Relationship between online-learning self-efficacy and risk for psychological distress and harmful substance use in South African university students

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"The LORD is my strength and song, And He has become my salvation." (*New King James Version*, 1982, Psalm 118:14)

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ABSTRACT

The COVID-19 pandemic brought about rapid emergency changes in learning formats at universities globally, with a mass migration to online learning. Students' level of online learning self-efficacy (OLSE) may be an important determinant of how they cope with these changes. This study explored whether sociodemographic and online learning context factors are associated with OLSE among South African university students, whether OLSE predicts psychological distress and harmful substance use, and whether level of perceived social support moderates these relationships. It also examined whether psychological distress mediates the relationship between OLSE and problematic substance use. A cross-sectional online survey was administered to students from the University of Cape Town (n = 627). Students who had higher levels of access to online learning resources, and students who were white had higher levels of OLSE, while students on a government bursary and those living in university residences rather than with family members had lower OLSE. Lower OLSE was found to be a significant predictor of higher psychological distress and increased harmful substance use, when controlling for sociodemographic and online learning context factors. Psychological distress mediated the relationships between OLSE and harmful alcohol and marijuana use. Perceived social support did not moderate the relationships between OLSE and mental health difficulties or substance use. These findings indicate that OLSE is an important predictor of how university students cope with online learning demands and suggest that students with lower OLSE should be identified and better supported with strategies to improve their OLSE levels. Further, students with lower OLSE levels may need greater mental health support from universities within the context of online learning, as the existing social supports do not appear to be adequately protective for students.

Keywords: Online learning self-efficacy, psychological distress, alcohol, marijuana, social support

Word count: 291

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CHAPTER 1: INTRODUCTION

In March 2020, the World Health Organisation (WHO, 2020) announced COVID-19 as a global pandemic. This pandemic has necessitated continuous and widespread use of social distancing and lockdown periods. Universities internationally and in South Africa had to swiftly adapt, resulting in rapid emergency changes in learning formats at universities across the world. Higher education was forced to suddenly shift to online learning (Cranfield et al., 2021). Universities in South Africa started to implement online learning in March/April 2020 (Department of Higher Education and Training, 2020; Ngqakamba, 2020).

During normal contact learning, there is a high risk for common mental disorders (that is, depression, anxiety and substance misuse) among university students. Understanding how students' experience of online learning has impacted their mental health is vital for planning teaching and learning practices and student support services going forward, as the pandemic continues in spite of large-scale vaccination rollouts. Within South Africa and other lower resource contexts, there may be unique difficulties with regard to online learning because of systemic inequalities and many students not having had previous experience with this type of learning. For example, undergraduate students in Ghana reported a negative response towards online learning (Agormedah et al., 2020) and less than half of a sample of students in the medical field in the Philippines deemed themselves able to adapt to this way of learning (Baticulon et al., 2021). The difficulties described included a lack of preparation in terms of experience and training regarding remote learning, restrictions on internet access owing to lack of preparation in terms of finances (Agormedah et al., 2020) and not having a study space (Baticulon et al., 2021). With regard to socioeconomic status, Baticulon and colleagues (2021) found that those who had the lowest likelihood of deeming themselves as able to learn online were from low- or middle-income families. Moreover, a review of how the COVID-19 pandemic effected systems of education within developing countries found that there is difficulty attached to distance learning, as a result of, among other things lack of technology (Tadesse & Muluye, 2020). It is also reported that students in rural regions may have to spend time supporting their family with having to farm and herd cattle (Tadesse & Muluye, 2020) rather than focusing on their own academic work. Amongst student samples at South African universities, challenges and barriers in the context of online learning included financial issues, home disruptions, not being able to access study material (Dube, 2021), time management (Laher et al., 2021), problems of connection and access to the internet (Patrick

et al., 2021; Mhandu et al., 2021), lack of knowledge about how to utilise digital devices (Patrick et al., 2021) and electricity shortages (Mhandu et al., 2021). First and second year students reported that not having face-to-face learning was very challenging, with first year students in particular feeling that shifting to learning online hindered their adjustment to university (Laher et al., 2021).

In addition to the aforementioned difficulties, the COVID-19 epidemic has exacerbated mental health difficulties among university students. Prior to the pandemic, high rates of mental health difficulties were reported for student samples internationally (Auerbach et al., 2018; Ibrahim et al., 2013; Paula et al., 2020) and in South Africa (Bantjes et al., 2019; Rousseau et al., 2020). International (Deng et al., 2021; Majumdar et al., 2020; Li et al., 2021) and local (Visser & Law-van Wyk, 2021) findings suggest that student mental health has been further negatively affected by the COVID-19 pandemic and lockdowns. However, it is not yet clear to what extent the negative mental health effects of the COVID-19 pandemic are specifically due to how students have experienced the shift to online learning.

Online learning self-efficacy (OLSE) refers to a person's perceptions about their own capability to successfully finish certain tasks that are expected from those who are learning online (Zimmerman & Kulikowich, 2016). Within the COVID-19 context, OLSE may play a vital role in determining the mental health effects on students of the rapid shift to online learning in tertiary education. There is evidence that increased mental health problems were significantly associated with lower self-efficacy in general amongst students (Gençoğlu et al., 2018; Rezayat & Dehgannayeri, 2013; Salami et al., 2021) and among students doing online learning, increased self-efficacy in online learning was associated with decreased anxiety (Heckel & Ringeisen, 2019). However, the contribution of OLSE to mental health difficulties amongst university students during the COVID-19 pandemic has not yet been examined. Moreover, mental health difficulties can generally create an increased risk for substance misuse amongst students (Conner et al., 2009; Hussong et al., 2017; Kuo et al., 2006; Swendsen et al., 2010), but it is not yet clear whether this also holds true for students within the specific context of remote learning.

Because social support appears to be protective against negative mental health outcomes (Alsubaie et al., 2019; Bruwer et al., 2008; Humm et al., 2018; Kugbey et al., 2015; Myer et al., 2008; Wang et al., 2014; Zhang et al., 2018) and is also associated with levels of

substance use (Arias-De la Torre et al., 2019; Cullum et al., 2013; Lechner et al., 2020; Orosova et al., 2014; Peltzer & Pengpid, 2017), social support could play a moderating role in the relationship between OLSE and these outcomes. However, to date this has not been examined.

Understanding how and to what extent OLSE affects levels of psychological distress and substance use among university students during the COVID-19 pandemic, and whether students' existing social support networks have a protective role in this, would add to a fuller understanding of the impact of online learning on students and indicate potentially highly useful pathways to enhance student support systems.

Study aims

This study aims to fill the existing gaps in the research by examining which sociodemographic factors and online learning context factors are related to OLSE in a sample of university students in South Africa; whether OLSE is associated with the severity of psychological distress, alcohol use and marijuana use; whether psychological distress mediates the relationship between OLSE and problematic substance use (alcohol and marijuana use); and whether perceived social support moderates the relationship between OLSE and psychological distress and between OLSE and problematic substance use.

Structure of the dissertation

The next chapter in this thesis will present an overview of the existing literature on OLSE, mental health difficulties and substance use among students, the relationship between mental health and substance use and the role of social support in student psychological distress and substance use. This will be followed by a chapter describing the methodology used in this study. The results of this study are presented and described in the fourth chapter. The final chapter will discuss the findings, consider the limitations of the study and provide recommendations for future research and for supporting and helping students at university going forward.

CHAPTER 2: LITERATURE REVIEW

This chapter will review the literature that presently exists on online learning self-efficacy (OLSE), mental health difficulties and substance use among students, the relationship between mental health and substance use, and the role of social support in students' psychological distress levels and degree of substance use.

Self-efficacy

The concept of OLSE comes from the concept of self-efficacy that was first defined and described by Bandura (1977, 1994, 2002, 2007). Bandura (2007) explains that perceived self-efficacy is not about what resources one has but one's belief in what one can do with the resources one can gather. He defines it as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p. 2), noting that for competent functioning, people need to have skills as well as self-efficacy beliefs in order to utilise those skills well (Bandura, 2002). He argues that self-efficacy beliefs govern thoughts, feelings, actions and how one motivates oneself (Bandura, 1994). He maintains that this system of beliefs is the basis of people's sense of agency (Bandura, 1999a).

Bandura (2005) states that people have differing areas that they work on in terms of efficacy, for example, organisational efficacy and parenting efficacy. He further holds that people have differing degrees to which they grow their self-efficacy, including within the areas on which they are working. As an example, he notes that the organisational efficacy of a business executive could be high, but they could have minimal parenting efficacy. People's self-efficacy belief system, thus, cannot be one overall, mono-dimensional characteristic. It is a "differentiated set of self-beliefs linked to distinct realms of functioning" (Bandura, 2005, p. 307). Instruments measuring perceived self-efficacy therefore need to be customised for the specific desired area of functioning (Bandura, 2005).

Bandura (1977, 1994) proposes four main sources of self-efficacy. Bandura (1994) argues that the best means to form a strong feeling of self-efficacy is by way of mastery experiences. Achievements that are not just easily attainable, whereby one has to overcome challenges, strengthen a person's belief in their efficacy to become resilient, whereas failing weakens this

belief. Second, vicarious experiences through social models help to form and strengthen self-efficacy, depending on one's observed alikeness. When people see those who are similar to them achieve by putting in constant effort, it increases their belief that they also have the ability to become proficient in similar activities in order to succeed. However, seeing these social models fail even when they have put in a lot of effort can have the reverse effect and weaken one's self-efficacy and efforts. Third, the use of social persuasion helps to strengthen self-efficacy. Those who are verbally persuaded by others that they have the ability to become proficient in certain activities have a greater likelihood of mustering up more effort and maintaining this effort. The last way to change people's beliefs about their efficacy is lessening their stress reactions and changing their negative affective and physiological states (Bandura, 1994). A review of aspects that impact self-efficacy among students in tertiary education found that "enactive mastery experiences" had the greatest influence in forming a solid sense of self-efficacy (Van Dinther et al., 2011, p. 104). Van Dinther and colleagues (2011) also found evidence for Bandura's (1994; Bandura, 1997, as cited by Van Dinther et al., 2011) vicarious experiences and social persuasion as sources of student self-efficacy. However, Van Dinther and colleagues (2011) found that the proof for the efficiency of vicarious experiences was inconsistent. Notably, they maintain that much research has indicated that combined sources of self-efficacy (instead of just one source) have great potential to improve the self-efficacy of students (Van Dinther et al., 2011). However, when learning online from home, students may have less access to social persuasion from others and to vicarious experiences of efficacy than when on campus interacting directly with others.

Bandura (1994) puts forward that having a strong sense of self-efficacy improves people's success and well-being in multiple respects. Empirical research confirms that higher levels of self-efficacy are associated with better academic achievement amongst students (Alhadabi & Karpinski, 2020; Macakova & Wood, 2020; Roick & Ringeisen, 2017; Tilfarlioglu & Ciftci, 2011). Further, meta-analyses have revealed that academic self-efficacy (ASE), in particular, significantly and positively affects academic performance (Talsma et al., 2018; Honicke, & Broadbent, 2016). General self-efficacy has also been associated with enhanced wellbeing amongst students across different contexts, including in Iran (Tamannaeifar & Motaghedifard, 2014), China (Tong & Song, 2004) and India (Siddiqui, 2015) and academic self-efficacy is a predictor for increased psychological well-being amongst undergraduate students in Italy (Matteucci & Soncini, 2021).

Bandura's social cognitive theory proposes that those who have the self-belief of being able to exert control on possible dangers (i.e. a threat, which "is a relational property reflecting the match between perceived coping capabilities and potentially hurtful aspects of the environment", Bandura, 1988, p. 77) will interpret environmental threats as manageable, thereby reducing feelings of anxiety or helplessness, while those who do not believe that they can manage possible dangers will be more prone to feel anxious and helpless in the face of stress (Bandura, 1982, 1988, 1997). He therefore conceptualised high self-efficacy as a psychological resource that can regulate and buffer the stress caused by environmental demands. Early experimental research indicated that perceived inefficacy to cope comes with elevated "subjective distress, autonomic arousal and catecholamine secretion" (Bandura, 1988, p. 77). Research has since found that higher levels of general and specific self-efficacy better mental health outcomes, including depression and anxiety (see review by Schönfeld et al., 2017). This same relationship is likely to apply to OLSE, as a specific form of self-efficacy belief: when one has a greater sense of self-efficacy to handle the potential threat or stress of having to pivot rapidly to online learning, one may experience less anxiety and depression.

While ASE has a positive relationship with academic performance, it is less clear if this relationship holds in the sphere of online learning. To build on Bandura's notion of specific areas of self-efficacy, Hodges (2008) notes that one's beliefs about self-efficacy depend on each situation. Therefore, changes in how students are learning, such as shifting from normal in-person learning to online learning, could influence students' self-efficacy regarding learning. The next section will consider how self-efficacy translates into the online learning environment.

Online learning self-efficacy (OLSE)

Drawing on Bandura (1977, 2002 and 2012), Zimmerman and Kulikowich (2016) define OLSE as a person's perceptions about their own capability to successfully finish certain tasks that are expected from those who are learning online. Further, building on Bandura (1997, as cited in Lee & Mendlinger, 2011) and Eastin and LaRose (2000, as cited in Lee & Mendlinger, 2011), Lee and Mendlinger (2011) explain that self-efficacy toward online learning is a situation-specific type of self-efficacy that is one's judgment of one's abilities to

be able to utilise online learning systems. These systems are comprised of computers, the internet and online tools for instruction and learning.

OLSE is often operationalised in terms of technological self-efficacy. There are several scales solely looking at specific technological self-efficacies related to online learning, such as the Online Technologies Self-efficacy Scale (which was tested with graduate students; Miltiadou & Yu, 2000), Internet Self-efficacy Survey (created with college students as participants; Chuang et al., 2015) and the Computer Self-Efficacy Scale (Murphy, et al., 1989). A literature review of OLSE research (Alqurashi, 2016) found that most OLSE research to date has examined these more technological aspects of OLSE. However, in learning online, there are multiple aspects at play as students need a variety of skills to succeed (Ko and Rossen 2010, as cited by Zimmerman & Kulikowich, 2016, Roper 2007, as cited by Zimmerman & Kulikowich, 2016; Zimmerman & Kulikowich, 2016), for example, Roper (2007) puts forward that in terms of online learning, students that purposefully plan to keep in contact with their peers in their classes have a higher lilkihood of doing well. Zimmerman and Kulikowich (2016) note the need for an OLSE measure that includes all of the different tasks that students who study online need to do.

There are some scales that have expanded the construct of OLSE to include dimensions beyond technology, although these are each based on somewhat differing conceptualisations and dimensions. The Self-efficacy Questionnaire for Online Learning (SeQoL; Tsai et al., 2020; Shen et al., 2013) conceptualises OLSE as including the following factors: self-efficacy to “complete an online course”, “interact socially with classmates”, “handle tools in a Course Management System”, “interact with instructors in an online course”, and “interact with classmates for academic purposes” (Shen et al., 2013, p. 12). Tsai and colleagues (2020) refined the scale and confirmed its five factors. In the Online Learning Self-efficacy Scale (OLSS; Sun & Rogers, 2020), OLSE includes self-regulation and motivation efficacy, technology use self-efficacy, online learning task self-efficacy and instructor and peer interaction and communication self-efficacy (Sun & Rogers, 2020). The self-efficacy subscale of the Online Learning Value and Self-Efficacy Scale (OLVSES; Artino & McCoach, 2008) measures to what degree “students feel confident they can learn effectively using self-paced, online courseware”. The questions cover technical challenges, learning without instructors, confidence in doing well in activities, understanding challenging coursework and learning online with distractions (Artino & McCoach, 2008, p. 283).

Zimmerman and Kulikowich (2016) noted that they could not use the OLVSES as a measure of OLSE as their institution mostly had paced classes – there was, thus, a need for an OLSE measure that could be used for courses that are not self-paced (such as structured semester-long university courses). Zimmerman and Kulikowich's (2016) therefore developed the Online Learning Self Efficacy Scale (OLSES), which examines multiple aspects of online learning with three subscales: learning in the online environment, time management and technology use. Furthermore, the OLSES has been developed for use both with students that have, and students that do not have, prior experience with learning online (Zimmerman & Kulikowich, 2016). This is important because many students may never have had to learn online prior to university or the recent COVID-19 pandemic.

Previous research on OLSE among university students

To date, research on OLSE among university students has explored OLSE levels, sociodemographic correlates of OLSE and the relationship between OLSE and learning outcomes.

Levels of OLSE were rated as high, very good, moderate/fairly high and fairly high amongst students in the United States (Tsai et al., 2020), Philippines (Andal EdD et al., 2020) Turkey (Yavuzalp & Bahçivan, 2020) and Thailand (Peechapol et al., 2018b), respectively. Students in the United States have reported fairly high levels of self-efficacy on the OLSES with mean scores ranging from 102.67 – 110.45 (Stephen & Rockinson-Szapkiw, 2021) out of a maximum score of 132 (Zimmerman & Kulikowich, 2016). Half (51%) of students in a university sample in Saudi Arabia reported good technology self-efficacy on the OLSES but insufficient learning self-efficacy and time management self-efficacy (Aldhahi et al, 2021). Students in the United States had significantly greater scores than students in Korea on questions about perceived self-efficacy for using the system for learning online. However, the students from the United States were university and graduate students only while the Korean sample also included high school and junior college students (Lee & Mendlinger, 2011).

Some studies have indicated that students' level of OLSE is associated with a variety of demographic factors. There have been mixed findings regarding age and OLSE. Age was not associated with online learning technology self-efficacy among students in Malaysia (Tanius,

2020) or Saudi Arabia (Aldhahi et al., 2021). However, amongst United States students, there was a higher level of computer self-efficacy (CSE) in students 35 years old and older, as opposed to those under 35 (Jan, 2015). Conversely, Queiros and De Villiers's (2016) study in South Africa reported that students younger in age tended to have a higher view of their computing abilities and used the internet to do their schoolwork more than older students.

Findings regarding gender are also inconsistent. In some studies, females tend to have higher online learning self-efficacy than men. For example, among American/Pacific Islander students, women had higher self-efficacy levels than men regarding finishing an online course, operating course management system tools, engaging with others in their classes for academic reasons and engaging with instructors in their online courses (Shen et al. 2013). In another study with students in the United States, women had higher OLSES scores than men, although the statistical significance of this difference was not reported (Tsai et al., 2020). However, studies in Saudi Arabia (Aldhahi et al., 2021), Malaysia (Tanius, 2020) and Turkey (Yavuzalp & Bahçivan, 2020) showed no significant gender differences in OLSE or OLSE-related constructs (Aldhahi et al., 2021; Tanius, 2020; Yavuzalp & Bahçivan, 2020). Amongst students in South Africa in their last year of study women had a higher level of CSE, although other aspects of OLSE were not explored (Chinyamurindi & Shava, 2015).

Regarding education level, no significant differences were found for learning, technology and time management self-efficacy among Saudi Arabian students studying towards a diploma, bachelor's degree or postgraduate degree (Aldhahi et al., 2021). However, Shen and associates (2013) found that amongst American/Pacific Islander students, graduates had a tendency for greater levels of technological self-efficacy compared to undergraduates.

Overall, there is evidence that OLSE levels may differ according to the sociodemographic variables of age, gender and educational level, but findings to date have been inconsistent and further research is needed.

OLSE has consistently been associated with positive learning outcomes. For example, higher OLSE is associated with higher perceived learning, higher student satisfaction (Alqurashi, 2019), higher learning satisfaction (Tsai et al., 2020) and reduced boredom and frustration (Artino & McCoach, 2008) among those who have done or are taking online courses. In one study, increased OLSE was associated with better academic outcomes amongst students that

have and do not have previous online learning experience (Zimmerman Kulikowich, 2016). However, some research has shown that previous exposure to computers and online learning are important factors impacting OLSE. In a systematic review of studies of factors affecting OLSE, Peechapol and colleagues (2018a) reported that 32% of studies were of the consensus that experience of, and knowledge about, online learning impacts self-efficacy. For example, Kim and Park (2017) found that, for students in Indonesia, experience with using computers improved CSE and Shen and colleagues (2013) found that, amongst American/Pacific Islander students, the more courses taken online, the greater their estimated self-efficacy in terms of finishing an online course. University students who have not had exposure to online learning in their schooling careers, which likely includes most students in South Africa, may therefore struggle to experience good OLSE within the context of the rapid shift to online learning which has been brought about because of the COVID-19 pandemic.

OLSE in the South African context

There is very little research about OLSE within the South African context. Some South African studies have focused on related concepts, such as CSE (Chinyamurindi & Shava, 2015; Schlebusch, 2018), self-regulated learning efficacy (comprised of persistence, time and study management, and seeking help; Pintrich & de Groot, 1990, as cited in Tladi, 2017; Tladi, 2017) and computer and online technologies self-efficacy (Miltiadou and Yu, 2000; Tladi, 2017). Among South African students doing distance learning, better distance learning self-efficacy was significantly associated with greater academic success while self-regulated learning efficacy and computer and online technologies self-efficacy were not (Tladi, 2017). Schlebusch, (2018) reported that amongst South African first year students at a university of technology, CSE was mostly high/moderate, but students lacked basic computer literacy such as using USBs or printing, which only 29.9% and 29.3%, respectively, had confidence to do. Another South African study, with a small sample of open distance learning fourth year students with no previous experience of learning online, found that levels of perceived computer efficacy were high (with 91.2% of students agreeing that they can easily use the internet and computers) even though only 46% had accessibility to a computer with internet where they reside (Queiros, & De Villiers, 2016). This limited research on OLSE within the South African context was conducted prior to the mass shift to online learning during the COVID-19 pandemic.

Many students in South Africa may be confronted with practical challenges related to online learning that affect their OLSE. In terms of internet accessibility, in the 2019 General Household Survey it was reported that only 9.1% of households in South Africa had internet connection where they were residing (Statistics South Africa, 2020). A survey with University of Cape Town (UCT) students in the first semester of 2020 reported the following practical difficulties with regard to Emergency Remote Teaching (ERT): having duties related to caring or families, not having a quiet place to do their studies, internet access issues in terms of speed or instability, not having enough data or having capped internet, having obligations to a job and having to share a laptop or computer (UCT, 2020). Therefore, it can be expected that students' OLSE may be impacted by their living circumstances and access to financial and technological resources, with students from lower resource contexts experiencing greater difficulties. However, since the shift to mass online learning in March/April 2020, OLSE amongst students attending university in South Africa has not been assessed.

Mental health difficulties among university students

Mental health challenges are generally high among university students during normal contact learning periods, including in South Africa. In a World Health Organisation (WHO) project with 13 984 first-year students in 8 countries, including South Africa, 31% had one or more twelve-month disorders, including substance use, mood and anxiety disorders (Auerbach et al., 2018). This study reported 12-month prevalence rates of 18.5% for major depressive episode, 16.7% for generalised anxiety disorder (GAD), 4.5% for panic disorder and 3.1% for broad mania. Systematic reviews of mental disorders in university students internationally have reported an overall prevalence rate of 24.5% for anxiety symptoms (Paula et al., 2020) and between 26.1% and 30.6% for depression (Ibrahim et al., 2013; Paula et al., 2020). Among students in low-and-middle income countries specifically, a meta-analysis revealed that about a quarter report current depression (Akhtar et al., 2020). Further, there has been a 3.2% increase in depression diagnosis/treatment amongst students in the United States from 2009 to 2015 (Oswalt et al., 2018). Alonso and associates (2018) found that major depression is the most disabling mental disorder amongst university students internationally.

Among university students at two universities in South Africa, the 12-month prevalence rate for a current common mental disorder was 31.5%. In this study, 20.8% of participants reported past year GAD and 13.6% reported past-year major depressive disorder (Bantjes et al., 2019). In another local study, 16.1% of first year students met criteria for 12-month depression (Mall et al., 2018). Further, amongst psychology students at one South African university, mean depression scores on the Beck Depression Inventory (BDI; Beck, 1996, as cited by Rousseau et al., 2020) increased each year from 2016 to 2019: the prevalence of moderate-severe depression increased from 14.44% to 31.66% of students and the rate of severe depressive symptoms rose from 3.81% to 12.63% (Rousseau et al., 2020).

Across different contexts, mental health issues have consistently been associated with reduced academic performance among university students (Ahmed & Julius, 2015; Awadalla et al., 2020; Moreira de Sousa et al., 2018; Tesera & Wohabie, 2021), including in South Africa (Bantjes et al., 2020).

