for the stressful experience or what happened after it?	0	1	2	3	4
11.	Having string negative feeling such as fear, horror, anger, guilt, or shame?	0	1	2	3	4

12.	Loss of interest in activities that you used to enjoy?	0	1	2	3	4
13.	Feeling distant or cut from the other people?	0	1	2	3	4
14.	Trouble experiencing positive feelings (for example, being unable to feel happiness or have feeling for people close to you)?	0	1	2	3	4
15.	Irritable behaviour, angry outbursts, or acting aggressively?	0	1	2	3	4
16.	Taking too many risks or doing things that could cause you harm?	0	1	2	3	4
17.	Being “superalert” or watchful or on guard?	0	1	2	3	4
18.	Feeling jumpy or easily startled?	0	1	2	3	4
19.	Having difficulty concentrating?	0	1	2	3	4
20.	Trouble falling or staying asleep?	0	1	2	3	4

Appendix F

PSQ

Instructions: Below is a list of events related to the pandemic that may or may not have happened to you. Please decide whether you have had each of these experiences as a result of the recent coronavirus pandemic. For each event which has happened, please decide how bad it was when it happened to you. When rating how bad each event was when it happened, please consider how much of a negative impact it had on your life, how often the event occurred, and how long it was a problem for you.

1 I had difficulty obtaining basic supplies because of the coronavirus pandemic (e.g., food, medicine, toilet paper). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

2 I had to move unexpectedly because of the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

3 I was unexpectedly separated from family, friends, or others close to me because of the coronavirus pandemic (e.g., due to moves or travel restrictions). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

4 I was unable to be with close family, friends, or partners because of the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

5 I had problems with my visa or the Student and Exchange Visitor Information System because of the coronavirus pandemic (e.g., unable to renew). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

6 I had to cancel travel or experienced a major disruption in travel plans because of the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

7 I had to cancel or postpone important events because of the coronavirus pandemic (e.g., events for a club, sporting events, major celebrations). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

8 I had to take on additional responsibilities caring for others (e.g., children, other family members) due to the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

9 I experienced significant financial strain due to the pandemic (e.g., due to travel, purchasing supplies, paying for housing). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

10	I temporarily or permanently lost a job or had my work hours greatly reduced due to the coronavirus pandemic.	Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

11	My workload increased substantially because of the coronavirus pandemic.	Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

12	Someone I rely on for financial support (e.g., partner, parent) temporarily or permanently lost a job or had their work hours greatly reduced because of the coronavirus pandemic.	Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

13	I was unable to complete important requirements for my education or professional goals due to the coronavirus pandemic (e.g., coursework, taking the National Benchmark Test, Grade 12 exams, thesis).	Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

14 I had problems with online courses and/or remote work (e.g., slow connection, no computer or internet access, major differences in time zone). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

15 I had conflicts or arguments with my partner or family members due to coronavirus (e.g., conflicts about living arrangements, shared work space, schedule expectations). Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

16 I experienced racism or discrimination due to the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

17 I had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

18 I was tested for COVID-19. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

19 I was diagnosed with COVID-19. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

20 I had difficulty accessing or paying for physical or mental health care for myself or my dependents due to the coronavirus pandemic. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

21 I was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

22 Someone close to me had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

23 Someone close to me was diagnosed with COVID-19. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

24 Someone close to me was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

25 Someone close to me died from COVID-19. Yes No

If yes: How bad was this event?

1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

Appendix G

IRI

The following statements inquire about your thoughts and feeling in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter of the scale at the top of the page: A, B, C, D or E. when you have decided on your answer, fill in the letter next to the item number. READ EACH ITEM CAREFULLY BEFORE RESPONDING. Answer as honestly as you can. Thank you.

	Items	Does describe	Somewhat	Neither	Somewhat	Does not
1.	I daydream and fantasize, with some regularity, about things that might happen to me.					
2.	I often have tender, concerned feelings for people less fortunate than me.					
3.	I sometimes find it difficult to see things from the “other guy’s” point of view.					
4.	Sometimes I don’t feel very sorry for other people when they are having problems.					
5.	I really get involved with the feelings of the characters in a novel.					
6.	In emergency situations, I feel apprehensive and ill-at-ease.					
7.	I am usually objective when I watch a movie or play, and I don’t often get completely caught up in it.					
8.	I try to look at everybody’s side of a disagreement before making a decision.					
9.	When I see someone being taken advantage of, I feel kind of protective towards them.					

10.	I sometimes feel helpless when I am in the middle of a very emotional situation.					
11.	I sometimes try to understand my friends better by imagining how things look from their perspective.					
12.	Becoming extremely involved in a good book or movie is somewhat rare for me.					
13.	When I see someone get hurt, I tend to remain calm.					
14.	Other people's misfortune does not usually disturb me a great deal.					
15.	If I'm sure I'm right about something, I don't waste time listening to other people's arguments.					
16.	After seeing a play or movie, I have felt as though I were one of the characters.					
17.	Being in a tense emotional situation scares me.					
18.	When I see someone being treated unfairly, I sometimes don't feel very much pity for them.					
19.	I am usually pretty effective in dealing with emergencies.					
20.	I am often quite touched by the things I see happen.					
21.	I believe that there are two sides to every question and try to look at them both.					
22.	I would describe myself as a pretty soft-hearted person.					
23.	When I watch a good movie, I can very easily put myself in the place of a leading character.					

Appendix H

UNIVERSITY OF CAPE TOWN

Department of Psychology

University of Cape Town Rondebosch 7701 South Africa
Telephone (021) 650 3417
Fax No. (021) 650 4104

06 September 2021

Zintle Mlomo
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Zintle

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for your study, COVID-19-related stress and exposure, mental health, and social cognition among South African university students. The reference number is PSY2021-050.

I wish you all the best for your study.

Yours sincerely

Lauren Wild (PhD)
Associate Professor
Chair: Ethics Review Committee

Appendix I

	RESEARCH ACCESS TO STUDENTS	DSA 100

NOTES

1. This form must be FULLY completed by all applicants who want to access UCT students for the purpose of research or surveys.
2. Return the fully completed (a) DSA 100 application form by email, in the same Word format, together with your: (b) research proposal inclusive of your survey, (c) copy of your ethics approval letter / proof (d) informed consent letter to: Nadierah.Pienaar@uct.ac.za. You application will be attended to by the Executive Director, Department of Student Affairs (DSA), UCT.
3. The turnaround time for a reply is approximately 10 working days.
4. NB: It is the responsibility of the researcher/s to apply for and to obtain ethics approval and to comply with amendments that may be requested; as well as to obtain approval to access UCT staff and/or UCT students, from the following, at UCT, respectively: (a) Ethics: Chairperson, Faculty Research Ethics Committee (FREC) for ethics approval, (b) Staff access: Executive Director: HR for approval to access UCT staff, and (c) Student access: Executive Director: Student Affairs for approval to access UCT students.
5. Note: UCT Senate Research Protocols requires compliance to the above, even if prior approval has been obtained from any other institution/agency. UCT's research protocol requirements applies to all persons, institutions and agencies from UCT and external to UCT who want to conduct research on human subjects for academic, marketing or service related reasons at UCT.
6. Should approval be granted to access UCT students for this research study, such approval is effective for a period of one year from the date of approval (as stated in Section D of this form), and the approval expires automatically on the last day.
7. The approving authority reserves the right to revoke an approval based on reasonable grounds and/or new information.

