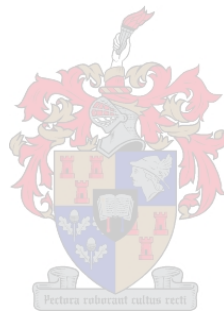


Development and Evaluation of an Academic Performance Structural Model for a Sample of Tertiary Students in South Africa

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Thesis submitted in partial fulfilment of the requirements for the degree of Master of Commerce (Industrial Psychology) in the Faculty of Economic and Management Sciences at Stellenbosch University

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Date: April 2022

DECLARATION

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third-party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

Given the low socio-economic status of a large percentage of South African citizens, the alleviation of poverty, unemployment and income inequality poses a core concern which could partly be addressed by the increased attainment of tertiary academic qualifications by a larger number of citizens.

Far-reaching repercussions that have persisted for years following the abolishment of the Apartheid regime, have resulted in income inequalities, high levels of poverty and continued disadvantage (Statistics South Africa, 2017a). The COVID-19 pandemic placed further strain on an already struggling economy (Council on Higher Education, 2020).

Research shows that educational attainment is closely correlated with poverty and inequality in populations. During the COVID-19 pandemic, South Africans with lower educational levels were more likely to receive reduced salaries than those with higher levels of education (Statistics South Africa, 2020). Therefore, educating a larger number of South African citizens at a tertiary level presents a sustainable, long-term solution for the creation of more skilled and semi-skilled individuals in the country over time.

The current study therefore sought to identify the most salient antecedents of variance in the tertiary academic performance of South African students. From the literature, the variables of mental toughness, imposing student 'job' demands, stress surplus, and engagement were identified as possible antecedents to academic performance outcomes. The job demands-resources model (JD-R model) was identified as the most suitable theoretical framework to guide the study.

A structural model was developed and empirically tested to explain the complex interactions between the variables and to determine whether/to what degree the variables cause variance in the tertiary academic performance in the sample of undergraduate students at Stellenbosch University in South Africa.

After obtaining ethical clearance, institutional permission, and informed consent from the respective parties, quantitative data were collected electronically (via email) from a sample of 600+ undergraduate tertiary students. The human rights of the participants were respected throughout the research process by strictly adhering to research ethics.

Participants were asked to complete a voluntary, self-administered, online questionnaire consisting of six sections, namely biographical information, academic performance information, job demands items, mental toughness items, stress overload items, and engagement items. The items were combined to form a composite questionnaire.

To empirically test the data, an exploratory ex post facto correlational research design was followed. The statistical techniques of Item Analysis (IA), Confirmatory Factor Analysis (CFA), Exploratory Factor Analysis (EFA), and Partial Least Squares (PLS) Structural Equation Modelling (SEM) were utilised to analyse the data, after which the various hypotheses were tested.

Seven path-specific hypotheses with five main interaction effects and two moderating interaction effects were formulated. From the results, the five main hypotheses were found to be statistically significant with one hypothesis not moving in the direction proposed by the literature. Neither of the hypothesised moderating effects were found to be statistically significant.

The objectives of the study were reflected on, limitations of the study and recommendations for future researchers were provided, followed by the provision of various practical implications and suggestions from the research findings.

OPSOMMING

Gegewe die lae sosio-ekonomiese status van 'n groot persentasie Suid-Afrikaanse burgers, hou die verligting van armoede, werkloosheid en ongelykheid in inkomste 'n kernbekommernis in wat deels aangespreek kan word deur die toenemende bereiking van tersiêre akademiese kwalifikasies deur 'n groter aantal burgers.

Verreikende gevolge – wat jare lank voortgeduur het ná die afskaffing van die Apartheidsregime – het gelei tot inkomsteongelykhede, hoë vlakke van armoede en voortgesette nadeel (Statistieke Suid-Afrika, 2017a). Die COVID-19-pandemie het verdere druk op 'n reeds sukkelende ekonomie geplaas (Raad op Hoër Onderwys, 2020).

Navorsing toon dat die verkryging van opleiding verband hou met armoede en ongelykheid in bevolking. Tydens die COVID-19-pandemie was Suid-Afrikaners met laer opleidingsvlakke meer geneig om verminderde salarisse te ontvang as dié met hoër opleidingsvlakke (Statistieke Suid-Afrika, 2020). Daarom bied 'n groter aantal Suid-Afrikaanse burgers op tersiêre vlak 'n volhoubare, langtermynoplossing vir die skepping van geskoolde opvolgers om die getal geskoolde werknemers en gedeeltelik bemeesterde individue in die land met verloop van tyd te verhoog.

Die huidige studie het dus gepoog om die mees gesoute voorbesorgers van variansie in die tersiêre akademiese prestasie van Suid-Afrikaanse studente te identifiseer. Uit die literatuur is die veranderlikes van verstandelike gehardheid, die oplegging van studente se werksvereistes, stres oorlading en betrokkenheid as moontlike voorvereistes vir akademiese prestasie-uitkomste geïdentifiseer. Die werkvereistes-hulpbronnemodel (JD-R-model) is geïdentifiseer as die geskikste teoretiese raamwerk om die studie te lei.

'n Strukturele model is ontwikkel om die komplekse interaksies tussen die veranderlikes te verduidelik en vas te stel of/tot watter mate die veranderlikes afwyking in die tersiêre akademiese prestasie in die steekproef van voorgraadse studente aan die Universiteit Stellenbosch in Suid-Afrika veroorsaak.

Na die verkryging van etiese klaring, institusionele toestemming, en ingeligte toestemming van die onderskeie partye verleen is, is kwantitatiewe data elektronies (per e-pos) ingesamel van 'n steekproef van 600+ voorgraadse tersiêre studente. Die

menseregte van die deelnemers is regdeur die navorsingsproses gerespekteer deur streng by navorsingsetiek te hou.

Deelnemers is gevra om 'n vrywillige, self-geadministreerde, aanlyn vraelys bestaande uit ses afdelings te voltooi, naamlik biografiese inligting, akademiese prestasie inligting, werkvereiste-items, verstandelike gehardheidsitems, stres oordadingsitems, en betrokkenheiditems. Die items is gekombineer om 'n saamgestelde vraelys te vorm.

Om die data empiries te toets, is 'n verkennende ex post facto korrelasie navorsingsontwerp gevolg. Verskillende statistiese tegnieke naamlik Itemanalise (IA), Bevestigende Faktoranalise (CFA), Verkennende Faktoranalise (EFA) en Gedeeltelike Minste Vierkante (PLS) Strukturele Vergelyking Modelling (SEM) is gebruik om die data te analiseer, waarna die verskillende hipoteses getoets is.

Sewe padspesifieke hipoteses met vyf hoofinteraksie-effekte en twee modereringsinteraksie-effekte is geformuleer. Uit die resultate is bevind dat die vyf hoof hipoteses statisties betekenisvol is, met een hoof hipotese wat nie ooreenstem het met die literatuur nie. Nie een van die hipotese modereringseffekte is statisties betekenisvol gevind nie.

Uit die bevindings is die doelwitte van die studie weerspieël, beperkings van die studie en aanbevelings vir toekomstige navorsers is verskaf, gevolg deur die voorsiening van verskeie praktiese implikasies en voorstelle van die navorsingsbevindinge.

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CHAPTER 1: INTRODUCTORY ARGUMENT

1.1 Introduction

The far-reaching and devastating repercussions of South Africa's Apartheid history have persisted for years since the abolition of the regime. Affirmative Action, Employment Equity (EE), and Broad-Based Black Economic Empowerment (BBBEE) initiatives have addressed some of the injustices of the Apartheid regime to an extent, but vast income inequalities, high levels of poverty, and continued disadvantage continues to plague South Africa and its citizens (Statistics South Africa, 2017a). The country has put considerable effort into the improvement of the wellbeing of its citizens since the 1994 transition to a democratic republic (World Bank, 2021). The progress that had been made has however stagnated within the last 10 years (World Bank, 2021).

The COVID-19 pandemic, which developed from pneumonia cases identified in Wuhan City in China, placed further pressure on already struggling economies and countries with existing strained socio-political climates (Council on Higher Education, 2020). Severe Acute Respiratory Syndrome Coronavirus Two also referred to as SARS-CoV-2 was later identified as the cause of the Coronavirus Disease 2019 or COVID-19 as we now know it, spread across the globe and to South Africa (Council on Higher Education, 2020).

From the Quarterly Employment Statistics (QES) survey from quarter two of 2020 it was evidenced that more than 600 000 jobs were lost within the South African formal sector amidst the level 5 COVID-19 lockdown (Statistics South Africa, 2020). Furthermore, a 9% decrease in year-on-year earnings was found in quarter two of 2020 (Statistics South Africa, 2020). This decrease is compared to earnings from June 2019 and amounted to R64 billion (Statistics South Africa, 2020). South Africa's formerly dire financial and employment struggles appear to have been exacerbated by the effects of the pandemic.

Chapter 1 provides context for this study by discussing the effects of South Africa's Apartheid history and its continued impact on the country's current labour market and

economy. High levels of poverty, inequality of income, high unemployment rates, and the skills misalignment in the country are considered specifically. The role of tertiary education and the South African educational regime, as a possible avenue for addressing these challenges is explored, whilst considering the historical context of the country. The way that the COVID-19 pandemic has aggravated the pre-existing underlying issues in the country is also addressed.

Chapter 1 also introduces the research objectives, presents the Research Initiating Question (RIQ) which inspired the direction of this study, lists specific research goals for the study, and provides a structural overview for the study.

The constructs of poverty, income inequality, unemployment, misalignment of skills, higher education, and the reality of the South African education regime are discussed below within the context of the COVID-19 pandemic.

1.2 Poverty, Income Inequality and Unemployment in South Africa

Based on a report published by Statistics South Africa (2017b) titled *Poverty on the rise in South Africa*, the majority of South African citizens were living below the poverty line in 2015. The data show specifically that more than half of South African citizens (55.5%) were living in poverty in 2015; that translates to over 30.4 million citizens living below the poverty line.

The COVID-19 pandemic occurred after South Africa had experienced years of low economic growth. The South African economy grew by a promising 0.2% in 2019, from 0.8% in 2018 (World Bank, 2021). However, the pandemic significantly worsened poverty in South Africa and has exacerbated a number of underlying problems surrounding the issue of poverty in the country. Estimates from the World Bank show a 7% contraction in the South African economy in 2020 (World Bank, 2021). These estimates show that the severe contraction will increase poverty by approximately 2 million people living below the poverty line (World Bank, 2021).

According to Credit Suisse (2020), the pandemic has caused the worst global economic crisis since World War Two, and human life has been affected in endless ways. National Lockdowns placed a halt on employment, which led many South African citizens to a point where a decision had to be made between working, if possible, to continue to supply food and income to their families versus staying safe and healthy at home.

As predicted, the continuation of the pandemic on both a global and domestic level continued to constrain the potential economic recovery of South Africa during the first six months of 2021 (World Bank, 2021). Furthermore, once economic activity had resumed, the prior constraints in the country such as electricity shortages, became pertinent once again. These structural constraints combined with weak economic growth undermined the progress that had been made to reduce poverty in the country (World Bank, 2021). Improvement to household welfare was also severely hampered due to the increase in unemployment levels (World Bank, 2021).

Many currencies also understandably depreciated against the US dollar in 2020, with large depreciations of minus 20% recorded for South Africa (Credit Suisse, 2020). Currency movements such as these significantly impact on the levels of household wealth (Credit Suisse, 2020). The already unstable economic climate in South Africa is predictably worsening in light of the pandemic and consequently leading a greater number of citizens into poverty.

1.3 Income Inequality in South Africa

Statistics provide evidence that income inequality in South Africa has historically been unacceptably high. The country has been labelled one of the top ten most unequal economies in the world, with 41,9% of the country's wealth being controlled by the wealthiest 1% of the population (Credit Suisse, 2016).

Data from 2017 record that the South African per-capita expenditure Gini coefficient, which reflects income inequality, was 0,68% in 2015 (Statistics South Africa, 2017a). Yitzhaki (1979) explains that the higher the Gini coefficient (i.e., the closer to 1%), the

more unevenly income is distributed. According to a World Bank report (2018), titled *Overcoming Poverty and Inequality in South Africa*, labour market income was identified as the principal cause of inequality within the country. Labour market income was responsible for over 90 percent of the overall Gini coefficient from 2006 to 2015.

High inequality levels persist because of a history of marginalization and exclusion, and the nature of economic growth in the country (World Bank, 2021). The South African economy is neither 'pro-poor' nor producing a sufficient number of jobs to address inequalities of wealth (World Bank, 2021). Income inequality remains high whilst there exists low intergenerational mobility; this means that inequalities in wealth are being passed down from generations with negligible change in circumstances over time (World Bank, 2021). Inequality of income remains a significant problem facing South Africa.

Given the current global reality in addition to the historical struggles faced by South Africa, this researcher opines that matters of poverty and income inequality are likely to remain prevalent in South Africa for the foreseeable future. Researching avenues to address these matters was therefore seen as important.

1.4 Unemployment in South Africa

Unemployment, in addition to high poverty levels and income inequality, is another long-standing and significant issue in South Africa. A report titled *Job Opportunities and Unemployment in the South African Labour Market* stated that the country's government failed to sustain the creation of new jobs in the 2015/2016 financial year, when compared to the preceding financial year (Department of Labour, 2016). In total, 29 736 new vacancies were advertised in the 2015/16 financial year. This number decreased from 46 391 in the 2014/15 financial year; a percentage decrease of 42% that was attributed to the turbulent political and economic climate of the country at that time (Department of Labour, 2016).

Results from the Quarterly Labour Force Survey (QLFS) from quarter four of 2017 showed promising statistical results, presenting a decline of 1,0% in the South African

unemployment rate – a decrease from 27.7% in the first quarter to 26.7% in the fourth quarter (Statistics South Africa, 2017a).

Findings from the Quarterly Labour Force Survey (QLFS) from the third quarter of 2020, however, showed an increase in unemployment by 2.2 million from 6.5 million in quarter two of 2020 (Statistics South Africa, 2020). The amount of work-seeker who were discouraged increased by 225 000, whilst the economically inactive individuals who were unemployed for reasons unrelated to discouragement declined by 29 million between the second and third quarters of 2020 (Statistics South Africa, 2020). The Quarterly Labour Force Survey (QLFS) showed a net decline of 2.6 million in the number of economically inactive individuals, from the second to the third quarter of 2020 (Statistics South Africa, 2020).

Unemployment data from 2020 which stands at 28.48%, shows a significant increase from the recorded 26.92% unemployment rate in 2018. South African data from 2020 provided initial estimates regarding the effect of the COVID-19 pandemic on matters of poverty and unemployment in developing countries. From the data, a decline of 40% was observed in the actively employed population, with half the number consisting of termination of jobs, suggesting a lasting impact on the labour market (Jain et al., 2020). Initially vulnerable groups were disproportionately affected, and it was estimated that 20% to 33% of job losers fell into poverty (Jain et al., 2020).

From the Quarterly Labour Force Survey released on 1 June 2021, unemployment rates in South Africa hit a staggering high of 32.60% (Statistics South Africa, 2021). The rate of unemployment is the highest among individuals between the ages of 15 and 24, averaging at about 63% (World Bank, 2021).

According to the Quarterly Labour Force Survey (QLFS), in quarter one of 2021, younger South Africans were struggling the most in the current labour market (Statistics South Africa, 2021). The unemployment rate for individuals aged between 15 and 34 years was 46.3%; this implies that approximately one in two young South Africans within the labour force were unemployed in quarter one of 2021 (Statistics South Africa, 2021).

Those individuals who are employed are concentrated primarily in the trade, agriculture, finance, and business services industries (Statistics South Africa, 2021). Unemployment in the basic and semi-skilled youth is concentrated in the trade industry, with employment in the skilled youth being primarily concentrated in social and community services, finance, and other business services industries. In most cases, these young individuals also have employment contracts of an unspecified or limited duration, which do not include employee benefits (i.e., medical aid, pension funds, paid sick leave, potential permanent employment) (Statistics South Africa, 2021). The issue of unemployment may become an even greater problem in the years to come.

Many of the problems stemming from decades of apartheid have not disappeared but rather seem to have become a normal part of the South African society. The high level of poverty, income inequality, and unemployment has been unacceptable historically and as seen from recent statistical data, has worsened significantly, especially within the past two years and specifically amongst the youth.

1.5 Skills Shortages and Skill Misalignment

This researcher contends that the issue of unemployment in the country can to some degree be attributed to a shortage of skills in the open labour market. According to Moganedi and Sithole (2020) high unemployment rates, specifically among the youth, could be one indicator of the skills shortages in the country. The shortage in skills is regarded as a critical stumbling block preventing the growth of the South African economy (Langeni, 2020).

The skills shortage has formed part of the government agenda in post-Apartheid South Africa for a long time, however, skills shortages in the country persist despite the focus the topic has received over the years (Langeni, 2020). This reality questions the usefulness of the policies that have been developed to address skills shortages and reduce poverty and unemployment in the country (Moganedi & Sithole, 2020).

The National Skills Development Act, Act 97 of 1998, amended in 2008, forms a portion of the legislative framework developed to combat problems of unemployment,

skills shortages, and poverty resulting from the apartheid regime in South Africa (Mogamedi & Sithole, 2020). The policy framework was developed to counteract these three fundamental issues within the country and include the following initiatives: Growth New Path (GNP); Reconstruction and Development Programme (RDP); Accelerated and Shared Growth Initiative for South Africa (ASGISA); Growth Employment and Redistribution Strategy (GEAR); and the National Development Plan (NDP) (Mogamedi & Sithole, 2020).