The COVID-19 pandemic appears to have further exacerbated mental health difficulties in university students. For example, meta-analyses of studies conducted during the COVID-19

pandemic amongst students have reported pooled prevalence rates of anxiety/anxiety symptomology of 32% (Deng et al., 2021) and 29.1% (Ebrahim et al., 2021) internationally and 28% internationally among students in the medical field (Lasheras et al., 2020). These rates are somewhat higher than those reported in pre-pandemic studies and Deng and colleagues (2021) report an overall trend of increasing prevalence of anxiety symptoms. Similarly, probable anxiety prevalence amongst students in China increased from 11.4% to 14.7% between the start of the first wave of the pandemic and its remission in China (Li et al., 2021). However, this has not been the case in Sweden, where anxiety slightly decreased over the course of the COVID-19 pandemic (Johansson et al., 2021). Regarding anxiety rates amongst students in South Africa during the COVID-19 pandemic, 45.6% of students at a residential university, surveyed in July 2020, conveyed subjective past month experiences of anxiety (Visser & Law-van Wyk, 2021) and at another university a thematic analysis with students, who were studying accounting, during lockdown reported that every student specified having anxiety as they were unsure about what was going to happen with their studies (Oluka et al., 2021).

Meta-analyses of studies with university/college students conducted during the COVID-19 pandemic across different countries similarly report high rates of depression/depression symptoms: 34% internationally (Deng et al., 2021); 23.2% internationally (Ebrahim et al., 2021) and 26% amongst Chinese students (Luo et al., 2021). Deng and associates (2021) note that their meta-analysis results overall reflect a slight trend of increased prevalence in depressive symptoms since the start of the pandemic, compared to Ibrahim and colleagues' study (2013). Other studies support this trend, with a 23.7% increase in depression symptoms among students in India during lockdown compared to pre-pandemic (Majumdar et al., 2020) and a 4.7% increase among students in China between the start of the first wave of the pandemic and its remission (Li et al., 2021). Interestingly, amongst students in Sweden, depression increased at the first follow-up but then decreased by the second (Johansson et al., 2021). For depression rates amongst students during the COVID-19 pandemic in South Africa, 35% reported past month subjective experiences of depression during lockdown (Visser & Law-van Wyk, 2021).

In addition to the general stressors associated with the pandemic and lockdowns, online learning challenges for university students during the COVID-19 pandemic may further increase the risk of mental health difficulties. Akpınar's (2021) review of research on the

impact of online learning on students' mental health during the COVID-19 pandemic reports growing mental health concerns that are linked to students being separated from their lecturers and fellow students, struggles in utilising platforms on the internet, and not having counselling and guidance. Compared to normal contact learning, students in Israel reported increased stress in online learning of a synchronous type (Besser et al., 2020) and students in Indonesia reported substantial anxiety due to lack of funds to purchase data to participate in online learning (Irawan et al., 2020). Within South Africa, the impact of learning online on students' mental health has not yet been systematically assessed. However, in the UCT (2020) survey of students during ERT, 71% reported that their difficulties with learning remotely were related to mental health challenges like depression, anxiety or stress.

As illustrated above, rates of mental health challenges were high amongst students before the COVID-19 pandemic began and may have been worsened by the pandemic. However, it remains unclear how challenges within the transition to online learning, and students' sense of OLSE within this context, may have affected the mental health of students. Bandura (1994) describes the mindset and actions of a self-efficacious person and says that this effective view brings about personal successes, decreases stress levels and even lessens depression susceptibility, but those with low self-efficacy tend to easily fall into depression and stress. This highlights self-efficacy as vital to success and also protection from mental health issues. Some research has confirmed that self-efficacy and mental health are related: Stress was significantly negatively correlated with self-efficacy amongst students in Turkey (Gençoğlu et al., 2018) and Korea (Lee, 2017). Depression was significantly negatively correlated with self-efficacy amongst students in Turkey (Gençoğlu et al., 2018) and Iran (Rezayat & Dehgannayeri, 2013). To date there has been little research on the relationship between OLSE in particular and mental health amongst university students, but a focus on this relationship is of greater urgency than before due to the scale of online learning in higher education internationally since the beginning of the COVID-19 pandemic. Using Artino and McCoach's (2008) scale that measures OLSE, it was found that among students attending a German university (at which students in this study did a minimum of one module that contained online learning components), increased self-efficacy in online learning was associated with decreased anxiety (Heckel & Ringeisen, 2019).

In addition to the above metal health challenges, substance use amongst university students is also high, as is reviewed below.

Substance use amongst university students

Among students, alcohol and marijuana are the most commonly used substances (Hynes et al., 2015; Schulenberg et al., 2019; Steyn & Hall, 2015; Twaise et al., 2014).

While there is some evidence of a decrease in harmful alcohol use among university students over time in a meta-analysis (Visontay et al., 2020), harmful levels of alcohol use remain prevalent in this population. For example, based on slightly different cut-offs (Berner et al., 2007; Conigrave et al., 1995; Fleming et al., 1991) of the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993), rates of problem drinking (i.e. harmful, hazardous or dependent alcohol consumption) were 31.7% in the United States (Moreno et al., 2012), 20% in the Netherlands (Verhoog et al., 2019) and 34.6% in Ecuador (López et al., 2019).A systematic review reported that nearly two thirds of students in the United Kingdom and Ireland had a hazardous AUDIT score, with more than 20% exceeding the sensible limits every week (Davoren et al. 2016). Further, meta-analyses and systematic reviews have reported past month alcohol use by 66.8% of male and 31.7% of female undergraduates in China (Newman et al., 2017) and 25.27% and 32.34% of university and college students in Ethiopia (Amare & Getinet, 2019).

Amongst undergraduate students at one university in South Africa, 18.5% reported frequent use of alcohol (Steyn & Hall, 2015). Studies amongst different student populations in South Africa similarly reveal fairly high statistics for alcohol use. For example, across a range of South African universities 28.2% reported hazardous drinking levels (Inaç et al., 2021), 15.8% indicated ‘always’ for current drinking status (Amoateng et al., 2017), 20.3% drank on 40 or more occasions in the last 12 months (Vorster et al., 2019), 18.5% reported consuming alcohol often (Steyn & Hall, 2015), 42.7% engaged in risky alcohol use (Mandeya & Ter Goon, 2019) and 22.3% drank either beer, wine or spirits every day (Surujlal et al., 2012). Reported AUDIT scores amongst different student populations in South Africa for hazardous, harmful or dependent drinking levels (i.e. a score higher than 8; Babor et al., 2001a; Babor et al., 2001b) are consistently over 20%: for example 25.3% (Van Zyl et al., 2015), 22% (Pengpid et al., 2013a), 21.1% (Pengpid et al., 2013b) and 22.2% (Pengpid et al, 2013c). Concerningly, 5.6% of first year students at two Western Cape universities met criteria for a full-blown alcohol use disorder in the past year (Bantjes et al., 2019).

Bandura (1999b) argues that perceived self-efficacy is important to bringing about action and tenacity when there are challenges – there needs to be the belief that one is able to bring about the wanted effects through one's behaviour, otherwise there is a low level of incentive for acting or persevering when challenges exist (Bandura, 1999b). With regard to substance use, Bandura (1997, as cited in Bandura, 1999b) suggests that perceived self-efficacy impacts all stages of change, including the starting of changes, attaining changes, relapse recovery and remaining abstinent over a long period of time.

While it is well-established that harmful substance use is prevalent at university during in-person learning, the impact of online learning on students' substance use is not yet thoroughly understood, given the recency of the COVID-19 pandemic and the resultant mass shift to online learning. During the COVID-19 pandemic, changes in alcohol use patterns amongst students have been reported, with conflicting results. Some studies amongst students in the United States indicated that there was a decrease in alcohol use/harmful alcohol use during the pandemic (Graupensperger et al., 2021a; Schepis et al., 2021; Ryerson et al., 2021; Jaffe et al., 2021; White et al., 2020; Jaffe et al., 2021). Similarly, amongst psychology students in the United Kingdom in their first/second year of studies, alcohol use lessened during lockdown (Evans et al., 2021). These reductions may reflect less accessibility to alcohol, and/or less opportunities for social drinking, under strict lockdown conditions.

In contrast, other studies have reported that, amongst students in the United States, alcohol use increased after the pandemic began and campuses shut down (Charles et al., 2021; Jaffe et al., 2021; Lechner et al., 2020; Schepis et al., 2021). However, in one United States study, alcoholic beverages consumed on a drinking day considerably decreased in 2020, compared to before pandemic restrictions (Jaffe et al., 2021) and after some time, alcohol use decreased again to even lower than it was in 2019 (Charles et al., 2021). The extent to which increases or decreases in alcohol use is related to the move to learning online, instead of other pandemic-related changes and stressors, is unclear. Further, there is a paucity of studies from contexts beyond the United States. Notably, a study with medical students across different countries did not identify changing patterns of substance use, including alcohol, subsequent to the start of the COVID-19 pandemic (Perez-Dominguez et al., 2021). However, medical students may not be representative of the broader general student population.

Other studies conducted during the COVID pandemic that have not compared pre- and post-pandemic alcohol usage indicate that harmful alcohol use is high amongst students. For example, amongst students in seven countries from April to May 2020, 22.8% of females and 32.1% of males were misusing alcohol (Du et al., 2021). Among undergraduates in the United States, 10.38% of males had 14 or more drinks in a week and 16.72% of females had seven or more in a week (Graupensperger et al., 2021a), which are upper limits for low-risk use that the National Institute of Alcohol Abuse and Alcoholism (n.d.) recommends.

Rates of marijuana use amongst student populations are also high internationally, though somewhat variable. In one cross-national study, past-month prevalence for marijuana use among student populations ranged between 22.2% and 69.9% across the United States, Argentina, Uruguay, Spain and the Netherlands (Bravo et al., 2019). Rates of 26.0% and 19.7% have been reported in United States samples of 19–22-year-olds (Schulenberg et al., 2020) and college and university students (Windle et al., 2017), respectively. In one United States study amongst undergraduate students, weekly use and daily/almost daily use were 13.8% and 6.3%, respectively (Palfai et al., 2015). Much lower rates have been reported among students in Bolivia (1.45%), Colombia (7.14%), Ecuador (3.67%) and Peru (1.62%), but these appear to be increasing over time (Hynes et al., 2015).

Amongst undergraduate student samples in South Africa, rates of reported marijuana use have been low to moderate. For example, studies have reported that 11.6% of students used marijuana currently (Pengpid et al., 2013a), 8.3% reported using it sometimes-often (Steyn & Hall, 2015), and 1.9% of medical students used it daily, 1.3% weekly, 6.9% monthly and 3.1% during stressful periods of time (Jain et al., 2018). Among first year students attending UCT and Stellenbosch University, the 12-month prevalence of substance use disorder was 3.1% (Bantjes et al., 2019), although this was not broken down by type of drug. In a more recent study, 46.2% and 32.7% of male and female students from South Africa, respectively, indicated that they have used marijuana (Inaç et al., 2021). Over 90% of students at a South African university who reported using drugs reported marijuana as their preferred drug (Twaise et al., 2014).

A few studies have examined marijuana use among students during the COVID-19 pandemic, with conflicting results. One study, among medical students across nine countries, did not identify patterns of change in substance use, including marijuana, after the start of the

pandemic (Perez-Dominguez et al., 2021). However, studies amongst students during the pandemic reported that drinking-to-cope motives were associated with higher marijuana use within the past 30 days (Mohr et al., 2021) and days of cannabis use were greater for those who gave data in the two months after universities closed because of COVID-19, as compared to before (Schepis et al., 2021).

Numerous harmful effects of marijuana and alcohol exist. Harmful effects or outcomes of alcohol consumption include behaviour that was afterwards regretted, driving in an unsafe manner, emotional/physical outcomes, relational conflict, reduced school or job performance (Patrick et al., 2020), increased rates of self-injurious behaviour (Serras et al., 2010), aggression (Duke et al., 2011), memory loss, not attending a class, financial issues because of money spent on alcoholic beverages (Rickwood et al., 2011) and sustaining injuries, being sexually assaulted, overdosing on substances, altered brain functionality, lasting cognitive insufficiencies and death (White & Hingson, 2013). For non-medical marijuana use, 91.2% of systematic reviews reported harm in terms of "several mental health disorders, brain changes, cognitive outcomes, pregnancy outcomes and testicular cancer" (Memedovich et al., 2018, p. E339). Negative marijuana outcomes according to students include sleep, cognitive, memory and motivation problems, overeating, overspending, lung issues/coughing, being unproductive, and not wanting to socialise/feeling social awkwardness (Lee et al., 2020). In a South African study, 7.9% and 2.3% of male and female students, respectively, did not go to class on at least two occasions within the past year because they were hungover, 7.0% and 2.3% received a lower mark as a result of their alcohol consumption, and 9.6% and 8.0% got into legal trouble as a result of their alcohol consumption (Surujlal et al., 2012).

In sum, alcohol and marijuana misuse among students are generally at concerning levels and may have worsened during online learning, raising the risk of negative physical, mental and cognitive outcomes.

Relationship between mental health and substance use

Mental health difficulties and substance misuse often co-occur. For example, systematic reviews and meta-analyses conducted prior to the COVID-19 pandemic report that substance misuse is commonly comorbid with both anxiety (Lai et al., 2015) and depressive disorders (Hunt et al., 2020; Lai et al., 2015). South African studies with university students have found

that higher levels of substance use were significantly associated with increased mental health issues (Malebana et al., 2019) and mental health issues were more common amongst those who consumed alcohol in the past month than those who were not drinkers (van Zyl et al., 2017). Similarly, during the COVID-19 pandemic, higher psychological distress and worsened mental health difficulties have been found to be associated with greater alcohol use (Jacob et al., 2021; Graupensperger et al., 2021b; Lechner et al., 2020; Schmits & Glowacz, 2021; Tran et al., 2020).

Using or misusing substances may develop due to having a mental health disorder or symptoms thereof (Conner et al., 2009; Hussong et al., 2017; Kuo et al., 2006; Swendsen et al., 2010). Mental health issues could increase substance use through the mechanism of 'coping motives', that is, using alcohol to cope with feelings of depression or anxiety (Cadigan et al., 2015; Kenney et al., 2018) possibly as a means and type of self-medication (Khantzian, 1997). Cooper and colleagues' (1995, p. 990) motivational model of alcohol use posits that alcohol is used to regulate emotion, whether of a positive or negative nature. As measured by versions of the Drinking Motives Questionnaire (Cooper, 1994, Cooper et al., 1992), amongst students, those who drink alcohol to cope with negative feelings have a higher likelihood of being harmful drinkers (Cadigan et al., 2015; White et al., 2016) and depressive symptomology had a direct effect on consuming alcohol in order to cope (Kenney et al., 2018). Pre-pandemic coping motives was found to be a predictor of higher alcohol use during the COVID-19 lockdown among Belgian students (Bollen at al., 2021) and coping motives involving the use of cannabis to cope with depression within the context of the COVID-19 pandemic predicted increased cannabis use amongst young adults aged 19-25 in Canada within the COVID-19 pandemic (Bartel et al., 2020). However, there have been studies that have found no prospective association between depression and cannabis use or that misusing substances may induce or worsen anxiety and mood disorders' intensity (Garey et al., 2020). The nature of the relationship between mental disorders/difficulties and substance use in student and general adult populations remains unclear and requires further investigation in order to identify the appropriate and most effective prevention and intervention strategies.

The role of social support in student psychological distress and substance use

Because mental health difficulties and substance misuse are prevalent amongst students at university, identifying protective factors for this population is important for intervention and prevention plans and efforts. Social support has been proposed as a possible protective factor for both of these negative outcomes. Social support has been defined as "information leading one to believe that he/she is cared for, loved, esteemed, and a member of a network of mutual obligations" (Cobb, 1976, p. 300). Social support has consistently been found to be protective against depression (Gariépy et al., 2016; Rueger et al., 2016).

Relational regulation theory proposes that the association between perceived social support and mental health predominately comes not from conversations specifically about ways to handle stress, but from everyday conversations about what is happening on a day-to-day basis in an individual's life and from activities done together, which helps individuals to regulate their thoughts feelings, and behaviours (Lakey & Orehek, 2011). The general benefits model of social support puts forward that social support provides higher levels of purpose, feeling of self-worth and positive affect states, thereby reducing negative affects (Cohen, 2004, as cited by Rueger et al., 2016; Cohen & Wills, 1985, as cited by Rueger et al., 2016; Rueger et al., 2016).

For university students, having social support has been shown to be associated with improved mental health within a range of different contexts. For example, increased familial, friend and partner support were all associated with decreased depression among students the United Kingdom (Alsubaie et al., 2019) and increased mental health difficulties were associated with lower social support in China (Wang et al., 2014; Zhang et al., 2018) and Ghana (Kugbey et al., 2015). Likewise, there is evidence from South Africa that social support is protective against mental health issues. Increased perceived social support on the MSPSS (Zimet et al., 1988) was associated with decreased depression on the Beck Depression Inventory (Beck et al., 1961; Bruwer et al., 2008) amongst South African high school pupils (Bruwer et al., 2008), low social support was related to higher psychological distress amongst adults (Myer et al., 2008), higher support from immediate family sources was associated with lower symptoms of depression symptoms amongst grade 7 pupils (Humm et al., 2018) and, for males, a caring male adult being present at home lessened the odds of depression whereas, for females, a caring female adult being present at home was related to a decrease in depression amongst young people aged 15-19 (Cheng et al., 2014).

During the COVID-19 pandemic, decreased social support was associated with increased anxiety and depression symptoms on the General Health Questionnaire (GHQ-28; Goldberg & Hillier, 1979) among medical students in Iran (Ghafari et al., 2021), the presence of social support was found to be related to lower levels of anxiety among students in China (Cao et al., 2020) and depression symptoms amongst Chinese students (Yu et al., 2021) and social support was found to be a protective factor against symptoms of anxiety among students in Switzerland (Amendola et al., 2021).

There is also evidence for the existence of a relationship between social support and substance use amongst university students, but the nature of that relationship is not as clear. Amongst university students in the United States, social support predicted reduced psychological distress over time, which in turn predicted reduced problem drinking (Segrin et al., 2016). Moreover, increased social support is related to decreased drinking frequency and quantity amongst students in New England (Cullum et al., 2013) and to decreased alcohol use at the follow-up, compared to baseline, amongst students in the Czech Republic, Hungary, Lithuania and the Slovak Republic (Orosova et al., 2014). During the COVID-19 pandemic, amongst students who endorsed alcohol, those who reported higher social support levels drank less overall following the university shutdowns in Ohio (Lechner et al., 2020). Amongst adults in Belgium during lockdown, 34.8% indicated that their motive for consuming more alcohol was because of lack of social contacts (Vanderbruggen et al., 2020). However, alcohol use was not found to be significantly predicted by social support amongst students at a conservative Christian university in the United States (Thompson, 2017) and there was no significant association between social support and heavy episodic drinking amongst undergraduates at a rural university in South Africa (Nkoana et al., 2016). In the COVID-19 pandemic lockdown, amongst adults in Belgium, 14.2% used alcohol more because of increased tension because of housemates being present at all times (Vanderbruggen et al., 2020).

In terms of marijuana, social support from family appears to be protective, however evidence about peer support playing a protective role is inconsistent. Amongst students, family support appears to be protective (Arias-De la Torre et al., 2019) but partner support is unrelated (Blumenstock & Papp, 2021). Lower familial support was related to higher cannabis consumption amongst first year students at Spanish universities (Arias-De la Torre et al., 2019), while support from a partner was not associated with marijuana use amongst

undergraduate students (freshmen and sophomores) in the United States (Blumenstock & Papp, 2021). Furthermore, amongst adolescents there were no significant associations between peer support and lifetime cannabis use in Iraq, Kuwait and Vietnam. Lack of peer support was related to lifetime cannabis use in Malaysia but positive support from peers was related to increased odds of lifetime cannabis use in Mongolia (Peltzer & Pengpid, 2017). The only recent relevant South African study found that amongst medical students at the University of Free State, 83.9% obtained cannabis from friends and 66.5% of lifetime users used cannabis at social gatherings such as parties (Jain et al., 2018). During the COVID-19 pandemic lockdown, amongst adults in Belgium, 48.7% indicated that their motive for using more cannabis was because of lack of social contacts while 11.8% used it more because of increased tension because of housemates being present at all times (Vanderbruggen et al., 2020).

Because social support relates to self-efficacy, psychological distress and substance use in university students, it could therefore act as a moderator of the relationship between OLSE and psychological distress and/or substance use. Daly and Thompson (2017) have noted that self-efficacy is not connected with wide appraisals of capability but instead to particular tasks. Thus, the present study argues that there is a need to explore the specific relationship of online learning self-efficacy with psychological distress, harmful substance use and social support.

It can be hypothesised that students with low OLSE could have a lower likelihood of developing mental health issues like depression or anxiety if they have higher degrees of perceived social support. The moderating role of social support on the relationship between OLSE and substance use is more difficult to predict, as findings on the relationship between social support and substance use are complex and it could depend on the particular source of social support. Social support could also function differently in the context of online learning, as students could have less in-person contact with peers, more in-person contact with family, or more social isolation. These shifts could affect how much social support can moderate the relationship between OLSE and common mental health difficulties.

Summary

Although online learning has been a planned strategy in 2021, compared with being an emergency response in 2020, the challenges of online learning remain and understanding how

students are coping with learning online is increasingly important. Based on existing findings, OLSE is likely to differ across students from different sociodemographic groups in South Africa, but this has not yet been systematically explored. Moreover, in the context of online learning, lower levels of OLSE could be related to increased risk for mental health difficulties, in the same way that low self-efficacy has been associated with worsened mental health. However, this too has not yet been studied within the South African context. In addition, students with a low level of OLSE could be engaging in substance use to try and cope with feelings of psychological distress, however this mediating relationship has not yet been explored within university populations. Finally, social support has been found to be associated with better mental health outcomes and to buffer the relationship between stress and poor mental health outcomes. In the same way, social support could potentially be a protective factor which moderates the relationship between OLSE, and mental health. The nature of the relationship between social support and substance use outcomes for students may depend on the source of support; as such, it is important to explore the role of different sources of social support in moderating the relationship between OLSE and substance use. This also has not yet been examined. This study will address these needed areas of research because they may point the way forward to better supporting university students and their coping through online learning.

CHAPTER 3: METHOD

This chapter will outline the research questions that this study will examine. It will then detail the study design, sampling, data collection process and procedures that this study followed. The data analysis procedures are then described. Finally, the ethical procedures followed will be outlined.

Research Questions

This study examined the following research questions:

1. Are sociodemographic factors and online learning context factors related to OLSE?

2. Is OLSE associated with the severity of psychological distress, alcohol use and marijuana use?

3. Does perceived social support (including family only, friends/significant other only and combined) moderate the relationship between OLSE and psychological distress and between OLSE and problematic substance use (alcohol and marijuana use)?

4. Does psychological distress mediate the relationship between OLSE and problematic substance use (alcohol and marijuana use)?

Study Design

The study used a correlational cross-sectional design. An online survey was used. Advantages of surveys include helping to obtain great amounts of data quickly, generating correct data about sensitive topics (as participants typically feel at liberty to express their opinions anonymously), ease of data analysis and ease of data storage (Albudaiwi, 2017). An online survey allows responses to be totally anonymised. Because substance use is a sensitive topic, anonymity may enhance the honesty of responses and reduce social desirability effects (Furr, 2010). Online surveys measuring illicit drug use, as compared to traditional survey methods,

have the advantages of resource, monetary and time efficiency, increased accuracy of data, reduced data bias and more accessibility to "hidden drug populations" (Kalogeraki, 2012, p. 239). Online surveys also allow for safe data collection in the COVID-19 pandemic.

Sample

The study sample consisted of university students from the University of Cape Town (UCT). The majority of the sample were Psychology students (n = 704), while the rest of the sample were students from the broader general UCT student population (n = 218), with a total of 922 respondents. As will be discussed in Chapter 4, because of missing data points and possible duplicate cases, a proportion of the 922 cases were removed. Therefore, the final sample size for analysis was 627.

The Psychology sample was recruited by advertising through the Psychology Department's Student Research Participation Programme (SRPP) point system to all students taking courses that require SRPP points. Access to the broader UCT population was attained through the UCT Department for Student Affairs (DSA). An advert was sent through a DSA announcement to UCT students. Beyond being a UCT student 18 years and above, there were no other inclusion or exclusion criteria (however, the DSA advert and consent form for the broader university population asked students to not take the survey again if they had already completed this survey as part of the Psychology Student Research Participation Programme).