SECTION A: RESEARCH APPLICANT/S DETAILS

Position	Staff / Student No	Title and Name	Contact Details (Email / Cell / land line)
A.1 Student Number	MLMZIN002	Miss Zintle W. Mlomo	MLMZIN002@myuct.ac.za / 082 581 1656
A.2 Academic / PASS Staff No.			
A.3 Visitor/ Researcher ID No.			
A.4 University at which a student or employee	University of Cape Town	Address if not UCT:	
A.5 Faculty/ Department/School	Faculty of Humanities / Department of Psychology		
A.6 APPLICANTS DETAILS if different from above	Title and Name	Tel.	Email

SECTION B: RESEARCHER/S SUPERVISOR/S DETAILS

Position	Title and Name	Tel.	Email
B.1 Supervisor	Dr Lea-Ann Pileggi	072 473 1006	leapileggi@gmail.com
B.2 Co Supervisor/s	Dr Kevin Thomas	021 650 4608	Kevin.thomas@uct.ac.za

SECTION C: APPLICANT'S RESEARCH STUDY FIELD AND APPROVAL STATUS

C.1 Degree – if applicable	MA in Psychological Research
C.2 Research Project Title	COVID-19-related stress and exposure, mental health and social cognition among South African university students
C.3 Research Proposal	Attached: Yes ■ No ☐
C.4 Target population	University students between 18-24 years of age
C.5 Lead Researcher details	If different from applicant:
C6. Will use research assistant/s	Yes ☐ No ■ If yes- provide a list of names, contact details:
C.7 Research Methodology and Informed consent	Research methodology: Cross-sectional design Informed consent: Participants will provide consent prior to participation (informed consent form attached)
C.8 Ethics clearance status from UCT's Faculty Ethics in Research Committee /Chair (ERC)	Approved by the UCT ERC: Yes ■ With amendments: Yes ☐ No ■ (a) Attach copy of your UCT ethics approval. Attached: Yes ■ No ☐ (b) State date/Ref. No/Faculty of your UCT ethics approval: 6/09/2021 Ref./Faculty: PSY2021-050

SECTION D: APPLICANT/S APPROVAL STATUS FOR ACCESS TO STUDENTS FOR RESEARCH PURPOSE
(To be completed by the ED, DSA or NOMINEE)

	Approved / With Terms / Not	* Conditional approval with terms		Applicant/s Ref. No.:
D.1 APPROVAL STATUS	(i) Approved ■ ~~(ii) With terms~~ ~~(iii) Not approved~~	a) Access to students for this research study must only be undertaken after written ethics approval has been obtained. b) In event any ethics conditions are attached, these must be complied with before access to students.		MLMZIN002 / Miss Zintle W. Mlomo
D.2 PREPARED BY:	Designation	Name	Signature	Date of Approval
	Personal Assistant	Nadierah Pienaar	Pienaar	22/03/2022
D.3 APPROVED BY:	Designation	Name	Signature	Date of Approval
	Executive Director Nominee Department of Student Affairs	Ms Edwina Brooks	EEBrooks	22 March 2022

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Appendix J

Research Invitation to Participants

Dear Student,

I would like to invite you to participate in a study which aims to examine the impact of COVID-19-related stress and exposure on the mental health and social cognition of university students. Should you participate in the study, you will be directed to an online platform, where you will be asked to sign a consent form, complete a brief demographic questionnaire, followed by 6 questionnaires, which **must be completed in one-sitting**. The entire survey will take between 20 and 30 minutes to complete. At the end of the survey, you will receive a debriefing form so you can know more about the nature of study (including that it is not meant for diagnostic purposes). Upon completion of the survey, you will be entered into a lucky draw to **win one of two R250 Takealot vouchers**.

Please note that to participate in the study, you need to be between the ages of 18 and 24, be a registered student, and have an electronic device (e.g., laptop/desktop or smartphone) with a stable internet connection. Your survey responses will be strictly confidential and secured in a password-protected laptop. The study is completely voluntary, and you may discontinue participation at any time. However, should you decide not to complete all questionnaires, you will unfortunately not be entered into the lucky draw. **Given the importance of this study into student mental health during this pandemic, you are encouraged to complete all questionnaires.**

If you experience any discomfort during or after the study, you will be provided with resources to seek assistance.

If you have any questions, please contact:

Zintle W. Mlomo (primary researcher): MLMZIN002@myuct.ac.za; 082 581 1656

Dr Lea-Ann Pileggi (supervisor): lea-ann.pileggi@uct.ac.za

Dr Kevin Thomas (co-supervisor): kevin.thomas@uct.ac.za

Please click on the link if you would like to participate:

https://www.surveymonkey.com/r/WNLVR5B

Best wishes,

Zintle Mlomo (Masters student, Department of Psychology, University of Cape Town)

Appendix K

Informed Consent Form

UNIVERSITY OF CAPE TOWN

Dear student,

COVID-19-related stress and exposure, mental health, and social cognition among South African university students

1. **Study invitation and purpose**

You are invited to participate in a study investigating the impact of COVID-19-relatated stress and exposure and traumatic exposure on the mental health and social cognition of South African university students. This study forms part of my Masters thesis in the Department of Psychology at the University of Cape Town. The study is purely for research and not for diagnostic purposes.

2. **Procedures**

Should you choose to participate, you will be asked to answer some demographic questions (e.g., your name, and any previous psychiatric diagnosis), followed by 6 questionnaires, which **must be completed in one sitting**. The study will take place online, and it will take between 20-30 minutes of your time.

3. **Risks, inconveniences and discomfort?**

The study requires you to give up no more than 30 minutes of your time. Furthermore, the study enquires about mental health during the pandemic, therefore some of the questions may make you feel uncomfortable. If you anticipate that the questions asked may distress or upset you, you are advised to not participate in the study. If you do participate and experience any distress during or after the study, you may discontinue participation. If you feel that you need some help, please contact the following places:

- Lifeline Cape Town: **021 461 1111 (24-hour helpline)**
- Rape Crisis: **021 447 9762 (24-hour helpline)**
- UCT Student Wellness: **021 650 1017**

- South African Depression and Anxiety Group UCT Student Careline: **0800 24 25 26** or **SMS 31393** for call-me-back **(24-hour helpline)**

4. Benefits

In return for your time and participation, upon completion of the study, you will be entered into a lucky draw to win one of two R250 Takealot vouchers.

5. Voluntary Participation and Confidentiality

Participation in this study is completely voluntary. You may withdraw at anytime, however you will not be entered into the lucky draw should you decide to discontinue participation. All information collected from this study will be kept in a password-protected laptop only accessible by the primary researcher. Your name and email will only be used for the lucky draw.

6. Queries

Should you have any questions, comments or complaints about the study, please contact:

Zintle W. Mlomo (primary researcher): MLMZIN002@myuct.ac.za; 082 581 1656

Dr Lea-Ann Pileggi (supervisor): lea-ann.pileggi@uct.ac.za

Dr Kevin Thomas (co-supervisor): kevin.thomas@uct.ac.za

Rosalind Adams (Research Ethics Committee contact): rosalind.adams@uct.ac.za

7. Participant consent to participate in the study

I have been informed about this research study and understand its purpose, possible benefits, risks, inconveniences and discomforts. I know that I am free to withdraw this consent and discontinue participation any time. I understand that if I withdraw before completing the study, I will not be eligible for the lucky draw.

- I consent
- I do not consent

Appendix L

Debriefing form for participating in the survey

Thank you participating in this study! Your participation is greatly appreciated.

Study purpose:

You were informed that the primary aim and purpose of the study is to examine the impact of COVID-19-related stress and exposure on the mental health and social cognition of university students. This is important as local and international studies have reported increased distress experienced by university students during the pandemic. Given the unpredictable nature of this pandemic and the lockdown, it is imperative to examine how students have been psychologically affected. Please note that although the study enquires about mental health during the pandemic, it was meant for research purposes alone (i.e., not for diagnostic purposes.

Confidentiality:

Your responses will remain strictly confidential and secured in a password-protected laptop only accessible by the primary researcher. Your name will only be used for the purposes of the lucky draw.

Please do not disclose study procedures to anyone who may participate in this study as this could influence the results of the study.

Final Report:

If you would like to access a copy of the final report of this study (or a summary of the findings), please feel free to contact the primary researcher.

Who can I contact if I am feeling distressed?

- Lifeline Cape Town: **021 461 1111 (24-hour helpline)**
- Rape Crisis: **021 447 9762 (24-hour helpline)**
- UCT Student Wellness: **021 650 1017**
- South African Depression and Anxiety Group UCT Student Careline: **0800 24 25 26** or **SMS 31393** for call-me-back **(24-hour helpline)**

Queries:

Should you have any questions, comments or complaints about the study, please contact:

Zintle W. Mlomo (primary researcher): MLMZIN002@myuct.ac.za; 082 581 1656

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Once again, thank you for your participation in this study!

Appendix M

Assumption checks

Independence

The assumption of independence of observations was upheld for all variables.

Random sampling

The assumption of random sampling was upheld. The study employed a convenience sampling approach, recruiting students across the university to participate in the survey.

Normality

Table 1 shows the Shapiro-Wilk tests assessing multivariate normality of the continuous response variables (Shapiro & Wilk, 1965). The assumption of multivariate normality was violated, as observed in the significant results from the Shapiro-Wilk tests. Furthermore, residual plots and boxplots were further examined to visualise any violations of normality.