Unfortunately, in spite of the adoption of the National Skills Development Act and implementation of the various initiatives mentioned, the shortage of skills in the country remains undiminished (Mogamedi & Sithole, 2020). The ability to provide the needed skills to the South African labour market remains a problem (Mogamedi & Sithole, 2020).

The reality remains that the majority of South African citizens are only qualified to work within the basic skilled and the lower-earning levels of the semi-skilled sectors. Individuals with basic skills compete in a saturated market while there is a demand for more highly qualified skilled individuals in the skilled and upper-earning levels of the semi-skilled sectors. Sector Education and Training Authorities (SETAs) consistently invest large amounts of capital in an attempt to address these skills shortages, but there have been few noticeable results and the country continues to lose jobs on a daily basis (Mogamedi & Sithole, 2020).

Amidst the current economic reality resulting from the on-going effects of the pandemic, job losses in the country are evident across sectors. The Quarterly Employment Statistics (QES) survey for quarter two of 2020 reported that the formal non-agricultural sector lost 648 000 jobs; thereby decreasing the total employed individuals in this sector to 9.5 million (Statistics South Africa, 2020).

The QES survey further noted a year on year decrease of 671 000 formal sector jobs in quarter two of 2020 (Statistics South Africa, 2020). Compared to the first quarter of 2020, job losses were evidenced across industries during the second quarter (Statistics South Africa, 2020). This loss of jobs was primarily due to a decrease in 192 000 jobs within the trade industry, the loss of jobs of 147 000 employees in the business services industry, and the loss of jobs of 103 000 employees from the community services industry (Statistics South Africa, 2020).

A loss of employment was also evidenced in the construction, manufacturing, and transport industries, with 74 000, 85 000, and 38 000 job losses respectively (Statistics South Africa, 2020). Statistics report around 6000 job losses in the mining industry and 3000 job losses in the electricity industry respectively (Statistics South Africa, 2020). Available job posts have also decreased significantly. In a country in which unemployment and poverty are already rife, such losses are even more troubling.

There have however been industries which have shown an increase in jobs in quarter three of 2020 namely: the finance industry (200 000); the social services industry (137 000); as well as private households (116 000) (Statistics South Africa, 2020). This could present as an opportunity for individuals to pursue the acquisition of skills and qualifications within these sectors and is indicative of potential for future job opportunities within financial fields and the field of social services.

This researcher therefore contends that the issue of unemployment in the country can, in part, be attributed to skill misalignment and a shortage of skills. While there is a lack of new job opportunities in the basic skilled sector and difficulties in developing more basic skilled positions, job opportunities are available in certain skilled and semi-skilled sectors. However, the number of suitably skilled and qualified individuals available appears to be insufficient to address the skill needs in the country.

To take a step back, in light of the saturated basic skilled labour market and an overall decrease in available jobs and job opportunities due to the pandemic, individuals now more than ever ought to become as skilled and educated as possible for job attainment and job security purposes. In light of the pandemic, even jobs within the skilled sector

have become increasingly difficult to obtain and retain, further emphasising the need for good quality, targeted, higher education.

High unemployment rates and the need for skilled, and semi-skilled, workers are connected, and job creation in the basic skilled sector may not be sufficient for alleviating the issue of poverty, unemployment, and income inequality in the country.

This researcher therefore argues that increasing the skill level of individuals in South Africa through higher education may prove to be a fruitful endeavour towards addressing the need for skilled employees. This is expected to positively impact the unemployment rate in the country.

Education is a crucial aspect required for the growth and progress of individuals, the communities in which they live, and the country as a whole (Kapur, 2018). Education imparts the necessary essential skills, abilities, and knowledge to individuals which not only allots them the opportunity to meet their personal goals and objectives but also provides them the chance to make a significant contribution to society (Kapur, 2018). Students who perform better than the expectations and norms of their society are anticipated to contribute to the growth, development, and sustainability of that society (Akinleke, 2017). Singh, Malik, and Singh (2016) provided evidence for a direct and significant connection between student academic performance and a country's socio-economic development.

Tertiary academic performance specifically is a vital predictor of workplace success later in life as it has been shown to predict job outcomes including job satisfaction, job performance, and salary (Braun et al., 2013; Von Stumm et al., 2011). According to research, individuals who perform well academically are more prone to be happy with their work and jobs, are more likely to remain in their current employment for longer periods, and are likely to earn higher salaries (Salanova et al., 2010). Those who attain higher educational levels are therefore more inclined to experience greater job and income stability; they will have a greater number of job opportunities to choose from; and their economic status will ultimately improve.

Targeted upskilling and the education of South African citizens, specifically on a tertiary level should be prioritised in the existing initiatives seeking to combat high levels of unemployment, high poverty rates, and persisting income inequality in South Africa.

1.6 The Role of Higher Education

Given the high demand for certain skill sets, an opportunity exists for skill development, training, and the attainment of higher educational levels to uplift individuals from the basic skilled sector to the semi-skilled and skilled sectors. Rather than focussing all efforts and budgets on shorter-term solutions centred around the creation of more basic skilled job opportunities, an increased focus on longer-term solutions involving the training, developing, educating, and up-skilling of South African citizens on a tertiary (or equivalent) higher educational level may prove worthwhile.

Lehohla (2014) conducted an analysis on the *Poverty Trends in South Africa* report from Statistics South Africa and found a meaningful link between higher degrees of education and lower levels of poverty. Skill and educational attainment impact on income distribution and therefore has an effect on poverty levels. Education offers improved economic opportunities, specifically among the less economically privileged since education imparts valuable theoretical knowledge and the skills required by individuals to be afforded an improved chance to enter into the skilled and semi-skilled labour market.

Research by Rogan and Reynolds (2016) found evidence for low unemployment rates in educated individuals, particularly when considering university graduates. Results from the Quarterly Labour Force Survey (QLFS) for the third quarter of 2017 found that individuals who are less educated are more likely to be unemployed (Statistics South Africa, 2017a). Specifically, the QLFS showed that 57,4% of the unemployed South African population have attained an education level lower than Grade 12/Matric or equivalent (Statistics South Africa, 2017a).

During the National Lockdown in South Africa, it was found that individuals in possession of lower educational levels were inclined to receive lower salaries when compared to individuals with higher educational levels, showcasing the importance of higher educational levels for income and job security, higher earnings, and a route to decreasing overall poverty levels in South Africa (Statistics South Africa, 2020). Most professionals and managers were still in employment and receiving pay during the lockdown, with many being able to work from home (Statistics South Africa, 2020).

Efforts focused solely on primary and secondary education may not be sufficient to alleviate poverty, unemployment, and inequality in the country.

With regard to efforts to reduce inequality, “tertiary education plays a critical role in promoting social mobility through equal educational opportunities for all groups, especially underprivileged students from low-income groups, minorities, and people with special needs” (Salmi, 2020, p. 15). Shimeles and Nabassaga (2018) found ethnic fractionalisation, limited tertiary education, poor governance, and inequality of opportunity as the main culprits behind the particularly high levels of inequality in Africa.

Distancing measures which were introduced in South Africa during the pandemic imposed great economic costs and have had a negative impact on the factor distribution of income. Labourers with lower levels of education were affected to a much greater extent in comparison to labourers with secondary or tertiary education (Arndt et al., 2020). Consequently, those households with a high dependence on labourers with low levels of educational attainment experienced an enormous real income shock which jeopardized, amongst other factors, the food security of these households (Arndt et al., 2020). Employers showed a preference for employing individuals with prior working experience and high education levels (Statistics South Africa, 2021).

Observations from the available literature found that only a small percentage of the South African population seem to obtain any form of tertiary qualification; data from 2016 show that only 14% of South Africans had acquired a tertiary qualification (Statistics South Africa, 2016). This is significant since a tertiary education provides

individuals the benefit of experiencing decreased competition in the hunt for a well-paying, satisfying job.

In light of this, if a greater number of citizens hold a tertiary qualification, they will likely obtain better quality employment, experience greater job security, and become skilled participants in the South African economy. Individuals who are skilled and educated, especially within high demand sectors, may therefore be at a significant advantage for obtaining employment and experiencing greater job security over the next few years.

In the turbulent economic climate, the country and world are currently facing, a focus on higher education in an appropriate field could provide some degree of economic stability. In essence, a tertiary qualification is likely to open doors to improved job opportunities whilst simultaneously providing greater financial stability and job security to individuals. It stands to reason that any form of higher education would promote greater job opportunities, job stability, and job satisfaction when compared to offering no higher qualification. South Africa would also benefit by means of poverty alleviation, a likely decline in unemployment rates, and an improvement in income inequalities and skill misalignment.

1.7 Academic Success and the South African Educational Regime

There are various aspects to consider regarding success at tertiary education level. One important aspect to success at tertiary level is sustaining high levels of academic performance and meeting minimum grade requirements to progress and/or graduate. Students who experience difficulties with meeting the academic requirements and sustaining the levels of performance needed to pass academic modules are at an increased risk of module and subject failures. This will reflect negatively on the individual's academic history and increase the probability of failure to graduate.

Academic institutions consider prior academic performance when screening students for admission into undergraduate and postgraduate programmes. Employers and organisations also consider academic performance, either secondary or tertiary, during their recruitment and selection processes.

Encouraging, supporting, and enabling the attainment of tertiary and higher education could prove a sustainable, long-term solution towards alleviating persisting problems of poverty, inequality, unemployment, and skills shortages in the country. Unfortunately, the reality of the South African educational system does not appear to be conducive to increased educational attainment. Langeni (2020) listed barriers to addressing the skills shortages in the country, in order of importance, as the; current education system, inadequate private sector participation, minimal organizational career development programs, disjointed State-owned company participation, and fragmented government policies.

According to the Council on Higher Education (2020) in South Africa, *Vital Stats* from 2013 until 2018 show the headcount for student enrolment at some form of tertiary institution increased from 983 698 to 1 085 567. The headcount for graduates in this same period increased from 180 823 to 227 188. This shows a very poor throughput rate of less than 25% completion (Council on Higher Education, 2020).

Therefore, identifying and addressing factors which either facilitate or hinder the attainment of higher educational qualifications is considered important in the pursuit to address issues of poverty, income inequality, and unemployment in South Africa.

This researcher contends that the South African government, tertiary institutions, and researchers bear the responsibility to identify, note, and develop more effective strategies to address these issues. Given the relation between education level and poverty and unemployment, identifying factors which differentiate high academic performers from their poorer performing peers is considered an appropriate place to start.

1.8 Research Objectives

To address the socio-political issues in South Africa through the proposed avenue of higher education, an attempt was made to find the most salient antecedents of variance in tertiary academic performance. The research objective of this study is therefore to identify the most significant precursors of variance in tertiary academic

performance in South Africa.

Identifying antecedents of variance in academic performance enables better understanding of the antecedents of variance in tertiary academic performance and provides insight into how to facilitate and promote greater academic performance in tertiary education. Identifying antecedents of variance in performance is the first move towards implementing an action plan to address and hopefully improve tertiary academic outcomes. As such, it is valuable to explore and identify the variables that can equip individuals with the necessary tools to excel in academic performance at a tertiary level.

To successfully handle a phenomenon, one must be able to measure both the outcome and the antecedents of the outcome. The overarching objective of this study is therefore to create a network of the most significant variables that influence tertiary academic performance in students in South Africa and empirically test a structural model outlining the precursors of variance in academic performance.

The main objective of this study is to ascertain whether the combination of identified antecedents significantly impacts on student tertiary academic performance, drawing from the framework of the Job-Demands Resources (JD-R) Model. The Model is elaborated on in Chapter 2.

The secondary objectives are as follows: i) to establish the types of relationships that exist between the identified latent variables; ii) the strength of these relationships; iii) the effect of identified moderating or mediating variables on these relationships; and iv) whether the proposed nomological network of variables can effectively explain unique variance in tertiary academic performance outcomes.

1.9 Research-Initiating Question

In order to expand on existing research regarding tertiary academic performance, the researcher identified the variables of engagement, mental toughness, stress surplus, and imposing job demands in the literature as factors which may influence on the

overall academic performance of students at a tertiary level in South Africa. These variables and the relationships between them are elaborated on in Chapter 2.

The expectation was that the data that were gathered would make it possible to determine what impact, if any, these factors have on tertiary academic performance and how these factors could be influenced to lead to greater academic outcomes.

The research-initiating question below therefore motivated the current study:

What factors best explain variance in the academic performance of tertiary students?

The goals of this research study, as developed from the RIQ, specifically were to:

- a) Develop and evaluate a conceptual model that displays the multiple and dynamic aspects of the constructs that are anticipated to explicate variance in the psychological processes at the core of tertiary student academic performance;
- b) Develop and evaluate an academic performance structural model;
- c) Evaluate the strength and the significance of the postulated relationships between the constructs depicted in the structural model; and
- d) Interpret the results from the study and develop practical recommendations which could be applied at tertiary educational institutions to enhance tertiary student academic performance and potentially lower student dropout rates.

1.10 Motivation for the Study

Given the low socio-economic status of a large percentage of citizens resulting from previous disadvantage, alleviation of poverty, unemployment, and inequality is a core concern in the country; one that could arguably be addressed, at least in part, by higher levels of education.

Attainment of a tertiary education by a larger number of citizens is seen to present a useful avenue for the alleviation of poverty, inequality, and unemployment, and reduction of the skills gap in South Africa. Improving the ability of individuals to become

skilled or semi-skilled participants in the economy thus is regarded to be of high importance.

Educating and up skilling citizens, enables them to move from the basic skilled sector into the semi-skilled and skilled sectors, where they will experience greater job availability; attain higher quality jobs; and experience greater job and financial stability. This is expected to ultimately result in a more economically and politically stable future for South Africa and its citizens.

Improving the ability of individuals to attain a tertiary qualification can decrease wastage of tertiary institution resources such as space to accommodate students and can improve student retention while growing the reputation of the institution in terms of graduate numbers, quality of graduates, and graduate performance (e.g., grades, cum laude and summa cum laude graduates, post-graduate graduates, number of publications). Student tertiary academic performance is key to the attainment of a tertiary qualification and is therefore regarded as a highly important outcome in the current research.

1.11 Outline of the Study

In this chapter, the context for this study was provided by exploring the effects of South Africa's Apartheid history, with its continued impact on South Africa's modern economy and labour market. Specifically, high levels of poverty, inequality of income, high unemployment rates, and the skills misalignment in the country were considered. The role of tertiary education, promoting academic success, and the South African educational regime, as possible avenues for addressing these challenges was then explored, in the historical South African context. The manner in which the COVID-19 pandemic has exacerbated the pre-existing underlying issues in the country was also addressed.

Chapter 1 introduces the objectives of the study, provides the Research Initiating Question (RIQ) which inspired the direction of the study, provides the specific research goals for the study, the motivation behind the study, and lastly provides a

structural overview for the study.

In Chapter 2, a thorough review of the literature is presented to offer greater theoretical understanding of the study and its interconnected constructs. The literature review explores the Job-Demands Resources framework; provides a detailed description of the latent variables of relevance in this study; and elaborates on the relationships posited between the variables.

This process led to the formation of the proposed nomological network portraying the various dynamics found to be important in influencing tertiary academic performance. The nomological network is shown as a conceptual model in Chapter 2, and as a structural model in Chapter 3.

Chapter 3 provides a description of the research that was performed (i.e., the chosen research design); the sampling procedure; the choice of participants; the way data were collected; the measuring instruments; the data analysis processes (i.e., the specific statistical analysis techniques that were utilised) to draw inferences and come to conclusions; and the way in which missing values were handled in the study. This chapter also presents the research and statistical hypotheses formed and the ethical considerations which were adhered to for the duration of the study.

Chapter 4 provides the statistical results which were obtained from the study and an interpretation of these results.

Finally, Chapter 5 addresses limitations to this study; provides useful approaches and interventions; makes suggestions for future researchers; provides a summary of the research; and presents concluding remarks.

1.12 Chapter Summary

This chapter sought to provide background and context to the study and introduces issues in the South African environment that this study aimed to address through a focus on tertiary education.

The chapter provides motivation for and clarifies the aim of the study and presents the

RIQ that guided the research. Both the overarching and specific aims of the study were explained. Lastly, the research methodology was explained in order to provide an outline of the sequence that was followed for the research process. The following Chapter (Chapter 2) provides a comprehensive evaluation of the available and relevant literature that informed and directed this study.

CHAPTER 2: LITERATURE STUDY

2.1 Introduction

The literature study is a review of the most up to date, significant, and relevant research available. The information gathered during this process thereby provided the theoretical base for this study and allowed the researcher to place the current research within the context of information available on the current research topic.

Various theoretical frameworks, multiple different approaches, and frames of thinking, including that of positive psychology as well as existing models of stress, and the JD-R model and theory, were consulted and considered whilst developing the motivation behind the current study and ultimately identifying the most applicable theoretical base for the study.

Existing literature is elaborated on in this chapter and has been used as a guide for the study. From the conducted research, the conceptual and structural models, as well as the hypothesised relationships between variables, were constructed for testing.

After consulting the literature, the Job Demands-Resources (JD-R) model and theory was considered the most applicable theoretical framework for this study. This research therefore conducted a thorough review of the JD-R model and theory and consulted the JD-R during the various stages of the study. The JD-R performance model, specifically, as theoretical framework became central to this study and the identification of possible antecedents to academic performance, and subsequently to the development of the models and hypotheses of this study.

A brief historical overview of the JD-R model and theory is provided below.