To compute the necessary sample size for the moderation analyses, G*Power 3.1.9.4 was used. As there are no previous studies of social support as a moderator of the relationship between OLSE and psychological distress and between OLSE and problematic substance use (alcohol and marijuana use), there are no previous effect sizes to use as a guide. The effect size conventions on G*Power 3.1.9.4 for f^2 are, respectively, for small, medium and large effect sizes: .02, .15 and .35. Sample sizes for these effect sizes were 395, 55 and 25, respectively, with the power at .8 at an α err prob of .05 (Wuensch, n.d.). For mediation analyses, following Baron and Kenny's (1986) steps, to get a .8 power level for the "small-small-zero condition", where *a*, *b* and *c'* (see Figures 4 and 5) are .14, a sample size of n = 562 is required (Fritz & MacKinnon, 2007, p. 236).

Data Collection

The following structured questionnaires, administered online through Google Forms, were used to collect data:

Sociodemographic and Online Learning Resources

A questionnaire assessed sociodemographic characteristics and online learning resources that may be relevant to participants' experience of OLSE, mental health and substance use (see Appendix A). Sociodemographic variables included gender, age, year of study and current residence (university residence, shared house/flat with other students, residing alone off-campus, living with parents/guardians or other family members, and other). To assess level of financial resources, which may be associated with previous exposure to online learning and with psychological distress and substance use, type of university funding was used as an indicator, with the options of National Student Financial Aid Scheme, Private Bursary, Parent or Guardian, Other. Race/ethnicity may impact university students' experience of learning online due to issues such as online access limitations or lack of experience with online learning at school, linked to the socioeconomic legacy of apartheid. This variable was therefore included, based on race categories used in UCT's annual report (University of Cape Town, 2019).

With regard to online learning context, respondents were asked about their access to the internet, data from UCT, a laptop/computer/smartphone and a quiet place to study, if they had any in-person learning in the current semester, and if they had previous online learning experience.

OLSES

The Online Learning Self-Efficacy Scale (OLSES) was used in this study to assess OLSE (see Appendix B). This scale was specifically developed to encompass tasks for online learning in paced courses (i.e. time-limited courses that have set deadlines). It is comprised of 22 items, with three subscales: learning in the online environment, time management and technology use (Zimmerman & Kulikowich, 2016).

The OLSE uses a Likert response scale with six points, with 1 (No Confidence) reflecting the participant's perception that that they would do the task poorly and 6 (Complete confidence) reflecting the perception that they would be able to do the task expertly (Zimmerman & Kulikowich, 2016; W. A. Zimmerman, personal communication, January 20, 2021; Zimmerman, 2015). No cut off score is specified. All the items were summed to obtain a total score.

For this study, the wording of some of the items in the OLSES was adjusted to better suit the UCT context e.g. "Find the course syllabus online" and "Submit assignments to an online drop box" (Zimmerman & Kulikowich, 2016, p. 184) have been changed to "Find the course outline on the Vula site" and "Submit assignments on Vula/online", respectively.

Cronbach's α values of .890 for the learning in the online environment sub-scale, .855 for the time management sub-scale and .843 for the technology sub-scale have been reported, indicating good internal consistency (Zimmerman & Kulikowich, 2016). Zhou and Yu (2021) reported an alpha of .974 for the OLSES. Evidence of divergent and convergent validity of the OLSES has previously been demonstrated (Zimmerman & Kulikowich, 2016). This scale has been used in studies with university students in a range of contexts, including Jordan (Jaradat, & Ajlouni, 2020), the United States (Stephen, et al., 2020) and the Philippines (Panergayo & Mansujeto, 2021).

MSPSS

This study used the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988) to assess perceived social support (see Appendix C). It has 12 items, with sub-scales for perceived support from family, friends and significant other (Zimet et al., 1988). Each item has a seven-point response scale, ranging from "very strongly disagree" (1) to "very strongly agree" (7; Zimet et al., 1998, p. 34). An average scale score of 1.0 - 2.9, 3.0 - 5.0 and 5.1 - 7.0 may, respectively, represent low, moderate and high perceived support (Zimet, 2016). For the purposes of the current study, the friends subscale and the significant other subscale were combined i.e. friends and significant other subscale. This was to account for students who do not have a significant other. A total score was computed for the full MSPSS scale by summing all of the item scores together. Sub-total scores were also computed for the family subscale and for the friends and significant other (FSO) subscale.

Further, for this study the wording of two items were slightly adapted to reflect more contemporary language.

In this scale's original validation research study, the subscales had strong factorial validity, the scale had good internal and test-retest reliability and its construct validity was found to be moderate (Zimet et al., 1988).

This scale has been used in studies with university students including in Italy (Savarese et al., 2019), Pakistan (Bukhari & Afzal, 2017), Malaysia (Foo & Prihadi, 2021) and the United Kingdom (Department of Education, 2016, as cited in Alsubaie et al., 2019; Alsubaie et al., 2019). Within a South African sample of youth, it had good internal consistency, and its three factors had a good fit with the data yielded by the study (Bruwer et al., 2008).

DASS-21

The Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995a; Parkitny, & McAuley, 2010) assesses severity of depression (which includes "low mood, motivation, and self-esteem"), anxiety (which includes "physiological arousal, perceived panic, and fear") and stress (which includes "tension and irritability"; Parkitny, & McAuley, 2010, p. 204; see Appendix D). There are 42 items in the original scale (Lovibond & Lovibond, 1993 as cited in Lovibond & Lovibond, 1995a; Lovibond & Lovibond, 1995a). The shortened version of this scale, which only has 21 items (Lovibond & Lovibond, 1995a), was used in this study to keep the survey short. It is comprised of three subscales: a Depression scale, Anxiety Scale and Stress scale (Antony et al., 1998; Lovibond & Lovibond, 1995a). The participants are asked to rate every item according to relevance for themselves in the past week, from "Did not apply to me at all (0)" to "Applied to me very much, or most of the time (3)" (Lovibond & Lovibond, 1995a, p. 339). Item scores were added in order to obtain a total score.

A systematic review of the DASS-21 psychometric properties found it to be reliable and valid in evaluating depression, anxiety and stress and that this does not vary over different cultures (Zolotareva, 2020). A study amongst South Africans in the work force reported strong evidence for discriminant and convergent validity (Dreyer et al., 2019). The DASS-21 scale has been used in studies with university students internationally including in The United

States (Beiter et al., 2015), Hong Kong (Cheung et al., 2020), Spain (Martínez-Monteagudo et al., 2020), Lebanon (Fawaz & Samaha, 2021) and South Africa (van Zyl et al., 2017).

AUDIT

The Alcohol Use Disorders Identification Test (AUDIT; see Appendix E) was created from a WHO collaborative project with six countries (Saunders et al., 1993). It is used to screen people for alcohol consumption that is hazardous and harmful. There are 10 items, which measure alcohol consumption, drinking behaviour, adverse reactions and alcohol-related problems (Saunders et al., 1993). Each item has a scale with a 0-4 range. Response scores are summed, with a score of 8 or greater being a sign of hazardous and harmful alcohol use and potential dependence on alcohol (Babor et al., 2001a). The AUDIT's minimum score is zero for those who do not drink (Saunders et al., 1993, p. 804) and is indicative that alcohol has never caused any problems for them (*Scoring the AUDIT*, n.d.).

A systematic review confirmed the AUDIT's validity and efficiency in identifying dependence on alcohol, abuse of alcohol and the harmful use of alcohol (de Meneses-Gaya et al., 2009). In studies among university students and high school learners in South Africa the AUDIT has demonstrated a Cronbach alpha of .83 (Young, & Mayson, 2010), .87 (Martin et al., 2014) and .84 (Peltzer et al., 2011), indicating consistently good internal reliability. The current study's online survey contained a scaling error for the response scale for item 9 **(“**Have you or someone else been injured as a result of your drinking?", Saunders et al., 1993, p. 803). To address this scaling error, we altered the item to be coded as a yes/no item distinguishing between those who reported that they or someone else has never been injured because of their drinking and participants who reported that they or someone else has been injured because of their drinking.

B-MACQ

The Brief Marijuana Consequences Questionnaire (B-MACQ; see Appendix F) measures problems related to marijuana use (Simons et al., 2012). It has 21 items, assessing social-interpersonal consequences, impaired control, self-perception, self-care, risk behaviours, academic-occupational consequences, physical dependence and blackout use (Simons et al., 2012; which are drawn from Read et al., 2006). Each item is a statement and is checked yes

or no based on if it describes what has happened to the participant within the past six months. The score range is 0 (no items endorsed) to 21 (all items endorsed), with higher scores signifying higher severity of marijuana-related problems. Item scores are summed in order to create a total score (Simons et al., 2012).

Two items about frequency of marijuana use were added to the beginning of the B-MACQ, for descriptive purposes, but were not added to the total score.

There is evidence for test-retest and discriminant validity for the B-MACQ (Simons et al, 2012). Bravo et al. (2019) have demonstrated that it is accurate in evaluating marijuana-related problems for college students in different countries including the United States, Spain, Uruguay and Argentina. This scale has previously been used in a study that included students from a university in South Africa (Bravo et al., 2021).

Procedures

A pilot study with ten university students was conducted to beta test the questionnaire and identify any issues needing to be addressed.

Subsequent to beta-testing, the study was advertised through the UCT Psychology Department's SRPP system, with an SRPP credit of one point (see Appendix G). After obtaining ethics permission from the UCT Human Research Ethics Committee (see Appendix H) and the DSA (see Appendix I) to administer the study to all UCT students, an invitation to participate in the survey was distributed to the DSA's student email database (see Appendix J).

Students who wanted to participate were asked to click on a link for the online survey. They first landed on a consent form page (see Appendices K and L) and needed to click "I consent to participate" before being transferred to the survey questions. After completing the survey, Psychology students had a final link to click on which took them to a separate site where they could record their name, student number and course code for the SRPP credit (see Appendix M). This information was de-linked from the survey responses to ensure anonymity.

The researcher exported the data from Google Forms into Excel and then SPSS. The de-identified survey data and the separate list of survey participants for SRPP credit were both stored in password-protected files on a password protected computer that belongs to the researcher and back-ups was kept by the supervisor on her password protected computer. Data will be stored for five years and then deleted.

Data Analysis

Cases that violated inclusion criteria (i.e. participants under the age of 18 years old) and cases without any data were removed.

All analyses in this study were conducted using IBM SPSS version 27 (IBM Corp, 2020), Except for the bootstrapped R square values that were calculated using Stata (version 17; StataCorp, 2021). This study used the threshold of $p < .05$ for statistical significance (George & Mallery, 2020), except where the Bonferroni correction was used where multiple tests where applied (Mackridge & Rowe, 2018).

Descriptive statistics for the demographics (frequencies and percentages) and for each scale (means, standard deviations, minimum and maximum scores, where applicable) were calculated. Reliability statistics for each scale were also computed using Cronbach's alpha. This study used George and Mallery's (2019) Cronbach's alphas rule of thumb specifications of .9 being excellent, .8 being good, .7 being acceptable, .6 being questionable, .5 being poor and lower than .5 not being acceptable.

To examine the association of sociodemographic and online learning factors with level of OLSE, independent samples *t*-tests were used for the binary variables and ANOVAs for variables that had more than two categories. Cohen's d is widely used within psychological research and was thus employed as the effect size for t-tests in this study (Lakens, 2013).2, .5 and .8 can be interpreted as small, medium and large effect sizes (Cohen, 1988). Where assumptions were violated, the non-parametric equivalent tests (i.e. Mann Whitney U tests or Kruskal Wallis tests, respectively) were used. The effect size for the Mann-Whitney *U*-tests were calculated using the formula: $r^2 = \eta^2 = Z^2/n$, (Fritz et al., 2011, as cited in Tomczak, & Tomczak, 2014; Fritz et al., 2011) where n is total observations (that Z is based off of) and Z is the standardised test statistic (Tomczak, & Tomczak, 2014). Overall effect size for

Kruskal-Wallis test were calculated using Cohen's (2008) formula where $\eta^2 = (H-k+1)/(N-k)$ (Cohen, 2008), where k is the amount of groups and N the amount of subjects. For the nonparametric tests, for r^2 ($\eta^2 = r^2$; Fritz et al., 2011), this study will follow the effect sizes of Cohen (1988): .01, .09 and .25 for small, medium and large, respectively. The variables that were found to be significantly associated with the OLSES in the bivariate analyses were all simultaneously entered into a regression model to predict OLSE.

Correlations between all the continuous variables of interest in this study were computed. Pearson's correlations were used but Spearman's rho was used when normality was violated (Ho, 2014).

Regression analysis was used in this study to examine whether OLSE was a predictor of psychological distress, harmful alcohol and marijuana use; whether perceived social support (including family support, support from friends and significant other, and combined sources of social support) moderates the relationship of OLSE with psychological distress, harmful alcohol and marijuana use; and whether psychological distress is a mediator of the relationship between OLSE and harmful alcohol and marijuana use. Regression models that were not bootstrapped were checked for influential points. Cook's distances (Cook., 1977, as cited by Sarkar et al., 2010, Hickey et al., 2018), DfBeta values (Schumacker, 2015) and hat values (as an identifier of high leverage points; Hickey et al., 2018) were used to identify these influential points. The constants were not counted as a coefficient in calculating leverage points.

Where the assumptions of normality or homoscedasticity were violated for the outcome variable, bootstrapped regression models were computed. Bootstrapping is a type of resampling method (Beasley & Rodgers, 2009; Hesterberg et al., 2003). Bootstrap CIs do not rely on assumptions about the distribution of the population (Hu et al., 2010) and resampling methods do not require normality (Hesterberg et al., 2003). Hayes (2022) proposes that 5 to 10 thousand samples are enough for the majority of applications; the current study therefore used 5000 bootstrapped samples. In bootstrapping, the null hypothesis is rejected if the bootstrapped percentile confidence intervals (CIs) contain zero (Taylor et al., 2007), thus bootstrapped CIs for the coefficients are significant when it does not have zero in it (Wang et al., 2020). Following Hayes' (2022) recommendation and Scharkow's (2017) advantage,

percentile bootstrapping was used. Bootstrapping was done at the 95% confidence level, which is commonly employed (Hu et al., 2010; Kane & Ashbaugh, 2017).

Mediation analysis was done using the SPSS macro PROCESS v4.0 (Hayes, 2017, 2021), using model 4 (Hayes, 2017).

Models were further confirmed using the bias corrected and accelerated (BCa) CIs for the simple regression and moderation models, and bias corrected (BC) CIs for the mediation models (Scharkow, 2017), as PROCESS only allows for BC (*PROCESS Documentation Addendum*, n.d.). Scharkow (2017) notes that BC and BCa are "more robust when the bootstrap distribution deviates strongly from normality" and they "correct the percentiles for the confidence limits when the bootstrap mean deviates from the sample mean" (p. 3).

Analyses were further guided by reputable sources (Bari et al, 2017; Baron & Kenny, 1986; Berger, 2004; Caron et al., 2020; Cleff, 2019; Cohen, 2008; Cohen, 1988; Fairchild & MacKinnon, 2008; Fritz et al., 2011, as cited in Tomczak, & Tomczak, 2014; Fritz et al., 2011; George & Mallery, 2020; Hayes, 2013, 2017, 2022; Ho, 2014; IBM, 2022; Kane & Ashbaugh, 2017; Jose, 2013; Lakens, 2013; Liang et al., 2019; Osborne & Waters, 2002; Tomczak, & Tomczak, 2014).

Ethics

Informed consent

Voluntary informed consent was obtained from participants through an online consent form that had to be completed before accessing the survey (see Appendices K and L). Students were informed of the purpose of and procedures for the research and how long the research would take. Participants were informed that they could elect not to participate in the survey and rather obtain their SRPP points in other ways, that they could withdraw from the study at any point after agreeing to participate (APA, 2017) and that they could choose not to answer specific items.

Privacy and Confidentiality

Survey responses were anonymous. For Psychology students, a separate link was given for personal details for the SRPP credit and survey responses was therefore de-linked from the personal details needed for the SRPP credit. The de-identified survey data and the personal details for the SRPP credit were stored on separate password protected files on a password protected computer belonging to the researcher and back-ups were kept by the supervisor on her password protected computer.

Risks and Benefits

Benefits for the participants in this study included contributing to knowledge and, for Psychology students, the opportunity to gain a research participation credit. This study entailed only minimal risk to participants. The only foreseeable risk was possible feelings of discomfort or distress arising from filling out items on substance misuse, psychological distress or perceived social support. Participants were informed that they were allowed to decline to answer an item if they chose and that they could withdraw from the study at any point in the study without any consequences, except for not receiving the SRPP credit. At the end of the survey, students were given information about mental health support services at UCT and at substance recovery centres (see Appendix N).

CHAPTER 4: FINDINGS

Removal of Possible Duplicate Cases

Participants' survey data was captured on one Google form while their personal details for the purpose of awarding a research participation credit was captured on a separate second Google form that was de-linked from the first form. Once the survey was closed for the Psychology student sample, it was noted that there were 704 survey respondents on the first Google form but only 604 unique names on the form for personal details. This suggests that there were 100 potential duplicates on the survey form. It appears that some participants attempted to get more than one credit for research participation by taking the survey more than once, or they forgot to submit their personal details when first completing the survey and thus took the survey again. Since duplicate responses could skew the results of the study, the researcher attempted to identify duplicate cases on the survey form. Since participants' personal information was de-linked from the survey data for anonymity, student names or student numbers could not be used for the identification of duplicate cases. The researcher therefore attempted to identify potential duplicates by finding cases where all the sociodemographic and online learning context questions on the survey were answered identically in more than one case. This approach identified 146 potential duplicate cases, where two or more cases matched exactly across all of these particular variables. These 146 identified cases were, therefore, removed from this study's analyses. This removed somewhat more than 100 duplicates, but still left 558 cases of the Psychology student sample for this study's analysis, so it was applied as a responsible approach without compromising power or discarding too much real data. For consistency and responsibility, this same approach was applied to the general UCT sample, in which there were 5 duplicate cases, with 213 cases remaining after removal. This left a total sample size of 771.

Missing Data

Of the total sample of 771 participants, 18.7% of cases had missing data, although there was less than 2.5% of missing data for each item in the survey. Ideally multiple imputation would be conducted as excluding cases that have missing data points could result in biased estimates. However, the multiple imputation methods were beyond the scope and time

restrictions of this master's dissertation. Thus, only the complete cases (n = 627) were retained for analysis.

Sample descriptives

To describe the study sample, Table 1 reports the frequency and percentage of each category of the sociodemographic and online learning variables.

Table 1

Sociodemographic and Online Learning Characteristics (n = 627)

		n	*%*
Gender	Male	142	22.6%
	Female	457	72.9%
	Non-binary	24	3.8%
	I prefer not to respond	4	0.6%
Race	SA African	176	28.1%
	SA Coloured	143	22.8%
	SA Indian	39	6.2%
	SA White	214	34.1%
	Other	41	6.5%
	I Prefer Not to Respond	14	2.2%
Year of study	First year undergraduate	253	40.4%
	Second year undergraduate	182	29.0%
	Third year undergraduate	105	16.7%
	Fourth year undergraduate	37	5.9%
	Postgraduate (including coursework)	31	4.9%
	Postgraduate (dissertation only)	12	1.9%
	Other	7	1.1%
Current residence	University residence	152	24.2%
	Shared house/flat with other students	98	15.6%
	Living alone off-campus	79	12.6%
	Living with parents/guardians or other family members	282	45.0%

	Other	16	2.6%
Type of university funding	National Student Financial Aid Scheme	234	37.3%
	Private Bursary	46	7.3%
	Funded by Parent/Guardian or Self-Funded	279	44.5%
	A combination of the above	49	7.8%
	Other	19	3.0%
Do you have a quiet place where you can study?	No	25	4.0%
	Only sometimes	128	20.4%
	Yes	474	75.6%
Do you have access to the internet?	No	1	0.2%
	Only sometimes	36	5.7%
	Yes	590	94.1%
Do you have access to a laptop or computer?	No	2	0.3%
	Only sometimes	6	1.0%
	Yes	619	98.7%
Do you have access to a smartphone?	No	9	1.4%
	Only sometimes	3	0.5%
	Yes	615	98.1%
Have you done online learning before 2021, at school or at university?	No	212	33.8%
	Yes	415	66.2%
Are you having any in-person tutorials, labs or practical work in addition to online learning this semester?	No	456	72.7%
	Yes	171	27.3%

The age of the sample ranged from 18 to 56 years with a mean age of 20.71 (*SD* = 3.66). Most of the sample (78.8%) was aged 18-21 years. This was expected since over 90% of the sample were undergraduate students. The majority of the sample are female and White, which likely reflects the tendency of undergraduate Psychology students at UCT to skew toward this demographic. Being funded by parents/guardians or self-funded was the most common type of funding, followed by NSFAS only funding. The most common living circumstance was living with parents/guardians or other family members, followed by living in university residence.

In terms of accessibility to resources for online learning, most participants had a quiet place where they could study and access to the internet, a laptop or computer and a smartphone. About two thirds of the sample reported that they have done online learning before 2021, at school or at university (n = 415, 66.2%). Further, most participants indicated that they were not having any in-person tutorials, labs or practical work in addition to online learning this semester (n = 456, 72.7%). The survey item "Does the university provide you with sufficient data to do your work?" was omitted from all analyses because it was deemed to be ambiguous, as participants may have sufficient data to do their work but are receiving it elsewhere instead of from the university.

For the requirements of subsequent analyses, certain variables were recoded. Year of study was dichotomised into first year undergraduate students and all other students. First year students may have the most difficulty with OLSE, as they would not have had as much experience with online learning at university compared to the students from second year onwards who had experience learning online in the prior academic year in 2020. Type of funding was dichotomised into students fully funded by NSFAS only and Other (i.e. all other categories of types of funding and a combination of types of funding). NSFAS bursaries are provided only to students who have the lowest financial means, therefore this variable as a binary variable functions as an indicator of socioeconomic status. For the variable race, the 'Other' and 'I prefer not to respond' categories were combined as the frequencies for each of these were quite small. Similarly, for current residence, the 'Other' and 'Living alone off-campus' categories were combined because of small frequencies. For gender, the male and female categories were retained, and the other categories were not included in the analyses because they had very few respondents, resulting in a sample of 599 for all analyses that include gender. The online learning context questions about access to a quiet place to study, the internet, a laptop or computer and a smartphone, were also recoded by combining "No" and "Only sometimes" into one category because they had low frequencies. These four items were then summed together to create an 'access to online resources' index where higher scores indicate higher levels of access. The mean for the access index was 3.67 (SD = .59) out of a maximum possible score of 4, indicating that, on average, participants in this sample had good access to resources and spaces that would enable online learning. This index was used in subsequent analyses instead of using each of the four items individually.

Scale statistics

Table 2 reports on the scale statistics for each measure.

Table 2

Scale Statistics (n = 627)

		OLSES	DASS	MSPSS total	MPSS Family support	MPSS FSO support	B-MACQ	AUDIT
N	Valid	627	627	627	627	627	627	627
M		92.52	31.78	52.82	18.46	34.36	1.68	4.76
Median		94.00	32.00	52.00	20.00	32.00	.00	3.00
SD		18.504	16.296	16.541	6.837	12.447	3.524	5.318
Interquartile Range		26	27	24	11	20	1	8
Minimum		34	0	12	4	8	0	0
Maximum		132	63	84	28	56	19	32
Alpha (α)		.929	.946	.884	.921	.867	.923	.851

On the AUDIT, most participants (71.5%; *n* = 448) reported that they have used alcohol and 45.5% of participants have 3 or more drinks on a typical day when they are drinking. For marijuana use, more than a third of respondents (38.8%; N = 243) reported that they have used marijuana and 7.0% of participants use marijuana 3 or more times on a typical day when they use marijuana.

The histograms in Appendix O show that the OLSES, MSPSS and DASS do not deviate from the normal bell-shaped distribution to a serious extent (Nicol, 2010). The skewness and kurtosis values are acceptable to excellent (George & Mallery, 2020). While the skewness and kurtosis of the family subscale and FSO subscale were excellent, the histograms show them to markedly deviate from normality, thus, they are considered as non-normally distributed in this study. The histograms in Appendix O show that the AUDIT and B-MACQ were non-normally distributed but were positively skewed (Martin & Bridgmon, 2012). The skewness statistic of the AUDIT may still be deemed acceptable; however, the kurtosis statistic of the AUDIT and skewness and kurtosis statistics of the B-MACQ were not

acceptable (George & Mallery, 2020). Therefore, both the AUDIT and the B-MACQ will be treated as variables that are not normally distributed.

As shown in Table 2, the Cronbach's alphas for all the scales are good to excellent.

Association of Sociodemographic Characteristics and Online Learning Access with OLSE

Tests of association were conducted to explore whether levels of OLSE differed significantly between respondents from different sociodemographic groups and different online learning contexts. Seven tests were run (i.e. one for each of the five sociodemographic variables, one for previous experience with online learning and one for access to any in-person learning), thus the Bonferroni corrected *p*-value of .007 was used (Mackridge & Rowe, 2018).