Table M1

Shapiro-Wilk tests of multivariate normality for the continuous variables

Continuous variable	*W*	*p*
K-10	.976	<.001
BDI-II	.990	<.01
BAI	.972	<.001
PCL-5	.976	<.001
IRI Affective empathy	.975	<.01
IRI Cognitive empathy	.956	<.001
PSQ General Life Disruption	.921	<.001
PSQ Educational & Professional	.879	<.001
PSQ Interpersonal	.913	<.001
PSQ Health-Self	.922	<.001
PSQ Health-Others	.906	<.001
PSQ Financial	.786	<.001

Homogeneity of variance

Table M2 shows the Levene's homogeneity of variance tests of the continuous variables. The assumption was upheld only for the BAI, while the other continuous response variables violated the assumption, as observed in the non-significant test results for the latter (Parra-Frutos, 2013).

Table M2

Homogeneity of variance: Levene's Tests of Equality of Error Variances for Kruskal-Wallis tests

Variable	*F*	*df1*	*df2*	*p*
K-10	2.256	4	506	.062
BDI-II	1.210	4	528	.306
BAI	2.433	4	512	.047
PCL-5	0.327	4	492	.860
IRI Overall empathy	0.636	4	154	.638
IRI Affective Empathy	0.213	4	154	.931
IRI Cognitive Empathy	0.864	4	154	.487

Appendix N

Table N1

Dunn's test results for K10 and level of study

Pairwise Comparison	Z	P unadjusted	P adjusted
First - Fourth Plus	1.7017753	0.088797505	0.88797505
First - Postgraduate	2.5797602	0.009886894	0.09886894
Fourth Plus - Postgraduate	0.9483288	0.342962072	1.00000000
First - Second	0.2114610	0.832527568	1.00000000
Fourth Plus - Second	-1.5102512	0.130979340	1.00000000
Postgraduate - Second	-2.4027910	0.016270483	0.16270483
First - Third	1.5407535	0.123376779	1.00000000
Fourth Plus - Third	-0.5472573	0.584201946	1.00000000
Postgraduate - Third	-1.5580719	0.119216198	1.00000000

Note. P-adjusted: the p-values have been adjusted with Bonferonni correction to avoid type 1 error due to multiple pairwise comparisons.

Table N2

Dunn's tests results for BDI-II and level of Study

Pairwise comparison	Z	P unadjusted	P adjusted
First - Fourth Plus	1.3278340	0.18423295	1.0000000
First - Postgraduate	2.1952393	0.02814644	0.2814644
Fourth Plus - Postgraduate	0.9139805	0.36072710	1.0000000
First - Second	-0.5730375	0.56661929	1.0000000
Fourth Plus - Second	-1.6629155	0.09632935	0.9632935
Postgraduate - Second	-2.4631187	0.01377343	0.1377343
First - Third	1.5105064	0.13091426	1.0000000
Fourth Plus - Third	-0.2199335	0.82592294	1.0000000
Postgraduate - Third	-1.2300220	0.21868886	1.0000000

Second - Third	1.9276798	0.05389496	0.5389496

Appendix O

Table O1

Results showing sex differences according to pandemic-related variables

Variable	Biological Sex		*U*		*VDA*	
	Female (*n*=431)	Male (*n*=102)	Value	*p*	Value	95% CI
PSQ General Life Disruption	1.81 (1.19)	2.07 (1.33)	16 372	.071	.372	[.315, .435)
PSQ Educational-Professional	1.54 (1.19)	1.63 (1.33)	17 136	.368	.390	[.328, .449]
PSQ Interpersonal	2.06 (1.19)	1.95 (1.33)	18 700	.464	.425	[.365, .484]
PSQ Financial	0.86 (0.81)	0.90 (0.84)	17 704	.646	.403	[.349, 459]
PSQ Health-Others	2.19 (1.21)	2.13 (1.19)	2 689	<.001	.061	[.040, .088]
PSQ Health-Self	1.88 (1.33)	1.88 (1.48)	2 264	.147	.052	[.032, .074]

Table O2

Results showing history of psychological diagnosis differences according to pandemic-related variables

Variable	History of Psychological Diagnosis		*U*		*VDA*	
	Yes (*n*=132)	No (*n*=401)	Value	*p*	Value	95% CI
PSQ General Life Disruption	1.84 (1.23)	1.94 (1.34)	21 925	.625	.414	[.363, .467)

PSQ Educational-Professional	1.56 (0.96)	1.55 (0.98)	22 409	.945	.423	[.370, .477]
PSQ Interpersonal	2.37 (1.13)	1.92 (1.20)	26 537	<.001	.501	[.446, .551]
PSQ Financial	0.76 (0.79)	0.90 (0.82)	20 240	.089	.382	[.332, 437]
PSQ Health-Others	2.28 (0.98)	2.15 (1.27)	23 022	.143	.424	[.372, .480]
PSQ Health-Self	2.20 (1.18)	1.77 (1.40)	26 942	<.001	.509	[.460, .557]

Table O3

Results showing time of survey differences according to pandemic-related variables

Variable	Time of survey		*U*		*VDA*	
	During Lockdown (*n*=396)	After Lockdown (*n*=137)	Value	*p*	Value	95% CI
PSQ General Life Disruption	1.83 (1.19)	1.94 (1.34)	22 576	.049	.416	[.356, .478)
PSQ Educational-Professional	1.57 (0.98)	1.50 (0.97)	20 590	.560	.380	[.325, .428]
PSQ Interpersonal	1.98 (1.21)	2.22 (1.65)	23 552	.053	.434	[.375, .492]
PSQ Financial	0.86 (0.80)	0.88 (0.86)	21 657	.917	.399	[.340, 457]
PSQ Health-Others	2.13 (1.23)	2.33 (1.12)	23 022	.143	.424	[.372, .480]
PSQ Health-Self	1.78 (1.29)	2.19 (1.52)	24 363	.016	.449	[.393, .515]

Table O4

Results for the Kruskal-Wallis tests comparing pandemic-related variables by level of study

Variable	Level of study					$\chi 2$ (*df*=4)	*p*	ESE	
	First year (*n*=193)	Second year (*n*=143)	Third year (*n*=118)	Fourth year Plus (*n*=48)	Postgraduate (*n*=31)			Value	95% CI
PSQ General Life Disruption	1.78 (1.02)	1.85 (1.31)	2.08 (1.40)	1.77 (1.27)	1.66 (1.17)	3.45	.49	.006	[.002, .037]
PSQ Educational-Professional	1.59 (0.97)	1.56 (0.97)	1.58 (0.99)	1.49 (1.03)	1.31 (0.93)	2.42	.65	.004	[.001, .031]
PSQ Interpersonal	1.98 (1.28)	1.96 (1.16)	2.15 (1.01)	2.26 (1.20)	2.00 (1.23)	2.85	.58	.005	[.002, .034]
PSQ Financial	0.93 (0.83)	0.93 (0.80)	0.80 (0.79)	0.81 (0.91)	0.52 (0.63)	7.60	.11	.014	[.005, .048]
PSQ Health-Self	1.98 (1.38)	1.65 (1.32)	1.98 (1.44)	2.09 (1.27)	1.69 (1.20)	3.29	.51	.013	[.003, .044]
PSQ Health-Others	2.17 (1.19)	2.25 (1.21)	2.14 (1.24)	2.12 (1.14)	2.17 (1.26)	0.84	.93	.002	[.001, .024]

Appendix P

Table P1

Pearson correlations between K-10, sociodemographic, empathy dimensions and pandemic-related variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1.K-10 Total	1												
2.Biological Sex	-.23***	1											
3.History of Psychological Diagnosis	-0.29***	.12**	1										
4.Level of Study	-.04	.02	-.06	1									
5.Time of survey	.02	-.04	.04	-.09*	1								
6.IRI Affective Empathy	.21**	0.27***	-.09	.13	.13	1							
7.IRI Cognitive empathy	.23**	-.11	-.03	.05	.09	.54***	1						
8.PSQ General Life Disruption	.05	.09	.01	-.09*	-.04	.03	-.12	1					
9.PSQ Educational-Professional	.19***	.04	.00	-.04	.03	.15	.04	.31***	1				

10.PSQ Interpersonal	.20***	-.04	-.16***	-.01	-.09	.17*	.22*	.30***	.17***	1			
11.PSQ Financial	.08	.02	.08	-.04	-.01	-.03	.11	.31***	.24***	.17***	1		
12.PSQ Health-Self	.10*	.00	-.14***	.01	-.13**	-.16*	-.02	.26***	.10*	.32***	.17***	1	
13.PSQ Health-Others	.09*	-.02	-.05	-.01	-.07	.05	.11	.16***	.13**	.29***	.07	.36***	1