2.2 Historical Overview of the JD-R

The JD-R model was introduced by Demerouti et al. (2001). Since the time of its conception, the model has been applied and utilised in thousands of organisations and has stimulated a multitude of empirical studies (Bakker & Demerouti, 2007; Bakker & Demerouti, 2017; Demerouti & Bakker, 2011; Lesener et al., 2019; Schaufeli & Taris,

2014; Schaufeli, 2017). The article by Bakker, Demerouti and Euwema (2005) titled *Job resources buffer the impact of job demands on burnout* is one pertinent case displaying the utility of the JD-R.

Bakker and Demerouti developed the well-accepted JD-R model after identifying a gap in two of the prevalent job-stress models of the time; the Effort-Reward Imbalance Model and the Job Demands-Control Model (Karasek, 1979; Siegrist, 1996). These two early job stress models became a base for the development of the JD-R model.

The gap identified in these earlier stress models inspired Bakker and Demerouti to investigate different possible groupings of job characteristics (i.e., demands and resources) and the way they interact with one another within different types of jobs. This resulted in the creation of the job demands–resources (JD-R) model.

The authors Bakker and Demerouti found the Job Demands-Control and the Effort-Reward Imbalance stress models to be too restrictive. These two stress models allowed only a limited number of predictors of job stress/wellbeing to be considered for any given job. The authors argued that the utilisation of such a limited number of predictors could not sufficiently explain the realities of multiple different jobs - on multiple job levels - across different sectors, industries, or countries. The JD-R model was therefore developed as an alternate to the prevailing job stress/well-being models to address these identified shortcomings.

Following its conception in 2001, the JD-R model was later expanded by Bakker and Demerouti and developed into a comprehensive theory. The JD-R theory, as it is understood today, remains relevant and significant as its authors are and have remained continuously invested in the consistent updating, improvement, and adaptation of their work from both their own and other objective research (Brenninkmeijer et al., 2021; Han et al., 2020; Lesener et al., 2019; Zeijen et al.).

The JD-R theory is therefore based on years of empirical, peer-reviewed research, as well as a constant influx of new empirical research which is actively acknowledged and considered by the original creators (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Lesener et al. 2019; Schaufeli & Taris, 2014; Schaufeli, 2017). This approach adds to the historical relevance but allows for consistent growth and

adaptation of the theory and accompanying models to remain applicable in changing times. The framework is therefore dynamic enough to remain relevant to current contexts but still maintains its core elements which have consistently remained part of the theory and is therefore considered a sound theoretical base to guide the current research study.

Before delving into the details of the JD-R model and theory, it is necessary to clarify one point regarding the current research study. Although the JD-R model and theory were developed for use within the working environment, the work environment is interpreted more broadly in this study. The work environment as referred to in the study is that of the tertiary academic environment with the 'employees' being professional students enrolled in tertiary studies. For the intent of this study, a professional student is seen to be an 'employee' whose tertiary studies constitute their 'work' at their relevant tertiary institution.

Limitations with regard to the success of the application of the JD-R model and theory in a student context were considered and it was of interest to note the efficacy of the translation of the theory into a student context. The limitations to this approach are discussed in Chapter 5 of the study.

In the next section, the JD-R model and theory is explained in more detail, given the significance of the model and theory as the foundation for this study.

2.3 The Job Demands-Resources Model and Theory

Details of the JD-R model and theory are explored in this section. A broad overview of the model and theory, the dual-processes taking place, the addition of personal resources, and the JD-R performance model are discussed.

2.3.1 Broad overview of the JD-R

In order to understand the JD-R model, it is important to understand the various parts that make-up the model.

According to Bakker and Demerouti (2014), the majority of work contexts can be understood in terms of two wide-ranging sets of conditions, namely job demands and job resources. These researchers proposed that most job characteristics can be grouped into either one of these two broad categories (Bakker & Demerouti, 2014). That is to say, in terms of the JD-R, any job characteristic can be grouped into either the job demand or the job resource category. This broad categorisation of job characteristics makes allowance for multiple factors such as personal, organisational, and environmental factors that effect a job to be considered (Bakker & Demerouti, 2014; Bakker & Demerouti, 2017).

Since every individual job consists of a unique set and mixture of job resources and job demands, an attempt to comprehend the complexities of each unique job can prove ineffective when considering a limited number of specific rather than broad factors. The JD-R framework sought to remedy this shortcoming by offering the two broad categories in which multiple, more specific job characteristics could be clustered (Bakker & Demerouti, 2014; Bakker & Demerouti, 2017).

As a result of this broad categorisation, the JD-R model and theory can be applied to, and comprehend, the unique characteristics of many different jobs in a heuristic manner (et al., 2019). Ample research has been performed on multiple combinations of job resources and job demands, with evidence found for the existence and significance of these interactions within a broad range of occupational settings over time (Bakker & Demerouti, 2007; Bakker & Demerouti, 2014; Bakker & Demerouti, 2017; Demerouti et al., 2019; Rothmann et al., 2006; Tims & Bakker, 2010).

The effective use of the JD-R model and theory in multiple different job types, different work environments, sectors, and industries can therefore be attributed, in part, to the simplicity of the clusters of characteristics into broad categories (Bakker & Demerouti, 2017). Additionally, the JD-R model and theory poses an overall structural equation

model (SEM) whereby all relationships hypothesised between variables in the model can be tested simultaneously (Bakker & Demerouti, 2017).

This SEM method allows researchers to simultaneously assess the relationships between a multitude of different job characteristics, providing a holistic and realistic understanding of specific jobs within their unique contexts. The SEM method will be discussed at length in Chapter 3.

Given the fact that the characteristics of any given job do not occur in an enclosed and isolated state, any research studies aimed at realistically measuring the characteristics of a job should reflect the reality of a position as closely and accurately as possible. Only when research studies reflect reality as closely as possible, by conducting meticulous and rigorous empirical research, can the most accurate information be inferred from the results.

Accuracy of inferences is crucial. It forms the point of reference to better identify job characteristics which may be more conducive to positive work-related outcomes and could also identify those job characteristics which are likely to result in negative work-related outcomes. Furthermore, a more accurate diagnosis of work-related outcomes as example allows for the development and implementation of more appropriate job intervention strategies.

In conclusion, the value of the JD-R lies in both its simplicity and the ability to simultaneously measure job characteristics for multiple different types of jobs and provide a realistic account of the actual job performed. This leads to an improved ability to draw accurate inferences and therefore develop and implement more fitting intervention strategies that are likely to prove more efficient compared to less targeted approaches.

When compared to results derived from previous job stress/wellbeing models employed prior to the development of the JD-R, once the JD-R was utilised it resulted in an improved understanding of the multitude of job characteristics and the manner in which they interact within many different jobs and job environments.

2.3.2 Dual-processes in the JD-R

Job resources and job demands as the two broad sets of working conditions in the JD-R are explained in more detail below.

Firstly, job demands, refer to any social, physical, and/or organisational aspect of a job which requires constant psychological and/or physical effort (Bakker & Demerouti, 2014; Bakker & Demerouti, 2017). As a result of this effort job demands are consequently considered to be related to individual physiological and/or psychological expenditure (Bakker & Demerouti, 2014; Bakker & Demerouti, 2017). In other words, those facets of a job that necessitates continued effort is termed job demands and they have the potential to lead to negative work-related outcomes.

Job demands can cause stress, strain, and burnout in employees when the demands exceed, or appear to exceed, available resources (Grover et al., 2017). High stress experiences can negatively impact the ability of employees to sustain their efforts and performance over time (Nisar & Rasheed, 2020). Occupational stress causes negative psychological and physical feelings in and about the work environment if demands do not correspond to the capabilities and resources available to employees (Wang et al., 2014). This in turn increases the likelihood of lowered employee satisfaction; motivation; and productivity and can have a negative impact on performance (Nisar & Rasheed, 2020). Job insecurity, high workload, and role conflicts are all considered job demands (Cao et al., 2020). High workload is an organisationally or institutionally dictated job demand which requires energy from employees and is linked to an increase in effort and time spent.

Secondly, job resources, comprises the social, physical, or organisational facets of a job which assist employees in attaining their workplace objectives. Job resources have intrinsic and extrinsic motivational potential where individuals with the necessary job resources are open to motivation from internal factors (i.e., a passion for their work tasks) or external factors (i.e., the potential for a raise or promotion) (Demerouti et al., 2017). Examples of job resources include the appreciation experienced; allowance for innovative thinking and action; autonomy in work and related tasks; variety of skills required for the job; support from supervisors; support in the work environment; high

quality relationships with supervisors; opportunities for career advancement and growth; and constructive performance feedback received on a regular basis (Bakker & Demerouti, 2017).

According to JD-R theory, these two broad groups of work conditions elicit one of two possible psychological processes, namely the motivational process or the health impairment process (Bakker & Demerouti, 2017; Van der Heijden et al., 2019; Zeijen et al., 2021).

The health impairment process is the physiological and/or psychological exhaustion associated with continuous and disproportionate job demands in the absence of the necessary resources to manage those demands (Zeijen et al., 2021). Zeijen et al. (2021) performed a study exploring the part that personal demands play in the well-being of students in a sample of 578 master students. They described the health impairment process as one in which the demands relating to studies impair the energy that students have at their disposal (Zeijen et al., 2021). The health impairment process is one that requires energy and can therefore result in reduced resources.

According to the health impairment process, above average job demands in the absence of adequate job resources can lead to undesirable consequences that deplete physical and mental resources, and which can result in stress, strain, decreased physical health, and burnout (Bakker & Demerouti, 2017). In such a case, the health of the employee would be impaired.

The health impairment process describes a decrease in employee well-being and a potential decline in employee work/job performance (Bakker & Demerouti, 2017). This happens when job demands are excessive, and employees maximise the usage of available resources to reach the high demands of the job. If the available resources prove insufficient for meeting such demands, the health of the employee can be adversely affected (Van der Heijden et al., 2019).

These authors further state that job demands tend to be costly since employees faced with high job demands need to spend time and energy engaging in strategies for 'performance-protection' which requires the investment of psychological and

physiological resources (Van der Heijden et al., 2019). Ultimately high job demands in excess of available job resources are detrimental to employees on both a personal and vocational level and are consequently detrimental to the organisation (Van der Heijden et al., 2019).

Constant, excessive job demands deplete resources over time which may result in individuals having progressively fewer resources at their disposal (Van der Heijden et al., 2019). A constant decrease in resources over time may result in an inability to meet job requirements in future. Demerouti et al. (2014) observed that attempts to maintain high levels of performance when exhaustion levels were also high was ineffective.

The motivational process, in contrast, occurs when employees are in possession of the necessary job resources to perform their jobs successfully and effectively (Van der Heijden et al., 2019). Within the motivational process, job resources are thought to predict engagement, enthusiasm, and motivation (Moreira-Fontán et al., 2019; Thisera & Wijesundara, 2020). Examples of job resources include high levels of autonomy, skill variety opportunities, provision of performance feedback, growth potential, the ability to participate in decision-making processes, and the presence or development of quality relationships (Bakker & Demerouti, 2017). The availability of sufficient job resources allows employees the opportunity to accomplish work-related goals and promotes employee learning as well as growth (Demerouti et al., 2001).

The two processes explained above may suggest that a work setting with ample job resources and few job demands would create ideal working conditions. However, researchers have found that the ideal work environment contains both high job demands and high job resources (Tadić et al., 2015).

Job demands should be sufficiently high to elicit action and engagement from an employee but should not become excessive (Van Yperen et al., 2016). Job demands that are excessive can lead to burnout, whilst job demands that are too low may result in boredom (Tadić et al., 2015). Therefore, the demands of the job should be high enough to elicit both action and engagement and there should be an availability of the necessary job resources to result in positive work-related outcomes (e.g., high work

performance).

In addition to the motivational and health impairment processes, job resources are proposed to play a moderating role in the relationship amongst stress and job demands in the JD-R (Tadić et al., 2015). Job resources can buffer the potential adverse impact of high job demands on an individual. In this sense, job resources could be a preventative and protective mechanism against high levels of stress or stress surplus as used in this study.

The first indication of a buffering effect from job resources on the relationship between strain and job demands was revealed in an article by Bakker et al. (2005). Further research revealed more evidence supporting these findings, for instance research by Xanthopoulou et al., (2007) reported that job resources had a buffering effect on the burnout – job demands relationship for home care professionals.

In its moderating and buffering role, job resources can reduce both the physiological (illness, absenteeism, burnout, and exhaustion) and psychological (disengagement, depression, and a lack of motivation) costs individuals may experience due to high job demands (Clays et al., 2016).

The availability of an adequate amount of job resources allows for an increased ability to meet high job demands with a lower risk of depleting these resources whereby one's well-being is compromised. To put it simply, high job demands would necessitate high job resources to improve an individual's ability to maintain their personal well-being and work outputs. With sufficient job resources to draw from, individuals are more likely to manage high job demands without having to tap into and potentially deplete resources. As such, the availability of sufficient job resources is likely to assist individuals in managing a variety of high job demands. This reality changes when job demands become excessive.

2.3.3 The inclusion of personal resources

Personal resources were later included in the JD-R model and were considered a noteworthy enhancement to the existing JD-R model and theory (Xanthopoulou et al.,

2007). The introduction of personal resources in addition to job resources extended the JD-R (Xanthopoulou et al., 2007). “Personal resources are aspects of the self that are generally linked to resilience and refer to individuals’ sense of their ability to control and impact upon their environment successfully” (Xanthopoulou et al., 2007, pp. 123-124).

Personal resources are positive self-assessments that describe the perception an individual has of their own ability to effectively organise and influence their environment. These positive self-assessments have been seen to predict factors such as motivation, performance, and work and life satisfaction (Bakker & Demerouti, 2014). Personal resources like mental toughness, optimism, and self-efficacy, have consistently proved to play a role similar to that of job resources in buffering the effect that high job demands have on individual wellness and work outcomes. And after its introduction, personal resources alongside job resources became a part of the JD-R’s motivational process. The model thence consisted of job demands driving the health impairment process and job resources and personal resources driving the motivational process.

Research found that personal resources are associated with positive work-related results (Xanthopoulou et al., 2007). Researchers have found that individuals with an abundance of real, or perceived, personal resources are likely to experience greater positive self-regard and deliver more positive self-evaluations (Strayhorn, 2014). Positive self-evaluation is seen to result in increased intrinsic work motivation and goal motivation (Bakker, 2011).

Bakker (2011) found evidence that personal resources correlate with high work and life satisfaction, and high levels of job performance. Other researchers found support for the effect that personal resources have on identified positive work-related outcomes. Such personal resources include adaptability, goal setting, motivation, and perseverance (Bakker et al., 2008; Hakanen et al., 2006). Personal resources have been included in studies used to predict work outcomes including work performance as well as job satisfaction and life satisfaction (Bakker, 2011; Judge et al., 2004; Judge et al., 2005; Luthans et al., 2007; Schaufeli & Taris, 2014; Strayhorn, 2014).

Following the addition of personal resources in the JD-R literature, the JD-R model was adjusted. This model is explained in the section below.

2.3.4 The JD-R performance model

The Job Demands-Resources Performance Model of Bakker and Demerouti (2017) is presented in Figure 2.1. The model presents personal resources and job resources clustered together while indicating that resources have a positive relationship with one another. Higher levels of job resources are expected to increase personal resource levels and vice versa.

When isolating the relationship between resources and motivation, the resource cluster is observed to have a positive relationship with motivation (including engagement, commitment, and flourishing), when not considering any moderating effects. According to the positive relationship posited, the higher the resources, the more likely it is that an individual will experience motivation, in the form of increased engagement, commitment, and flourishing. Motivation, in turn, positively relates to job performance. The more motivated a person is, the better their resulting job performance is likely to be.

From Figure 2.1, it can also be seen that individuals who experience motivation due to the availability of resources tend to participate more in crafting their jobs, thereby increasing their resources, and creating an upward gain spiral (Bakker & Demerouti, 2017).

Furthermore, the resource cluster is seen to moderate the job demands-strain relationship. This refers to resources having a moderating impact on the relationship between strain and job demands. As such, the presence of resources is likely to decrease the experience of strain resulting from job demands.

From the model it can also be observed that when isolating the job demands – strain relationship, a positive relationship is seen to exist between strain (i.e., exhaustion, stress, job-associated anxiety) and job demands when not considering any moderating effects. (Bakker & Demerouti, 2017). Without job or personal resources, job demands

are likely to lead to strain, and the higher the demands, the more likely it is that an individual will experience strain. Strain, in turn, has a negative relationship with job performance. The more strain an individual experiences, the less well they are likely to perform on the job.

Figure 2.1 below, also shows that individuals who experience strain due to the demands of a job are more prone to take part in self-undermining behaviours leading to a downward spiral (Bakker & Demerouti, 2017).