The mean OLSE scores for each category of these seven variables are presented in Table 3. The maximum possible score for the total OLSE score is 132.

Table 3:

Mean OLSE scores

		OLSES	
		M	*SD*
Gender	Male	92.49	19.347
	Female	93.21	17.988
Year of study	Second year onwards	92.14	18.653
	First year	93.08	18.305
Type of funding	Private Bursary, Funded by Parent/Guardian or Self-Funded, A combination of the above and Other combined	94.43	17.943
	National Student Financial Aid Scheme	89.31	19.021
Current residence	University residence	88.62	19.164
	Shared house/flat with other students	89.81	19.307
	Living with parents/guardians or other family members	94.43	17.363

	Other	95.85	18.710
Race	SA African	89.45	19.820
	SA Coloured	90.37	17.450
	SA Indian	92.85	18.451
	SA White	97.73	17.018
	Other and I Prefer Not to Respond combined	87.38	18.340
Previous online learning	No	90.20	18.438
	Yes	93.70	18.448
In-person learning	No	92.16	18.324
	Yes	93.48	18.997

Independent sample *t*-tests were run for gender, year of study and type of funding. The assumptions of normality and constant variance were not seriously violated for these variables. Although the assumption of equal variances was not violated for current residence, race, previous online learning and in-person learning, the assumption of normality was violated based on inspecting differences in shape and size on the histograms for these variables. Non-parametric tests were therefore conducted. The Kruskal-Wallis test was conducted for current residence and race, which each had more than two categories, and the Mann-Whitney *U* test for previous online learning and in-person learning, which each had two categories.

There was no significant difference in OLSE level between men and women, $t(597) = -.414$, $p = .679$, or between participants in first year and participants in second year onwards, $t(625) = -.621$, $p = .535$. However, participants funded by NSFAS had significantly lower OLSE levels than participants with other types of funding, $t(625) = 3.379$, $p = .001$, where *Cohens d* = .279, which is a small effect size.

The Kruskal-Wallis tests revealed that OLSE is significantly different for both race ($H(4) = 27.248$, $p < .001$, where $\eta^2 = 0.04$, which is a small effect) and current residence ($H(3) = 14.763$; $p = .002$, where $\eta^2 = 0.02$, which is a small effect). These comparisons showed that African participants (*Median* = 90, *Test Statistic* = -78.574, *se* = 18.430, $p < .001$), Coloured participants (*Median* = 91, *Test Statistic* = -75.013, *se* = 19.562, $p < .001$) and those who

specified Other and I Prefer Not to Respond combined (*Median* = 90, *Test Statistic* = 97.887, *se* = 27.380, *p* <.001) had significantly lower OLSES scores than White participants (*Median* = 100). Further, those who live in university residence (*Median* = 88) had lower OLSES scores than those who live with parents/guardians or other family members (*Median* = 97, *Test Statistic* = -58.025, *se* = 18.224, *p* = .001) and those who specified Other (*Median* = 100, *Test Statistic* = -73.339, *se* = 23.687, *p* = .002). The difference between those who live in a shared house/flat with other students (*Median* = 94) compared with participants who specified Other for their current residence (*Test Statistic* = -54.495, *se* = 26.077, *p* = .037) approached significance, where the former had lower levels of OLSE compared to the latter, however it did not meet the significance level of the more conservative Bonferroni correction, which is .007.

The Mann-Whitney tests show that OLSE level does not differ significantly across participants who had in-person learning that semester and participants who did not (*U* = 41053.500, *se* = 2019.754, *p* = .306). The difference of OLSE levels between participants who had experience of online learning before 2021 (*Median* = 95) and participants who had none (*Median* = 92) approaches significance, as the significance level is below .05, however, it did not meet the Bonferroni correction significance level of .007 (*U* = 48776.000, *se* = 2145.408, *p* = .026, where $\eta^2 = 0.01$, which is a small effect).

A correlation test was used to examine the association between the access index and the OLSE. The access index was non-normally distributed and was negatively skewed (see histogram in Appendix O; Martin & Bridgmon, 2012). The skewness statistic of the access index falls between -2 and 2, which may still be deemed acceptable, however, the kurtosis value of the access index does not fall within the acceptable range (George & Mallery, 2020). Therefore, to examine the relationship between the access index and the OLSE, Spearman's rho correlation was used instead of using Pearson's *r*. This showed that a higher level of access to resources for online learning, as indicated by the access index score, was significantly associated with higher OLSE (*r* = .195, *p* < .001).

The above bivariate analyses revealed that race, current residence, type of funding and the access index are all significantly associated with level of OLSE. However, some of these variables could be proxies for one another, such as type of funding or the access index possibly acting as proxies for race, because in the context of South Africa there is a high

likelihood that socioeconomic status and resource access are related to race. Thus, a regression analysis was run including these four variables as predictors, to identify which of these variables independently predict level of OLSE when they are considered simultaneously. Because previous online learning approached significance, it was also included as a predictor.

SA White and university residence are the reference categories used for race and current residence, respectively. Age was not included in the regression models as a covariate because the range was very narrow for most of the sample. The assumptions for normality, acceptable reliability, independence, linearity and homoscedasticity were not violated to a serious extent. In terms of multicollinearity, the VIF values were between 1 and 3, indicating that only moderate correlations are present (Daoud, 2017). Daoud (2017) states that collinearity is shown by tolerance values below .1, which was not the case here as the lowest tolerance value was .415 and .404 for the models with and without influential values, respectively. The results of this regression analysis are presented below in Table 4.

Table 4

Regression model: OLSE as a function of sociodemographic and online learning factors (n = 627)

	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*	95,0% Confidence Interval for B	
Mode	*B*	*SE*	*Beta*			*LL*	*UL*
(Constant)	67.306	5.529		12.174	<.001	56.449	78.164
NSFAS – type of funding	-1.885	1.690	-.049	-1.115	.265	-5.203	1.433
Access index	6.925	1.232	.222	5.620	<.001	4.505	9.344
Previous online learning	2.213	1.497	.057	1.479	.140	-.726	5.153
Shared house/flat with other students	-2.125	2.549	-.042	-.834	.405	-7.131	2.881
Living with parents/guardians or other family members	5.166	2.186	.139	2.364	.018	.874	9.458

Other residence	4.992	2.557	.097	1.952	.051	-.030	10.014
SA African	-4.584	2.146	-.111	-2.136	.033	-8.799	-.369
SA Coloured	-5.188	2.097	-.118	-2.474	.014	-9.305	-1.070
SA Indian	-5.630	3.088	-.074	-1.823	.069	-11.695	.434
Other and I Prefer Not to Respond combined	-9.778	2.684	-.150	-3.643	<.001	-15.048	-4.507

Note: Reference categories are SA White for race and University residence for current residence.

The model (R = .340, R^2 = .116, *Adjusted* R^2 = .101, $F(10) = 8.071$, p <.001) was significant, explaining 11.6% of the variance in OLSE. The access index, living with parents/guardians or other family members, African, Coloured and Other and I Prefer Not to Respond combined were significant, where higher access level predicts higher OLSE level, students living with parents/guardians or other family members had higher OLSE than students in university residence, and African, Coloured and Other and I Prefer Not to Respond combined participants had lower OLSE levels than White participants. Notably, type of funding and previous online learning ceased to be significant when considered simultaneously with the other variables in the model, which suggests that they could have been proxies for the other variables.

It is to be noted only the comparisons with the reference categories for race and current residence can be interpreted in this model, but other significant comparisons may also be present i.e. between Shared house/flat with other students and the Other residence category. The reference categories chosen for this model were those with the most significant comparisons previously identified in this section.

The model was also run without influential values, of which there were 29 cases. This model (R = .312, R^2 = .098, *Adjusted* R^2 = .082, $F(10) = 6.353$, p <.001) was significant, explaining 9.8% of the variance in OLSE (n = 598). The results were largely similar to the results in Table 4, except that additionally, students who specified Other for current residence had higher OLSE levels than students in university residence (p = .007).

Correlations between key variables

Ahead of conducting regression analyses to establish whether OLSE predicts psychological distress and substance use when sociodemographic factors and factors related to online learning context are accounted for, correlations between the relevant variables were calculated. Non-parametric correlations (i.e. Spearman's rho) were employed where correlations included the family support subscale, FSO support subscale, AUDIT and B-MACQ, as these variables violated normality. The other correlations employed Pearson's *r* as all of the assumptions for this were met. These correlations are presented in Table 5.

Table 5

Correlations between OLSE, social support, psychological distress and harmful substance use (n = 627)

	DASS total score	MSPSS total score	Family support	FSO support	AUDIT total score	B-MACQ total score
MSPSS total score	-.347**					
Family support	**-.370****	**.722****				
FSO support	**-.270****	**.923****	**.423****			
AUDIT total score	**.086***	**.041**	**-.023**	**.061**		
B-MACQ total score	**.158****	**-.056**	**-.124****	**-.017**	**.429****	
OLSES total score	-.395**	.442**	**.442****	**.368****	**-.080***	**-.162****

Note: *p < 0.05; ** p < 0.01

Boldface indicates Spearman's rho; the other correlations use Pearson's *r*

OLSE was positively correlated with the social support variables but negatively correlated with psychological distress and harmful alcohol and marijuana use, which indicates that higher levels of OLSE were associated with higher levels of social support and with decreased psychological distress and harmful substance use. Psychological distress was positively correlated with both harmful alcohol and marijuana use, while negatively correlated with the social support variables, which indicates that lower levels of psychological distress were associated with higher levels of social support and decreased harmful substance use. The social support variables were positively associated with one another. With the exception of family support being negatively correlated with harmful marijuana use, where increased problematic marijuana use was associated with less support from family members, the social support variables were otherwise not correlated with

harmful alcohol and marijuana use. Harmful marijuana and alcohol use were positively correlated with one another, thus more harmful alcohol use is associated with more harmful marijuana use.

Relationship between OLSE and psychological distress

A simple regression analysis was conducted to examine whether OLSE level is a predictor of psychological distress (as measured by the DASS). All regression models that follow in this study control for the covariates gender, year of study, type of funding, race, current residence, the access index, having done online learning before 2021 and having had in-person tutorials, labs or practical work in addition to online learning that semester. SA African and university residence are the reference categories used for race and current residence, respectively, for all regression analyses that follow. Age was not included in the regression models as a covariate because most of the sample was in the narrow 18-21 years age range.

The assumptions for normality, acceptable reliability, independence, linearity and homoscedasticity were not violated to a serious extent. VIF values were between 1 and 3 and tolerance was above .1. The results of this regression analysis are presented below in Table 6.

Table 6

Regression model predicting psychological distress as a function of OLSE

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for *B*	
Model	*B*	*SE*	*Beta*	*t*	*p*	*LL*	*UL*
(Constant)	67.063	5.214		12.862	<.001	56.822	77.303
OLSES	-.320	.035	-.359	-9.074	<.001	-.389	-.250
Female – gender	6.122	1.433	.160	4.272	<.001	3.307	8.936
First year – year of study	-1.580	1.256	-.048	-1.258	.209	-4.048	.888
NSFAS – type of funding	-.301	1.465	-.009	-.206	.837	-3.179	2.577
Access index	-2.909	1.132	-.103	-2.570	.010	-5.132	-.686
Previous online learning	.816	1.312	.024	.622	.534	-1.760	3.393

In-person learning	.722	1.379	.020	.523	.601	-1.987	3.431
Shared house/flat with other students	-.270	2.221	-.006	-.122	.903	-4.632	4.092
Living with parents/guardians or other family members	.668	1.888	.020	.354	.724	-3.040	4.376
Other residence	-2.276	2.204	-.050	-1.033	.302	-6.606	2.053
SA Coloured	1.239	1.884	.032	.657	.511	-2.463	4.940
SA Indian	-1.883	2.916	-.028	-.646	.519	-7.610	3.843
SA White	-.199	1.864	-.006	-.107	.915	-3.861	3.463
Other and I Prefer Not to Respond combined	1.900	2.527	.032	.752	.452	-3.064	6.864

Note: Reference categories are SA African for race and University residence for current residence.

The model (R = .445, R^2 = .198, *Adjusted* R^2 = .179, $F(14) = 10.300$, $p < .001$) was significant, explaining 19.8% of the variance in psychological distress. Less OLSE significantly predicted increased psychological distress, when controlling for the sociodemographic factors and online learning context variables. Of the covariates, gender and the access index were significant, where females and those with lower levels of access had a higher risk of psychological distress. The regression analysis excluding 18 identified influential values had similar results.

Relationship between OLSE and harmful alcohol use

To examine if OLSE is a predictor of harmful alcohol use, bootstrapped regression was used because the AUDIT was not normally distributed and was positively skewed. The results of this regression analysis are presented in Table 7. VIF values were between 1 and 3 and tolerance was above .1. Note that the null hypothesis is rejected (i.e., results are considered statistically significant) if the bootstrapped percentile confidence intervals contain zero.

Table 7

Bootstrapped regression model predicting harmful alcohol use as a function of OLSE

		Bootstrap				
					95% Confidence Interval	
Model	*B*	*Bias*	*SE*	*p*	*LL*	*UL*
(Constant)	10.764	-.013	1.922	<.001	**7.175**	**14.593**
OLSES	-.041	.000	.011	.001	**-.063**	**-.019**
Female – gender	-.639	.004	.542	.237	-1.722	.431
First year – year of study	-1.030	-.003	.438	.020	**-1.890**	**-.154**
NSFAS – type of funding	-.971	.000	.487	.048	**-1.952**	**-.050**
Access index	-.084	.008	.413	.841	-.912	.693
Previous online learning	.186	.002	.460	.693	-.734	1.066
In-person learning	-1.222	.001	.439	.008	**-2.108**	**-.357**
Shared house/flat with other students	.174	-.011	.748	.821	-1.288	1.650
Living with parents/guardians or other family members	-1.536	-.012	.634	.018	**-2.791**	**-.348**
Other residence	.671	.000	.878	.452	-1.036	2.405
SA Coloured	-.847	.000	.687	.225	-2.204	.472
SA Indian	-.681	.006	1.168	.563	-2.908	1.688
SA White	1.504	.004	.741	.047	**.051**	**2.964**
Other and I Prefer Not to Respond combined	-1.826	-.018	.856	.035	**-3.546**	**-.174**

Note: Boldface indicates significant Bootstrap CIs

Reference categories are SA African for race and University residence for current residence.

The bootstrapped R^2 = .121 (*se* = .025, *z* = 4.92, *p*>|*z*| <.001, 95% CIs [.073, .169]) shows that 12.1% of the variance in harmful alcohol use as measured by the AUDIT is explained by the predictors in this model. The bootstrap for the model summary reported *bias* = -.786, *se* = .098 and 95% CIs [1.148, 1.529]. OLSE significantly predicted harmful alcohol use when controlling for the sociodemographic factors and online learning context variables, where lower OLSE predicts increased harmful alcohol use. Some covariates were significant as well. Participants in first year had lower harmful alcohol use than those in second year

onwards; those who had NSFAS only funding had less harmful alcohol use than those with other types of funding; those who had in-person tutorials, labs or practical work in addition to online learning had lower harmful alcohol use than those who did not have any contact teaching; participants living with parents/guardians or other family members had lower harmful alcohol use than those in university residence; and White participants had higher harmful alcohol use than African participants while those who specified Other or I Prefer Not to Respond for race had lower harmful alcohol use than African participants. In sum, this regression analysis indicates that participants with lower OLSE levels have a higher risk of exhibiting harmful alcohol use, over and above the risk that is posed by sociodemographic and online access factors.

The bias corrected accelerated bootstrapping method similarly showed lower OLSE to be a predictor of increased harmful alcohol use.

Relationship between OLSE and harmful marijuana use

To examine if OLSE is a predictor of harmful marijuana use, bootstrapping was again used because the B-MACQ was not normally distributed and was positively skewed. VIF values were between 1 and 3 and tolerance was above .1. The results of this regression analysis are reported in Table 8.

Table 8

Bootstrapped regression model predicting harmful marijuana use as a function of OLSE

		Bootstrap				
					95% Confidence Interval	
Model	*B*	*Bias*	*SE*	*p*	*LL*	*UL*
(Constant)	5.443	-.025	1.326	<.001	**2.915**	**8.054**
OLSES	-.015	-4.198E-7	.006	.017	**-.028**	**-.003**
Female – gender	-1.581	.000	.395	<.001	**-2.366**	**-.803**
First year – year of study	-.649	-.003	.262	.014	**-1.173**	**-.132**
NSFAS – type of funding	.398	-.005	.297	.176	-.186	.979
Access index	-.385	.008	.278	.160	-.941	.170

Previous online learning	-.137	.001	.292	.651	-.703	.415
In-person learning	-.653	.003	.265	.015	**-1.181**	**-.132**
Shared house/flat with other students	.154	-.002	.502	.760	-.788	1.168
Living with parents/guardians or other family members	-.849	-.001	.396	.034	**-1.642**	**-.089**
Other residence	-.419	.000	.442	.353	-1.274	.475
SA Coloured	.895	.000	.386	.023	**.142**	**1.662**
SA Indian	1.607	-.002	.728	.028	**.248**	**3.121**
SA White	1.623	-.010	.388	<.001	**.859**	**2.378**
Other and I Prefer Not to Respond combined	1.230	-.001	.546	.021	**.237**	**2.366**

Note: Boldface indicates significant Bootstrap CIs

Reference categories are SA African for race and University residence for current residence.

The bootstrapped R^2= .097 (*se* = .025, *z* = 3.91, *p*>|*z*| <.001, 95% CIs [.048, .145]) indicates that 9.7% of the variance in harmful marijuana use as measured by the B-MACQ is explained by the predictors in this model. OLSE was found to be a significant predictor of harmful marijuana use, where lower OLSE predicts increased marijuana-related consequences. The bootstrap for the model summary reported *bias* = -.719, *se* = .113 and 95% CIs [1.100, 1.540]. Some covariates added to the risk for harmful marijuana use: females had lower harmful marijuana use than males; participants in first year had lower harmful marijuana use than those in second year onwards; those who had in-person tutorials, labs or practical work had lower harmful marijuana use than those who did not; participants living with parents/guardians or other family members had lower harmful marijuana use than those in university residence; and participants from the other racial categories had higher harmful marijuana use than African participants. In sum, this regression analysis indicates that participants who have lower levels of OLSE have a higher risk of exhibiting harmful marijuana use, over and above the risk posed by sociodemographic and online access factors.

The bias corrected accelerated bootstrapping method similarly showed lower OLSE to be a predictor of increased harmful marijuana use.

Social support as a moderator of the relationships between OLSE and psychological distress

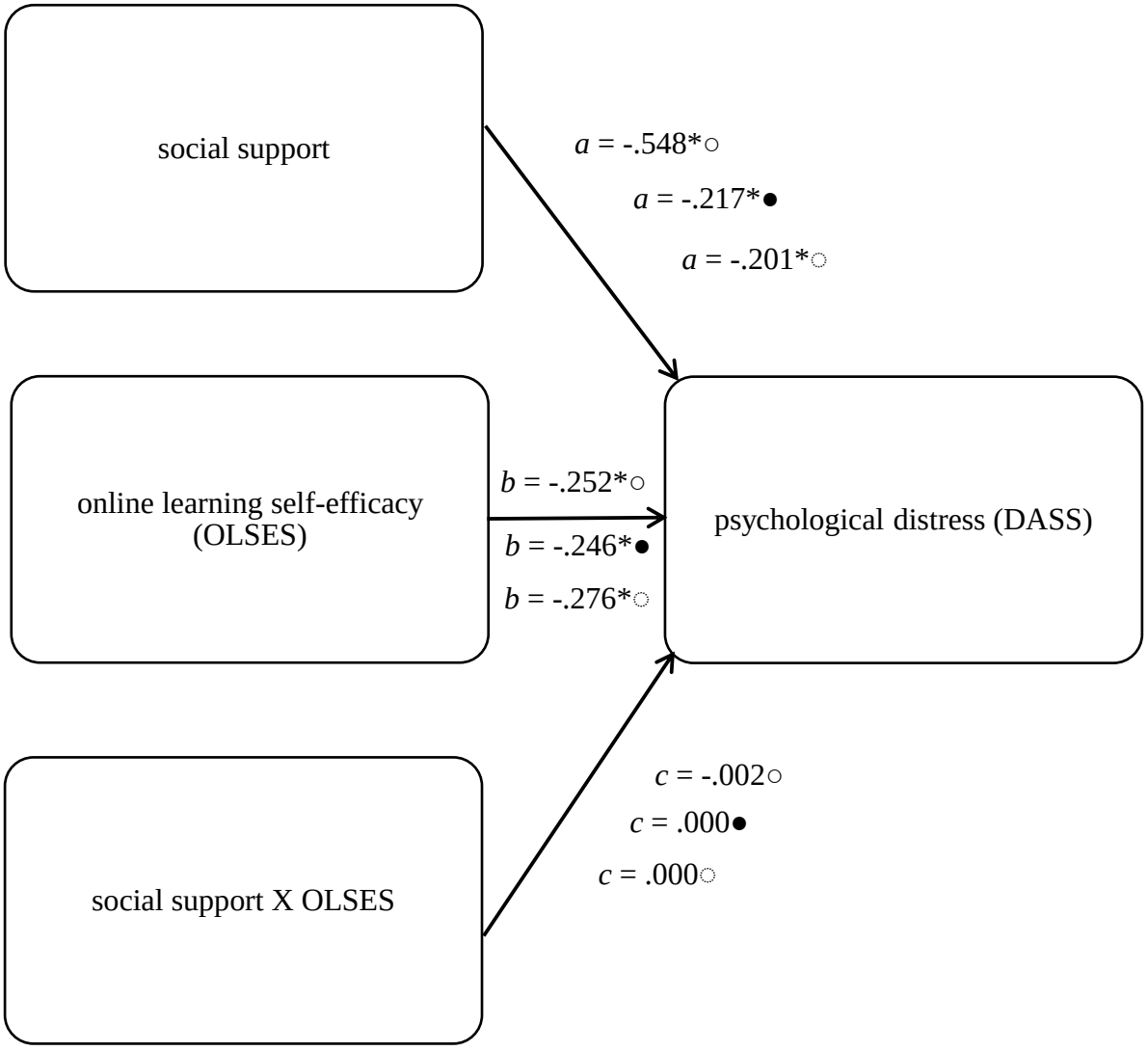
As illustrated above, OLSE is a predictor of psychological distress. Regression analysis was used to examine whether social support (from family, from friends and significant other and from combined sources) moderates this relationship. The assumptions of normality, acceptable reliability, independence, linearity and homoscedasticity were not violated to a serious extent.

To reduce multicollinearity for all moderation models in this study, the MSPSS and its subscales and the OLSES were all centred based on the mean of the n = 599 participants that were included in the models (as it had no missing values). The VIF values were between 1 and 3 and tolerance values were above .1, as the lowest tolerance value was .411.

Figure 1 below shows the statistical diagram of the three moderation analyses for psychological distress.

Figure 1

Moderation of MSPSS, Family support and FSO support on the relationship between OLSE and psychological distress



Note. *significant according $p < .05$; *a* = main effect of social support on psychological distress; *b* = main effect of OLSE on psychological distress; *c* = interaction effect of social support and OLSE on psychological distress; ○ Family support; ◌ FSO support; ● MSPSS total score

The results of the regression analyses are presented in Table 9. Model 1 reports on whether combined social support was a moderator. Because a specific source of social support may

play a unique role in moderating the relationship between OLSE and psychological distress, regression analyses were also performed to test whether support from family plays a unique moderating role (model 2) and whether support from friends and significant other plays a unique moderating role (model 3).