Table P2

Pearson correlations between BDI-II, sociodemographic variables, empathy dimensions and pandemic-related variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1.BDI-II Total	1												
2.Biological Sex	-.14**	1											
3.History of Psychological Diagnosis	.12***	.32**	1										
4.Level of Study	-.04	.02	-.08	1									
5.Time of survey	.02	-.04	.04	-.09*	1								

	1	2	3	4	5	6	7	8	9	10	11	12	13
6.IRI Affective Empathy	.06	-.27***	-.09	.13	.13	1							
7.IRI Cognitive empathy	.10	-.11	-.03	.05	.09	.54***	1						
8.PSQ General Life Disruption	.05	.09	.01	-.09*	-.04	.03	-.12	1					
9.PSQ Educational-Professional	.22***	.04	.00	-.04	.03	.15	.04	.31***	1				
10.PSQ Interpersonal	.23***	-.04	-.16***	-.01	-.09	.17*	.22*	.30***	.17***	1			
11.PSQ Financial	.05	.02	.08	-.04	-.01	-.03	.11	.31***	.24***	.17***	1		
12.PSQ Health-Self	.10*	.00	-.14***	.01	-.13**	-.16*	-.02	.26***	.10***	.32*	.17***	1	
13.PSQ Health-Others	.10*	-.02	-.05	-.01	-.07	.05	.11	.16***	.13**	.29***	.07	.36***	1

Table P3

Pearson correlations between BAI, sociodemographic variables, empathy dimensions and pandemic-related variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1.BAI Total	1												
2.Biological Sex	-.23***	1											
3.History of Psychological Diagnosis	-32***	.12	1										
4.Level of Study	-.01	.02	-.08	1									
5.Time of survey	.00	-.04	.04	-.09*	1								
6.IRI Affective Empathy	.13	-.27***	-.09	.13	.13	1							
7.IRI Cognitive empathy	.14	-.11	-.03	.05	.09	.54***	1						
8.PSQ General Life Disruption	.09*	.09	.01	-.09*	-.04	.03	-.12	1					
9.PSQ Educational-Professional	.16***	.04	.00	-.04	.03	.15	.04	.31***	1				

10.PSQ Interpersonal	.23***	-.04	-.16***	-.01	-.09	.17*	.22*	.30***	.17***	1			
11.PSQ Financial	.06	.02	.08	-.04	-.01	-.03	.11	.31***	.24***	.17***	1		
12.PSQ Health-Self	.17***	.00	-.14***	.01	-.13**	-.18*	-.02	.26***	.10***	.32*	.17***	1	
13.PSQ Health-Others	.18***	-.02	-.05	-.01	-.07	.05	.11	.16***	.13**	.29***	.07	.36***	1

Table P4

Pearson correlations between PCL-5, sociodemographic variables, empathy dimensions and pandemic-related variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1.PCL Total	1												
2.Biological Sex	-.17***	1											
3.History of Psychological Diagnosis	-22***	.12**	1										
4.Level of Study	-.06	.02	-.08	1									
5.Time of survey	.00	-.04	.04	-.09*	1								

6.IRI Affective Empathy	.16*	-.27***	-.09	.13	.13	1							
7.IRI Cognitive empathy	.15	-.11	-.03	.05	.09	.54***	1						
8.PSQ General Life Disruption	.14**	.09	.01	-.09*	-.04	.03	-.12	1					
9.PSQ Educational - Professional	.26***	.04	.00	-.04	.03	.15	.04	.31***	1				
10.PSQ Interpersonal	.23***	-.04	-.16***	-.01	-.09	.17*	.22*	.30***	.17***	1			
11.PSQ Financial	.16***	.02	.08	-.04	-.01	-.03	.11	.31***	.24***	.17***	1		
12.PSQ Health-Self	.10*	.00	-.14***	.01	-.13**	-.18*	-.02	.26***	.10***	.32*	.17***	1	
13.PSQ Health-Others	.11**	-.02	-.05	-.01	-.07	.05	.11	.16***	.13**	.29***	.07	.36***	1

Appendix Q

Assumption checks and regression model diagnostics.

Multicollinearity

The variance inflation factor (VIF) was calculated for each regression model to determine any cases of multicollinearity. All VIFs were between <10, suggesting there is low to moderate multicollinearity among the variables in the models (Vatcheva et al., 2016).

Homoscedasticity, Linearity and Normal distribution of errors

These assumptions were upheld for all models except the K-10 Model 1, BDI-11. However, this was expected since the sociodemographic variables in these particular models were categorical (Rosopa et al., 2013). The non-constant variance test was also computed to determine whether there was any heteroscedasticity in the models (see Table Q1). For models the test was non-significant, suggesting there is no heteroscedasticity in the distribution of the residuals (Astivia & Zumbo, 2019). See Figure Q1-18 for visual depictions of the test assumptions.

Table Q1

Results from the Non-constant variance tests computed for the models

Model	X^2	*df*	*p*
Model 1	0.341	1	.55
Model 2	1.138	1	.29
Model 3	0.511	1	.474
Model 4	1.573	1	.209
Model 5	1.139	1	.286
Model 6	0.060	1	.805
Model 7	2.627	1	.105
Model 8	1.812	1	.178
Model 9	3.160	1	.075
Model 10	0.942	1	.331
Model 11	2.128	1	.145
Model 12	0.562	1	.453
Model 13	1.085	1	.297

Model 14	0.779	1	.377
Model 15	1.247	1	.264
Model 16	3.109	1	.078
Model 17	1.363	1	.242
Model 18	2.447	1	.118