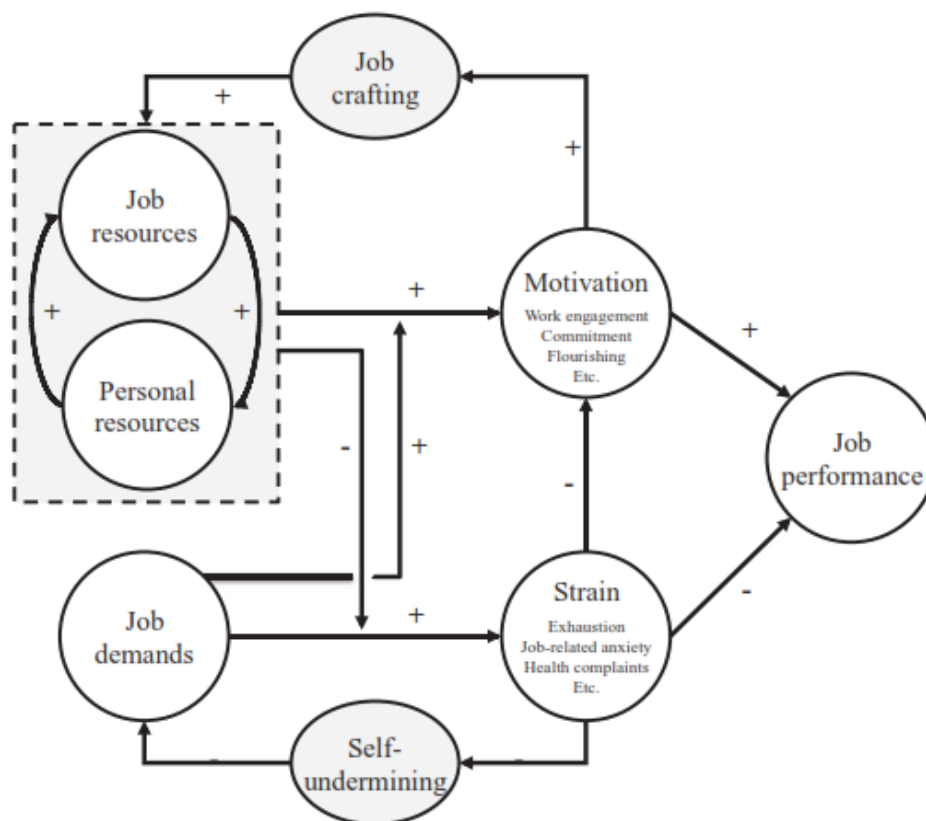
Furthermore, job demands are seen to positively moderate the relationship between motivation and resources. This refers to demands being a moderator of the relationship between motivation and resources. Job demands therefore alter the relationship between resources and motivation. As such, job demands will probably increase the experience of motivation resulting from a presence of resources. This in turn is theorised to increase performance outcomes in the JD-R performance model. This happens as a result of the activation effect that job demands have on individuals.

Using the model below as guidance, the researcher identified the most salient variables thought to influence tertiary academic performance on grounds of information obtained in the literature. The identified variables, and the reasoning for their inclusion in the academic performance model, are described in section 2.4.

Figure 2.1

The Job Demands Resources Model (JD-R Model) (Bakker & Demerouti, 2018)

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2.4 Relevant Latent Variables

The variables considered the most salient for the development of a tertiary academic performance model in this study are academic performance, engagement, stress surplus, excessive job demands, and mental toughness. These variables are explained in greater detail below. The variables are first explained as separate constructs and then in relation to the other latent variables within this study.

2.4.1 Academic performance

Performance, specifically academic performance, is the first latent variable of relevance to this study. As an overarching construct, performance can be split in two; with objective performance and subjective performance forming the two sections. Subjective performance denotes performance appraisals that are open to interpretation and differ on the basis of the appraiser and the appraisal criteria

(Gucciardi et al., 2015). One example of subjective performance is that of a colleague who subjectively regards the performance of their co-worker as exceptional due primarily to the fact that they are friends. This example of the appraisal of the friend is based on the relationship and not on measurable performance output.

Objective performance, on the other hand, can be measured and is expressed as tangible performance indicators including for example grades, sales, and race times (Gucciardi et al., 2015). In this study, academic performance is considered objectively on the basis of averaged academic grades. It must be noted that the averaged academic grades that was collected was self-reported. This is important to note as it opens the door to self-report bias in the form of misrepresentation of information. Self-report bias may distort findings and is considered a limitation in this study. The consideration of objective over subjective performance information is still likely to provide student performance data that are more empirical and less biased when compared to using a subjective approach.

Objective performance data provides a standardised indication of the quality of work of an individual on the basis of empirical results. Standardisation of results allows for comparisons to be made between candidate performances. Objective performance results therefore tend to be more impartial than subjective performance appraisals as they reflect the empirical results of individuals in the form of standardised grade results (i.e., Grade 12/Matric results) for example.

The specific performance outcome variable of relevance to this study is academic performance. Academic performance is a difficult construct to define as it is conceptualised in many different way. Conceptualisations differ among academic institutions; across states or provinces; and across countries to name a few (Kirschner & Karpinski, 2010).

From recent literature, academic performance is defined as the knowledge acquired by students and measured using marks provided by an educator and the educational goals set by the students and/or their educators to achieve during a certain amount of time (Rono et al., 2014; Narad & Abdullah, 2016). Yusuf et al. (2016) presented a definition of academic performance that is focussed on skill, ability, and achievement.

These authors stated that academic performance can be defined as the quantifiable and apparent behaviour of a student in a definite period of time; it is an aggregate of the marks achieved by the student in various evaluations (Yusuf et al., 2016).

York et al. (2015) suggested a definition of academic performance that is centred on persistence. According to these authors, academic performance is defined in terms of student persistence, which refers to the academic progression of students and the completion of a degree, regardless of institutional difficulties and differing institutional contexts. The academic performance of students is an important goal of education (Rono et al., 2014; Narad & Abdullah, 2016).

The differences in opinion regarding which measure of academic performance is most appropriate to use such as student Grade Point Average (GPA) or letter equivalents (A, B, C, D, F) is also important to address (Kirschner & Karpinski, 2010). The research consulted in this review showed preference for the use of students' GPA to measure academic performance (Kumar et al., 2021; Narad & Abdullah, 2016; Singh et al., 2016).

According to the authors Narad and Abdullah (2016), the construct of academic performance is knowledge that is gained by the student, and which is assessed by an educator along with time-based education-centred goals. This performance is measured by continuous assessment or examinations. Grade Point Average (GPA) is considered a standard, universally accepted, and acclaimed measure of academic performance of students (Kumar et al., 2021). As such, academic performance by and large appears to be equated with a final, average grade for a year, course, or degree attainment. GPA was used as the measure of academic performance in this study. From the above it is noted that the key to tertiary academic success, and consequent success later in life, relates to sustaining high levels of academic performance and meeting grade requirements to progress and/or graduate.

2.4.2 Stress surplus

Stress surplus, specifically relating to work or job stress, is the second latent variable of relevance in this study.

Early theories of stress provide varied definitions of the construct and clarified the manner in which stress impacts on individual health. Selye (1956) developed a model referred to as General Adaptation Syndrome. According to this model, stress is considered a biological construct and is defined as any threat to homeostasis (Selye, 1956). From this interpretation, stress can be resolved by meeting the threats to homeostasis and countering these threats using the resistive resources of the body. According to Selye (1956), when the demands to adapt exceed the ability of the body to resist, ill health or even death may occur.

The Conservation of Resources theory regards stress as the real or potential loss of resources, above and beyond an increase in resources (Hobfoll, 1989; Hobfoll, 1998). Based on this theory, the subjective experience of a loss of resources is greater than the experience of resources gained (Hobfoll, 1989; Hobfoll, 1998). The loss of resources can also lead to a loss spiral which ultimately leaves the individual vulnerable to illness (Hobfoll, 1989; Hobfoll, 1998). According to Hobfoll (1998), when individuals lose resources, they are in a position of increased vulnerability since they have not only experienced the loss of resources, but they also have a smaller pool of resources to utilise to meet future demands.

McEwen (2000) observed and departed from Selye's model and its focus on physical demands and outcomes. McEwen provided evidence that psychological stressors, rather than physical demands, have a greater impact on functioning (McEwen, 2000). These findings echoed a theory by Lazarus and Folkman (1984) stating that stress is psychological instead of physiological in nature. De Bruin and Taylor (2005) also considered psychological stress and regarded stress as the interaction between multiple variables which involves a specific relationship that exists between an individual and the environment in which they function. The individual appraises their environment as very demanding or exceeding the coping resources they have at their disposal and posing a danger to their well-being (De Bruin & Taylor, 2005)

The psychological experience of stress results from an assessment of the balance of perceived job demands and perceived resources (Lazarus & Folkman, 1984). Based on the view of stress as a psychological construct, stress and the pathological outcomes related to it occurs when a relationship between an individual and their environment is appraised as demanding or exceeding their available resources and therefore placing their well-being in danger (Lazarus & Folkman, 1984; McEwan, 2000).

In terms of perceived stress, an individual who perceives their context/work as too demanding in relation to their available resources is likely to experience high levels of stress. This is mostly due to such individuals either not being in possession of the appropriate resources or regarding their available resources as insufficient to deal with their demands.

McEwan (2004) later embarked to refine Selye's model to fit more recent physiological evidence. The author argued that the definition of stress should not be focussed on the construct of homeostasis, since homeostatic mechanisms such as pH balance or body temperature are not abundant and are not found to vary in response to external trials (McEwan, 2004). Rather, most of the bodily systems are allostatic, which refers to blood pressure and the immune response as example, and these fluctuate to meet demands for adaptation. As such, it was posited that a stress definition should focus on allostatic mechanisms, that are found to promote short term adaptation but can cause damage over the long term (McEwan, 2004). McEwan (2004) states that it is the "allostatic load", or the result of continued and/or repeated demands which necessitates adaptation and/or the compromised reaction to these demands, that causes allostasis to become pathogenic or dysregulated and cause stress.

Despite the differences in these early stress theories, there appears to be a common thread present with regards to the potential negative outcomes of a demanding environment on an individual (Amirkhan, 2012). From the stress theories above, stress can be considered as the result of a process wherein external demands drain or exceed the capacity of the individual to adapt to these demands, leading to potentially physiological and psychological changes which could put the individual at risk for poor health (Amirkhan, 2012). All of the theories above support the idea of stress surplus,

which occurs due to the interplay of resources and demands (Amirkhan, 2012). Furthermore, these theories all seem to converge on the point that the constructs of resources and demands must pair in a particular way (i.e., the mixture of low resources with high demands) for stress and illness outcomes to occur (Amirkhan, 2012). The construct of work or job stress specifically must also be considered.

The original Transactional Theory and Model of Stress provided an early explanation for the construct of organisational stress (Hankin & Abramson, 2001). In terms of the transactional approach, employees are stimulated by various factors in the work environment (Hankin & Abramson, 2001). Following exposure, employees appraise the stimuli according to their individual perceptions of the stimuli in order to determine whether they perceive them to be stressors or not (Hankin & Abramson, 2001). According to this theory, organisational stimuli are interpreted as being either threatening or unthreatening in nature (Hankin & Abramson, 2001).

When a stimulus is appraised as a stressor or threat, the individual will determine the magnitude of the threat and whether they have the necessary resources available to successfully manage or deal with the threat (Hargrove et al., 2015). If an individual appraises a stimulus as a significant threat that is regarded as unmanageable and in excess of their resources, high levels of stress ensue.

If a threat is identified but regarded as manageable, the individual may still experience some level of stress, however since the perception is that they have the necessary resources to deal with it, negative outcomes related to stress can be mitigated to an extent and the stress can usually be managed effectively. It is important to understand that some degree of stress can be motivating, however when stress becomes excessive it can be debilitating and may even result in burnout if the stress is experienced at an excessive level over an extended period of time.

Jamal (2007) defines work-, or job, stress as the reaction of individuals to the characteristics of their working environment that appear mentally, emotionally and/or physically threatening. Aspects that lead to stress span from demands such as everyday stressors to demands in the form of significant life events that can greatly jeopardise the capacity of an individual to preserve their performance levels and to

accomplish their desired objectives (Gucciardi et al., 2015).

Excessive stress is a serious problem faced by modern organisations, institutions, and their workforce world-wide (Gorgens-Ekermans & Herbert, 2013). A highly demanding work environment can result in negative work-related effects such as low performance, stress, ill-health, depression, exhaustion, intention to quit, actual turnover, burnout, absenteeism, and 'presenteeism' (Gucciardi et al., 2015; Hargrove et al, 2015;).

In light of the COVID-19 pandemic, work-related stress has been predictably high. One study sought to determine the effects of the COVID-19 pandemic and aspects like working remotely, on the work and study-related stress of a sample of 1055 staff and 925 students at a University in the United Kingdom. The study measured stress using the VAS-scale and the Perceived Stress Questionnaire (PSQ) (Der Feltz-Cornelis et al., 2020).

In the study titled, *Workplace Stress, Presenteeism, Absenteeism, and Resilience Amongst University Staff and Students in the COVID-19 Lockdown*, results show that University staff experienced high stress as a result of the pandemic with 66.2% of staff being labelled as vulnerable (Der Feltz-Cornelis et al., 2020). Low levels of stress were experienced by 33.8% of staff who were consequently labelled as resilient (Der Feltz-Cornelis et al., 2020). In contrast, students showed surprisingly high levels of resilience, with 71.7% of students being labelled as resilient and 28.3% non-resilient (Der Feltz-Cornelis et al., 2020).

Although higher levels of resilience occurred in students compared to staff, the experience of psychological distress was found to be much higher in students, specifically in students who were female, those who had children, and those in social isolation (Der Feltz-Cornelis et al., 2020). This finding suggests that factors predicting resilience may differ from those predicting psychological distress (Der Feltz-Cornelis et al., 2020). Therefore, any interventions aimed at improving resilience, or other personal resources, ought not to focus solely on psychological distress but may need to consider other factors such as engagement, as example.

In this study, the potentially negative impact of stress surplus on academic

performance will be considered. Given the utilisation of the JD-R theory and model as the academic framework for this study, a focus on stress differentiates this study from the JD-R which places its attention on burnout or exhaustion as the primary obstacle to performance.

The current researcher contends that focusing on stress rather than burnout or exhaustion may prove fruitful in the context of tertiary education as the presence of high stress levels can be identified sooner, allowing for the possibility to prevent burnout and exhaustion. Given the brief duration of undergraduate studies (the sample group focused on in this study), as well as the high risk for poor performance during the first two years of studies, it is considered important to identify any factors that may negatively impact academic performance as quickly as possible. Stress can therefore be identified and addressed before resulting in exhaustion or burnout and potentially allow for intervention before the impact on academic performance may be irreversible.

Since burnout occurs when individuals experience stress over prolonged periods. High stress levels that are left unchecked can eventually lead to burnout. Therefore, considering stress rather than burnout (or exhaustion; which is one of the three sub-variables that constitute the larger variable of burnout) could provide a window to address the factors causing stress. This will allow an opportunity to design and possibly implement appropriate intervention strategies to decrease the chance of students dropping out of tertiary programs.

Given the age group of our sample, intervention strategies for high stress or stress surplus are important. The sample of undergraduate students in this study is in a psychologically vulnerable stage of life. Students between the ages of 18 and 22 are in a developmental stage at which individuals are at a peak risk for the emergence of several internalising disorders such as major depression, panic disorder, and generalised anxiety disorder (Kessler et al., 2005).

This study will employ the definition of stress surplus as described by the Stress Overload Scale (SOS), which states that stress overload occurs as a result of two events: imposing demands and compromised resources (Amirkhan, 2012; Amirkhan et al., 2015).

Facing adversity and coping with imposing demands in absence of one's usual available resources is an ordinary expectation in the high achievement context of tertiary education. This researcher contends that individuals with a greater capacity to manage the stress that often accompanies imposing demands and who are able to overcome obstacles to performance despite a potentially compromised pool of resources, would be more likely to succeed in high achievement academic environments. The impact of stress surplus on academic performance within a tertiary academic environment is therefore considered an important area to explore.

2.4.3 Engagement

Engagement is the third latent variable identified for its potential role in influencing tertiary academic performance outcomes in this study.

2.4.3.1 *Defining engagement*

The first conceptualisation of engagement describes the construct as being “the simultaneous employment and expression of a person's ‘preferred self’ in task behaviours that promote connections to work and to others, personal presence (physical, cognitive, and emotional) and active, full role performances” (Kahn, 1990, p. 700).

Kahn (1990) further refers to engagement as the “harnessing of organisation members' selves to their work roles; in engagement people employ and express themselves physically, cognitively, emotionally and mentally during role performances” (p. 694). Based on Kahn's conceptualisation, employees who are engaged identify with and express themselves through their work, which in turn is linked to achieving superior performance.

Rothbard (2001) developed a definition of engagement from Kahn's conceptualisation. Rothbard (2001) considered engagement to be two-dimensional in nature, comprising of Attention (i.e., the cognitive availability as well as the time spent contemplating a role) and Absorption (i.e., the degree of focus or concentration employed with regard to a role).

Roux (2010) describes Employee Engagement as the involvement, satisfaction, and enthusiasm an employee experiences in relation to their work. Engagement has also been defined as voluntary effort exerted by an employee to advance their organisation and as a means of expression of the self through one's work and work-related tasks (Lin, 2010).

Bakker (2011) defines work engagement as the energy individuals direct towards their task-related goals in the workplace. Quick and Nelson (2013) define engagement as an expression of the self while performing work and related tasks. As can be seen, the definition of engagement has changed slightly over time, however, one commonality found in all the above definitions is that of concerted and intentional effort or energy towards work and work tasks.

Demerouti et al. (2001) were the first researchers to consider engagement as three-dimensional in nature. According to these authors, engagement consists of dedication, vigour, and absorption (Demerouti et al., 2001). Three-dimensional engagement is defined as a positive and rewarding work-related mindset which is not based on certain events, objects, behaviours, or individuals, but is primarily characterised by its three dimensions (Demerouti et al., 2001).

The three-dimensional approach has gained considerable support since its conceptualisation and has informed research and widely utilised measures of engagement, specifically the well-known The Utrecht Work Engagement Scale-17 (UWES-17) measuring instrument utilised in this study.