Table 9

Regression models predicting psychological distress as a function of OLSE with social support as a moderator

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	*p*	95,0% Confidence Interval for *B*	
		B	*SE*	*Beta*			*LL*	*UL*
1	(Constant)	35.220	4.845		7.269	<.001	25.703	44.736
	OLSES	-.246	.038	-.276	-6.539	<.001	-.320	-.172
	MSPSS	-.217	.041	-.217	-5.261	<.001	-.298	-.136
	OLSESxMSPSS	.000	.002	-.004	-.112	.911	-.004	.004
	Female – gender	6.351	1.414	.166	4.491	<.001	3.574	9.129
	First year – year of study	-1.601	1.230	-.048	-1.302	.193	-4.016	.814
	NSFAS – type of funding	-.478	1.435	-.014	-.333	.739	-3.297	2.341
	Access index	-2.468	1.111	-.087	-2.222	.027	-4.650	-.287
	Previous online learning	.873	1.284	.025	.680	.497	-1.650	3.395
	In-person learning	.546	1.355	.015	.403	.687	-2.115	3.207
	Shared house/flat with other students	.133	2.176	.003	.061	.951	-4.141	4.406
	Living with parents/guardians or other family members	.368	1.850	.011	.199	.842	-3.265	4.001
	Other residence	-2.714	2.159	-.060	-1.257	.209	-6.955	1.527
	SA Coloured	1.894	1.853	.049	1.023	.307	-1.744	5.533
	SA Indian	-2.302	2.857	-.034	-.806	.421	-7.913	3.310

	SA White	1.159	1.844	.034	.629	.530	-2.462	4.781
	Other and I Prefer Not to Respond combined	1.685	2.474	.029	.681	.496	-3.173	6.544
2	(Constant)	35.156	4.855		7.242	<.001	25.621	44.691
	OLSES	-.252	.037	-.284	-6.834	<.001	-.325	-.180
	Family support	-.548	.101	-.225	-5.410	<.001	-.746	-.349
	OLSESxfamily support	-.002	.005	-.018	-.492	.623	-.011	.007
	Female – gender	5.979	1.405	.156	4.257	<.001	3.220	8.738
	First year – year of study	-1.229	1.230	-.037	-.999	.318	-3.644	1.186
	NSFAS – type of funding	-1.165	1.443	-.035	-.808	.420	-3.999	1.668
	Access index	-2.340	1.113	-.083	-2.102	.036	-4.526	-.153
	Previous online learning	.835	1.283	.024	.651	.515	-1.684	3.354
	In-person learning	.802	1.355	.022	.592	.554	-1.860	3.464
	Shared house/flat with other students	-.318	2.171	-.007	-.147	.883	-4.581	3.945
	Living with parents/guardians or other family members	.621	1.846	.019	.337	.737	-3.004	4.247
	Other residence	-3.079	2.160	-.068	-1.426	.155	-7.320	1.163
	SA Coloured	1.462	1.846	.038	.792	.429	-2.164	5.088
	SA Indian	-1.678	2.850	-.025	-.589	.556	-7.275	3.919
	SA White	1.310	1.844	.038	.711	.478	-2.311	4.932
	Other and I Prefer Not to Respond combined	2.166	2.472	.037	.876	.381	-2.690	7.022
3	(Constant)	36.208	4.881		7.418	<.001	26.621	45.795
	OLSES	-.276	.037	-.310	-7.463	<.001	-.348	-.203
	FSO support	-.201	.053	-.152	-3.823	<.001	-.304	-.098
	OLSESxFSO support	.000	.003	.005	.142	.887	-.005	.006
	Female – gender	6.410	1.431	.168	4.481	<.001	3.600	9.220
	First year – year of study	-1.722	1.244	-.052	-1.384	.167	-4.165	.721

NSFAS – type of funding	-.145	1.451	-.004	-.100	.920	-2.994	2.704
Access index	-2.729	1.122	-.096	-2.433	.015	-4.933	-.526
Previous online learning	.863	1.298	.025	.665	.507	-1.687	3.412
In-person learning	.534	1.367	.015	.391	.696	-2.151	3.219
Shared house/flat with other students	.142	2.202	.003	.064	.949	-4.183	4.466
Living with parents/guardians or other family members	.403	1.870	.012	.215	.830	-3.270	4.076
Other residence	-2.406	2.182	-.053	-1.102	.271	-6.691	1.880
SA Coloured	1.768	1.872	.046	.944	.345	-1.909	5.444
SA Indian	-2.313	2.891	-.034	-.800	.424	-7.991	3.366
SA White	.510	1.855	.015	.275	.783	-3.132	4.153
Other and I Prefer Not to Respond combined	1.577	2.503	.027	.630	.529	-3.338	6.492

Note: Reference categories are SA African for race and University residence for current residence.

The models with combined sources of social support (R = .484, R^2 = .234, *Adjusted* R^2 = .213, $F(16) = 11.141$, p <.001), family support (R = .486, R^2 = .237, *Adjusted* R^2 = .216, $F(16) = 11.276$, p <.001) and support from friends and significant other (R = .467, R^2 = .218, *Adjusted* R^2 = .196, $F(16) = 10.121$, p <.001) were all significant. Respectively, these models explained 23.4%, 23.7% and 21.8% of the variance in psychological distress as measured by the DASS. In each moderation model, OLSE and social support (family, FSO and combined sources) are both significant predictors of DASS score, where less OLSE and less social support each independently predict increased psychological distress. However, the interaction terms between OLSE and social support for all models were not significant. Social support, whether combined or from specific sources, was therefore not a moderator of the relationship between OLSE and psychological distress. As with the regression analysis in Table 6, predicting psychological distress from OLSE without moderation by social support, gender and lower access to online learning resources remained significant covariates. The analyses excluding 15, 16 and 18 identified influential values for the 3 models, respectively, had

similar results, except in model 2 the access index was no longer significant (p = .057). Thus, these data points were retained.

Social support as a moderator of the relationship between OLSE and problematic substance use

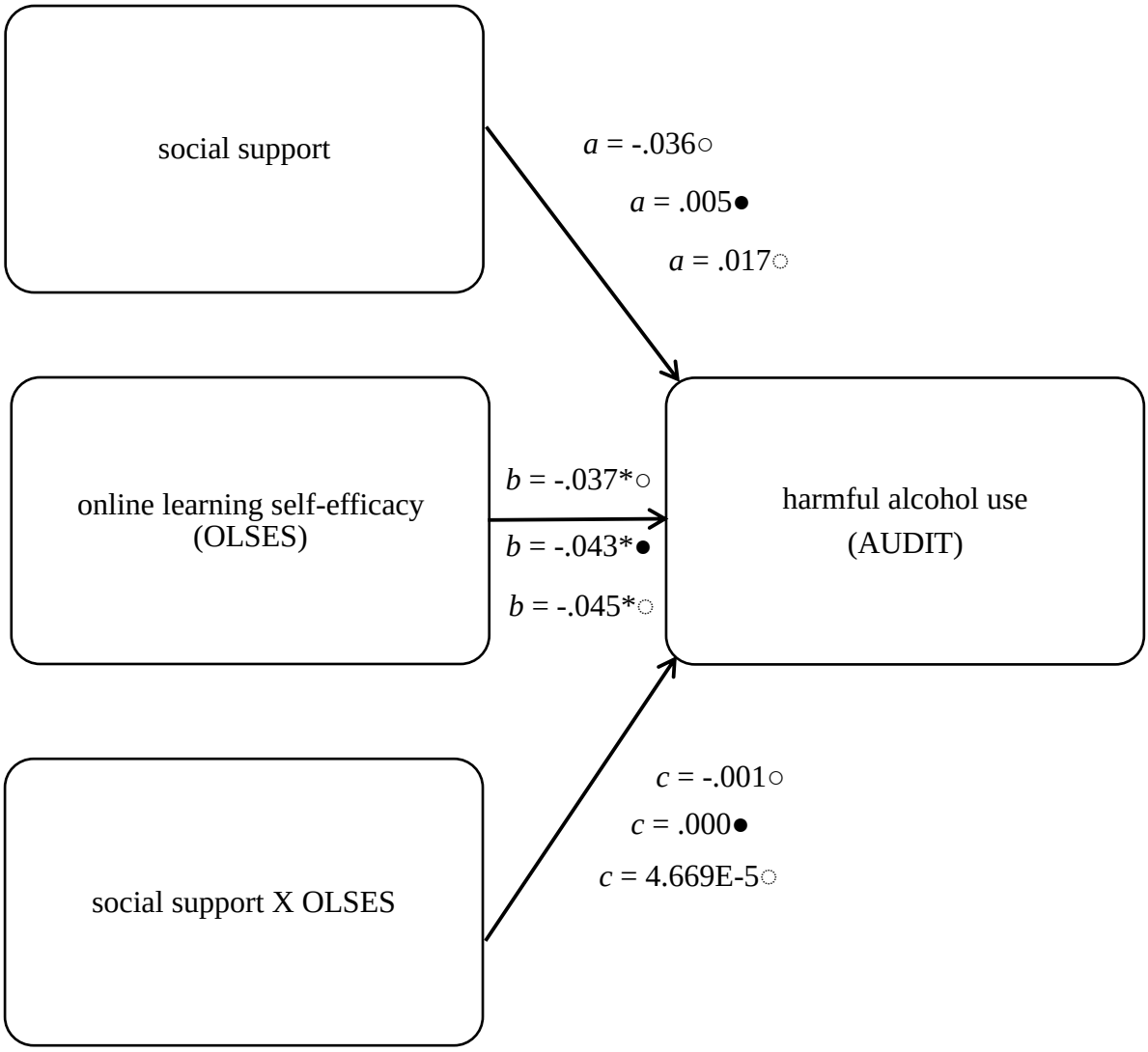
As illustrated above, OLSE is a significant predictor of harmful alcohol and marijuana use. To examine if social support moderates these relationships, bootstrapping was used because the AUDIT and B-MACQ were not normally distributed. Combined sources of social support, family support and support from friends and significant other were examined as moderators in separate models as the literature points towards different support sources having different effects on substance use (see Chapter 2).

Prior to bootstrapping, the VIF values were between 1 and 3 and tolerance values above .1, as the lowest tolerance value was .411.

Figure 2 below shows the statistical diagram of the three moderation analyses for harmful alcohol use.

Figure 2

Moderation of MSPSS, Family support and FSO support on the relationship between OLSE and harmful alcohol use



Note. *significant according to the bootstrap CIs; *a* = main effect of social support on harmful alcohol use; *b* = main effect of OLSE on harmful alcohol use; *c* = interaction effect of social support and OLSE on harmful alcohol use; ○ Family support; ○ FSO support; ● MSPSS total score

The bootstrap regressions testing whether perceived social support from combined sources (model 1), family support (model 2) and support from friends and significant other (model 3)

moderate the relationship between OLSE and harmful alcohol use are presented below in Table 10.

Table 10

Bootstrap regression models predicting harmful alcohol use as a function of OLSE with social support as a moderator

			Bootstrap				
						95% Confidence Interval	
Model		*B*	*Bias*	*SE*	*p*	*LL*	*UL*
1	(Constant)	7.000	-.021	1.784	<.001	**3.531**	**10.526**
	OLSES	-.043	.000	.013	.001	**-.068**	**-.019**
	MSPSS	.005	.000	.015	.745	-.023	.034
	OLSESxMSPSS	.000	-2.718E-5	.001	.867	-.001	.001
	First year – year of study	-1.030	-.018	.433	.019	**-1.914**	**-.206**
	NSFAS – type of funding	-.965	.006	.492	.053	-1.937	.002
	Female – gender	-.655	.009	.534	.219	-1.701	.362
	SA Coloured	-.869	-.014	.692	.209	-2.247	.485
	SA Indian	-.679	-.041	1.181	.577	-2.913	1.665
	SA White	1.471	-.014	.725	.040	**.052**	**2.860**
	Other and I Prefer Not to Respond combined	-1.821	-.011	.866	.038	**-3.555**	**-.152**
	Shared house/flat with other students	.161	-.006	.739	.826	-1.298	1.580
	Living with parents/guardians or other family members	-1.526	.003	.632	.015	**-2.773**	**-.281**
	Other residence	.682	.005	.869	.430	-.967	2.422
	Access index	-.093	.009	.419	.828	-.921	.700
	Previous online learning	.187	.006	.466	.693	-.709	1.129
	In-person learning	-1.212	.001	.451	.008	**-2.089**	**-.320**
2	(Constant)	6.866	-.008	1.756	<.001	**3.491**	**10.348**

	OLSES	-.037	-.001	.012	.001	**-.062**	**-.014**
	Family support	-.036	.001	.035	.310	-.103	.036
	OLSESxfamily support	-.001	-9.839E-5	.002	.593	-.004	.002
	First year – year of study	-1.005	-.020	.433	.021	**-1.889**	**-.182**
	NSFAS – type of funding	-1.019	.008	.497	.041	**-1.987**	**-.034**
	Female – gender	-.666	.008	.536	.216	-1.710	.361
	SA Coloured	-.851	-.017	.694	.222	-2.208	.490
	SA Indian	-.670	-.036	1.174	.580	-2.900	1.678
	SA White	1.598	-.018	.725	.027	**.150**	**2.982**
	Other and I Prefer Not to Respond combined	-1.824	-.015	.862	.037	**-3.547**	**-.167**
	Shared house/flat with other students	.172	.001	.741	.813	-1.284	1.608
	Living with parents/guardians or other family members	-1.532	.004	.633	.015	**-2.771**	**-.296**
	Other residence	.612	.008	.867	.472	-1.038	2.348
	Access index	-.056	.005	.411	.896	-.873	.718
	Previous online learning	.193	.007	.465	.681	-.704	1.144
	In-person learning	-1.195	.000	.449	.009	**-2.084**	**-.306**
3	(Constant)	7.024	-.019	1.785	<.001	**3.510**	**10.547**
	OLSES	-.045	.000	.012	.001	**-.069**	**-.021**
	FSO support	.017	-9.662E-5	.019	.373	-.020	.055
	OLSESxFSO support	4.669E-5	-1.799E-5	.001	.962	-.002	.002
	First year – year of study	-1.017	-.019	.433	.020	**-1.900**	**-.191**
	NSFAS – type of funding	-.985	.004	.491	.046	**-1.955**	**-.020**
	Female – gender	-.659	.010	.532	.217	-1.706	.351
	SA Coloured	-.889	-.016	.692	.198	-2.261	.458
	SA Indian	-.640	-.043	1.183	.600	-2.895	1.730
	SA White	1.445	-.016	.728	.046	**.013**	**2.853**
	Other and I Prefer Not to Respond combined	-1.801	-.011	.864	.041	**-3.536**	**-.128**

Shared house/flat with other students	.142	.002	.740	.851	-1.294	1.561
Living with parents/guardians or other family members	-1.515	.006	.630	.015	**-2.753**	**-.277**
Other residence	.680	.007	.873	.432	-.976	2.425
Access index	-.100	.007	.418	.811	-.929	.695
Previous online learning	.182	.007	.467	.702	-.710	1.128
In-person learning	-1.208	.000	.451	.009	**-2.085**	**-.312**

Note: Boldface indicates significant Bootstrap CIs
Reference categories are SA African for race and University residence for current residence.

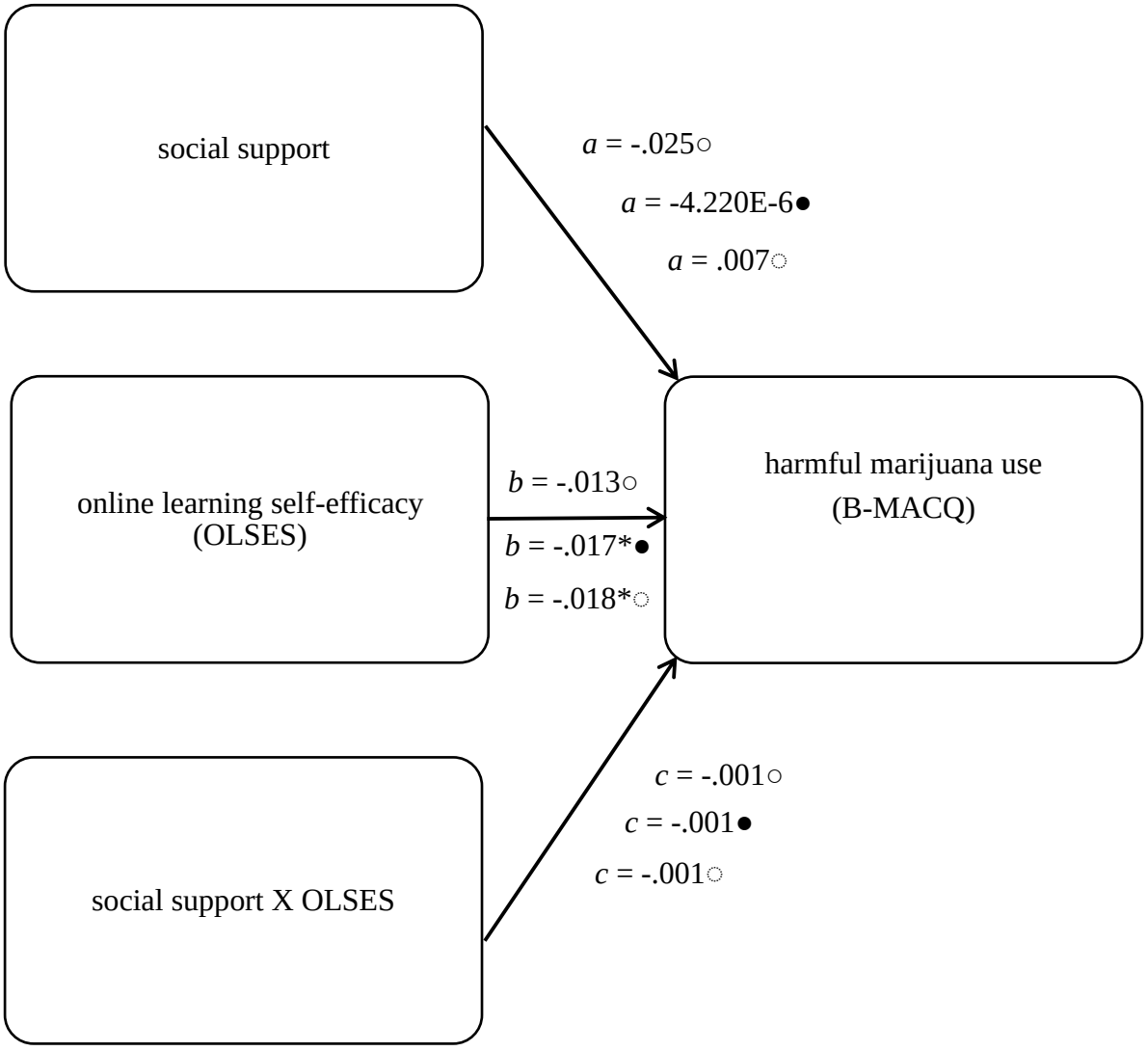
The bootstrapped R^2 values for the models with combined sources of social support (R^2 = .121, *se* = .025, *z* = 4.86, *p*>|*z*| <.001, 95% CIs [.072, .170]), family support (R^2 = .123, *se* = .025, *z* = 5.00, *p*>|*z*| <.001, 95% CIs [.075, .171]) and support from friends and significant other (R^2 = .122, *se* = .025, *z* = 4.86, *p*>|*z*| <.001, 95% CIs [.073, .172]) show that 12.1%, 12.3% and 12.2% of the variance in harmful alcohol use is explained by the predictors in these three models, respectively. The bootstrap for the model summaries that were reported for the model with combined sources of social support was *bias* = -.780, *se* = .097 and 95% CIs [1.139, 1.516], for the model with family support was *bias* = -.782, *se* = .097 and 95% CIs [1.143, 1.513] and for the model with and support from friends and significant other was *bias* = -.779, *se* = .098, 95% CIs [1.140, 1.521]. In all three moderation models, OLSE was a significant predictor of harmful alcohol use, where less OLSE predicts increased harmful alcohol use. However, in all three models, social support (family, FSO and combined sources) was not a predictor of harmful alcohol use and the interaction terms between OLSE, and social support were also not significant. Social support is therefore not a moderator of the relationship between OLSE and harmful alcohol use. The covariates that were significant in the regression model in Table 7, predicting harmful alcohol use from OLSE without moderation by social support, largely remained significant in all three moderation regressions (i.e. year of study; type of funding; in-person learning; living with parents/guardians or other family members; and the racial categories White and Other and I Prefer Not to Respond combined), except type of funding was not significant for model 1. All three models run

using the bias corrected accelerated bootstrapping method similarly showed that lower OLSE predicted increased harmful alcohol use and that social support was not a moderator.

Figure 3 below shows the statistical diagram of the three moderation analyses for harmful marijuana use.

Figure 3

Moderation of MSPSS, Family support and FSO support on the relationship between OLSE and harmful marijuana use



Note. *significant according to the bootstrap CIs; *a* = main effect of social support on harmful marijuana use; *b* = main effect of OLSE on harmful marijuana use; *c* = interaction effect of social support and OLSE on harmful marijuana use; ○ Family support; ◌ FSO support; ● MSPSS total score

Table 11 reports the bootstrap regression analyses results testing whether perceived social support from combined sources (model 1), family support (model 2) and support from friends

and significant other (model 3) moderate the relationship between OLSE and harmful marijuana use.

Table 11

Bootstrap regression models predicting harmful marijuana use as a function of OLSE with social support as a moderator

			Bootstrap				
						95% Confidence Interval	
Model		*B*	*Bias*	*SE*	*p*	*LL*	*UL*
1	(Constant)	4.111	-.020	1.182	.001	**1.821**	**6.506**
	OLSES	-.017	.000	.008	.047	**-.033**	**-.001**
	MSPSS	-4.220E-6	.000	.012	.999	-.023	.023
	OLSESxMSPSS	-.001	-1.582E-5	.000	.218	-.001	.000
	First year – year of study	-.653	-.001	.258	.011	**-1.178**	**-.148**
	NSFAS – type of funding	.409	.000	.295	.169	-.149	1.005
	Female – gender	-1.628	-.012	.396	<.001	**-2.426**	**-.883**
	SA Coloured	.863	-.006	.389	.026	**.125**	**1.628**
	SA Indian	1.574	-.020	.725	.024	**.230**	**3.052**
	SA White	1.610	-.014	.391	<.001	**.821**	**2.369**
	Other and I Prefer Not to Respond combined	1.231	.007	.548	.023	**.226**	**2.366**
	Shared house/flat with other students	.137	.017	.489	.771	-.784	1.127
	Living with parents/guardians or other family members	-.833	.007	.396	.037	**-1.638**	**-.068**
	Other residence	-.412	-.003	.447	.359	-1.283	.485
	Access index	-.382	.009	.288	.182	-.955	.176
	Previous online learning	-.129	.005	.295	.664	-.712	.450
	In-person learning	-.623	.003	.265	.019	**-1.125**	**-.103**
2	(Constant)	3.981	-.022	1.159	.001	**1.772**	**6.301**
	OLSES	-.013	.000	.008	.094	-.028	.002

	Family support	-.025	8.223E-5	.025	.318	-.074	.024
	OLSESxfamily support	-.001	-3.838E-5	.001	.499	-.003	.001
	First year – year of study	-.632	-.003	.257	.013	**-1.152**	**-.133**
	NSFAS – type of funding	.366	.003	.299	.218	-.195	.972
	Female – gender	-1.599	-.012	.397	<.001	**-2.396**	**-.854**
	SA Coloured	.892	-.006	.388	.021	**.160**	**1.658**
	SA Indian	1.615	-.016	.720	.021	**.286**	**3.089**
	SA White	1.688	-.012	.386	<.001	**.921**	**2.448**
	Other and I Prefer Not to Respond combined	1.231	.007	.552	.023	**.208**	**2.368**
	Shared house/flat with other students	.153	.017	.489	.750	-.774	1.141
	Living with parents/guardians or other family members	-.846	.007	.394	.035	**-1.653**	**-.084**
	Other residence	-.460	-.003	.453	.311	-1.334	.431
	Access index	-.367	.009	.281	.188	-.923	.184
	Previous online learning	-.132	.007	.296	.660	-.713	.448
	In-person learning	-.634	.000	.268	.018	**-1.144**	**-.114**
3	(Constant)	4.106	-.019	1.184	.001	**1.836**	**6.471**
	OLSES	-.018	.000	.007	.018	**-.033**	**-.003**
	FSO support	.007	.000	.014	.630	-.021	.034
	OLSESxFSO support	-.001	-2.121E-5	.001	.177	-.002	.000
	First year – year of study	-.652	-.003	.259	.011	**-1.179**	**-.148**
	NSFAS – type of funding	.399	-6.298E-5	.297	.182	-.168	1.000
	Female – gender	-1.641	-.012	.394	<.001	**-2.432**	**-.900**
	SA Coloured	.851	-.006	.388	.027	**.108**	**1.615**
	SA Indian	1.576	-.020	.725	.025	**.230**	**3.064**
	SA White	1.586	-.013	.388	<.001	**.797**	**2.341**
	Other and I Prefer Not to Respond combined	1.258	.007	.545	.020	**.263**	**2.386**
	Shared house/flat with other students	.114	.019	.489	.810	-.816	1.113

Living with parents/guardians or other family members	-.825	.006	.395	.038	**-1.622**	**-.072**
Other residence	-.398	-.003	.444	.373	-1.265	.490
Access index	-.377	.008	.288	.189	-.947	.181
Previous online learning	-.133	.005	.294	.652	-.709	.447
In-person learning	-.628	.004	.265	.018	**-1.131**	**-.105**

Note: Boldface indicates significant Bootstrap CIs

Reference categories are SA African for race and University residence for current residence.