Figure Q1

Residuals showing heteroscedasticity and non-linearity within K10: Model 1

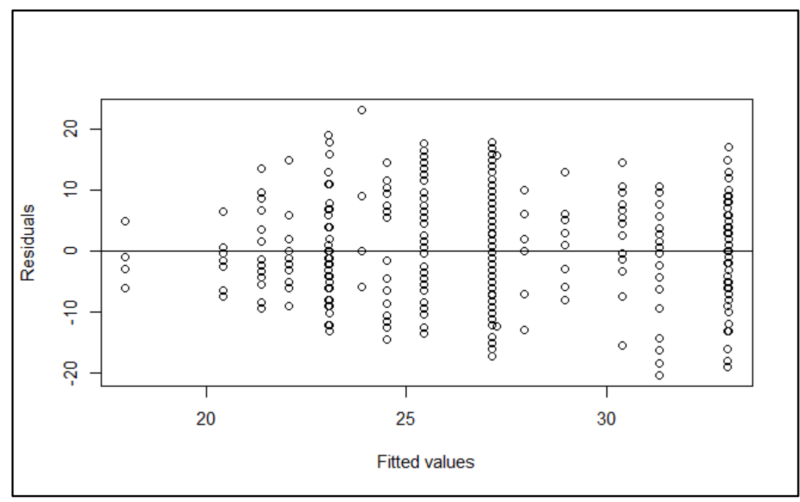

Figure Q2

Residuals showing homoscedasticity and linearity within K-10: Model 2

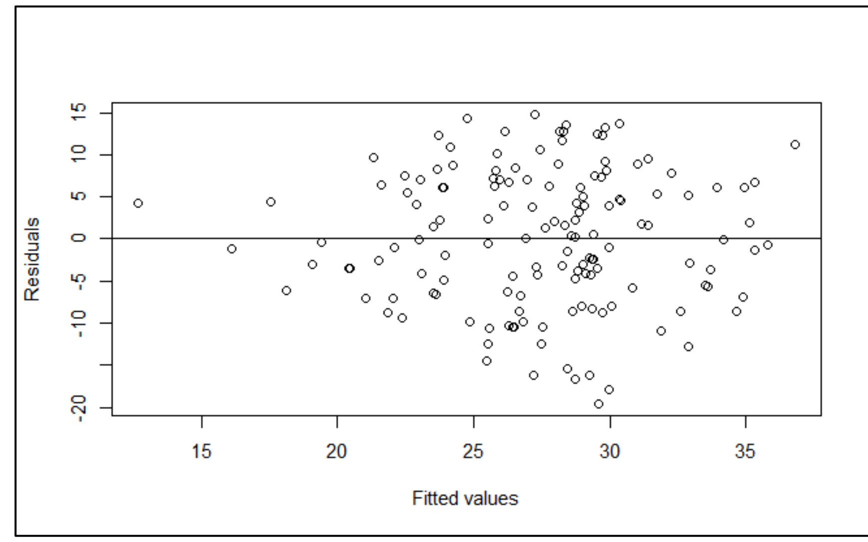

Figure Q3

Residuals showing homoscedasticity and linearity within K10: Model 3

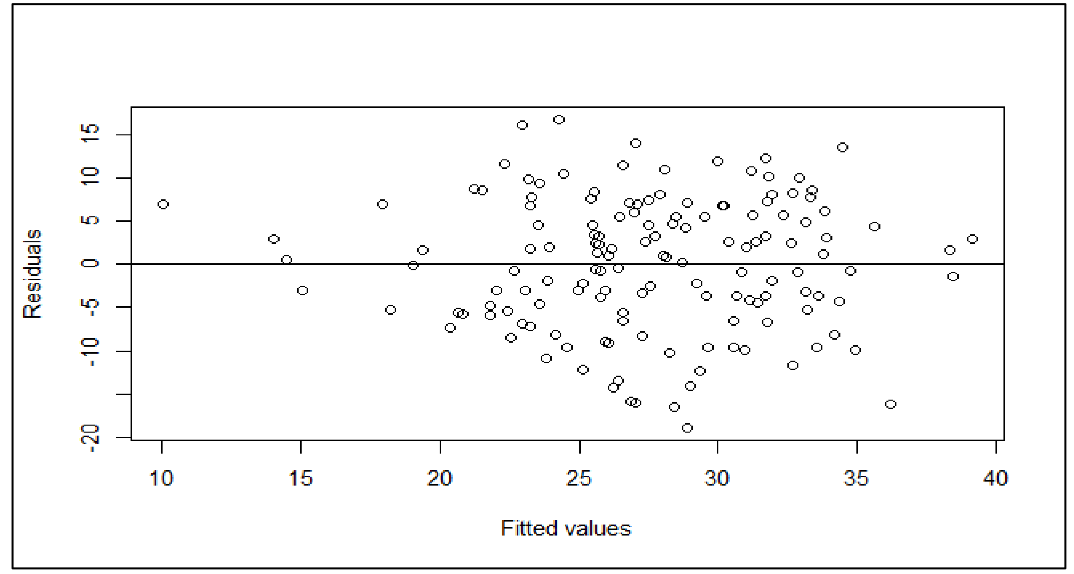

Figure Q4

Residuals showing heteroscedasticity and non-linearity within BDI-II: Model 4

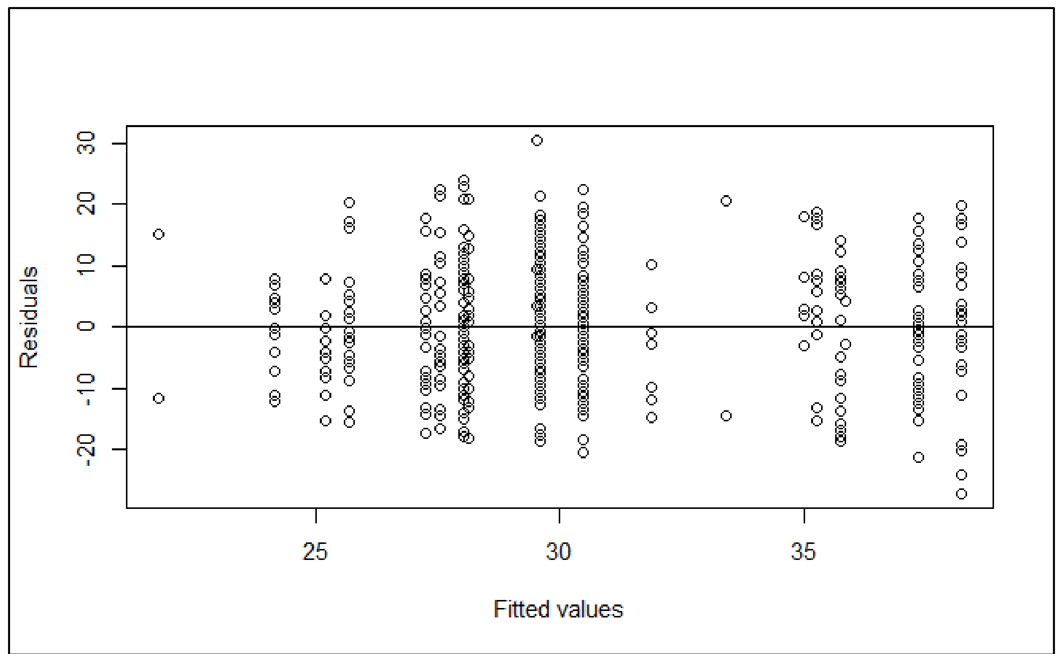

Figure Q5

Residuals showing homoscedasticity and linearity within BDI-II: Model 5

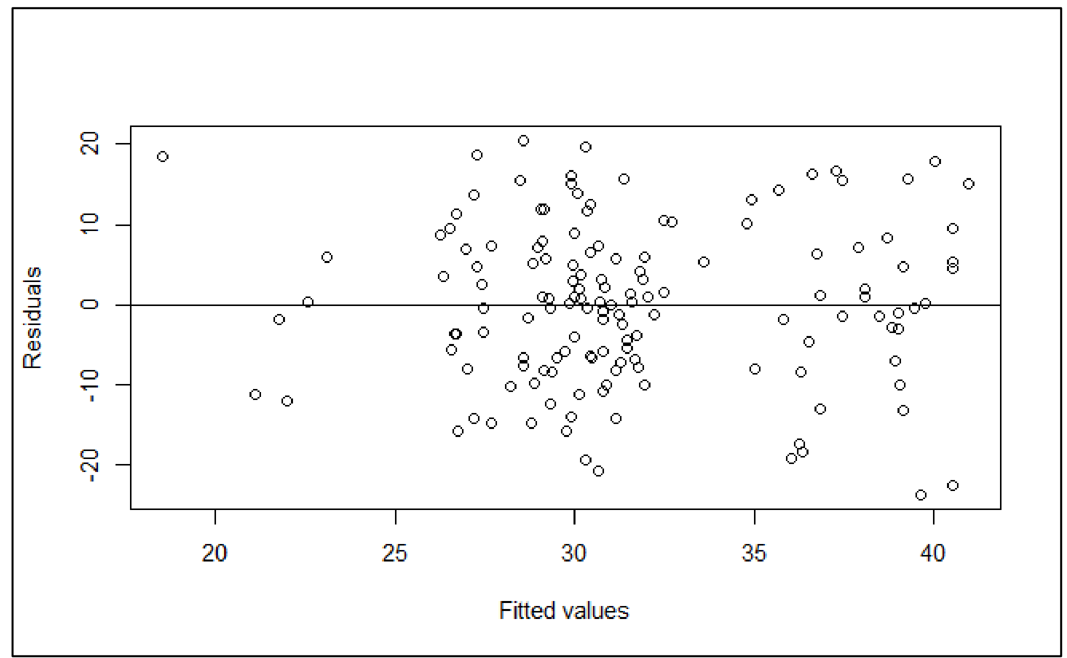