As multiple authors agree with the three-dimensional definition of work engagement and utilise similar descriptions when referring to the construct of engagement (Tims et al., 2012; Geldenhuys et al., 2014; Bakker & Demerouti, 2017). The three-dimensional

definition of work engagement has become the most widely accepted definition in psychological literature.

On the basis of the three-dimensional definition of engagement, Bakker and Demerouti (2017) describe work engagement as a mental state in which employees feel physically energised (vigour); have enthusiasm regarding their work content and their work duties (dedication); and they are so engrossed with their work tasks that it feels to them that time speeds up while they are working (absorption). As such, the construct of engagement as expressed in the JD-R, is deemed a multidimensional construct.

The three dimensions comprising the larger construct of engagement (i.e., dedication, vigour, and absorption) are divided based on their physical, emotional, and cognitive natures (Demerouti et al., 2001; Bakker & Demerouti, 2008; Geldenhuys et al., 2014; Bakker & Demerouti, 2017). Vigour can be considered the first dimension of work engagement and denotes the eagerness and willingness of employees to put in effort and dedicate their time to their work. Vigour is considered to be the physical element of work engagement and it is distinguished by high energy levels as well as a resilience in individuals in spite of failure or the experience of challenging work tasks (Bakker & Demerouti, 2008; Bakker & Demerouti, 2017; Geldenhuys et al, 2014).

The second dimension of engagement, dedication, refers to the strong identification and involvement that employees feel towards work, the experiences of challenge and significance they derive from their work tasks, and the enthusiasm they feel towards these tasks (Tims et al., 2012; Geldenhuys et al., 2014; Bakker & Demerouti, 2017). Employees who are dedicated see the work they perform as both meaningful and significant in nature, they are also prideful about their work, and ready to face work challenges. Dedication represents the emotional element of engagement (Bakker & Demerouti, 2017). Employees who are dedicated to their work are emotionally invested in their work; they relate with the work they do and attach meaning to that work.

Absorption is the third dimension of work engagement and is described as the full concentration on and pleasant preoccupation with one's work (Bakker & Demerouti, 2008; Bakker & Demerouti, 2017; Geldenhuys et al., 2014). Absorption is the cognitive

element of engagement, which refers to the full captivation with one's work (Bakker & Demerouti, 2017). An individual who is absorbed concentrates fully on their work and is cognitively present when conducting work tasks (Bakker & Demerouti, 2017). Absorbed individuals also tend to find disengagement from work difficult, which may present as a willing commitment to work that extends past the structured work hours.

In terms of these three dimensions of work engagement, engaged employees can be described as: willing and ready to commit their time, effort, and energy to their work; being able to emotionally identify with and find meaning in their work; and being mentally engrossed in their work tasks.

Several authors have gone on to research the reasons why engaged employees are consistently found to outperform their less engaged or unengaged peers and colleagues (Bakker, 2011; Knowler & Frederickson, 2013). Firstly, engaged employees are found to experience a greater number of positive emotions including feelings of joy, enthusiasm, and gratitude with regards to their work (Knowler & Frederickson, 2013). According to these authors, since individuals enjoy experiencing these positive emotions, they consequently seek out work opportunities that will allow them to experience these emotions (Knowler & Frederickson, 2013).

According to Broaden and Build Theory (Knowler & Frederickson, 2013), the experience of these positive feelings results in a momentary expansion or broadening of individual thinking and attention, which allows a temporary capacity to produce a wider range of ideas and visualise and understand connections on a higher and more complex level. Individuals are then able to build on this now broadened understanding and consequently develop further. Therefore, engaged employees are more inclined to experience a higher number of positive feelings, are more likely to seek out future opportunities that will allow for further engagement and resulting positive emotional outcomes, and utilise this experience to broaden their understanding of the world which leads to the improvement and development of the individual. It stands to reason that engaged individuals would consequently perform better than their peers, as they are in a constant state of growth and development.

2.4.3.2 Engagement and the JD-R

Work engagement forms a portion of the JD-R's motivational process, which is centred on employee well-being. The concept of engagement promotes enthusiasm, ideal levels of functioning, and employee health and well-being in institutions and organisations. Employee engagement can lead to several positive individual and organisational outcomes (Quick & Nelson, 2013). On an individual level, engaged employees are found to experience elevated levels of energy and self-efficacy and are less inclined to become drained by their work (Bakker & Demerouti, 2008; Quick & Nelson, 2013).

Engaged employees also view their work as having a positive impact on their psychological and physical health and well-being (Chalofsky & Krishna, 2009). Employees who engage, are actively involved in their work tasks; strongly identify with their work; and are more enthusiastic about and take greater pride in the work they perform (Leiter & Bakker, 2010).

Schaufeli (2011) summarised the findings from a number of research studies centred around engagement and which relate specifically to individual health. Engaged employees are found to experience less anxiety and work-related stress, and to be less depressed than less engaged or unengaged employees. Engaged employees also tend to be in better physical health, experience more positive feelings, and are more likely to sustain their performance throughout the workday (Schaufeli, 2011).

Furthermore, engaged individuals are more likely to sustain their efforts despite setbacks and failures (Siu et al., 2010). As such, although engaged employees may experience work fatigue in the same manner that any worker would, engaged employees continue to work hard and appear to remain satisfied with their work despite tiring (Bakker, 2011; Schaufeli, 2011).

Engaged employees are valuable assets to an organisation. When all three dimensions of engagement are present, engagement tends to lead to job satisfaction, higher job involvement levels, and greater levels of organisational citizenship

behaviour (OCB) (Geldenhuys et al., 2014; Schaufeli, 2011; Quick & Nelson, 2013;). Bakker (2011) describes work engagement as a key predictor of employee job performance which ultimately benefits the larger organisation or institution. Employees who are engaged display higher levels of productivity which, in turn, lead to greater profitability (Leiter & Bakker, 2010).

Further research supports the statement that engaged employees are more likely to portray positive organisational behaviour and do more than is expected from them in their job description (Macauley, 2015). Engaged employees are also more likely to align their own values to the values of the organisation or institution where they work or study (Macauley, 2015). Researchers have found that employee engagement can decrease negative work-related consequences like absenteeism and errors, and increase positive work-related results such as productivity, retention, and customer satisfaction (D'Emiljo & Du Preez, 2017).

Engaged employees have a greater work ethic and are more likely to devote a significant amount of both time and effort to their work (Chalofsky & Krishna, 2009). According to Jave et al. (2015), organisations that focus on increasing employee engagement are likely to experience faster business growth than those who fail to make engagement a priority. On the other hand, disengagement can lead to employee distrust, poor performance, high employee burnout levels and poor organisational commitment (Lin, 2010).

According to Roux (2010), understanding the psychology behind employee engagement can provide valuable information regarding the reasons why some employees strongly identify with and engage with their work, while others do not. These insights can allow for an improved understanding of what fosters employee engagement and therefore afford the opportunity to address employee engagement in an effort to lead to increased positive work-related outcomes. Given the above, engagement is included in this study due to the potential of the construct to influence tertiary academic performance outcomes.

2.4.4 Job demands

The fourth latent variable in this study is job demands. Job demands are any social, physical, psychological, and/or organisational features of a job which necessitate constant psychological input, physical effort, and skill from employees (Bakker & Demerouti, 2014). Examples of job demands include job/work overload, restraints with regards to time and deadlines, job insecurity, and interpersonal demands (Bakker, 2011). Other demands include high work pressure, high work pace, organisational constraints, emotionally demanding interactions, physical job demands, cognitive demands, and work-life conflicts (Bakker & Demerouti, 2017; Tre ´panier et al., 2014). Glaser et al. (2015) define job demands as work characteristics that cause employees to exert effort which leads to the loss and possible depletion of physical and psychological energy and resources.

Job demands are not inherently negative. In terms of the JD-R model, the assumption is that, when job or work demands are high, employees are required to exert extra effort to meet their job or work goals (Schaufeli & Taris, 2014). This is seen to activate employees. However, this is only true up to a certain point. When job demands become excessive or imposing, there are psychological as well as physical costs such as irritability and fatigue that can ensue (Schaufeli & Taris, 2014). Very high or imposing job demands can therefore increase the risk of employees experiencing health impairment outcomes such as stress, strain, and burnout.

Crawford et al. (2010) conducted a meta-analytic study wherein they expanded on the definition of job demands by discerning between challenge and hinder demands. Schaufeli and Taris (2014) stated that the nature or the type of job demand could determine whether the resulting work outcomes are either positive or negative. These authors also considered job demands as being either hindering or challenging in nature (Schaufeli & Taris, 2014).

LePine et al. (2005), defined hindering job demands as demands which are experienced as stressful and seen to place unnecessarily high pressure on employees. Hindering demands can prevent individual growth of employees and are

often perceived to be restrictions or obstacles (Crawford et al., 2010). Hindering demands are demands which hinder or decrease the ability of an individual to function optimally (LePine et al., 2005).

Schaufeli et al. (2009) stated that the experience of exposure to hindering or imposing job demands can increase individual stress and burnout and decrease their engagement levels. This occurs because, as a result of individuals utilising a substantial number of their available resources to manage hindering demands, fewer resources are available for them to remain engaged with their work and focus on their well-being (Schaufeli et al., 2009). Hindering job demands drain the psychological and physical energy of employees and contribute to negative work-related outcomes (Tre´panier et al., 2014). Hindering demands are therefore more likely to result in high stress levels and lead to decreased engagement levels.

Challenging demands are job demands that cause an active response in employees and are demands that can be solved in a solution-orientated manner (Crawford et al., 2010). “Challenging job demands may promote employee’s personal growth and future gains and tend to be perceived as opportunities to learn” (Lesener et al., 2019:77-78).

Individuals confronted with challenging job/work demands have a propensity to be more motivated to work hard to reach the goal they have set. Challenging demands are therefore regarded as the demands that ‘activate’ employees to work harder (Bakker & Demerouti, 2007; Becker & Hargrove, 2015; Hargrove et al., 2015; Hobfoll, 2001; Karasek, 1979; Scott, 1966; Robbins, 2005).

When faced with challenging demands, individuals are likely to seek out and make better use of their resources in order to meet these demands. This is in line with the finding from Hobfoll (2001) which states that resources become more salient and motivating and become especially useful when they are needed. According to Karasek (1979), challenging demands combined with sufficient resources activate behaviour and pose a challenge for employees to become more informed and learn new things; test out new behaviours; find alternative resources to meet their demands; as well as motivate them to make full use of their available resources. Challenge demands are therefore literally challenging employees to acquire new information and to continue

to learn during the performance of their job. Challenge demands also act as a motivator for employees to use more novel behaviours. Therefore, these demands pose a challenge which motivates individuals to work harder, make use of the resources available to them, and expand their thinking and behaviour (Bakker & Demerouti, 2007).

The absence of challenging job demands can negatively affect engagement as well as performance outcomes (Hargrove et al., 2015). According to activation theory (Robbins, 2005; Scott, 1966), employees who lack challenging job demands, are unlikely to be 'activated' by their work and are therefore unlikely to put in the necessary effort to achieve high levels of performance. Employees who do not experience the demands of the work they perform as a challenge, experience little drive to perform and are unlikely to feel motivated to put in the hard work needed to excel in their job.

Bakker and Demerouti (2007) also concluded, that challenging job demands constitute a motivator that fosters growth, learning, and development. According to these authors, individuals are only motivated to put in effort when they are challenged and are required to learn how to address novel work demands (Bakker & Demerouti, 2007). It could therefore be argued that job demands are considered problematic when they are, or appear to be, hindering in nature and when they are not presenting a challenge.

Ideally, jobs should consist of challenging demands with an equally high pool of resources to meet these demands. To achieve positive work-related outcomes, a job should have comparatively high demands and resources to keep individuals challenged and focused. Jobs that link challenging demands and a high level of resources are appropriately termed 'active jobs' (Karasek, 1979). This combination leads to an ideal state, as the mixture of a high level of resources and a high level of demands tend to result in motivation, engagement, job satisfaction, and high employee performance (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2007; Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009b).

In the absence of sufficient resources, high job demands are more likely to be appraised as hindering as opposed to challenging in nature and are more likely to result in negative work-related outcomes (Bakker, 2011; Tre'panier et al., 2014).

Alternatively, individual appraisal could lead individuals to perceive high demands as unthreatening, and therefore they would view them as a challenge. In this scenario, the individual is unlikely to have a negative stress response to such demands.

Therefore, individuals who either perceive their resources as sufficient in the face of perceived threatening demands or who perceive demands as non-threatening but rather challenging, are likely to progress and perform better in high-pressure environments. These individuals are not only likely to experience less stress in demanding environments but are also less likely to suffer the negative ramifications that accompany stress responses and are therefore more likely to sustain or even excel in their performance within highly demanding environments.

In this study, job demands are the demands that are faced by students during tertiary education and the demands of studies were measured using the work overload job demands sub-scale of the Job Demands-Resources Scale (Rothmann et al., 2006). Since tertiary students are faced with high academic demands, especially when compared to the demands of secondary education, it is posited that they would require a high level of resources to handle the demands of tertiary education. Individual differences are expected to differ with regards to the perception of the demands of tertiary education as being either challenging or hindering.

2.4.5 Personal resources

Personal resources are the final latent variable of relevance to this study. The part that personal resources play in this study will be discussed in more detail below. Personal resources are the perceptions that individuals have about their own capacity to effectively manage the environment they operate in (Hobfoll et al., 2003). A personal resource exists in the individual and it can be either of worth or value in and of itself, such as having high levels of self-esteem, or it can offer an avenue to gain valued outcomes which are external to the individual, such as gaining interpersonal competences (Kira et al., 2010).

In this study, focus is placed specifically on 'protective' or 'resistance' personal resources given the proposed mediating effect that personal resources can have on

the relationship between stress and job demands in the JD-R.

Protective, or resistance, resources act as a buffer for the negative impact of life's difficulties (Gucciardi et al., 2015). Protective resources are especially valuable at times when adaptation and change are required for success (Gucciardi et al., 2015). Successful adaptation to change and the ability to cope are particularly important during transitional periods. Considering this, protective resources may prove highly beneficial to sustaining student academic performance during the transition from secondary to tertiary education.

For a professional student, protective personal resources can shield them from the possible adverse effects from imposing high demands, including the experience of high stress levels, strain, and burnout. Due to this shielding effect, those individuals with more protective personal resources or a higher level of personal protective resources are more inclined to cope well in instances where they have to deal with high job demands compared to individuals with fewer or lower levels of resources. It is argued that the reason for this is that the presence of personal protective resources may lead an individual to rather appraise work demands as challenging than hindering, as they would be more likely to perceive their available resources as sufficient to meet the demands they are faced with. These individuals are also in possession of a greater number of resources which can balance out high job demands.

The researcher now introduces a few personal protective resources which have dominated the literature. These resources will be elaborated on later in the chapter.

Personal protective resources such as resilience, hardiness, perseverance, grit and mental toughness, to name but a few, have received noticeable research attention in various high-performance environments over the years (Crust et al., 2014; Gucciardi et al., 2009; Gucciardi et al., 2015; Hardy et al., 2014; Kobasa, 1979; St Clair-Thompson et al., 2014). Due to their utility, the various personal protective resources mentioned above were considered for the possible inclusion in this study. A definition and brief description of the resources is provided below.

Resilience is a personal protective resource that describes the dynamic process

wherein an individual either retains or reclaims steady, healthy physical functioning after experiencing hardship (Gucciardi et al., 2015). According to Gucciardi et al. 2015, resilience refers to the process of either maintaining one's current functionality or recovering from and 'bouncing back' following primarily negative occurrences (Gucciardi et al., 2015). Resilience could therefore be ascribed to sustained performance and functionality of students after, for example, performing very poorly in a test or exam.

One personal protective resource that has demonstrated its value especially in high performance environments is hardiness. According to Kobasa (1979), hardiness is a personality disposition that consists of three main dimensions; control, commitment, and challenge.

Control refers to the capacity to feel and behave in a way which exhibits control over one's life and work. Commitment refers to the propensity to become further involved in one's life and work activities rather than moving away from these activities during stressful times. Challenge refers to the capability to view stressful or tough circumstances in a positive way and to view challenges as an opportunity for growth.

Individuals who exhibit the challenge component of hardiness regard change and ambiguity as a normal life process which can lead to self-development (Kobasa, 1979). According to Kobasa's definition, hardy individuals therefore have the capacity to feel and to act in a manner that reflects having control over their work and life; increase their commitment and engagement with life and work during times of stress rather than pulling away from it; and regard change and challenges as an opportunity for growth and self-development rather than as a barrier to success.

A later definition describes hardiness as a vital psychological construct that differentiates individuals who suffer from ill health from those who remain in good health during times of high stress and strain (Crust et al., 2014). In this view, hardiness is seen to have a marked focus on the health of individuals and their ability to resist the negative impact of stressors.

Perseverance is another personal protective resource that has proven to be of use to

individuals in high performance environments, and it refers to the tendency to sustain hard work in the face of challenges, despite feelings of frustration or fatigue. According to Gucciardi et al. (2009), perseverance is defined as consistently accomplishing one's goals and not giving up when encountering adversity or difficulties. Based on this definition, students who rate high with regard to the perseverance resource are more likely to continue working hard to meet their goals despite being faced with high demands.

Grit is another personal protective resource worth considering. Duckworth et al. (2007) first presented grit as a measure within a student learning environment. These authors defined grit as the perseverance for and passion for one's long-term goals (Duckworth et al., 2007). According to Bashant (2014), grit is a combination of the measures of resilience, conscientiousness, self-control, and perseverance. In other words, grit consists of a combination of four sub-factors.