The bootstrapped R^2 values for the models with combined sources of social support (R^2 = .099, *se* = .025, *z* = 3.97, *p*>|*z*| <.001, 95% CIs [.050, .148]), family support (R^2 = .099, *se* = .025, *z* = 3.91, *p*>|*z*| <.001, 95% CIs [.049, .148]) and support from friends and significant other (R^2 = .100, *se* = .025, *z* = 4.03, *p*>|*z*| <.001, 95% CIs [.051, .148]) show that 9.9%, 9.9% and 10.0% of the variance in harmful marijuana use as measured by the B-MACQ is explained by the predictors in these three models, respectively. The bootstrap for the model summaries that were reported for the model with combined sources of social support was *bias* = -.751, *se* = .118 and 95% CIs [1.127, 1.590], for the model with family support was *bias* = -.750, *se* = .117 and 95% CIs [1.122, 1.589] and for the model with and support from friends and significant other was *bias* = -.752, *se* = .118 and 95% CIs [1.126, 1.594].In the moderation models with combined sources and support from friends and significant other, OLSE was a significant predictor of harmful marijuana use, where less OLSE predicts increased harmful marijuana use. However, OLSE was not a significant predictor in the model with family support as a moderator. In all three models, social support (family, FSO and combined sources) was not a predictor of harmful marijuana use and the interaction terms between OLSE and social support for all models were not significant. Social support is therefore not a moderator of the relationship between OLSE and harmful marijuana use. The covariates that were significant in the regression model in Table 8, predicting harmful marijuana use from OLSE without moderation by social support, remained significant in all three moderation regressions (i.e. year of study; gender; the racial categories Coloured, Indian, White and Other and I Prefer Not to Respond combined; living with parents/guardians or other family members; and in-person learning). Using the bias corrected accelerated bootstrapping method, models 1 and 3 similarly showed no moderation and lower OLSE predicted increased harmful marijuana use. Model 2 similarly showed no moderation and OLSE was not a significant predictor of harmful marijuana use.

Psychological distress as a mediator of the relationship between OLSE and problematic substance use

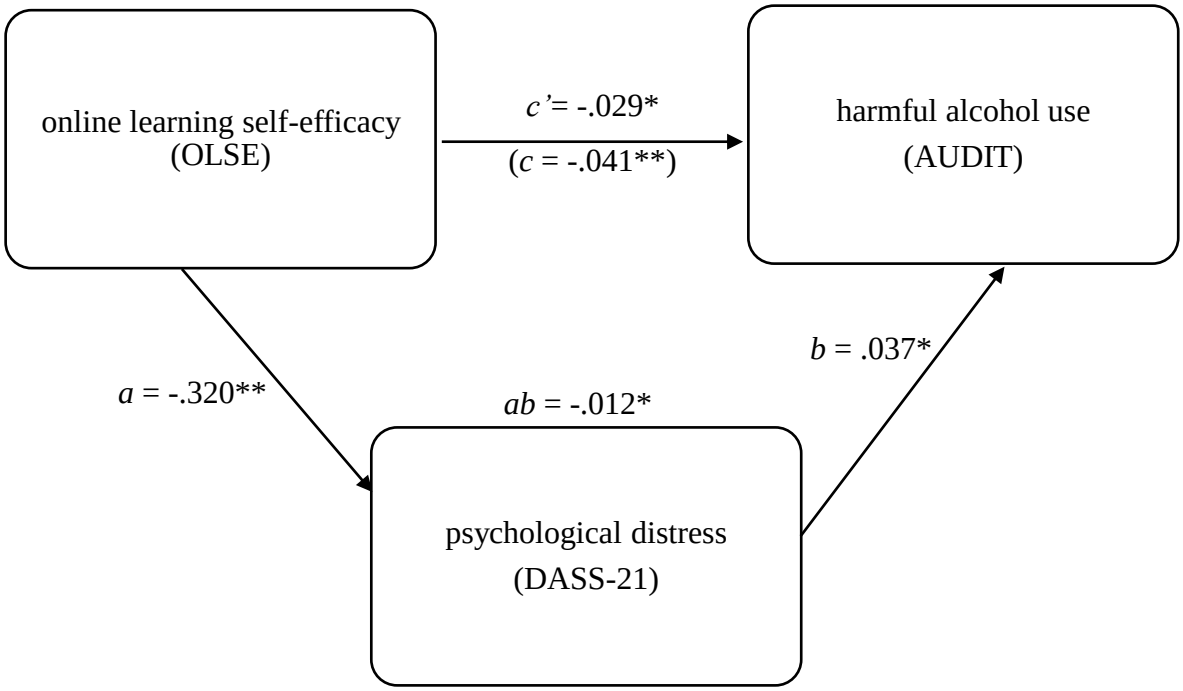
As previously demonstrated, OLSE significantly predicts both harmful alcohol use and harmful marijuana use. It is important to understand the nature of these relationships to inform possible interventions. These relationships may possibly be mediated by the participants' level of psychological distress, where participants with lower levels of OLSE may experience psychological distress as they do not feel able to effectively meet the requirements and demands of learning online, and then attempt to cope with this psychological distress by using alcohol or marijuana to regulate their emotions. To examine if psychological distress is a mediator of the relationship between OLSE and problematic substance use, bootstrapping was again used because the AUDIT and B-MACQ were not normally distributed.

Prior to bootstrapping, the VIF values were between 1 and 3 for all mediation models and tolerance values were above .1, as the lowest tolerance value was .412.

First, a bootstrap regression analyses examined whether psychological distress mediates the relationship between OLSE and harmful alcohol use. The total, direct and indirect effects are presented in Figure 4.

Figure 4

Psychological distress as a mediator of the relationship between online learning self-efficacy and harmful alcohol use



Note. *significant according to the bootstrap CIs; **significant at $p < .05$ level; effects are unstandardized; *a* = the effect of OLSE on psychological distress; *b* = the effect of psychological distress on harmful alcohol use; *c* = total effect of OLSE on harmful alcohol use; *c'* = the direct effect of OLSE on harmful alcohol use; *ab* = indirect effect.

The regression analysis predicting harmful alcohol use as a function of OLSE with psychological distress as a mediator, including sociodemographic factors and online learning context factors as covariates, is presented in Table 12. The effect of OLSE on psychological distress was reported previously in Table 6 for the linear-regression predicting psychological distress as a function of OLSE.

Table 12

Regression model predicting harmful alcohol use as a function of OLSE with psychological distress as a mediator

	Coefficient	*BootMean*	*BootSE*	*BootLL*	*BootUL*
Constant	8.270	8.261	2.157	4.034	12.552
OLSES	-.029	-.030	.012	**-.053**	**-.006**
DASS	.037	.037	.014	**.009**	**.066**
First year – year of study	-.971	-.977	.433	**-1.812**	**-.123**
NSFAS – type of funding	-.960	-.956	.482	**-1.890**	**-.024**
Female – gender	-.867	-.851	.536	-1.928	.203
SA Coloured	-.893	-.883	.691	-2.280	.428
SA Indian	-.611	-.608	1.177	-2.850	1.795
SA White	1.511	1.523	.744	-.034	2.918
Other and I Prefer Not to Respond	-1.897	-1.911	.837	**-3.564**	**-.292**
Shared house/flat with other students	.184	.184	.725	-1.257	1.599
Living with parents/guardians or other family members	-1.561	-1.574	.646	**-2.847**	**-.331**
Other residence	.755	.761	.853	-.888	2.460
Previous online learning	.156	.159	.471	-.769	1.098
In-person learning	-1.249	-1.255	.454	**-2.125**	**-.338**
Access index	.024	.035	.415	-.785	.831

Note: Boldface indicates significant Bootstrap CIs

Reference categories are SA African for race and University residence for current residence.

The bootstrapped R^2 = .131 for the model in Table 12 (*Bootstrap SE* = .026, z = 5.04, $p>|z|$ <.001; 95% CIs [.080, .182]) shows that 13.1% of the variance in harmful alcohol use as measured by the AUDIT is explained by the predictors in this model. According to the bootstrapped confidence intervals (which indicate significance when they do not cross zero), lower OLSE levels were associated with higher psychological distress (a = -.320), and higher psychological distress was associated with increased harmful alcohol use (b = .037). The number of percentile 95% confidence intervals was 5000. This showed that the indirect effect

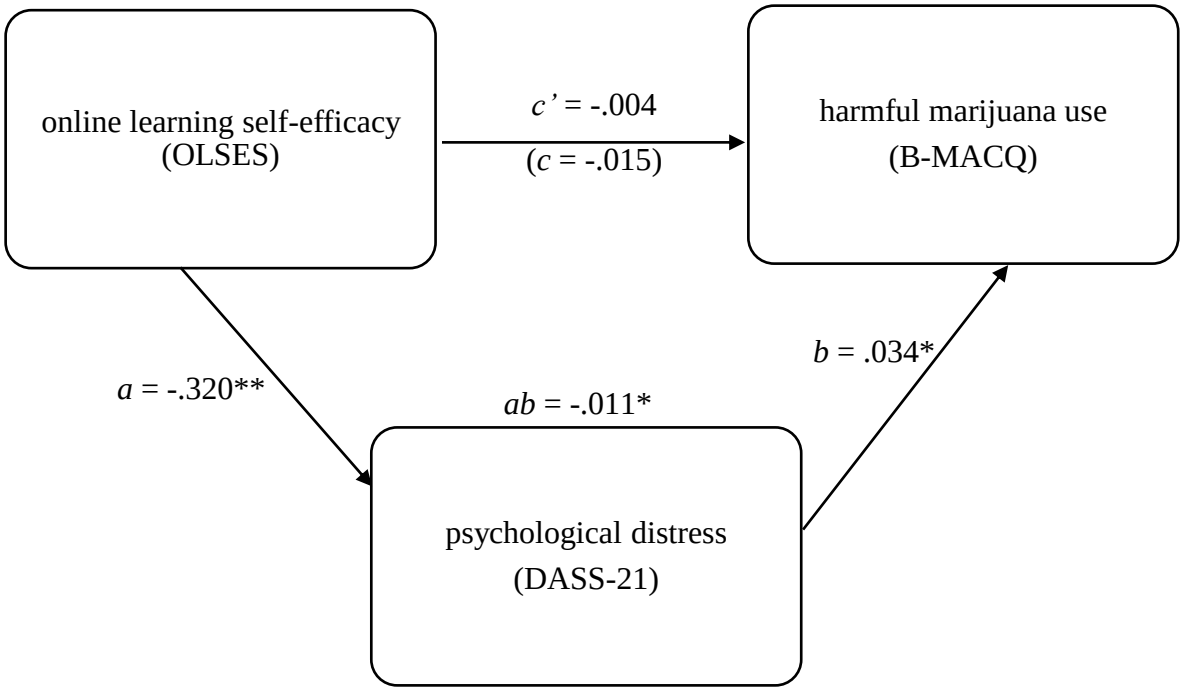
(*ab* = -.012, boot *se* =.005, 95% boot CIs [-.022, -.003]) was completely below zero in terms of CIs, thus it was significant. Therefore, lower OLSE levels predicts increased harmful alcohol use through psychological distress. Lower OLSE levels also had a direct effect on increased harmful alcohol use, even when taking into consideration OLSE's indirect effect through psychological distress (*c'*= -.029, *se* = .013, *t* = - 2.292, *p* = .022, 95% CIs [-.054, -.004], *c'_cs* = -.101, boot *mean* = -.030, boot *se* = .012, 95% boot CIs [-.053, -.006]). The ratio index of the indirect effect divided by the total effect shows that of 29.3% OLSE's total effect on harmful alcohol use goes through psychological distress, (Panti & Gempes, 2018), while the remainder (70.7%) is direct (Victoria University of Wellington, 2013).

PROCESS did not provide the bootstrapped total effect, thus the non-bootstrapped total effect of OLSE on harmful alcohol use was *c* = -.041 (*se* = .012, *t* = -3.424, *p* = .001, 95% CIs [-.065, -.018], *c_cs* = -.142). The covariates that were significant in the regression model in Table 7, predicting harmful alcohol use from OLSE without psychological distress, remained significant (i.e. year of study, type of funding, the racial category Other and I Prefer Not to Respond combined, living with parents/guardians or other family members and in-person learning), with the exception of White participants no longer being significant here. Running this model with bias corrected bootstrapping yields similar results.

Second, a bootstrap regression analyses examined whether psychological distress mediates the relationship between OLSE and harmful marijuana use. The total, direct and indirect effects are presented in Figure 5, which shows the mediation model.

Figure 5

Psychological distress as a mediator of the relationship between online learning self-efficacy and harmful marijuana use



Note. *significant according to the bootstrap CIs; **significant at $p < .05$ level; effects are unstandardized; *a* = the effect of OLSE on psychological distress; *b* = the effect of psychological distress on harmful marijuana use; *c* = total effect of OLSE on harmful marijuana use; *c'* = the direct effect of OLSE on harmful marijuana use; *ab* = indirect effect

The regression analysis predicting harmful marijuana use as a function of OLSE with psychological distress as a mediator, including sociodemographic factors and online learning context covariates, is presented in Table 13. Again, the effect of OLSE on psychological distress was reported previously in Table 6 for the linear regression predicting psychological distress as a function of OLSE.

Table 13

Regression model predicting harmful marijuana use (B-MACQ) as a function of OLSE and psychological distress (DASS)

	Coefficient	*BootMean*	*BootSE*	*BootLL*	*BootUL*
Constant	3.177	3.149	1.536	.191	6.186
OLSES	-.004	-.005	.007	-.018	.010
DASS	.034	.034	.010	**.015**	**.053**
First year – year of study	-.596	-.600	.260	**-1.112**	**-.095**
NSFAS – type of funding	.408	.418	.292	-.159	.984
Female – Gender	-1.788	-1.792	.402	**-2.593**	**-1.019**
SA Coloured	.853	.852	.392	**.103**	**1.642**
SA Indian	1.671	1.659	.733	**.336**	**3.184**
SA White	1.630	1.624	.387	**.874**	**2.388**
Other and I Prefer Not to Respond	1.165	1.162	.532	**.171**	**2.270**
Shared house/flat with other students	.163	.167	.492	-.776	1.148
Living with parents/guardians or other family members	-.872	-.866	.406	**-1.660**	**-.085**
Other residence	-.343	-.340	.455	-1.228	.571
Previous online learning	-.164	-.162	.290	-.729	.409
In-person learning	-.678	-.679	.275	**-1.232**	**-.139**
Access index	-.287	-.276	.284	-.848	.271

Note: Boldface indicates significant Bootstrap CIs

Reference categories are SA African for race and University residence for current residence.

The bootstrapped R^2 = .118 for the model in Table 13 (*Bootstrap SE* = .026, z = 4.48, $p>|z|$ <.001; 95% CIs [.066, .169]) shows that 11.8% of the variance in harmful marijuana use as measured by the B-MACQ is explained by the predictors in this model. As shown by the bootstrapped confidence intervals that do not cross zero, which indicates significance, lower OLSE levels were associated with higher psychological distress (a = -.320) and higher psychological distress was associated with harmful marijuana use (b = .034). The number of percentile 95% confidence intervals was 5000. This showed that the indirect effect (ab = -

.011, boot *se* = .003, 95% boot CIs [-.018, -.005]) had CIs that were completely below zero, thus it was significant. Therefore, lower OLSE levels predicts increased harmful marijuana use through psychological distress. When taking into consideration OLSE's indirect effect through psychological distress, there was no significant direct effect of OLSE on harmful marijuana use (*c'* = -.004, *se* = .008, *t* = - .538, *p* = .591, 95% CIs [-.021, .012], *c'_cs* = -.024, boot *mean* = -.005, boot *se* = .007, 95% boot CIs [-.018, .010]).

PROCESS did not provide the bootstrapped total effect, thus the non-bootstrapped total effect of OLSE on harmful marijuana use was *c* = -.015 (*se* = .008, *t* = -1.951, *p* = .052, 95% CIs [-.031, .000], *c_cs* = -.082). The covariates that were significant in the regression model in Table 8, predicting harmful marijuana use from OLSE without the mediator psychological distress, remained significant (i.e. year of study; gender; the racial categories Coloured, Indian, White and Other and I Prefer Not to Respond combined; living with parents/guardians or other family members and in-person learning). Running this model with bias corrected bootstrapping yields similar results.

The ratio index shows that 73.3% of OLSE's total effect on harmful marijuana use goes through psychological distress. While the direct effect between OLSE and harmful marijuana use was found to be significant in the simple regression model in Table 8, when the mediator's effect was accounted for, this effect ceased to be significant. This indicates that the mediation effect accounts for most of OLSE's effect on harmful marijuana use.

CHAPTER 5: DISCUSSION

As a result of COVID-19, higher education was driven to make an abrupt shift to remote learning using online methods. This appears to have set a course towards continuing with online learning, in a blended or hybrid learning model, even after COVID-19 ceases to be a threat. Because of this, it is vital to identify which students may be struggling with learning online, and how this may be affecting them, in order to plan and implement appropriate strategies to support them. The current study centred on OLSE, which is an important component to learning online successfully. Given the diversity of South Africa's student population, the current study's aim was to identify sociodemographic factors and aspects related to the online learning context that are associated with OLSE. It further had the aim to examine if OLSE predicts psychological distress and harmful alcohol and marijuana use, which have been found to be largely prevalent amongst student populations during online and contact learning. In order to better understand the relationship between level of OLSE and these negative outcomes, the study also explored whether perceived social support moderates these relationships, and whether psychological distress mediates the relationship between OLSE and harmful alcohol and marijuana use. The findings of these research questions are discussed below, considering previous research and implications for further research and support initiatives for students.

Association Of Sociodemographic Characteristics and Online Learning Access With OLSE

To identify students struggling the most with OLSE, several factors relating to sociodemographic characteristics and resources for learning online were examined. In the bivariate analysis, there were no significant differences between males and females in terms of OLSE level, which is consistent with studies done in Saudi Arabia (Aldhahi et al., 2021), Malaysia (Tanius, 2020) and Turkey (Yavuzalp & Bahçivan, 2020), and indicates that generally male and female students have equivalent levels of OLSE. Further, there were no significant differences for year of study, when comparing first year undergraduate students to everyone else, which aligns with a previous study where no significant differences were found for learning, technology and time management self-efficacy among Saudi Arabian students studying towards a diploma, bachelor's degree or postgraduate degree (Aldhahi et al., 2021).

It would be expected that first year students, who are presumably less experienced with learning online, may have struggled more with OLSE than students in higher years of study who would have already had experience with online learning in 2020. There may have been no difference for year of study because how much experience students had with online learning did not play a great role in students OLSE levels, as was seen in the current study, where having had experience of online learning before 2021 or not, only approached significance, but did not meet the Bonferroni correction significance level. This may be because whether students have had online learning or not, most students have probably had some level of experience with technological device and the internet.

Further, OLSE level did not differ significantly across participants who had in-person learning that semester and participants who did not. Perhaps the content taught to students in face-to-face classes did not directly speak to the challenges that these students were experiencing with the online learning components.

Overall, race, current residence, type of funding and the access index were all significantly associated with level of OLSE in this study. Previous online learning only approached significance. Because some of the sociodemographic and online learning context variables could be proxies for one another, a regression analysis was run, including the significant or nearly significant variables from the bivariate analysis. The model was significant and explained 11.6% of the variance in OLSE.

It was found that African and Coloured participants, and participants who indicated Other or I Prefer Not to Respond in terms of their race, had lower OLSE levels than White participants, even when controlling for type of funding, access to online learning resources, previous online learning and current residence. White students in South Africa have historically had more financial opportunities and, consequently, possibly greater access to and experience with technology or finances for tutors to assist with challenges with online learning. They may also have access to more privileged education systems that facilitate academic success and therefore increased learning self-efficacy in general, compared to students who come from historically disadvantaged contexts and backgrounds. This possibly could translate to level of OLSE as well: White students' access to better resourced educational contexts may have provided them with more exposure to direct mastery and vicarious mastery experiences

of online learning. South Africa as a country has large socioeconomic divides, which is historically racialised because of the cruel lasting effects of apartheid. It is the duty of higher education institutions to work towards closing these gaps for students, to ensure that students are afforded equal opportunities for experiencing confidence and success within the online learning context.

Participants living with parents/guardians or other family members had higher OLSE than participants in university residence and, in the model without influential values, those who specified Other for current residence also had higher OLSE levels than those in university residence. The Other category is comprised of students who live alone off-campus or who just specified other. Perhaps living with peers in residence can be more distracting from academic work because of parties and socialising more, while there may be higher levels of accountability, routines or structure in place when living with parents/guardians or other family members, or when living alone. These factors may affect the level of confidence that students feel in terms of managing online learning. It might be expected that when learning online from home, students may have less access to social persuasion and to vicarious experiences of efficacy (Bandura, 1977, 1994) than when on campus interacting directly with others. However, perhaps the verbal persuasion came more from family members than peers. In terms of vicarious experiences, part of Bandura's theory (1994) notes that seeing other people fail, even when they have put in a lot of effort, can weaken one's self-efficacy beliefs and efforts. Perhaps in residence, participants' peers were struggling in the same way that they were with online learning, and this is in turn weakened participants views about their own self-efficacy.

On average, participants within the current study had high access levels to online learning resources, including a quiet place to study, the internet, a laptop or computer and a smartphone. Participants that had more access to resources for online learning (as measured by the access index) had higher OLSE levels. This finding contrasts with a study done in South Africa with fourth year students with no previous experience of learning online, which found that levels of perceived computer efficacy were high even though only 46% had accessibility to a computer with internet where they reside (Queiros, & De Villiers, 2016). However, computer efficacy, which has to do with the technical use of computers, is different to OLSE, which encompasses one's feelings about capacities to manage the full online learning experience, not only computer efficacy.

The comparison of OLSE levels between those who did and did not do previous online learning approached significance within the bivariate analysis, however when considered simultaneously with the other variables in the regression model for OLSE, it did not approach significance any longer. In previous studies, experience with using computers predicts improved CSE for students in Indonesia (Kim & Park, 2017) and a higher number of previous courses taken online was associated with higher self-efficacy in terms of finishing an online course amongst American/Pacific Islander students (Shen et al., 2013). The current study's findings suggest that having the necessary current resources for online learning is of greater importance in the prediction of OLSE levels than previous experience with online learning. Regardless of previous experiences learning online, having a quiet place to study allows students to focus and work more effectively without distractions and thus they could have higher OLSE, and having access to a smartphone, the internet and laptop or computer allows students to do the required work and hopefully have sufficient time to do so. More access to these resources and more time with these resources can facilitate students to achieve, despite the challenging circumstances under which they are studying in terms of the COVID-19 pandemic. This can lend itself to mastery experiences (Bandura, 1977, 1994), which among students in tertiary education, has been found to have the greatest influence in forming a solid sense of self-efficacy (Van Dinther et al., 2011, p. 104).

Different types of funding, as a variable intended to be an indicator of socioeconomic status, had a significant association with OLSE levels within the bivariate analysis, however this was not a significant variable in the regression model, which may indicate that it was only a proxy for another variable, such as race. Within the COVID-19 pandemic, in the online learning context, the contextual challenges faced by race groups that have been historically disadvantaged may extend beyond the challenges that come with relying financially on a government supplied bursary, including, for example, having disadvantaged schooling backgrounds, which may impact OLSE as previously discussed.

Overall, these findings suggest that the diversity of our student sample was associated with varying OLSE levels. Participants from historically disadvantaged groups, with lower levels of access to online learning resources, and participants living in university residence, had less OLSE and students from these groups may therefore need greater levels of support from universities in order to boost their levels of OLSE. This is important to address because we

know that higher levels of self-efficacy are associated with better academic achievement amongst students (Alhadabi & Karpinski, 2020; Macakova & Wood, 2020; Roick & Ringeisen, 2017; Tilfarlioglu & Ciftci, 2011) and with enhanced wellbeing amongst students across different contexts, including in Iran (Tamannaeifar & Motaghedifard, 2014), Italy (Matteucci & Soncini, 2021), China (Tong & Song, 2004) and India (Siddiqui, 2015). Further, higher OLSE is associated with higher perceived learning, higher student satisfaction (Alqurashi, 2019), higher learning satisfaction (Tsai et al., 2020) and reduced boredom and frustration (Artino & McCoach, 2008) among those who have done or are taking online courses; better academic outcomes amongst students that have and do not have previous online learning experience (Zimmerman Kulikowich, 2016); and among South African students doing distance learning, better distance learning self-efficacy was significantly associated with greater academic success (Tladi, 2017). If online learning is to continue to be part of higher education, then ensuring that students who come from different backgrounds and have varying living circumstances have comparable OLSE levels should be prioritised by universities going forward. To ensure this, universities need to provide students with the necessary tools and support, which may include implementing bridging courses, step-by-step guides, or tutorials focused on improving OLSE. Further, universities need to do all that they can to facilitate every student having equal access to the necessary online learning resources. The consequence of failing to help students in this area can result in OLSE becoming yet another unjust barrier to the academic success of students who have less privileged backgrounds.