Figure Q6

Residuals showing homoscedasticity and linearity within BDI-II: Model 6

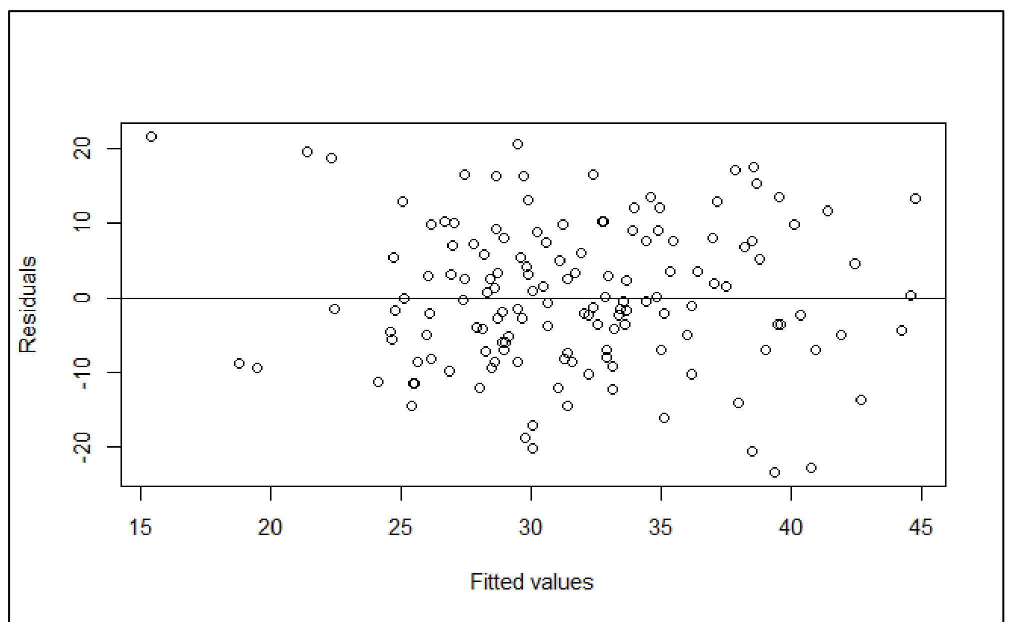

Figure Q7

Residuals showing heteroscedasticity and non-linearity in the BAI: Model 7

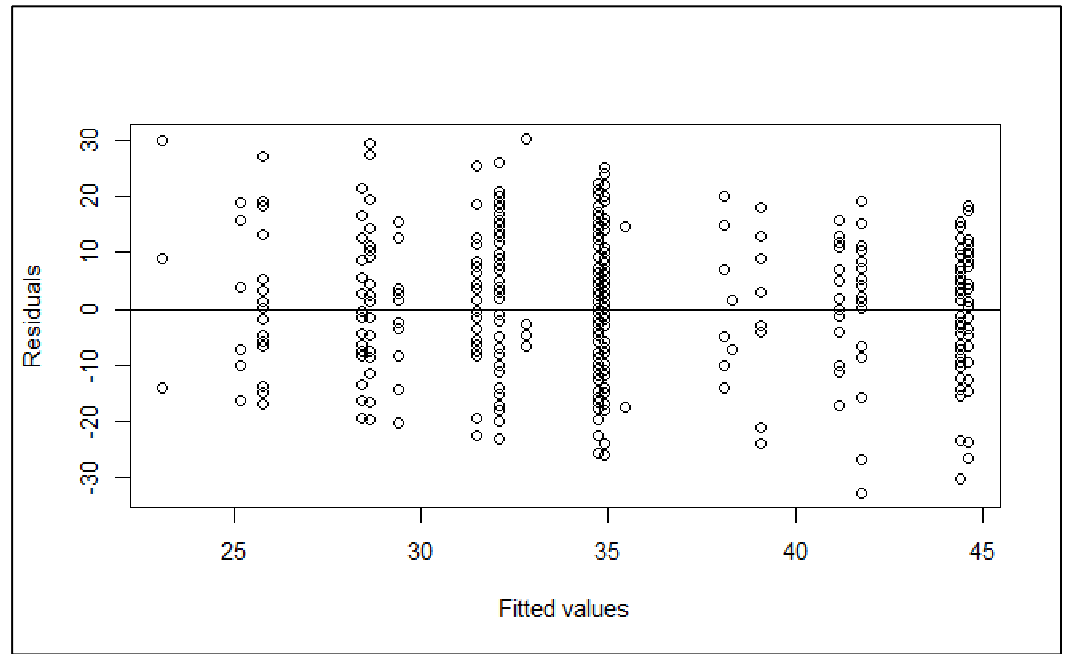

Figure Q8

Residuals showing homoscedasticity and linearity within the BAI: Model 8

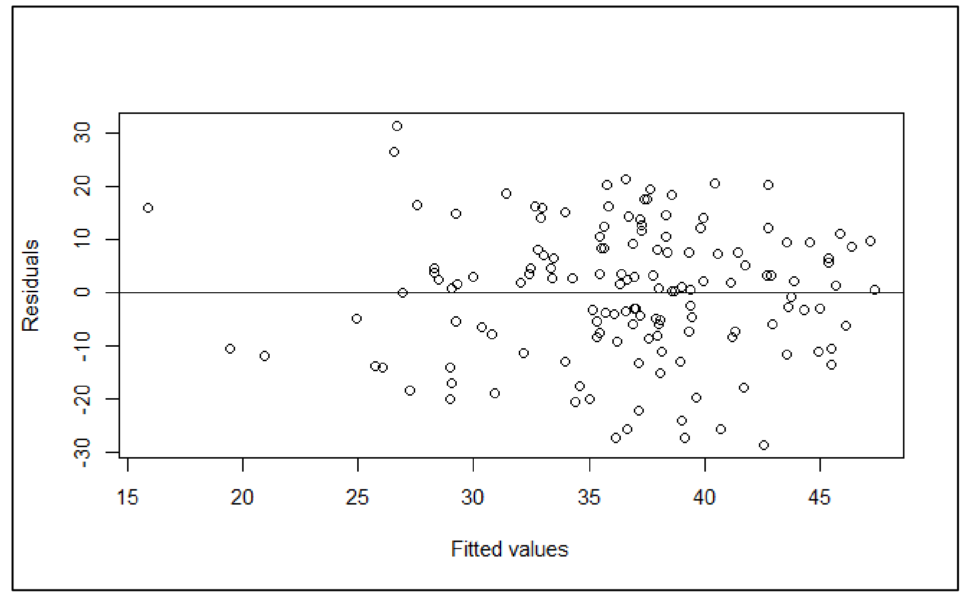

Figure Q9

Residuals showing homoscedasticity and linearity within BAI: Model 9

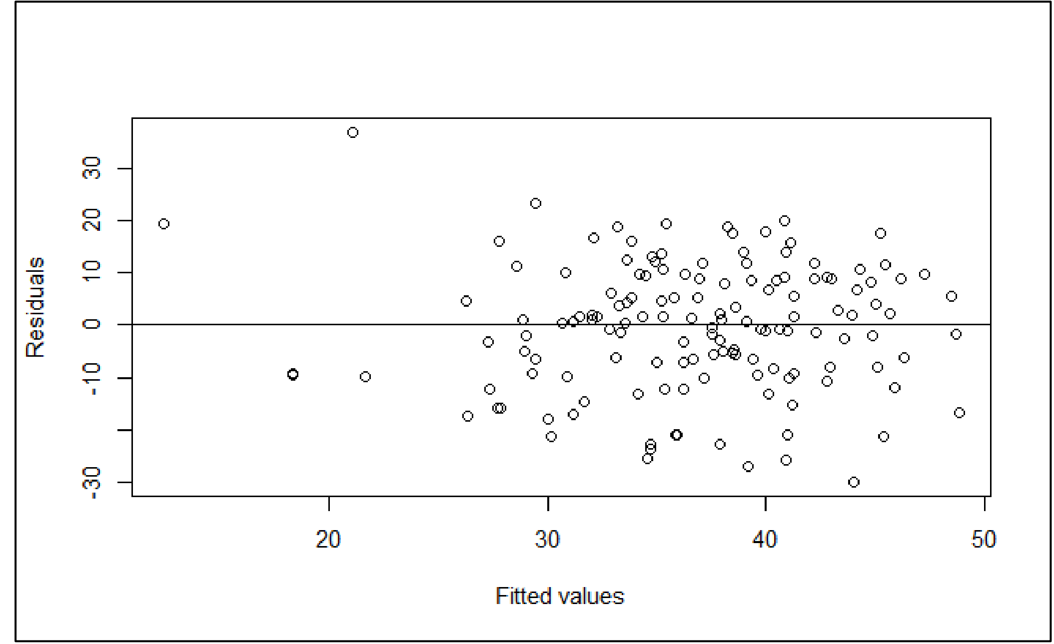

Figure Q10

Residuals showing heteroscedasticity and non-linearity within PCL-5: Model 10

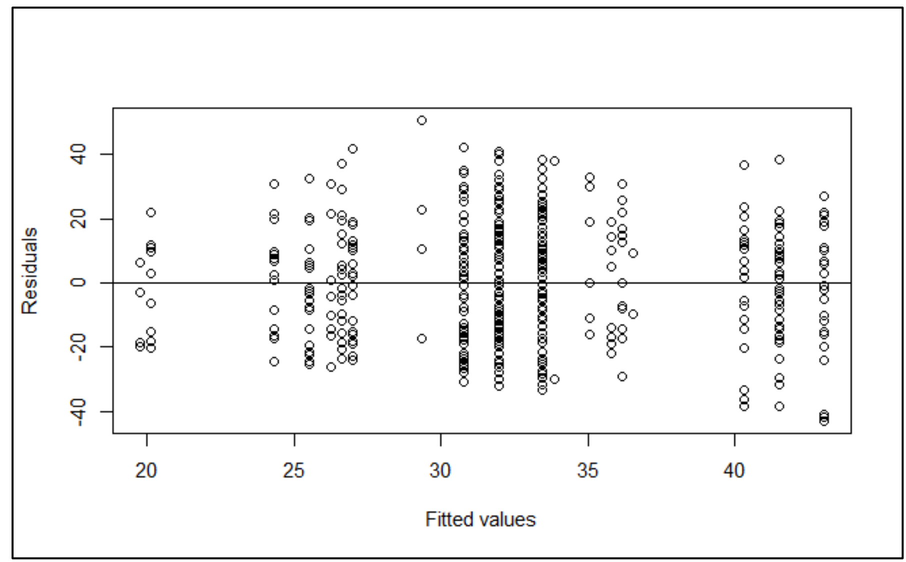