In their early research, Duckworth et al. (2007) reasoned that an individual with grit relentlessly persists in the face of adversity and sustains their level of effort over time. As a result, an individual with grit is more likely to be a high achiever when compared to another individual possessing lower levels of grit (Duckworth et al., 2007).

According to Christopoulou et al. (2018), grit has been considered a novel non-cognitive construct that plays a significant role in successful educational outcomes. These authors define grit as a mixture of both persistent effort and consistent interest (Christopoulou et al., 2018).

From this definition, it could be argued that grit is a combination of the constructs of perseverance and engagement. The above authors conducted a systematic assessment of the available literature to determine the relationship posited to exist between positive educational outcomes and grit (Christopoulou et al., 2018). Between 2012 and 2017, they identified 29 published studies that assessed grit within the domain of education (Christopoulou et al., 2018). Findings from their review revealed that grit displayed moderate to weak correlations with the considered educational outcomes (Christopoulou et al., 2018).

The final personal protective resource considered is Mental Toughness (MT). The authors Gucciardi et al. (2014) refer to the resource of MT as the psychological capability of individuals to perform on a consistent and high level, regardless of high demands stemming from their current situation. In terms of this definition, an individual high in MT is seen to have the personal ability to deliver constant high performance and achieve their goals regardless of highly demanding circumstances (Gucciardi et al., 2014).

Gucciardi et al. (2015) conceptualised MT as a three-fold construct that consists of surviving demands and hardships, consistently striving towards, and achieving one's goals, and thriving during times of high stress and pressure. These authors view MT as more than the ability to survive stressors and hardship while continuing to strive towards their goals. They view MT as a construct that is also defined by individuals who thrive in demanding environments marked by high pressure, uncertainty, and stress (Gucciardi et al., 2015). The inclusion of the concept of thriving in the definition of MT has been a particular differentiator of this personal protective resource from others.

In terms of the above definition, an individual who is mentally tough will not only successfully cope during difficult times and consistently strive towards goals, but will also flourish, achieve their goals, sustain high levels of performance, and perhaps even increase performance when confronted with demanding and stressful situations. In terms of this conceptualisation, individuals high in MT could surpass their previous levels of performance during times of stress and hardship and perform better when confronted with highly demanding tasks or circumstances.

Given the above, the MT personal protective resource caught the attention of this researcher due to its implications for potentially increased levels of performance during strenuous circumstances. For the purpose of this study, MT will be the representative personal resource. This researcher opines that MT is more comprehensive than other similar resources, has shown utility in extended comprehension of concepts of

engagement and stress, and has demonstrated its value in multiple high-performance domains.

MT as a personal protective resource is elaborated on below.

2.4.5.1 *Mental toughness as a personal protective resource*

The definition of MT is still being refined, and researchers differ regarding its precise meaning, but several working definitions have been developed to describe the construct.

One definition of MT states that mentally tough individuals are social; outgoing; and competitive; they remain calm in stressful scenarios; present with lower levels of anxiety when compared to their non-mentally tough peers; they believe in themselves and in their ability to control their life and future; and they are able to continue unaffected by conflict and harsh conditions (Horsburgh et al., 2008).

Gucciardi et al., (2009) describe MT as an assemblage of both built and intrinsic attitudes, emotions, values, and thoughts, all of which impact the way individuals evaluate, approach, and react towards life and work stressors. This collection of resources is of such a nature that it allows the individual to continue to strive for and reach their goals even in trying times.

According to Coulter et al. (2010), MT refers to the presence of some or all natural and developed attitudes, emotions, values, thoughts, and behaviours which impact the way individuals assess and respond to stressors, pressure, challenges, and adversity while consistently achieving their goals.

Crust and Clough (2011) relate MT to high competitiveness, commitment, self-motivation, effective coping, and concentration in environments of high pressure; persistence during difficult times; and maintaining high levels of self-belief despite setbacks.

Furthermore, Gerber et al. (2012) describe MT as the capacity and enthusiasm that individuals have to solve problems, recover from adversities, learn from their errors,

and act self-efficaciously, while Clough and Strycharczyk (2012) refer to MT as a quality that governs how effectively individuals handle challenges, pressure, and stress, regardless of continuing difficult conditions.

MT, as defined by Hardy et al. (2014), is referred to as the ability to continue to strive towards achieving one's objectives under the psychological circumstances that would lead less mentally tough individuals to fail. These authors more specifically define MT as the capacity to persist to pursue and achieve one's personal goals despite difficulties and pressure stemming from life and work stressors (Hardy et al., 2014).

The definition of MT has evolved and been refined, but most researchers now seem to agree on the basic principle underlying the MT construct. Specifically, mentally tough individuals are able to successfully manage the hurdles, stress, challenges, pressure, and setbacks of both daily life and momentous life stressors, while continuing to strive towards their goals despite difficult circumstances. MT therefore entails the triumph over daily troubles and stressors, whilst consistently reaching for and achieving one's goals, regardless of hurdles.

Gucciardi et al. (2014) extended the definition of MT. While these authors still regard MT as the ability to endure challenges and stressors in life while continuing to strive towards goal attainment, they link MT to achievement and performance outcomes. Specifically, MT is referred to as the psychological capability of an individual to constantly offer high levels of performance and achieve their goals regardless of high demands (Gucciardi et al., 2014).

The same authors took this definition one step further, Gucciardi et al. (2015) regard MT as more than the capacity to survive stressors and hardship whilst consistently striving towards their goals, but also see individuals thriving in demanding environments marked by high pressure, uncertainty, and stress.

The development of the MT construct is laid out in Table 2.1. The table shows the definitions of MT which have been formulated by researchers over time and presents a summary of these MT definitions.

Table 2.1*Definitions of Mental Toughness*

Year	Author/s	Definition
2008	Horsburgh, Schermer, Veselka and Vernon	"Mentally tough individuals are social and outgoing, remain calm and relaxed in stressful situations, are competitive, have lower anxiety levels than their non-mentally tough peers, believe in themselves, believe they are in control of their own destiny, and can remain relatively unaffected by fierce competition and adversity."
2009	Gucciardi, Gordon and Dimmock	"MT is a collection of developed and inherent values, attitudes, emotions, and cognitions that affect the way in which individuals assess, approach, and respond to life and work stressors in such a way as to continue to reach their goals in difficult times."
2010	Coulter, Mallett and Gucciardi	"MT refers to the presence of some or all natural and developed values, attitudes, emotions, cognitions, and behaviours that impact the way an individual assesses and responds to positive and negative stressors, pressure, challenges, and adversity while consistently achieving their goals."
2011	Crust and Clough	"MT is related to high competitiveness, commitment, self-motivation, effective coping and concentration in high pressure environments, persistence during difficult times, and maintaining high levels of self-belief despite setbacks."
2012	Gerber et al.	"MT is the ability and motivation of individuals to solve problems, bounce back from hardships, learn from their mistakes, and act with self-efficacy."
2012	Clough and Strycharczyk	"MT is a quality that determines how effectively individuals deal with challenges, stressors and pressures regardless of prevailing circumstances."
2014	Hardy, Bell and Beattie	"MT is the ability to continue to strive towards achieving one's goals under psychological conditions where others are likely to fail."
2014	Gucciardi et al.	"MT is the psychological capacity of individuals to deliver high performance on a consistent basis regardless of high demands stemming from a current situation."
2015	Gucciardi et al.	"MT is a three-fold construct consisting of surviving demands and hardships; consistently striving towards and achieving one's goals; and thriving during times of high stress and pressure. MT is more than the ability to survive stressors and hardships while continuing to strive towards their goals; it is also defined by individuals who thrive in demanding environments marked by high pressure, uncertainty, and stress."

Regardless of the development of the definitions of MT, the model that is most utilised to this day and therefore considered the most appropriate model to use to account for MT in this study is the 4 Cs model of MT developed by Clough et al. (2002). Regardless of the year of its origin, the 4 C's model of MT remains the most applicable and useful explanation of MT.

The 4 C's model was developed from the construct of hardiness. Clough et al.'s (2002) model consists of six separate, but related dimensions labelled: commitment, challenge, control of emotion, control of life, confidence in abilities, and interpersonal confidence. This model was named the 4 Cs model, which refers to the four overarching aspects of commitment, challenge, control (i.e., control of emotion and control of life), and confidence (i.e., confidence in abilities and interpersonal confidence).

The first difference between the construct of MT and hardiness is that MT, unlike hardiness, is not a fixed personality trait or personality disposition. MT involves the interpretation of life and the reaction to life's stressors rather than being a fixed state. Secondly, MT is thought to be an extension of the hardiness construct as described by Kobasa (1979). As mentioned, this author defines hardiness as comprising of three key elements, namely control, commitment, and challenge (Kobasa, 1979). Clough et al.'s (2002) model of MT consists of six dimensions labelled: commitment, challenge, control of emotion, control of life, confidence in abilities, and interpersonal confidence.

According to the 4 Cs model of MT, commitment refers to perseverance in tasks when facing difficult circumstances (Clough et al., 2002). The challenge component of MT represents individuals looking for opportunities for development and seeing potential difficulties as opportunities rather than obstacles (Clough et al., 2002). The control dimension of the 4 Cs model of MT is subdivided into life control and emotional control (Clough et al., 2002).

Emotional control is explained as the capacity to keep one's feelings and anxiety in line and to not disclose these feelings to other people (Clough et al., 2002). Life control is the belief individuals have about the level of control they have over their life (Clough

et al., 2002). The confidence dimension of MT is subdivided into confidence of ability as well as interpersonal confidence (Clough et al., 2002). Confidence in ability refers to a faith in one's individual virtues and does not depend on the validation of others (Clough et al., 2002). Interpersonal confidence is the ability to be assertive and remain unintimidated when in social environments (Clough et al., 2002).

The 4 C's model of MT is regarded as the optimal model to be consulted as reference to MT in this study, since the most utilised tool used to measure MT was formulated based on this model. Clough et al. (2002) developed an instrument containing 48 items used to measure MT and aptly named it the Mental Toughness Questionnaire (MTQ48). The MTQ48 is the most utilised MT measure and is based on the 4C conceptualisation of MT (Gucciardi and al., 2012). A shortened version of this tool, the Mental Toughness Questionnaire Lite (MTQ-Lite) was utilised in this study. This conceptualisation of MT will therefore be considered for the purpose of this study.

2.4.5.2 Clarifying the constructs

For the sake of conceptual clarity, it is important to be cognisant of and recognise both the similarities and differences that exist between MT and other similar personal protective resources. Given the similarities between personal protective resources, researchers have erroneously used these constructs interchangeably in the past, leading to distorted data and construct confusion.

Considering these constructs as interchangeable and consequently conducting research on this premise, would provide an inaccurate portrayal of the data. The results from such a study are highly likely to be inaccurate and would result in a further increase in existing conceptual confusion. As such, the manner in which these constructs are both similar and different will be explored, to clarify exactly what is meant when speaking of MT in this research study.

The 4 C's model of MT was utilised to provide a clear description of the overlap between the construct of MT and other personal protective resources.

The conceptual overlap between MT and hardiness will be explained first, initially focussing on the key differences between the two constructs. The most quoted and

most referenced definition of hardiness as described by Kobasa (1979) was utilised for the comparison between MT and hardiness. Both the 4 C's model of MT and the definition of hardiness have stood the test of time and remain relevant in today's context.

The first difference between these constructs is that MT, unlike hardiness, is not a fixed personality trait or personality disposition. MT involves the interpretation of life and the reaction to life's stressors rather than being a fixed state. Secondly, MT is thought to be an extension of the hardiness construct as described by Kobasa (1979). As mentioned, this author defines hardiness as comprising of three key elements, namely control, commitment, and challenge. Clough et al.'s (2002) model of MT consists of six dimensions labelled: commitment, challenge, control of emotion, control of life, confidence in abilities, and interpersonal confidence.

According to the 4 Cs model of MT, commitment refers to perseverance in tasks when facing difficult circumstances (Clough et al., 2002). In terms of hardiness, commitment refers to the predisposition to further engage rather than move away from life and work activities during stressful times (Kobasa, 1979). In this sense, both descriptions of commitment refer to a continuation in adverse conditions, but MT speaks about commitment in terms of perseverance in such conditions whereas hardiness speaks of becoming increasingly involved during trying times.

The challenge dimension of MT refers to individuals seeking out possibilities for self-development and seeing potential difficulties as opportunities rather than obstacles (Clough et al., 2002). Challenge within the hardiness construct refers to the ability to see stressful and difficult circumstances positively and to regard them as a chance to grow. Individuals who exhibit the challenge component of hardiness regard change and ambiguity as a normal life process which can lead to self-development (Kobasa, 1979). With regards to this dimension, both MT and hardiness regard challenge as an opportunity for self-development as well as viewing potential obstacles as opportunities rather than threats. This dimension is therefore highly similar for both constructs.

The control dimension of 4 Cs model of MT is subdivided into emotional control and life control (Clough et al., 2002). Emotional control is the capability to keep emotions

and anxiety under control and in line, and to not show these feelings to other people, while life control is the belief individuals have about their personal control over the unfolding of their life (Clough et al., 2002). Control in the hardiness dimension refers to the capacity to feel and behave in such a way that shows control of one's life and work (Kobasa, 1979). The control dimension in hardiness is more simplistic than the MT dimension. The MT construct separates control into two further sub-dimensions of emotional control and life control (Clough et al., 2002). No such a distinction is made when referring to the control dimension used in hardiness, with the control dimension of hardiness being similar to the life control sub-dimension of MT and furthermore making no reference to displaying a sense of emotional control (Kobasa, 1979; Clough et al., 2002). The control dimension of MT can therefore be regarded as an extension of the hardiness control dimension when considered in this way.

As has been mentioned, the 4 Cs model of MT has a fourth dimension called confidence (Clough et al., 2002). The hardiness construct as defined by Kobasa (1979) comprises of only three dimensions. The fourth dimension is subdivided into confidence in ability and interpersonal confidence (Clough et al., 2002). Confidence in ability refers to the belief in one's own talents regardless of external validation (Clough et al., 2002). Interpersonal confidence is about showing assertiveness in social setting and remaining un intimidated in the process (Clough et al., 2002).

From the above it can be seen that the three components of hardiness do overlap with the commitment, challenge, and control dimensions of the 4 C's model of MT to some degree (Clough et al., 2002; Kobasa, 1979). With regards to the challenge dimension, MT and hardiness have very similar definitions of this dimension. This dimension holds the most conceptual overlap between MT and hardiness.

In terms of the remaining dimensions, MT differs from the hardiness construct in that MT refers to the commitment dimension in terms of perseverance in adverse conditions whereas hardiness speaks of becoming increasingly involved during difficult times. The control dimension in hardiness is more simplistic than the MT dimension. The control dimension is divided into two sub-dimensions of emotional control and life control in the MT model and no such distinction is made with the control dimension of hardiness. Rather, the control dimension of hardiness shows a high level

of similarity to the one control sub-dimension of MT (i.e., life control) with no reference to emotional control. The control dimension of MT is therefore an extension of the hardiness control dimension in that it adds emotional control to its definition.

The 4C's model of MT further extends the hardiness construct by including a fourth dimension; confidence (Clough et al., 2002). As such, although hardiness and MT do have some conceptual overlap, the difference in their definitions is clear.

MT also shares several characteristics with resilience. Resilience is defined as a process that involves several different personal protective resources and MT is regarded as one of the personal protective resources within the resilience process (Gucciardi et al., 2015). The entirety of the MT construct as explained by the 4C's model of MT is not represented in the resilience process. Specifically, only the challenge and control subscales of MT are represented in the resilience process. Therefore, as much as the resilience process claims to include MT as one of its personal protective resources, the entire construct is not represented and therefore it would not be accurate to claim that it is the construct of MT that is in fact being measured (Gucciardi et al., 2015).

Furthermore, resilience refers primarily to the process of 'bouncing back' after a setback and continuing to perform and function, whilst MT is associated with the experience of a smaller dip in performance and functionality rather than a return after a large setback. These two constructs should therefore not be regarded as conceptual equals nor should they be used interchangeably (Gucciardi et al., 2015).

Perseverance is the third personal protective resource that has conceptual overlap with MT. Perseverance is defined as consistently reaching for one's targets and not giving up when encountering adversity and difficulties; it is the tendency to sustain hard work in the face of challenges, despite feelings of frustration or fatigue (Gucciardi et al., 2009). Perseverance appears to overlap somewhat with the commitment dimension of the 4C's model of MT. According to the 4 Cs model, commitment refers to perseverance in tasks when facing difficult circumstances (Clough et al., 2002). It is therefore observed that perseverance describes part of the larger MT construct which consists of a number of other variables as well. Therefore, these constructs cannot be

used interchangeably.

Furthermore, unlike MT, the construct of perseverance is not linked to performance outcomes. Individuals who persevere in their tasks are not necessarily going to perform well. These individuals are persistent in their efforts over time and could succeed in achieving their goals over time as they do not give up, but persistence does not equate to good performance.

Grit is another construct that is sometimes used interchangeably with other personal resources such as MT. Duckworth et al. (2007) first described grit as the combination of persistence and a passion for one's long-term goals. These authors reasoned that a gritty individual is one who persists unceasingly in the face of adversity, sustains effort over time, and is more inclined to achieve highly when compared to their others of equal intelligence who exhibit lower levels of grit (Duckworth et al., 2007).

According to Christopoulou et al. (2018), grit is a non-cognitive factor reported to play a large and noteworthy role in positive outcomes in multiple areas but especially in the field of education. The concept of grit is based on two premises namely, perseverance of effort and consistency of interest (Christopoulou et al., 2018). From the above, it is clear that grit has primary conceptual overlap with the personal protective resource of perseverance.