OLSE as a Risk Factor for Psychological Distress and Harmful Substance Use

University students have been learning mostly or completely online in the context of COVID-19. Going forward in higher education, blended or hybrid learning models seem to be the ‘new normal’ (Cabauatan et al., 2021; Pham & Ho, 2020). Thus, it is important to understand the possible risks that learning online could bring about for students. University students that have lower OLSE levels may have a greater vulnerability to negative psychosocial outcomes compared to students with a greater level of confidence in their online learning capabilities and capacities.

In this study, lower levels of OLSE predicted a higher risk of psychological distress, over and above the risks posed by sociodemographic and online learning context factors. This model

accounted for almost 20% of the variance in psychological distress amongst participants in this study, indicating that OLSE is a highly important contributor to the understanding of psychological well-being of students in the context of the COVID-19 pandemic and online learning. This finding supports previous findings that general self-efficacy is associated with enhanced wellbeing amongst students across different countries, including in Iran (Tamannaeifar & Motaghedifard, 2014), China (Tong & Song, 2004) and India (Siddiqui, 2015) and academic self-efficacy is a predictor for increased psychological well-being amongst undergraduate students in Italy (Matteucci & Soncini, 2021). However, this study extends these findings by specifically focusing on mental health risks posed by feelings of self-efficacy in the online learning context, instead of just self-efficacy in general. The findings of this study show that participants with lower self-efficacy levels in terms of the ability to manage online learning were at a higher risk for feeling psychological distress (i.e. depression, anxiety and stress symptoms). In addition to having feelings of inability and inadequacy about managing the demands of online learning, concerns about possibly failing their courses, financial implications of failing their courses, and potentially disappointing others could exacerbate the psychological distress that is associated with low levels of OLSE. Student mental health services are already overburdened (Brown, 2018) and higher distress levels among students struggling with OLSE will add to this if experiences of low OLSE are not effectively addressed by universities.

In this study, lower OLSE also predicted increased harmful alcohol and marijuana use, over and above the risk posed by sociodemographic and online learning context factors. These models accounted for around 12% of the variance in harmful alcohol use and nearly 10% of the variance in harmful marijuana use amongst participants in this study, indicating that OLSE plays an important role in the understanding the risk for problematic substance use amongst students within the context of the COVID-19 pandemic and online learning. One study found that increased substance use was associated with lower general self-efficacy amongst clinical students at a dental school in Turkey (Ersan et al., 2017). However, to the researcher's knowledge, this is the first time that the relationship between OLSE and harmful substance use among university students has been explored. As previously discussed in Chapter 2, harmful alcohol and marijuana use are already prevalent amongst many university samples around the world and cause many different negative harmful effects (Duke et al., 2011; Lee et al., 2020; Memedovich et al., 2018; Patrick et al., 2020; Rickwood et al., 2011;

Serras et al., 2010; Surujlal et al., 2012; White & Hingson, 2013). This current study shows that low OLSE levels could further heighten the risk for these harmful behaviours.

Thus, it appears that in this sample of university students during the COVID-19 pandemic, lower OLSE levels carried a higher risk for both psychological distress and harmful substance use. Over time, students in general may become more accustomed to, and better at, online learning as part of their higher education studies, but the findings of this study suggest that those students who have lower OLSE levels may continue to have a higher risk for negative mental health and substance misuse outcomes in comparison to those with who have more confidence in their ability to navigate online learning. Conversely, with more confidence in their ability to learn in the online environment, manage time and use technology, students may be at a decreased risk for psychological distress and engaging in harmful alcohol and marijuana use. This amplifies the urgent need for universities to establish supportive programmes in order to bolster levels of OLSE for those students who may struggle with this. Further, it points toward the need to identify potential protective factors and intervention mechanisms for university students that have low OLSE levels and are experiencing psychological distress or problematic substance use.

Social Support as a Moderator of the Relationship of OLSE With Psychological Distress and Harmful Substance Use

Social support on all levels, whether only from family, only friends and significant others, or from combined sources, predicted levels of psychological distress, where less social support was associated with increased psychological distress. Even within the context of the COVID-19 pandemic, where access to social support for many was radically changed in several ways, social support still appeared to lessen the likelihood of experiencing psychological distress. This aligns with numerous pre-pandemic studies where increased support was associated with a lower risk of depression (Alsubaie et al., 2019; Bruwer et al., 2008; Humm et al., 2018) and lower support was associated with increased negative mental health outcomes (Kugbey et al., 2015; Myer et al., 2008; Wang et al., 2014; Zhang et al., 2018). It further reflects similar findings amongst students during the COVID-19 pandemic, where decreased social support was associated with increased anxiety and depression symptoms in Iran (Ghafari et al., 2021), in China the presence of social support was found to be related to lower levels of anxiety

(Cao et al., 2020) and depression symptoms (Yu et al., 2021) and social support was found to be a protective factor against symptoms of anxiety in Switzerland (Amendola et al., 2021).

Students who had more social support during the COVID-19 pandemic would likely experience less distress because when one feels overwhelmed and distressed, one can seek counsel, reassurance and help to ease one's ones worries and difficulties. Aligning with the general benefits model (Rueger et al., 2016), perhaps students who were encouraged and supported by family members, friends and partners could better develop a sense of self-confidence and emotional safety in the stressful and challenging transitions of the COVID-19 pandemic and its lockdowns, which consequently had positive effects on their mental health. Further, relational regulation theory's emphasis on everyday conversations about what is happening on a day-to-day basis in an individual's life and from activities done together to aid in mental regulation (Lakey & Orehek, 2011) may be evident here, where ongoing daily support from loved ones buffered against students' psychological distress.

However, social support from family, friends and significant others, or combined sources, did not moderate the relationship between OLSE and psychological distress in the current study. Therefore, while less perceived social support predicts more psychological distress, perceived social support does not seem to be protective for participants against the psychological distress specifically predicted by OLSE. The students in this study's sample who struggled with their OLSE had a higher likelihood of experiencing psychological distress regardless of the level of perceived social support they were receiving. This finding is quite concerning because it does not align with the robust relationship that has been consistently reported in previous studies between social support and psychological distress. Within the context of the COVID-19 pandemic, there is the possibility that even when students perceive social support, it cannot reduce the psychological distress students are experiencing that specifically comes from feelings of incompetence and inadequacy about online learning. This again emphasizes the great need for universities to put strategies and systems into place to support the improvement of OLSE levels for students, because their naturally occurring social support systems within the context of online learning may not buffer against the negative psychological effects of low levels of OLSE.

In this current study, social support on any level did not predict harmful alcohol and marijuana use. There are contradictory findings within previous studies for the relationship

between social support and substance use. The findings in the current study are inconsistent with previous studies across multiple different countries that found increased social support is related to decreased alcohol use (Cullum et al., 2013; Orosova et al., 2014) and less/lack of support is related to some level of more substance use (Arias-De la Torre et al., 2019; Peltzer & Pengpid, 2017; Vanderbruggen et al., 2020). However, this current study's result is similar to previous findings of a lack of association/relation between social support and substance use amongst adolescents and students within different contexts (Nkoana et al., 2016; Blumenstock & Papp, 2021; Peltzer & Pengpid, 2017; Thompson, 2017). Overall, social support seems to not be as consistently related to substance use compared to psychological distress.

As found with psychological distress, perceived social support did not appear to play a moderating role in lessening the risk of harmful alcohol and marijuana use among university students that have low levels of OLSE. Participants with low levels of OLSE had a higher risk for both harmful alcohol and marijuana use regardless of the level of perceived social support they were receiving. Yet again this highlights the necessity for universities to support students in developing good OLSE, because students' current support systems that they have access to may not be adequate to protect against problematic substance use for students that have low levels of OLSE.

There is the possibility that social support did not moderate the negative risks that are associated with OLSE as the nature of the COVID-19 pandemic altered how students could access and experience their systems of support. The pandemic came with increased isolation, which may have caused students to be cut off from their main support sources or having less support than they previously did. The social support that was available to students may not have been sufficient in either quantity or quality as to buffer against negative outcomes for the students that felt especially overwhelmed by the challenges and demands of learning online. After the COVID-19 comes to an end, and social relations regain a sense of normalcy, social support could begin to play a more protective role within the relationship between OLSE and psychological distress and harmful alcohol and marijuana use. Future research would need to investigate this.

Psychological Distress as a Mediator of the Relationship Between OLSE and Problematic Substance Use

A novel finding from the current study is that psychological distress mediated the relationship between OLSE and harmful alcohol and marijuana use. The mediation models accounted for around 13% of the variance in harmful alcohol use and nearly 12% of the variance in harmful marijuana use among participants in this study and are thus an important contribution to understanding how of students are coping with online learning. These findings resonate with Khantzian's (1997) self-medication hypothesis, whereby people use substances to relieve painful feelings. As discussed in Chapter 2, it has been shown that mental health issues may increase substance use through using alcohol to cope with feelings of depression or anxiety (Cadigan et al., 2015; Kenney et al., 2018) and that, amongst students, those who drink alcohol to cope with negative feelings have a higher likelihood of being harmful drinkers (Cadigan et al., 2015; White et al., 2016). Substance use may be a means of coping that students used even before the COVID-19 pandemic, which they are continuing to utilise now, as in Bollen and colleagues (2021) study amongst Beligian adults. When students struggle with their education and have difficulties with learning (in this case a new method of learning online and remotely), it may cause feelings of distress, thus they turn to substances to cope with these feelings.

Through regression analysis, it was found that 29.3% of OLSE's total effect on harmful alcohol use goes through psychological distress, while the remainder is direct. For marijuana use, there was no direct effect when the mediator's effect was accounted for, so it can be seen that the role that psychological distress plays is particularly important for understanding how OLSE creates greater risk for harmful marijuana use.

Limitations

There were several limitations in the current study that should be considered when interpreting its results.

Firstly, this study's survey relied completely on participants' self-reports, which are subject to bias. Self-report bias, a measurement error, occurs when there is a discrepancy between what respondents report and what the reality is on the same instrument (Bauhoff, 2014).

When people are given self-report surveys that contain questions pertaining to sensitive topics, people's prejudices give rise to social desirability bias, so participants tend to overreport qualities that are viewed as socially desirable but underreport those that are not (Krumpal, 2014).Research has shown that people's concerns about social desirability predicted conflicting reports of substance use as well as reporting lower levels of substance use than what it was in reality (Johnson & Fendrich, 2005). Another study across different countries found that when they corrected for the bias of self-reports, there was higher "social disparities in hazardous drinking" for females but lower for males. (Devaux & Sassi, 2015, p. 129). However, this study did have an online survey, which allowed the responses to be totally anonymised and as noted in Chapter 2, because substance use is a sensitive topic, anonymity may enhance the honesty of responses and reduce social desirability effects (Furr, 2010).

Secondly, this was a cross-sectional study, which can establish the directionality of variables' relationships by use of correlations. However, it does not have the ability to ascertain causality. This would require a longitudinal study that is designed carefully (Cockcroft et al., 2019). There is the possibility that more complex relationships exist between the variables within this study, such as psychological distress acting to reduce self-efficacy, as Bandura (1994) postulated that one way to change people's beliefs about their efficacy is lessening their stress reactions and changing their negative affective tendencies and misunderstandings of physiological states. A longitudinal research design would be better suited to understanding these complexities.

Thirdly, this is a cross-sectional study, which was conducted within the second year of the COVID-19 pandemic, therefore it affords a snapshot of psychological distress and harmful marijuana and alcohol use and their related characteristics at a particular juncture (Levin, 2006). Within the first year of the COVID-19 pandemic, and in the coming years, the correlates and outcomes that are associated with OLSE could be different.

Because of SPSS's software limitations, the bootstrapped R square values were outsourced whereby Stata was used. Even though the seed was set as the same number, there remained slight differences between models on the different software programs because of bootstrapping. This difference would only be marginal though.

Due to time restrictions, multiple imputation was not done in this study and only complete cases were used for analysis. While there was still a large enough sample size for sufficient statistical power, it is possible that excluding cases that have missing data values skewed the results.

Implications of the Findings for Future Research and Practice

For future research, it is recommended that this study be replicated amongst students in other contexts, such as other countries of varying socioeconomic standings and at other universities within South Africa, as this study was done at only one university in South Africa, which has the means to, and does, provide students with some online learning resources (e.g. data and laptops where needed). The findings of access issues being a problem came through clearly even though the university did provide resources, so it would be vital to repeat this study in university contexts that are less well-resourced in order to see the extent of the problem.

Because of the narrow age range in the current study, age was not included as a variable in analyses. Previous research has reported mixed findings in terms of age and OLSE, where age was not associated with online learning technology self-efficacy (Aldhahi et al., 2021; Tanius, 2020) but in another context, there was a higher level of computer self-efficacy (CSE) in students 35 years old and older, as opposed to those under 35 (Jan, 2015). Queiros and De Villiers (2016) reported that students younger in age tended to have a higher view of their computing abilities and used the internet to do their schoolwork more than older students. Therefore, more clarity is needed around if students of different ages differ in their OLSE levels.

There is a need for replication of this study at different time periods, as learning online becomes part of a ‘new normal’ within higher education. There may be value in replicating this study in a couple of years’ time to see if there have been any changes as the higher education space continues to change, and to explore if the relationships examined in this study hold. A longitudinal study is recommended, as it allows for observing changes as time progresses in specific people that are in the cohort (Caruana et al., 2015). This will also allow the identification of patterns of causality (Cockcroft et al., 2019).

More research needs to be done to identify other possible protective factors for the relationship between OLSE and harmful substance use and psychological distress. This is necessary to help students cope better with the demands of and challenges within the online learning context.

The findings of the current study suggest that South African universities need to pay greater attention to supporting and helping students who are struggling with OLSE. Universities could screen students for low levels of OLSE and actively offer these students access to support. One intervention could involve students with higher OLSE levels mentoring and supporting those who are struggling with OLSE, or another possible intervention could be to implement bridging courses or tutorials focused on improving OLSE. Based on Bandura's (1977, 1994) main sources of self-efficacy, students could have practice workshops where they are taught and tasked with challenges related to OLSE in order to experience mastery experiences to build up their self-efficacy and universities could facilitate online workspaces for students to work together, whereby vicarious experiences can occur. Further, a buddy system with student mentors (Zahid et al., 2021) where students can be encouraged by other students could lend itself to social persuasion, which Bandura argues helps to strengthen self-efficacy (Bandura, 1994, 1977). Ultimately, evaluation studies testing whether these interventions are effective in increasing OLSE levels and reducing psychological distress that is associated with OLSE, would be valuable. If levels of OLSE are improved, there may be less need for campus mental health service providers to address psychological distress and harmful substance use.

Conclusion

Online learning self-efficacy is a key concept to the understanding how students have coped with the challenges and demands of higher education's rapid switch to learning online brought about by the COVID-19 pandemic. In this study, OLSE has been shown to vary according to sociodemographic characteristics and different online learning contexts, where some students have a significantly higher likelihood to struggle with OLSE. This can worsen and perpetuate the existing inequalities that exist within South Africa's education system. When controlling for sociodemographic factors and online learning context factors, lower OLSE was a significant predictor of higher psychological distress and increased harmful substance use, and social support did not moderate these relationships. Further, psychological

distress mediated the relationships between OLSE and harmful alcohol and marijuana use. These findings indicate that OLSE is an important predictor of how university students cope with online learning demands and suggest that students with lower OLSE should be identified and better supported with strategies to improve their OLSE levels. Further, students with lower OLSE levels may need greater mental health support from universities within the context of online learning, as their existing social supports do not appear to be adequately protective.

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APPENDIX A

Sociodemographic information

Age _____

Gender

- ☐ Male
- ☐ Female
- ☐ Non-binary
- ☐ I prefer not to respond

Which racial group do you identify with?

- ☐ SA African
- ☐ SA Coloured
- ☐ SA Indian
- ☐ SA White
- ☐ Other
- ☐ I Prefer Not to Respond

Year of study

- ☐ First year undergraduate
- ☐ Second year undergraduate
- ☐ Third year undergraduate
- ☐ Fourth year undergraduate
- ☐ Postgraduate (including coursework)
- ☐ Postgraduate (dissertation only)
- ☐ Other

Current residence

- ☐ University residence
- ☐ Shared house/flat with other students
- ☐ Living alone off-campus
- ☐ Living with parents/guardians or other family members

- ☐ Other

Type of university funding

- ☐ National Student Financial Aid Scheme
- ☐ Private Bursary
- ☐ Funded by Parent/ Guardian or Self-Funded
- ☐ A combination of the above
- ☐ Other

Do you have a quiet place where you can study?

- ☐ Yes
- ☐ No
- ☐ Only sometimes

Do you have access to the internet?

- ☐ Yes
- ☐ No
- ☐ Only sometimes

Do you have access to a laptop or computer?

- ☐ Yes
- ☐ No
- ☐ Only sometimes

Do you have access to a smartphone?

- ☐ Yes
- ☐ No
- ☐ Only sometimes

Does the university provide you with sufficient data to do your work?

- ☐ Yes
- ☐ No

Have you done online learning before 2021, at school or at university?

- ☐ Yes
- ☐ No

Are you having any in-person tutorials, labs or practical work in addition to online learning this semester?

- ☐ Yes
- ☐ No

APPENDIX B

The Online Learning Self-Efficacy Scale (OLSES; Zimmerman & Kulikowich, 2016; Zimmerman, 2015)

The Online Learning Self-Efficacy Scale

Rate your confidence in your current ability to perform the following tasks related to learning online successfully. A rating of 1 is the lowest. Give a rating of 1 to any tasks that you have no confidence that you could complete successfully. A rating of 6 is the highest. Give a rating of 6 to any tasks that you have complete confidence that you could complete successfully. Or give a rating somewhere in-between.

No confidence **Complete confidence**

1 2 3 4 5 6

1. Navigate online course materials efficiently
2. Find the course outline on the Vula site
3. Communicate effectively with my lecturer, tutor or supervisor via e-mail
4. Communicate effectively with UCT technical support (ICTS)
5. Submit assignments on Vula/online
6. Overcome technical difficulties on my own
7. Navigate the online gradebook
8. Manage time effectively
9. Complete all assignments on time
10. Learn to use a new type of technology efficiently
11. Learn without being in the same room as the lecturer, tutor or supervisor
12. Learn without being in the same room as other students
13. Search the Internet to find the answer to a course-related question
14. Search the online course materials
15. Communicate using technologies that are not in real time (e.g. Vula discussion forums, chat rooms, e-mail, WhatsApp etc.)
16. Meet deadlines with very few reminders

17. Complete a group project entirely online
18. Use real-time technology to talk directly with others (such as Zoom/Microsoft Teams/Google hangouts/ Skype)
19. Focus on university work when faced with distractions
20. Develop and follow a plan for completing all required work on time
21. Use the library's online resources efficiently
22. When a problem arises, promptly ask questions in the appropriate forum (e-mail, Vula discussion board, ICTS helpdesk etc.)

APPENDIX C

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988; Zimet et al., 1988 as cited in Zimet, 2016)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you Very Strongly Disagree
Circle the "2" if you Strongly Disagree
Circle the "3" if you Mildly Disagree
Circle the "4" if you are Neutral
Circle the "5" if you Mildly Agree
Circle the "6" if you Strongly Agree
Circle the "7" if you Very Strongly Agree

1. There is a significant other/partner who is around when I am in need. 1 2 3 4 5 6 7
2. There is a significant other/partner with whom I can share my highs and lows. 1 2 3 4 5 6 7
3. My family really tries to help me. 1 2 3 4 5 6 7
4. I get the emotional help and support I need from my family. 1 2 3 4 5 6 7
5. I have a significant other/partner who is a real source of comfort to me. 1 2 3 4 5 6 7
6. My friends really try to help me. 1 2 3 4 5 6 7
7. I can count on my friends when things go wrong. 1 2 3 4 5 6 7
8. I can talk about my problems with my family. 1 2 3 4 5 6 7
9. I have friends with whom I can share my highs and lows. 1 2 3 4 5 6 7
10. There is a significant other/partner in my life who cares about my feelings. 1 2 3 4 5 6 7
11. My family is willing to help me make decisions. 1 2 3 4 5 6 7
12. I can talk about my problems with my friends. 1 2 3 4 5 6 7

APPENDIX D

Depression Anxiety Stress Scales (DASS-21; Antony et al., 1998; Lovibond & Lovibond, 1995a; Lovibond & Lovibond, 1995c).

For each of the statements below, please circle the number which best indicates how much the statement applied to you OVER THE PAST WEEK. There are no right or wrong answers.

Did not apply to me at all (0)
Applied to me to some degree, or some of the time (1)
Applied to me a considerable degree, or a good part of the time (2)
Applied to me very much, or most of the time (3).

1. I found it hard to wind down. 0 1 2 3
2. I was aware of dryness of my mouth. 0 1 2 3
3. I couldn't seem to experience any positive feeling at all. 0 1 2 3
4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion). 0 1 2 3
5. I found it difficult to work up the initiative to do things. 0 1 2 3
6. I tended to over-react to situations. 0 1 2 3
7. I experienced trembling (e.g. in the hands). 0 1 2 3
8. I felt that I was using a lot of nervous energy. 0 1 2 3
9. I was worried about situations in which I might panic and make a fool of myself. 0 1 2 3
10. I felt that I had nothing to look forward to. 0 1 2 3
11. I found myself getting agitated. 0 1 2 3
12. I found it difficult to relax. 0 1 2 3
13. I felt downhearted and sad. 0 1 2 3
14. I was intolerant of anything that kept me from getting on with what I was doing. 0 1 2 3
15. I felt I was close to panic. 0 1 2 3
16. I was unable to become enthusiastic about anything. 0 1 2 3
17. I felt that I wasn't worth much as a person. 0 1 2 3
18. I felt I was rather touchy or irritable. 0 1 2 3
19. I was aware of the action of my heart in the absence of physical exertion

(e.g. sense of heart rate increase, heart missing a beat). 0 1 2 3

20. I felt scared without any good reason. 0 1 2 3

21. I felt that life was meaningless. 0 1 2 3

APPENDIX E

The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993)

THE AUDIT

Please choose the answer that is correct for you

A1. How often do you have a drink containing alcohol?

□ Never □ Monthly or less □ 2- 4 times per month □ 2 to 3 times a week □ 4 or more times a week

A2. How many drinks containing alcohol do you have on a typical day when you are drinking?
(If you answered Never above, please leave out this item)

□ 1 or 2 □ 3 or 4 □ 5 or 6 □ 7 to 9 □ 10 or more

A3. How often do you have six or more drinks on one occasion?

□ Never □ Less than monthly □ Monthly □Weekly □ Daily or almost daily

A4. How often during the last year have you found that you were not able to stop drinking once you started?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A5. How often during the last year have you failed to do what is normally expected from you because of drinking?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A7. How often during the last year have you had a feeling of guilt or remorse after drinking?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A9. Have you or someone else been injured as a result of your drinking?

□ Never □ Less than monthly □ Monthly □ Weekly □ Daily or almost daily

A10. Has a relative or friend, or a doctor or other health worker been concerned about your drinking or suggested that you cut down?

□ No □ Yes, but not in the last year □ Yes during the last year

APPENDIX F

These are questions about your use of marijuana (also called dagga, cannabis, weed or dope). How often do you use marijuana? (Please select the correct answer)

- ☐ Never
- ☐ Once a month or less
- ☐ 2-4 times a month
- ☐ 2-3 times a week
- ☐ 4 times a week or more often

How many times do you use marijuana on a typical day when you use marijuana? (Please select the correct answer)

- ☐ I do not use marijuana
- ☐ 1-2 times a day
- ☐ 3-4 times a day
- ☐ 5-6 times a day
- ☐ 7 times or more often

The Brief Marijuana Questionnaire (B-MACQ; Simons et al., 2012)

The Brief Marijuana Consequences Questionnaire - B-MACQ
The following is a list of things that sometimes happen to people either during, or after they have been using marijuana. Select either YES or NO to indicate whether that item describes something that has happened to you IN THE PAST 6 MONTHS.
If you have not used marijuana in the past 6 months, just reply NO to each item below

	Yes	No
1. The quality of my work or schoolwork has suffered because of my marijuana use.		
2. I have driven a car when I was high.		
3. I have felt in a fog, sluggish, tired, or dazed the morning after using marijuana.		