Figure Q11

Residuals showing homoscedasticity and linearity within the PCL-5: Model 11

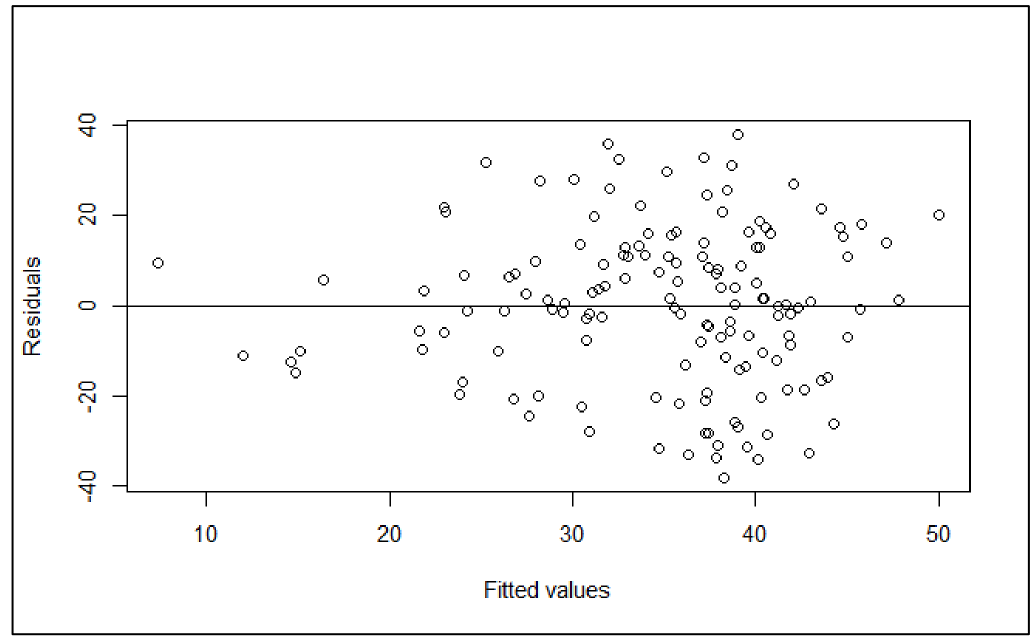

Figure Q12

Residuals showing homoscedasticity and linearity within the PCL-5: Model 12

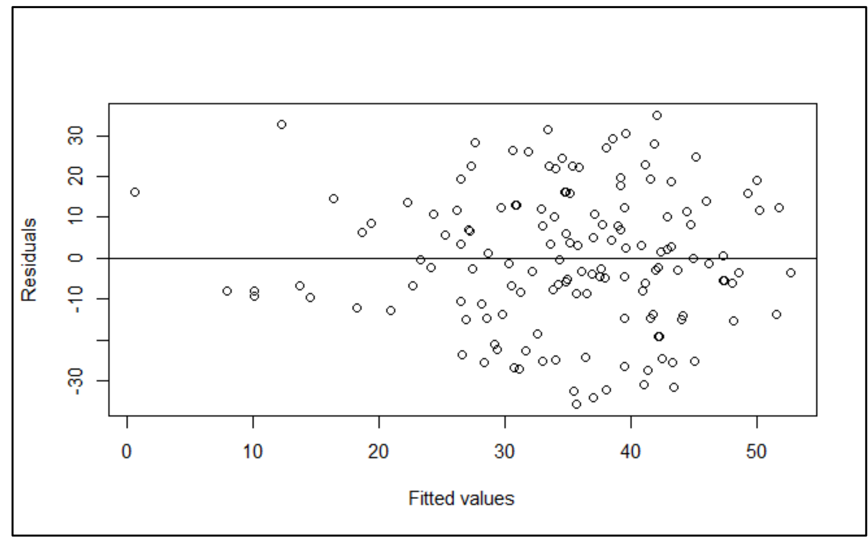

Figure Q13

Residuals showing homoscedasticity and linearity within K-10 moderation: Model 13

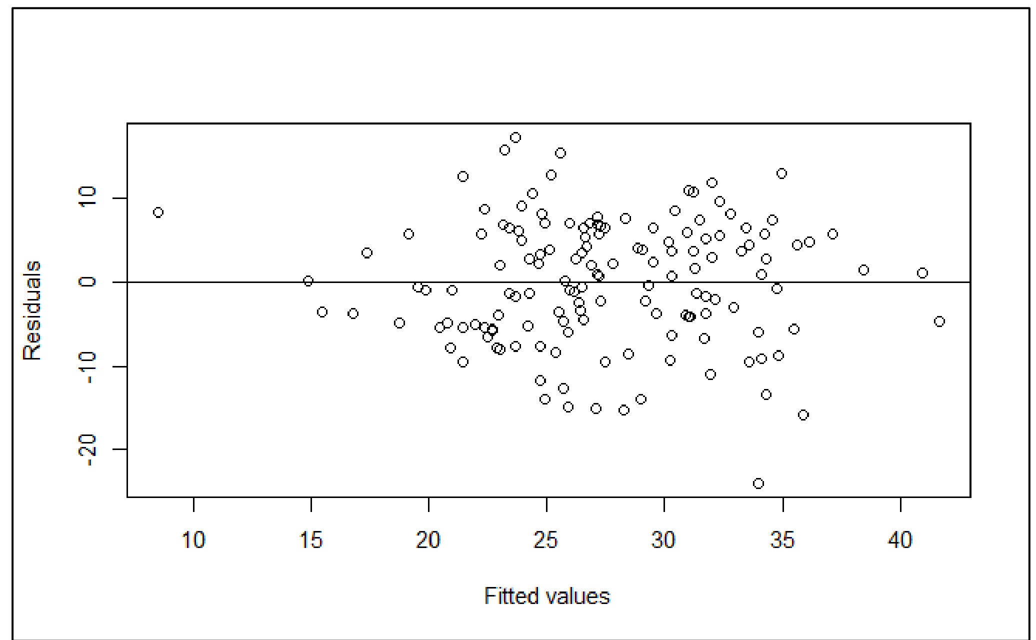

Figure Q14

Residuals showing homoscedasticity and linearity within the K-10 moderation: Model 14

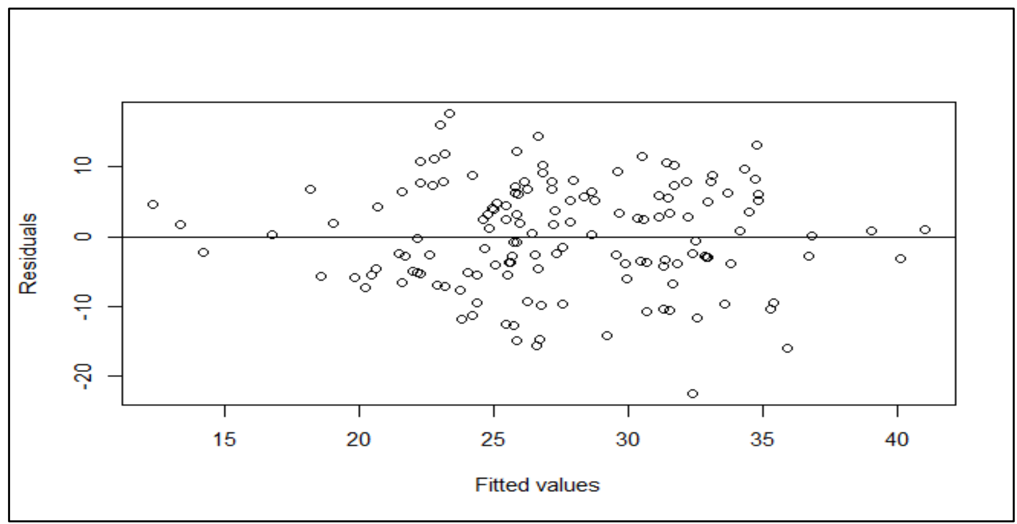

Figure Q15

Residuals showing homoscedasticity and linearity within the K-10 moderation: Model 15