In conclusion, MT extends the construct of hardiness as it includes the dimension of confidence and expands on the dimension of control by including emotional control. Two of the MT subscales show conceptual overlap with resilience, but resilience is a process that includes other protective resources along with two MT subscales. MT and resilience also differ in terms of their categorisation, with resilience being regarded as a fixed personality trait and MT not being fixed but involving an interpretation of life and a reaction to stressors. Perseverance is seen as one component of the larger MT construct differing in its lack of correlation between perseverance and performance outcomes. Lastly, the construct of grit shows significant overlap with perseverance. Therefore, although these personal resources may appear similar on face value and share some qualities, their differences are significant and need to be acknowledged,

not just for conceptual clarity but to ensure that the right construct is measured and interpreted.

2.4.5.3 *Mental Toughness in higher education*

This section will consider the value of the personal protective resource of MT within higher education.

The construct of MT first emerged in sport psychology and many authors regard it as a key ingredient for successful sport performance (Bull et al., 2005; Connaughton et al., 2008; Jones et al., 2007). In this context, the presence of MT has been found to correlate with the capacity of athletes to better deal with the high demands of elite sport. There are, however, a number of competitive and high-pressure settings which fall outside the realm of sport, and it did not take long for MT to receive attention in other high-performance domains (Crust, 2008; Gerber et al., 2012; Gucciardi et al., 2015; Gucciardi et al., 2021; St Clair-Thompson & Clough, 2017).

Research into the utility of MT quickly expanded from its focus on sport psychology and has since shown utility in other areas emphasising high achievement and high-performance outcomes.

MT has since received research attention in multiple high-performance domains including the military, the health sector, the field of education, and business (Anthony et al., 2016; Clough & Strycharczyk, 2012; Cowden et al., 2014; Gucciardi et al., 2021; Lin et al., 2017; McGeown et al., 2017).

According to Percy et al. (2019), MT is central to high-level performance in demanding situations. MT provides the base and the driving force for consistently high levels of performance and relates to perseverance, and superior performance in highly demanding environments (Gucciardi et al., 2015; 2019 Gucciardi et al., 2021; Percy et al., 2019).

Anthony et al. (2016) described MT as a necessary resource for high levels of performance in most competitive and demanding environments. Research conducted

on various high achievement environments found that MT plays an essential role in the process of predicting performance outcomes (Gucciardi et al., 2015; Percy et al., 2019). Lin et al. (2017) conducted a comprehensive and systematic review of multiple empirical studies of MT and their conclusions suggest that MT is linked to a number of positive psychological qualities, efficient and effective coping strategies, and overall positive outcomes in both the spheres of education and mental health. Furthermore, the findings from their study suggest that a 'mental toughness advantage' exists which has implications for the development of interventions to facilitate higher achievement (Lin et al., 2017).

Tertiary education is one high-performance domain where MT has shown great utility. Research findings show that MT is a sound predictor of academic performance in tertiary education (Gerber et al., 2012; Lin et al., 2017). MT is regarded as significant in the tertiary academic environment owing to its link to academic outcomes, dropout rates, graduate employability, and student ambitions (Godlewski & Kline, 2012). From the research of Crust et al. (2012), the academic performance of undergraduate students who are mentally tough is consistently seen to be pointedly higher when compared to the academic performance of students with lower MT levels. Research conducted by Crust et al. (2014) found that MT had considerable relation to the academic performance and academic progression of first-year students at university.

Given its association with high performance in competitive domains, Lin et al. (2017) conducted a study on MT to determine if individual differences in MT correlated with success during both higher education and at work. These authors assessed academic performance and attendance over a three-year period on a sample of individuals at a British university (Lin et al., 2017). From the study it was found that MT was linked to higher average academic grades, and that individual MT differences could predict income. These findings suggest that MT consists of positive psychological properties which are of importance to both academic and career success (Lin et al., 2017).

A study by St Clair-Thompson et al. (2015) considered MT in relation to academic performance in higher education. Three studies investigated the relationship between MT and factors of educational performance in 159 adolescents aged 11 to 16 from a school in England. Results from one of these studies showed significant relations

between facets of MT (specifically the control of life dimension) and academic success and attainment (St Clair-Thompson et al., 2015).

Research conducted by Stock et al. (2018) examined the connections between MT, positive as well as negative emotions, and academic success. Their study consisted of a sample of 141 psychology undergraduate students and most notably, the findings revealed a positive relationship between the control of life dimension of MT and academic success, which was measured using academic grades (Stock et al., 2018).

In a study by St Clair-Thompson et al. (2015) it was found that, in higher education, MT explained up to 25% of variance in the academic performance of individuals. From the above it is clear that the mindset and attitude of an individual has an impact on their performance, well-being, and behaviour. Individuals who are mentally tough work with greater purpose, deliver greater results, are more committed to their studies, and are more competitive (St Clair-Thompson et al., 2015).

Stamp et al. (2015) wrote that an individual who is mentally tough is likely to have higher self-esteem, make more positive self-appraisals, and is therefore more likely to receive more optimistic performance appraisals. Consequently, these individuals experience greater academic achievement, personal development, and have better attendance rates.

Mentally tough individuals have also been found to manage stress better, experience greater levels of overall well-being, are more engaged, and respond more positively to change and adversity (St Clair-Thompson et al., 2015; Percy et al., 2019). Individuals with higher levels of MT deal better with new settings, new programmes, new courses, new teachers, and new colleagues and are more comfortable with change and transition than less mentally tough individuals (St Clair-Thompson et al., 2015). The capacity to not only handle changes and novel demands which arise during life transitions, but to see such changes as a test rather than a threat, are indicative of the possession of MT (Stamp et al., 2015).

A study by St Clair-Thompson and Clough (2017) specifically linked MT and educational transition. These authors studied the connection between MT and

adjustment to university life in a sample of 200 undergraduate students at various stages of study. When students transition from secondary to tertiary education, they experience increased responsibility; an increase in academic workload; changes to the learning environment; high academic expectations; increased self-reliance, and often a decrease in external support. For the sake of sustained academic performance, students should ideally manage and adapt to these changes as quickly and effectively as possible, given the link between the transition to tertiary education and a decrease in academic performance (Stamp et al., 2015). Multiple researchers have found evidence that tertiary students experience a decline in academic performance, specifically during the first and second year of tertiary studies (Crust et al., 2012; Godlewski & Kline, 2012; Cowden et al., 2014; Stamp et al., 2015).

Adjustment can prove difficult and can result in stress and anxiety which can negatively impact cognitive functioning and impair the ability of individuals to perform well (St Clair-Thompson et al., 2017; McGeown et al., 2017).

Results from the study by St Clair-Thompson et al. (2017) revealed that several aspects of MT are important in the context of tertiary education; commitment, control of life, control of emotions, confidence in abilities, and interpersonal confidence were all found to play a vital part in successful adjustment to university life, and consequently to student academic success. Individuals high in MT will therefore adjust better to tertiary studies, manage their stress and anxiety better, and will consequently perform better academically.

Some researchers have argued that MT can also be useful in explaining why some individuals perform better or worse than the scores on their cognitive ability tests might predict (Duckworth & Quinn, 2009). Academic performance, success, and attainment have been found to differ greatly among individuals presenting with equal IQ scores, with some individuals triumphing over others regardless of similar, equal, or even inferior IQ levels. Early meta-analytical findings suggested that cognitive ability correlates to about $r = .50$ with performance within academic and work environments (Lievens & Sackett, 2012). However, Duckworth and Eskreis-Winkler (2013) still contended that MT is not only good, but perhaps a better predictor of performance than cognitive ability.

The Intelligence Quotient (IQ) enjoyed a great deal of research interest in the past in an attempt to explain variance in educational and work performance (Duckworth & Seligman, 2005; Duckworth et al., 2007; Gucciardi et al., 2014; Gucciardi et al., 2015). However, cognitive ability may not be sufficient in predicting performance outcomes in a tertiary context and other factors need to be considered.

As intellectual aspects alone may not be able to account for the variations in the academic performance of tertiary students, factors other than intelligence may be crucial to making accurate predictions of student performance. Several non-intellective factors associated with academic performance were identified from the research and it is also suggested that performance predictions may be more accurate if multiple individual differences are assessed, instead of focusing solely on past achievement and cognitive capabilities.

Mentally tough individuals, for instance, are likely to possess more effective coping skills and are therefore more likely to perform better in environments marked by stress and challenges, compared to individuals with lower MT but have a similar or even higher cognitive ability (Stamp et al., 2015).

There is substantial evidence displaying MT as an important personal resource that influences academic performance (Anthony et al., 2016; Clough & Strycharczyk, 2012; Cowden et al., 2014; Gucciardi et al., 2015; Gucciardi et al., 2021; Hardy et al., 2014; Lin et al., 2017; McGeown et al., 2017; Stamp et al., 2015; St Clair-Thompson et al., 2017; Percy et al., 2019; This study seeks to expand on that research.

2.4.5.4 *Developing mental toughness*

From the different definitions of the construct of MT, there is support that MT as a construct is open to development.

MT, as defined by Gucciardi et al. (2015), is viewed as existing on a continuum rather than being either present or not present. From this perspective, individuals can have degrees of mental toughness and are not necessarily mentally tough or not

mentally tough.

Another definition of MT describes it as a phenomenon involving the interpretation of events, rather than a fixed personality trait (Gucciardi et al., 2009). In terms of this definition, MT is open to influence by altering the way individuals see, interpret, and respond to occurrences in life. MT is also regarded to be, at least in part, a function of the external environment, and is therefore open to outside influences (Stamp et al., 2015).

Hardy et al. (2014) conceptualised MT as a stable construct that is unlikely to change quickly over time. According to these authors, if development and change in MT does occur, it is not likely to happen very quickly but rather slowly over a period of time (Hardy et al., 2014). This may bring into question the ability to address MT using short-term intervention strategies.

Most of the literature does suggest that MT is a malleable rather than a fixed construct that can be developed over time and through life experience. This has implications for interventions or strategies that may influence the development of mental toughness. The interventions and strategies will be discussed in Chapter 5.

The next section will consider the relationships that exist between all the latent variables that have been introduced.

2.5 Relationships Between the Latent Variables

All relevant latent variables in the study have now been discussed separately. The relationships between these variables are subsequently explored in detail below.

2.5.1 Stress surplus and academic performance

A negative relationship is posited to exist between stress surplus and academic performance.

As early as 1996, Westman and Eden found very high levels of job stress to be dysfunctional for both employees and the organisations they worked for (Westman & Eden, 1996). This remains true today. Chronically high levels of job stress can result

in negative work and personal outcomes such as burnout, exhaustion, and a decline in objective measures of performance (Bakker et al., 2008).

When individuals suffer high levels of job stress, they spend a significant amount of time and energy attempting to manage their stress. This depletes both their time and energy resources; resources which could otherwise have been directed towards their work. Individuals experiencing high levels of job stress therefore utilise the resources they have at their disposal to manage and cope with their stress, instead of utilising those resources to perform their work tasks.

High stress comes at a cost to organisations and institutions by resulting in a marked decrease in the productivity and efficiency of employees under high stress (Gorgens-Ekermans & Herbert, 2013). Employees under a great deal of stress are more likely to show a decrease in their objective performance (Gorgens-Ekermans & Herbert, 2013).

When stress is too elevated, it can have a debilitating effect on performance, leaving the stressed individual with a decreased capacity to sustain high levels of performance (Hargrove et al., 2015). This is also relevant within the tertiary academic environment where students experience stress and pressure which could be debilitating and prevent sustained levels of academic performance if it becomes excessive.

As mentioned in Section 2.4.2, a moderate amount of stress is ideal since it activates the desire to exert effort to perform work without leading to the negative outcomes associated with excessive stress (Hargrove et al., 2015). In addition to the negative impact of excessive stress, when stress levels are too low due to low job demands, individuals often feel no motivation to perform or work hard. As such, moderate stress levels are regarded as ideal for high job performance.

Tertiary educational environments are often described as high-pressure, high-performance environments and are demanding by nature. Individuals within a tertiary environment are therefore likely to experience stress as a result of the requirements from the tertiary institution or programme. However, individuals have differing

experiences of stress even within the same environment. It is therefore reasonable to assume that in a group of individuals in similar circumstances, some individuals will experience low levels of stress, some will experience moderate levels of stress, and some will experience high levels of stress or a surplus of stress. There are multiple reasons, ranging from personal to environmental, as to why individuals experience stress to varying degrees.

One study by Heikkilä et al. (2021) aimed to explore how differences in stress reactivity (i.e., the capacity or tendency to respond to a stressor) in a work environment could predict burnout. The sample of this study consisted of 341 Chinese female hospital nurses (Heikkilä et al., 2021). The factors of job control and job support were considered as representatives of a supportive work environment (Heikkilä et al., 2021).

The cortisol content, a stress hormone, from 1-cm of hair was used as a 'biomarker' to measure the reaction to stress in the research sample over a one-month period (Heikkilä et al., 2021). Findings showed that the interaction of cortisol and job control was able to positively forecast professional efficiency in nurses, whilst psychological demands were able to negatively forecast the emotional exhaustion of nurses (Heikkilä et al., 2021).

Nurses who had high cortisol levels displayed pointedly higher professional efficiency compared to nurses who showed low cortisol levels, given that they were in a position where they had a high level of control over their job (Heikkilä et al., 2021). In other words, when experiencing high levels of stress, the sample showed higher efficiency at work when they also had a high degree of control over their job. The reverse is also true. Nurses who displayed high cortisol levels showed drastically lower professional efficiency when in a position where they had low control over their jobs (Heikkilä et al., 2021). This indicates that high stress levels can result in high professional efficacy if an individual has a high level of control over their job.

Those nurses who presented with low cortisol levels showed substantially higher professional efficiency when compared to nurses with high cortisol levels within environments where there was high co-worker support (Heikkilä et al., 2021). In other

words, when experiencing low levels of stress, the sample showed higher efficiency at work when they also had a high degree of co-worker support. The reverse was also found to be true, with nurses presenting with low cortisol displaying considerably lower professional efficiency when compared to nurses with high cortisol, when in a work environment marked by low co-worker support (Heikkilä et al., 2021). This indicates that for those individuals not experiencing high levels of stress, professional efficacy may be more accurately attributed to the support they receive from their colleagues.

In this study, the level of tertiary student stress was considered in order to determine the degree of stress students experience during their studies and what impact, if any, this has on their academic performance.

When not considering work-related resources like 'job' control and peer support, it is anticipated that high stress levels are likely to lead to lower academic performance. As such, the relationship between stress surplus and tertiary academic performance of students is hypothesised to be significant and negative.

Hypothesis 1: Stress surplus has a significant and negative relationship with academic performance.

2.5.2 Engagement and academic performance

Research on the relationship between engagement and performance has been abundant in the literature for a number of years.

Bakker and Demerouti (2008) observed that work engagement has a direct correlation with employee performance and organisational performance. Organisations desire employees who are engaged with their job, work, and workplace due to the impact that engagement has on performance outcomes as example (Bakker & Demerouti, 2008). As such, organisations are committed to fostering engagement in their employees to ultimately improve both employee and organisational performance.

Results from a study by Xanthopoulou et al. (2009) displayed that a sample of employees working in a fast-food restaurants obtained improved financial results (an

objective performance indicator) on days when they were highly engaged at work. Engaged individuals have greater work ethic, are more committed to the work, are more committed to the organisation, and display high levels of OCB, all of which add up to increased individual and organisational performance (Chalofsky & Krishna, 2009).

Bakker (2010) described work engagement as a highly valuable predictor of job performance. Research results from a study by Bakker and Bal (2010) found that the work engagement of teachers was positively associated with their job performance. Engaged employees are also more proactive in their jobs and in the general working environment which leads to higher overall levels of personal and organisational performance (Bakker, 2011). According to Bledow et al. (2011), employee performance is higher when work engagement is higher.

Engaged individuals tend to work harder when compared to unengaged individuals (Demerouti & Bakker, 2011). This is likely a result of the higher quantity of effort that engaged individuals exert. Employees who are engaged are more dedicated, more absorbed, and vigorously participate in the activities of their job, as such they are able to fully focus on their work, they are happily occupied, and they enjoy the challenges that the work presents (Demerouti & Bakker, 2011).

Schaufeli (2011) gives one explanation for the reasoning behind why engaged employees perform better than their less engaged or unengaged peers. According to the author, engaged employees regard and experience their work as being more fun and exciting, and consequently they are naturally more motivated to work harder and perform better (Schaufeli, 2011). Furthermore, because engaged employees find enjoyment and pleasure in their work, they also enjoy more positive emotions, which results in the increased capacity to process information and perform better (Schaufeli, 2011).

Researchers have seen that employee work engagement predicts incremental variance in performance above and beyond most established job attitudes including job involvement, job satisfaction, perceived organisational support, and work centrality (Christian et al., 2011; Dalal Baysinger et al., 2012). Kim et al. (2012) also found that engagement is an essential component for promoting and facilitating high employee

performance.

In a study Runhaar et al. (2013), the results showed that engaged teachers were found to work harder and be more innovative and creative than their unengaged co-workers. De Beer et al. (2013) found that engagement leads to an increase in performance as engaged employees are not only more active and enthusiastic but are also more productive compared to their less engaged colleagues.

Hopstaken et al. (2015) conducted studies that showed how engaged individuals actually perform better when confronted with difficult tasks since they are capable of concentrating their interest and attention on the specific activity at hand. Individuals who either disengage when faced with obstacles or continuously change interests and focus are not likely to practice enough deliberate action to achieve high performance levels (Crede et al., 2017).