4. I have been unhappy because of my marijuana use.		
5. I have gotten into physical fights because of my marijuana use.		
6. I have spent too much time using marijuana.		
7. I have felt like I needed a hit of marijuana after I'd gotten up.		
8. I have become very rude, obnoxious, or insulting after using marijuana.		
9. I have been less physically active because of my marijuana use.		
10. I have had trouble sleeping after stopping or cutting down on marijuana use.		
11. I have neglected obligations to family, work, or school because of my marijuana use.		
12. When using marijuana I have done impulsive things that I regretted later.		
13. I have awakened the day after using marijuana and found I could not remember a part of the evening before.		
14. I have been overweight because of my marijuana use.		
15. I haven't been as sharp mentally because of my marijuana use.		
16. I have received a lower grade on an exam or paper than I ordinarily could have because of marijuana use.		
17. I have tried to quit using marijuana because I thought I was using too much.		
18. I have felt anxious, irritable, lost my appetite or had stomach pains after stopping or cutting down on marijuana use.		
19. I often have thought about needing to cut down or to stop using marijuana.		
20. I have had less energy or felt tired because of my marijuana use.		
21. I have lost motivation to do things because of my marijuana use.		

APPENDIX G

Advertisement for Psychology students

Subject: SURVEY OF ONLINE LEARNING AND MENTAL HEALTH: EARN 1 SRPP POINT [SRPP 2021]

INVITATION TO TAKE PART IN AN ONLINE SURVEY ABOUT THE RELATIONSHIP BE TWEEN ONLINE LEARNING, MENTAL HEALTH AND SUBSTANCE USE: EARN 1 SRPP POINT

Dear students,

My name is Tiffany Henning and I am currently doing my Master of Arts in Psychological Research.

I am inviting you to participate in my Masters research study. The study aims to explore the relationship between online learning experiences, mental health and subst ance use among South African university students during the time of physically distanced learning. I would also like to explore the role that social support can play in influencing these relationships. This could yield some useful information about how to help students cope with online learning demands at university.

What does taking part in this study involve?

- This study involves you completing an anonymous online survey with questions about online learning, mental health, substance use and social support.
- It will take approximately 15 - 20 minutes to complete this survey.

Who can participate in this study?

If you are a UCT student, you are eligible to be a participant.

How will my participation be kept private and confidential?

All survey responses will be totally anonymous. You will not provide your name or other identifying details on the survey. Identifying information such as names, student numbers, and course codes will be required for your SRPP point, however this information will be entered on a completely separate web page after you have completed the survey. There is no way to link your survey responses with your identifying information. Your survey responses and your SRPP details will be stored separately in password protected files on the password protected computer of the researcher.

Are there any benefits to taking part?

- You will receive 1 SRPP point for completing the full survey.
- You will contribute to a better understanding of the support needs of students who are engaged in online learning at university.

Are there any risks to taking part?

- The only possible risk is that you might feel some discomfort or distress when answering questions about your mental health, substance use or social support. You may choose not to answer a specific question if you prefer, and you may withdraw from this study at any stage without any consequences, except that you will not receive an SRPP credit. You may also choose not to participate in the survey at all and rather obtain SRPP points in other ways e.g. through a different study offering SRPP points.

If you would like to participate in this study, follow this link for the survey or paste it into your browser:

https://forms.gle/ttNSnmpVPZmY51S67

If you have any queries or want any information about the research, please contact me at HNNTIF001@myuct.ac.za
Many thanks,
Tiffany Henning

APPENDIX H

Ethics Review Committee of the Faculty of Humanities Ethics Approval Letter

UNIVERSITY OF CAPE TOWN

Department of Psychology

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

07 April 2021

Tiffany Henning
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Tiffany

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for the amendments to your study, *Relationship between online-learning self-efficacy and risk for psychological distress and harmful substance use in South African university students.* The reference number remains PSY2020-061.

I wish you all the best for your study.

Yours sincerely

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

APPENDIX I

Human Research Ethics Committee Ethics Approval Letter

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room G50- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-enquiries@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

01 September 2021

HREC REF: 280/2021

A/Prof D Kaminer
Department of Psychology
Upper Campus -UCT
Email: Debbie.kaminer@uct.ac.za
Student: Hntif001@myuct.ac.za

Dear A/Prof Kaminer

PROJECT TITLE: RELATIONSHIP BETWEEN ONLINE-LEARNING SELF-EFFICACY AND RISK FOR PSYCHOLOGICAL DISTRESS AND HARMFUL SUBSTANCE USE IN SOUTH AFRICAN UNIVERSITY STUDENTS. (MASTER'S DEGREE - MS TIFFANY HENNING)

Thank you for your response letter, addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

This approval is subject to strict adherence to the HREC recommendations regarding research involving human participants during COVID -19, dated 17 March 2020: 06 July 2020 & 01 July 2021.

Approval is granted for one year until the 30 September 2022.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: - Ms Tiffany Henning will also be involved in this study

Please quote the HREC REF 280/2021 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

APPENDIX J

Advertisement for general UCT population

[Dsa_research_invitations-l] Research Invitation: Relationship between online learning, mental health & substance use

Dear students,

My name is Tiffany Henning and I am currently doing my Master of Arts in Psychological Research.

I am inviting you to participate in my Masters research study. The study aims to explore the relationship between online learning experiences, mental health and subst ance use among South African university students during the time of physically distanced learning. I would also like to explore the role that social support can play in influencing these relationships. This could yield some useful information about how to help students cope with online learning demands at university.

What does taking part in this study involve?

- This study involves you completing an anonymous online survey with questions about online learning, mental health, substance use and social support.
- It will take approximately 15 - 20 minutes to complete this survey.

Who can participate in this study?

- If you are a UCT student 18 years old or above, you are eligible to participate.
- If you have already completed this survey as part of the Psychology Student Research Participation Programme (SRPP), please do NOT take it again.

How will my participation be kept private and confidential?

All survey responses will be totally anonymous. You will not provide your name or other identifying details on the survey. There is no way to link your survey responses with your identifying information. Your survey responses will be stored in a password protected file on the password protected computer of the researcher.

Are there any benefits to taking part?

- You will contribute to a better understanding of the support needs of students who are engaged in online learning at university.

Are there any risks to taking part in this study?

- This is a low-risk study. The only possible risk is that you might feel some discomfort or distress when answering questions about your mental health, substance use or

social support. You may choose not to answer a specific question if you prefer, and you may withdraw from this study at any stage without any consequences. You may also elect not to participate in the survey at all.

If you would like to participate in this study, follow this link for the survey:

https://forms.gle/dvf1FHKNgRJuqgwB8

If you have any queries or want any information about the research, please contact me at HNNTIF001@myuct.ac.za.

Many thanks,
Tiffany Henning – Researcher
HNNTIF001@myuct.ac.za

APPENDIX K

Consent form for Psychology students

Survey on online learning, social support, mental health and substance use

*Required

Consent Form

Dear students,

My name is Tiffany Henning and I am currently doing my Master of Arts in Psychological Research.

I am inviting you to participate in my Masters research study. The study aims to explore the relationship between online learning experiences, mental health and substance use among South African university students during the time of physically distanced learning. I would also like to explore the role that social support can play in influencing these relationships. This could yield some useful information about how to help students cope with online learning demands at university.

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If you are a UCT student, you are eligible to be a participant.

How will my participation be kept private and confidential?

All survey responses will be totally anonymous. You will not provide your name or other identifying details on the survey. Identifying information such as names, student numbers, and course codes will be required in order to get your SRPP point, however this information will be entered on a completely separate web page after you have completed the survey. There is no way to link your survey responses with your identifying information. Your survey responses and your SRPP details will be stored separately in password protected files on the password protected computer of the researcher.

Are there any benefits to taking part?

o You will receive 1 SRPP point for completing the full survey.
o You will contribute to a better understanding of the support needs of students who are engaged in online learning at university.

Are there any risks to taking part in this study?

o This is a low-risk study. The only possible risk is that you might feel some discomfort or distress when answering questions about your mental health, substance use or social support. You may choose not to

answer a specific question if you prefer, and you may withdraw from this study at any stage without any consequences, except that you will not receive an SRPP credit. You may also elect not to participate in the survey at all and rather obtain SRPP points in other ways e.g. through a different study offering SRPP points.

If you wish to obtain further information about this study, please contact the researcher Tiffany Henning at HNNTIF001@myuct.ac.za or the research supervisor A.Prof. Debbie Kaminer at debbie.kaminer@uct.ac.za. If you have any queries or concerns about your rights as a participant please contact Rosalind Adams at rosalind.adams@uct.ac.za

BY CLICKING "I CONSENT TO PARTICIPATE" BELOW, YOU CONSENT TO PARTICIPATE IN THIS RESEARCH STUDY. IF YOU DO NOT CONSENT TO PARTICIPATE DO NOT CLICK BELOW AND YOU CAN CLOSE THIS WEBPAGE NOW.

* *

□ I CONSENT TO PARTICIPATE

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Clear form

APPENDIX L

Consent form for general UCT population

Survey on online learning, social support, mental health and substance use

*Required

Consent Form

Dear students,

My name is Tiffany Henning and I am currently doing my Master of Arts in Psychological Research.

I am inviting you to participate in my Masters research study. The study aims to explore the relationship between online learning experiences, mental health and substance use among South African university students during the time of physically distanced learning. I would also like to explore the role that social support can play in influencing these relationships. This could yield some useful information about how to help students cope with online learning demands at university.

What does taking part in this study involve?

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o It will take approximately 15 - 20 minutes to complete this survey.

Who can participate in this study?

o If you are a UCT student 18 years old and above, you are eligible to be a participant.
o If you have already completed this survey as part of the Psychology Student Research Participation Programme (SRPP), please do NOT take it again.

How will my participation be kept private and confidential?

All survey responses will be totally anonymous. You will not provide your name or other identifying details on the survey. There is no way to link your survey responses with your identifying information. Your survey responses will be stored in a password protected file on the password protected computer of the researcher.

Are there any benefits to taking part?

o You will contribute to a better understanding of the support needs of students who are engaged in online learning at university.

Are there any risks to taking part in this study?

o This is a low-risk study. The only possible risk is that you might feel some discomfort or distress when answering questions about your mental health, substance use or social support. You may choose not to answer a specific question if you prefer, and you may withdraw from this study at any stage without any consequences. You may also elect not to participate in the survey at all.

If you wish to obtain further information about this study, please contact the researcher Tiffany Henning at HNNTIF001@myuct.ac.za or the research supervisor A.Prof. Debbie Kaminer at debbie.kaminer@uct.ac.za. If you have any queries or concerns about your rights as a participant please contact Rosalind Adams at rosalind.adams@uct.ac.za or the UCT Human Research Ethics Committee at hrec-enquiries@uct.ac.za or 021 6501236.

BY CLICKING "I CONSENT TO PARTICIPATE" BELOW, YOU CONSENT TO PARTICIPATE IN THIS RESEARCH STUDY. IF YOU DO NOT CONSENT TO PARTICIPATE DO NOT CLICK BELOW AND YOU CAN CLOSE THIS WEBPAGE NOW.

* *

I CONSENT TO PARTICIPATE

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Page 2 of 8

Clear form

APPENDIX M

Details for SRPP credit

Details for SRPP credit

Please note that each student can only claim 1 SRPP point for taking part in this study; duplicate claims will be disregarded.

hnntif001@myuct.ac.za (not shared) Switch accounts

Student number

Your answer

Surname, First name (example of format: Henning, Tiffany)

Your answer

Which course code do you want this SRPP point to be allocated to e.g. PSY1005S

Your answer

Submit

APPENDIX N

Note: The highlighted sections that speak to SRPP points was excluded when recruiting from the general UCT population

Debrief form:

Survey on online learning, social support, mental health and substance use

Thank you for participating in this survey. Please take a screenshot of this page right now.

At the end of this page there is a link that will take you to a separate web page where you can submit your details for your SRPP credit if you need it. But first, please read the information below.

If you have any concerns about your level of social support, mental health, or use of alcohol or marijuana, please contact one of the following UCT support services:

UCT Wellness Centre Counselling Service
Telephone number: 021 650 1017
Website for online bookings: http://www.dsa.uct.ac.za/student-wellness/counseling-services/overview

SADAG / UCT Student Careline
0800 24 25 26 (free from a Telkom line) or send an SMS to: 31393 for a "call-me-back" service.

The following services can also assist if you have concerns about your alcohol or marijuana use:
UCT Wellness Centre Health Service
Telephone number: 021 650 1020
Website for online bookings: http://www.dsa.uct.ac.za/student-wellness/health-services/overview

Cape Town Drug Counselling Centre (Observatory)
Address: 1 Roman Road, Observatory, Cape Town
Telephone number: 021 447 8026
E-mail address: ashley@drugcentre.org.za

To find other substance abuse treatment centres in the Western Cape, please follow this link: https://www.westerncape.gov.za/directories/facilities/736

If you would like to view the completed study, it will be provided to you upon request by emailing me at HNNTIF001@myuct.ac.za. The study will be completed by the end of the 2021 UCT academic year.

CLICK ON THIS LINK TO SUBMIT YOUR DETAILS FOR THE SRPP CREDIT:
https://forms.gle/u2v28t7H357Z2aYH8

APPENDIX O

Frequency distributions of scale variables

Figure 6

Histogram of the access index

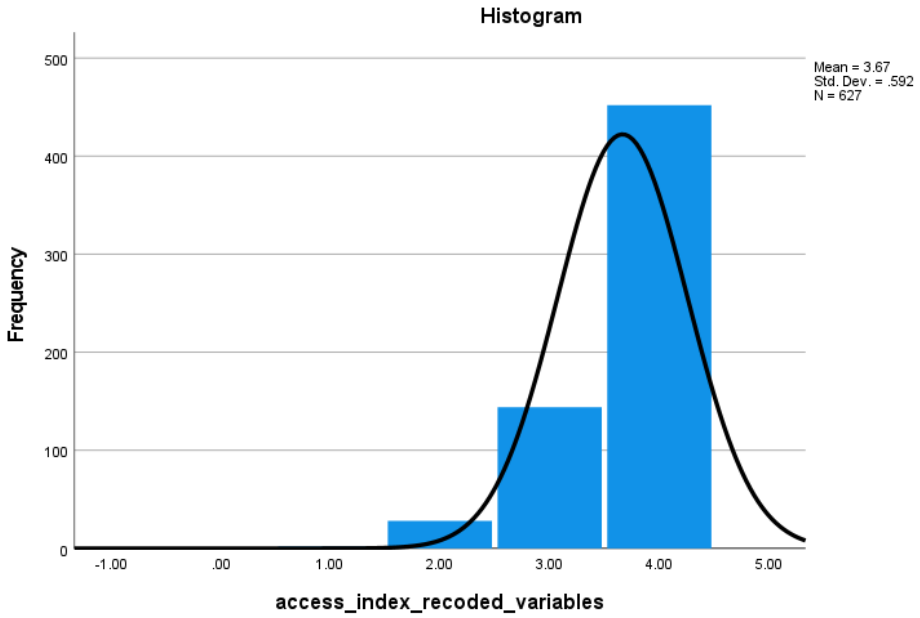

Figure 7

Histogram of the OLSES total score

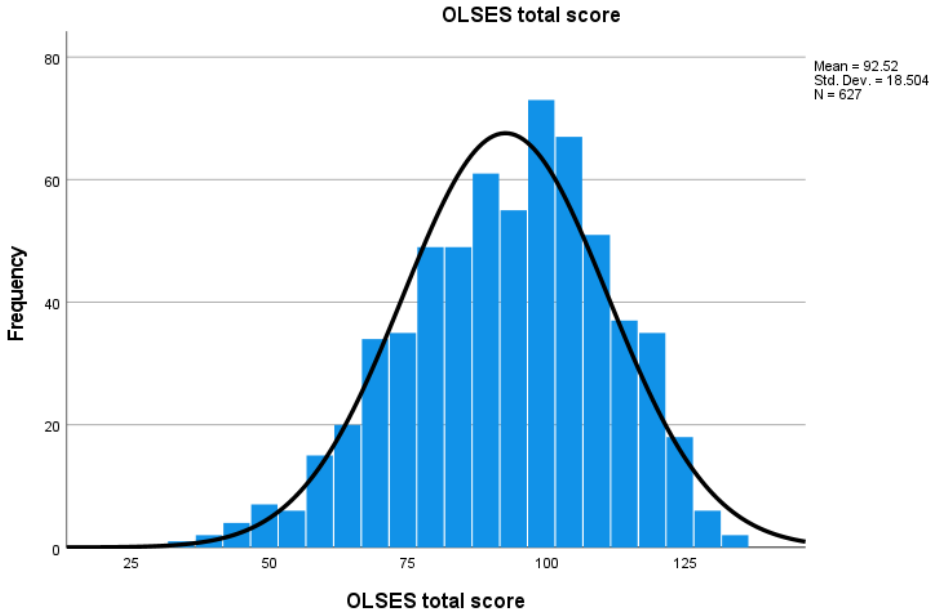

Figure 8

Histogram of the MSPSS total score

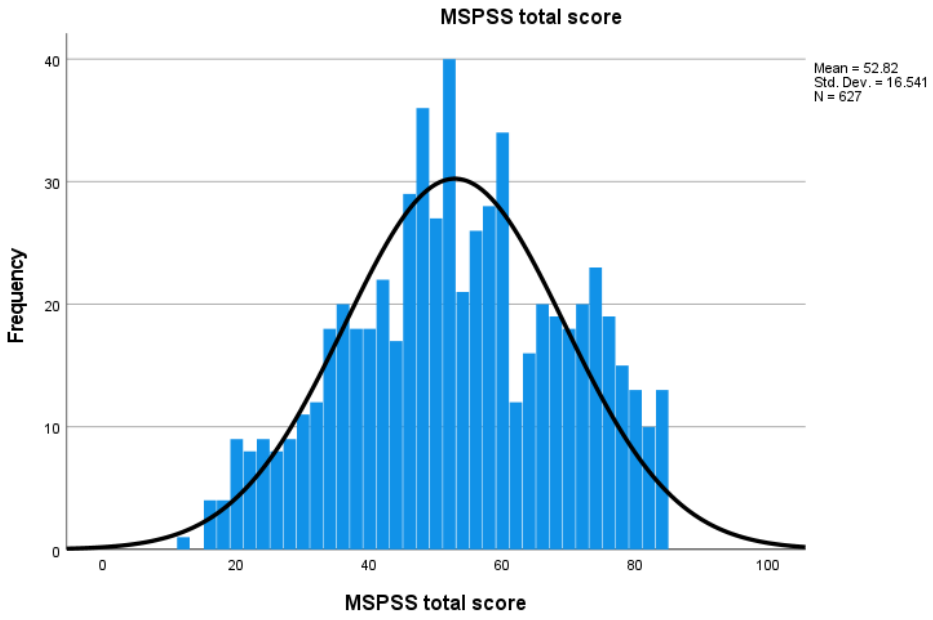

Figure 9

Histogram of the family subscale

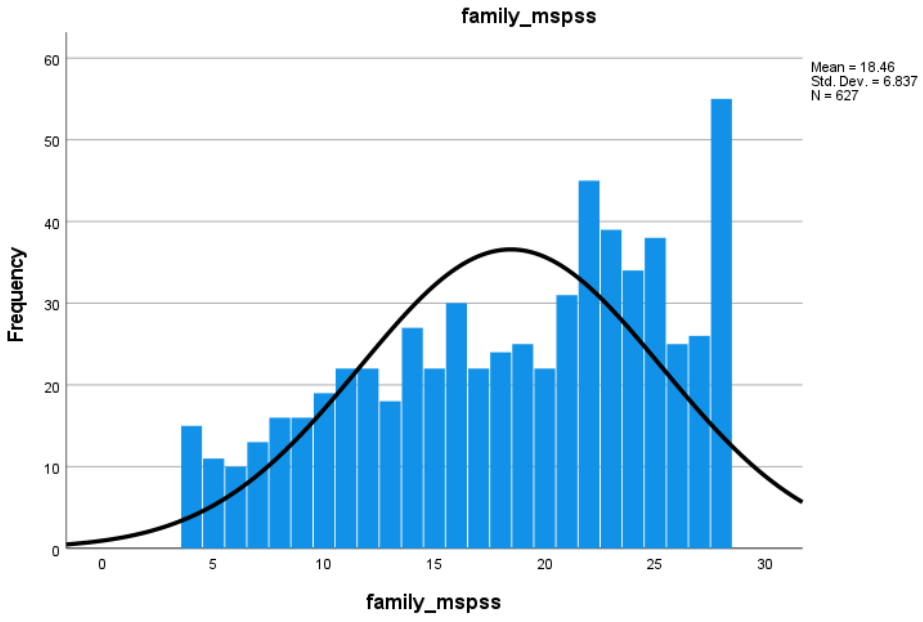

Figure 10

Histogram of the friends and significant other subscale

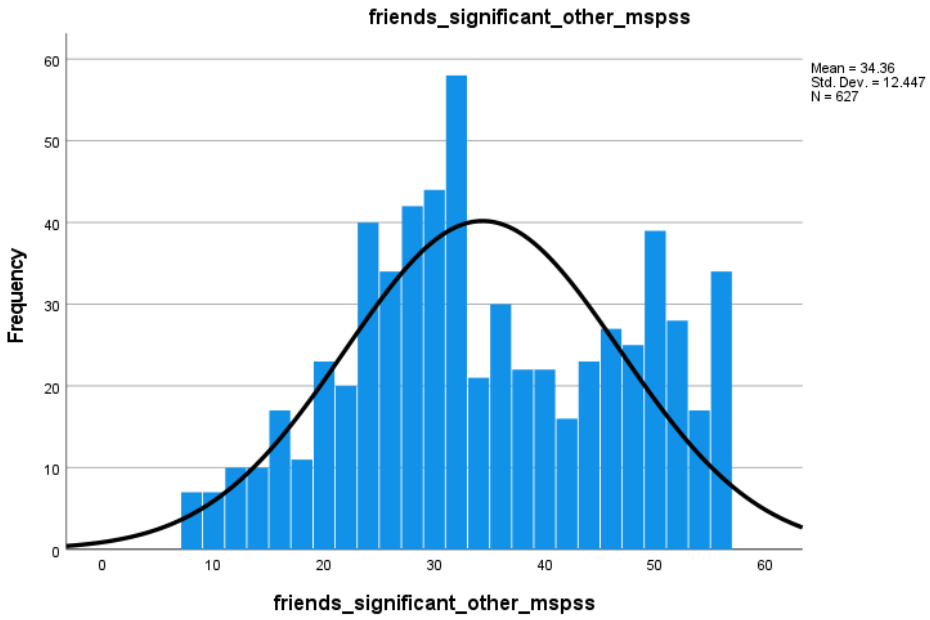

Figure 11

Histogram of the DASS total score

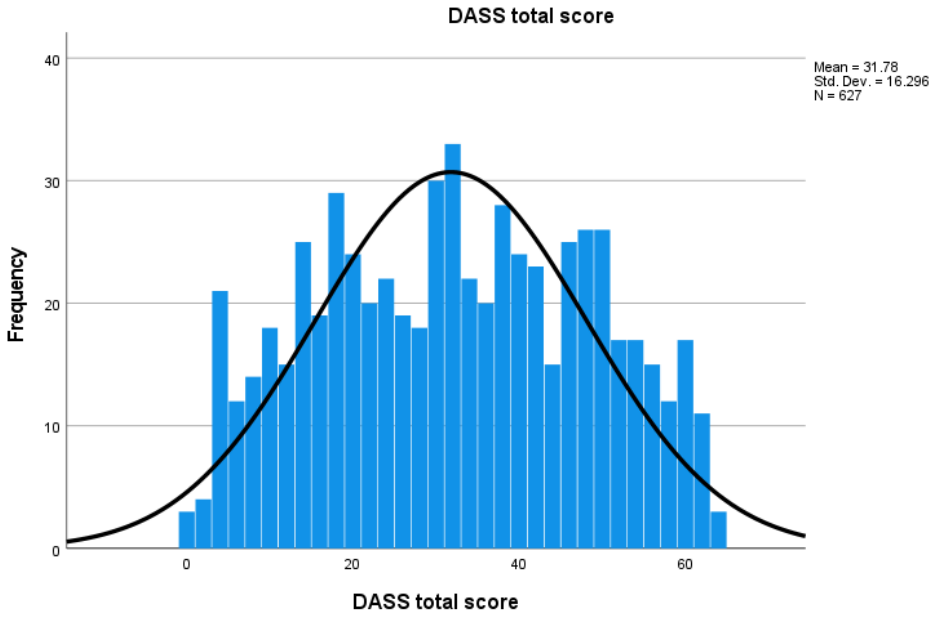

Figure 12

Histogram of the AUDIT total score

Figure 13

Histogram of the B-MACQ total score