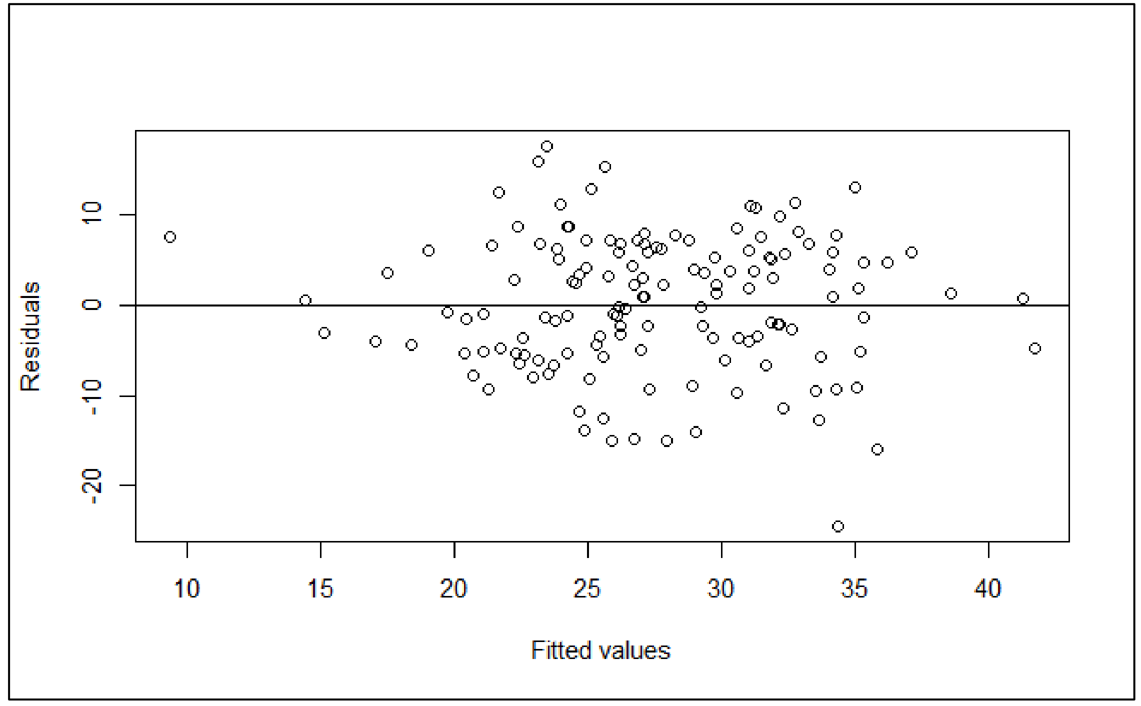

Figure Q16

Residuals showing homoscedasticity and linearity within the PCL-5 moderation: Model 16

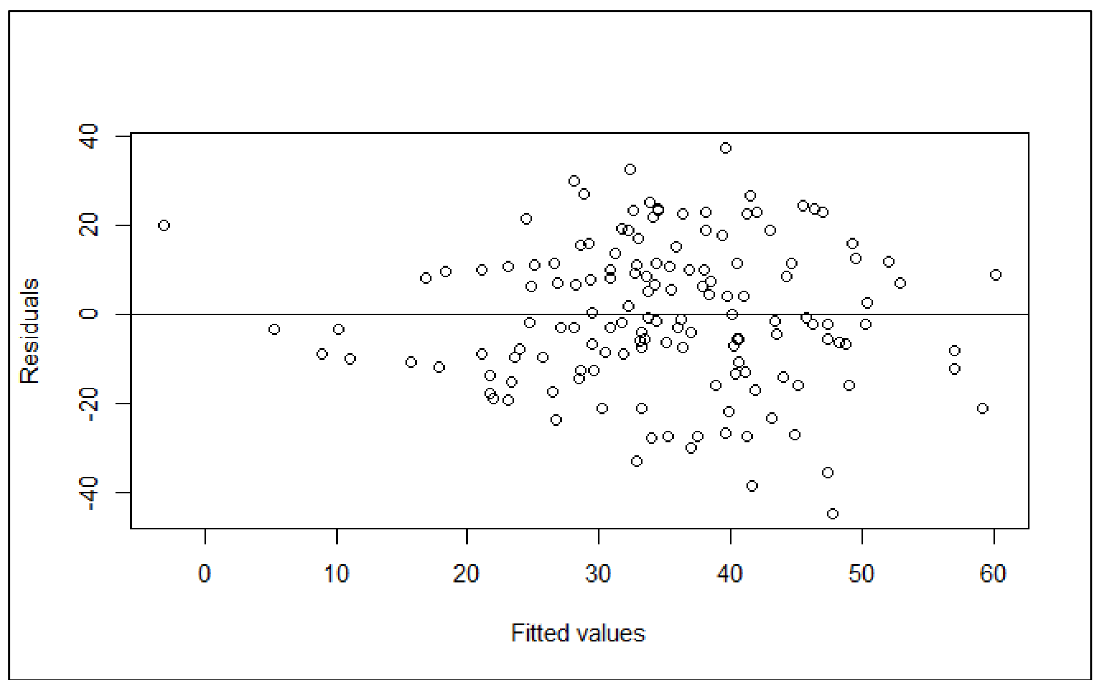

Figure Q17

Residuals showing homoscedasticity and linearity within the PCL-5 Moderation: Model 17

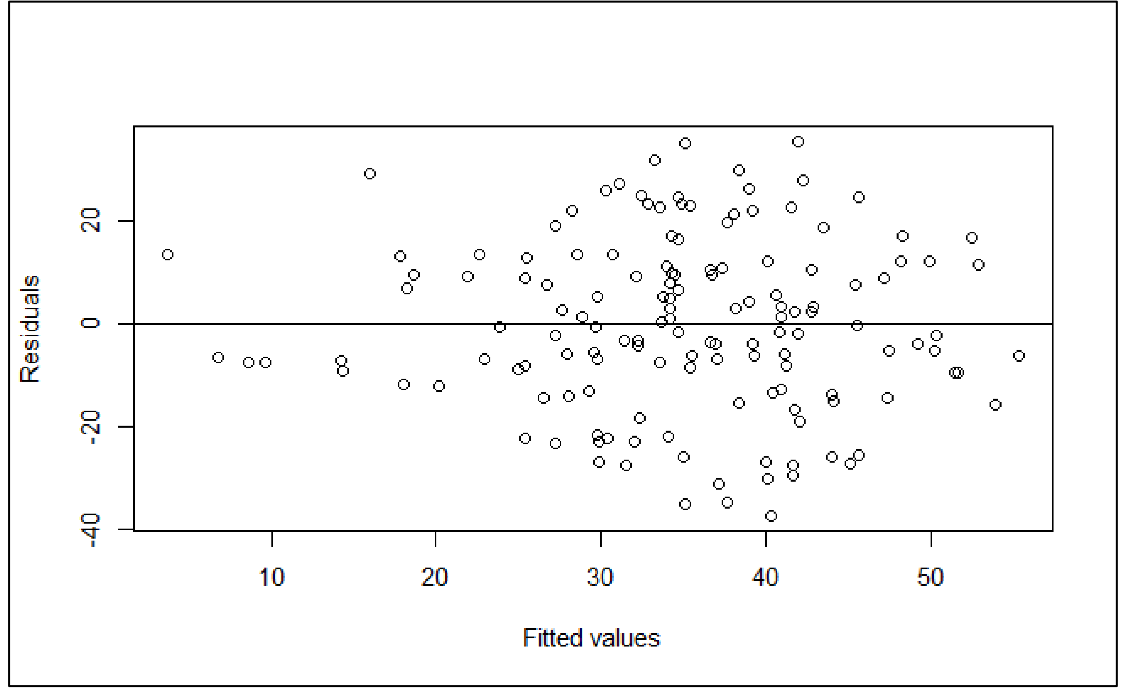

Figure Q18

Residuals showing homoscedasticity and linearity within the PCL-5 Moderation: Model 18