The relationship between academic engagement and academic performance specifically was also considered. In a study by Vizoso et al. (2018), the relationships between coping, the three components of academic engagement (consisting of vigour, dedication, and absorption) and academic performance was evaluated. The study consisted of 808 undergraduate university students. The results of relevance to this current study showed academic engagement and academic performance had a positive relationship (Vizoso et al., 2018). Furthermore, academic engagement was found to improve academic performance (Vizoso et al., 2018).

Moubayed et al. (2018) conducted research on e-learning and investigated the relationship between student engagement and their academic performance within an e-learning environment. Focus was placed on one significant challenge of e-learning platforms; keeping students engaged and motivated (Moubayed et al., 2018). Findings showed a positive correlation between student engagement levels and academic performance within a blended e-learning environment (Moubayed et al., 2018). Specifically, higher engagement was found to result in greater academic performance (Moubayed et al., 2018). These results provide confirmation that prior studies considering the positive relationship between engagement and academic performance in traditional classrooms extends to e-learning (Moubayed et al., 2018).

Researchers from different contexts agree that a positive relationship exists between engagement and high performance. In other words, as engagement increases, performance increases, and vice versa. The relationship between engagement and academic performance is subsequently hypothesised below.

Hypothesis 2: Engagement has a significant and positive relationship with academic performance.

2.5.3 Stress surplus and engagement

The relationship between stress surplus and engagement has also enjoyed a great deal of research attention over time. According to Visser et al. (2003), low job satisfaction combined with high stress levels leads to an increased risk for low levels of vigour, which would lead to lower work engagement. Schaufeli and Bakker (2004) found that high stress and engagement are negatively related. In other words when stress levels increase, engagement levels decrease, and vice versa.

In a study by Rothmann (2008) the link between job satisfaction, burnout, work stress, and engagement as aspects of work-related welfare was analysed in 677 South African Police Service (SAPS) members. From the study, engaged employees were shown to experience lower anxiety, lower levels of work-related stress, and displayed fewer signs of depression when compared to their less engaged or unengaged employees (Rothmann, 2008). Therefore, regarding the relationship between work stress and work engagement, these research findings show that some individuals do not disengage from their work, even when they are required to manage high job demands or work long hours (Rothmann, 2008). Rather, these individuals appeared to enjoy dealing with these stressors (Rothmann, 2008).

Research by Schaufeli (2011) found that engaged employees are in better physical health, experience more positive emotions, are less inclined to burn out, and sustain their performance during long workdays when compared to their unengaged peers (Schaufeli, 2011). Kim et al. (2012) found that increasing employee engagement can decrease stress and burnout outcomes.

Alternatively, stressed individuals may be more inclined to experience withdrawal and exhibit a negative attitude towards their job and work, which is likely to result in a decrease in engagement levels (Kim et al, 2012). De Beer et al. (2013) found that tired employees view their work environment more negatively. This perception is likely to lead to unproductive behaviour, intention to turnover, and low or missing engagement. A study by Travis et al. (2016) found that burnout (closely related to stress) was a major contributor to disengagement levels. Furthermore, according to Bakker and Demerouti (2014), severe stress can lead to strain, ill health, and burnout.

Employees who are very stressed may be less dedicated to and less committed to their work due to the negative interpretation of their work and their work environment. Therefore, the dedication dimension of engagement of highly stressed employees is likely to decrease.

Employees who perceive their work and their working environment negatively, tend to be less absorbed in their job and work tasks, as they no longer hold it in high regard. As such, high levels of stress are likely to cause a decrease in the absorption dimension of engagement.

High levels of stress are also found to deplete energy resources. Stressed employees will behave with less vigour and have less energy to invest in their work. The vigour dimension of engagement is therefore also likely to decrease when stress levels are high, as individuals may not be able to exert the same amount of energy when performing work tasks.

While moderate stress levels may activate employees to be more engaged, if stress levels become too high, all three dimensions of engagement are likely to decrease. As such, engagement as a whole decreases when stress surplus occurs.

In a study by Van Mol et al. (2018), the focus was placed on the work engagement of 193 Intensive Care Unit (ICU) professionals working at a university hospital. The relationships between engagement, job demands, and personal resources of the sample were explored (Van Mol et al., 2018). These authors established that engagement corrects for work-based stress responses (Van Mol et al., 2018). In other words, those professionals who were found to be engaged in their work were less

susceptible to the adverse impact of work-related stress.

Cordioli et al. (2019) performed a study in which they evaluated the levels of occupational stress and work engagement in a sample of 85 health care workers in São Paulo, Brazil. From the results it was found that 36,5% presented with significant occupational stress and a negative correlation was seen to exist between occupational stress and engagement (Cordioli et al., 2019). In other words, the health care workers who presented with high levels of occupational stress showed a tendency towards lower levels of engagement (Cordioli et al., 2019).

Given the focus of this research study on the highly demanding and pressurised tertiary academic environment, such an environment may elicit stress surplus in students. Based on the information reported above, a significant negative relationship is therefore hypothesised to exist between stress surplus and engagement. In other words, when stress becomes excessive, engagement levels are expected to decrease.

Hypothesis 3: Stress surplus has a significant and negative relationship with engagement.

2.5.4 Imposing job demands and stress surplus

From to the health impairment process in the JD-R theory, demands that exceed an individual's resources can cause adverse outcomes including burnout, high stress, and ill health (De Beer et al., 2013). Job demands are expected to lead to different strain outcomes, like that of stress, burnout, and/or general impaired well-being. As a result, this could lead to withdrawal behaviour and a negative attitude towards work (Hakanen et al., 2008; Bakker et al., 2009; Angelo & Chambel, 2015).

Bakker et al. (2014) define job demands as the facets of a job that required continuous physical, cognitive, or emotional effort. Consequently, job demands are associated with both physiological as well as psychological costs. Research found that repetitive exposure to excessive job demands, in the absence of the necessary resources increases stress levels and the likelihood of burnout (Nahrgang et al., 2009). Continued exposure to high job demands can cause exhaustion, psychological

distancing from work, stress, and burnout (Adriaenssens et al., 2015; Wolkow et al., 2015).

Several physiological and psychological costs are linked to excessive or hindering demands. These include poor physical and mental health, exhaustion, low motivation, poor performance, absenteeism, and increased turnover (Tims et al., 2012; Bakker & Demerouti, 2014). Experiencing the negative impact of stress can lead to withdrawal, the experience of negative attitudes towards work, and a decrease in innovativeness.

According to Sarwat et al. (2021), individuals who are under high stress are unable to fully make use of their energy to perform their work as they are distracted by the stress experience. This concept is termed stress-related presenteeism. In the study by Sarwat et al. (2021), the relationship of both challenge job demands (i.e., workload) and hinder job demands (i.e., cognitive job demands) with stress-related presenteeism, and the subsequent relationship of stress-related presenteeism with psychological well-being was explored by means of the JD-R model as well as the theory of conservation of resources. Data from a sample of 211 individuals were collected from bank employees working in three large cities in Pakistan (Sarwat, Ali, & Khan, 2021).

Findings revealed that challenging job demands such as workload was negatively associated with stress-related presenteeism, whereas hindering job demands such as cognitive job demands were positively related to stress-related presenteeism (Sarwat et al., 2021). In other words, individuals exposed to challenging job demands were less likely to experience stress-related presenteeism. On the other hand, individuals required to work with hindering job demands were more likely to experience stress-related presenteeism. Stress-related presenteeism was also found to have a mediating impact on the relationships of challenging job demands and hindering job demands on the psychological well-being of the individuals in this sample (Sarwat, Ali, & Khan, 2021).

According to Hobfoll's (1989) conservation of resources (COR) theory, individuals constantly try to obtain and preserve their resources. Therefore, in situations where

individuals anticipate a substantial loss, or threat of a loss, of resources (i.e., when faced with imposing or hindering job demands) the individual is more likely to experience or regard that situation as stressful. Individuals thus appraise a situation as stressful on the basis of the anticipated impact the situation is likely to have on their available resources. It is therefore reasonable to assume that individuals who perceive demands as unthreatening or who perceive their resources as adequate, are less likely to experience the negative outcomes associated with high job demands.

Tertiary students who perceive their job demands as hindering, imposing, or excessive are expected to experience higher stress levels than their peers who perceive job demands as manageable. In other words, the higher the perceived imposing nature of job demands, the higher the stress levels. The relationship that is suggested between imposing job demands and stress surplus is thus expected to be significant and positive. It is therefore hypothesised that imposing job demands will have a positive and significant relationship with stress surplus.

Hypothesis 4: Imposing job demands have a significant and positive relationship with stress surplus.

2.5.5 Mental toughness and engagement

According to the JD-R model, the personal and job resource cluster is the most important predictor of work engagement (Bakker & Demerouti, 2008).

A growing quantity of research studies have begun to focus on a direct path between personal resources and work engagement. Xanthopoulou et al. (2013) found evidence that personal resources like self-efficacy was positively associated with engagement, especially during times when individuals faced high demands. Researchers have found that personal resources including active coping style, sense of coherence, self-efficacy, conscientiousness, and resilience, can predict work engagement (Bandura, 1977; Janse van Rensburg et al., 2013; Xanthopoulou et al., 2008).

Furthermore, Bakker and Sanz-Vergel (2013) conducted a study which considered engagement on a weekly basis and concluded that the personal resources of self-efficacy and optimism were positively related to employees flourishing at work, given low hindrance demands and a challenging job which activates motivation and engagement. Bakker and Demerouti (2017) found that personal resources are antecedents to engagement that can predict engagement independently from job resources. These authors proposed a positive and direct relationship between personal resources and work engagement (Bakker & Demerouti, 2017). From the available literature, high personal resource levels appear to relate to increased employee engagement.

One study by Sağkal (2019) considered the potential role of MT in the direct and indirect relationships of strength-based parenting in the school results of adolescents. Strength-based parenting is described as recognising and fostering the strengths in one's children in an attempt to lead to positive outcomes (Sağkal, 2019). The author examined the direct and indirect relationship (via MT) between strength-based parenting, school engagement, and scholar burnout in 350 high school students from a central school district in Aydın, Turkey (Sağkal, 2019).

The results showed a statistically significant indirect relationship between strength-based parenting and school engagement and between strength-based parenting and scholar burnout through MT (Sağkal, 2019). MT mediated the relationship between strength-based parenting and school engagement and scholar burnout (Sağkal, 2019). The findings from this research offer some evidence for a relationship between MT and engagement, since the success of strength-based parenting on promoting engagement is mediated by MT.

Given the limited amount of available research on the MT – engagement relationship, the relationship between engagement and other similar personal resources were consulted. In line with the JD-R, a number of research studies found evidence for the impact of personal resources on engagement. According to Mache et al. (2014), there are significant relations between the personal strengths of physicians and their work engagement. Suzuki et al. (2015) discovered that a significant positive relationship exists between grit and work engagement in a sample of 1 134 adults.

In a study conducted by the authors Lo et al. (2013), hardiness was found to be positively associated with the dedication and vigour components of engagement. Oluremi (2014) investigated the correlation between academic perseverance and class attendance with the academic engagement of a sample of 200 secondary school students. Findings revealed a significant relationship between academic perseverance and academic engagement (Oluremi, 2014).

As a result of the recency of the construct of MT and the lack of literature on the relationship between MT and engagement, the relationships between engagement and the above variables that are closely related to MT (i.e., resilience, hardiness, perseverance, and grit) offer evidence that MT may positively impact engagement.

It is therefore proposed that MT as the personal resource of relevance in this study will have a significant positive relationship with engagement. Higher levels of MT thus are expected to result in higher engagement levels.

Hypothesis 5: MT has a significant and positive relationship with engagement.

2.5.6 MT as moderator of the job demands-stress surplus relationship

An important consideration is the impact that personal resources may exert on the relationship between imposing job demands and a surplus of stress.

Higher levels of personal resources can render individuals more resistant to the effects of high or excessive demands (Amirkhan et al., 2015). Research evidence supports the notion that MT is a central resistance resource used to buffer the negative effects of excessive stress, work demands, pressure, and challenge in those life domains that prioritise high performance (Stamp et al., 2015). According to Gucciardi et al. (2015) there is an inverse relationship that exists between MT and the experience of distress. In other words, higher levels of individual MT equate to the experience of lower levels of stress.

Excessive job demands can cause stress in the absence of adequate resources and can lead to emotional, physiological, and behavioural changes that put an individual's

psychological well-being at risk. MT can buffer the negative effects of high demands. Mentally tough individuals are less likely to regard demands as excessive and therefore less likely to experience significant amounts of stress. MT seems to influence the perception that individuals have about the adequacy of their available resources to successfully cope in their existing environment, and whether they view their life demands as stressors or challenges (Gucciardi et al., 2015).

An individual with high MT is less inclined to perceive that their demands exceed the resources they need to cope with these demands, nor that the demands they do face are unmanageable or threatening. Mentally tough individuals are therefore more inclined to see demands as a challenge rather than a threat. This in turn leads to a decreased likelihood of a high stress response to work demands. Authors propose that personal resources can boost the challenge component of job demands that elicit employee motivation and can improve performance (Bakker & Demerouti, 2017).

Furthermore, Bakker and Demerouti (2017) suggested that personal resources can also buffer the unwanted effect that hindrance demands can have on experienced strain and increase the positive effect that challenge demands can have on individual motivation (Bakker & Demerouti, 2017). Therefore, not only do individuals with high personal resources experience fewer job demands as threatening, but those that are experienced as threatening do not place as much stress and strain on the individual. The individuals with high levels of personal resources also benefit from the experience of greater motivation when confronted with demands that are considered challenging.

It is clear that individual perception is an important aspect to consider when observing the relationship between demands and stress. Certain personality factors have also been found to influence the way individuals view their working environment. Personality factors such as emotional stability, extraversion, and hardiness have been linked to an inclination to view work in a more favourable manner, regardless of the reality of the work and workplace (Bakker et al., 2014).

Alternatively, employees who lack resilience or are neurotic may experience a greater amount of stress from high demand jobs (Bakker et al., 2014). It is posited

that certain personality traits also predispose individuals to cope more easily with highly demanding jobs (Meriac et al., 2015). Individuals with these personality traits would be more proficient at buffering the effects of their work demands and prevent the negative repercussions from an experience of distress.

Although the literature indicates that the objectively stressful aspect of work is likely a more significant predictor of stress and burnout than is personality, individual variation in perception must be considered. It is suggested that an individual with the necessary personal resources is likely to perceive the demands of their work more favourably, and as a result may be able to buffer, at the very least, some of the effects of distress. MT is therefore regarded as a useful resource for buffering the effects of demand-related stress on individuals.

Grover et al. (2017) performed research examining the ways that the personal resource of mindfulness has been found to reduce stress. Their study is based on the JD-R model and consists of a sample of 415 Australian nurses (Grover et al., 2017). The results illustrated that mindfulness has a direct, negative relation to stress and perceived emotional demands but acts as a shield in the relationship between emotional demands and psychological stress (Grover et al., 2017).

Research conducted by Tesi et al. (2019) considered the occupational health of social workers by exploring the relationships posited between job demands, work engagement, and psychological well-being within the context of the JD-R model. The sample consisted of 140 Italian social workers. From the results it was found that when the personal resource of psychological well-being was high, job demands were related to an increase in the levels of engagement (Tesi et al., 2019). These results shine light on the buffering effect of psychological well-being in the job demands-engagement relationship (Tesi et al., 2019).

The buffering effect of MT can reduce the negative outcomes from stressors, change the observations and thoughts elicited by stressors, moderate the reactions following stress appraisals, and decrease the health impairment often accompanying stress responses. This highlights the importance of personal resources in relation to stress perceptions. Personal resources therefore not only play a role in influencing

engagement and performance but are also crucial in mitigating the appraisal of the work environment as a stressful one.

Part of this study therefore considers what impact the personal resource of MT has on individual stress appraisal, in other words, whether high levels of MT correlate with self-reported stress experiences in individuals who experience similar objective work demands.

Given the above, this researcher hypothesises that tertiary students endure high work demands, specifically work overload, and are therefore more vulnerable to experience high levels of stress. It is however proposed that the relationship between demands and stress surplus is affected by individual levels of MT.

It is therefore hypothesised that MT has a buffering impact on the relationship between imposing job demands and stress surplus. The following hypothesis was developed with regards to the buffering impact of MT on the relationship between imposing job demands and stress surplus:

Hypothesis 6: MT has a significant buffering effect on the relationship between imposing job demands and stress surplus.

2.5.7 Demands as moderator of the MT- engagement relationship

The potential effect of job demands on the MT - engagement relationship is another important consideration that requires attention.

From the literature surrounding the JD-R model, job demands have been suggested as a moderator variable (Bakker, 2011; Demerouti & Bakker, 2011). The connection between job demands and resources is an important factor to consider as it plays a crucial part in the development of engagement (Bakker & Demerouti, 2007).

In the JD-R model it is demonstrated that resources play a particularly important role in the motivation as well as engagement of individuals when job demands are high. As has been mentioned earlier, sufficiently high job demands activate individual motivation and engagement. Furthermore, according to the theory of COR, individuals seek to gain, retain, and safeguard the resources they value. As such,

when these resources are under threat due to high job demands, individuals will endeavour to do more than guard their resources, but also attempt to increase them to create a buffering effect against the impacts of high demands. As such, resources gain their saliency as a predictor of engagement when demands are high (Bakker & Demerouti, 2007).

It has often been shown that high levels of personal resources are more likely to result in high levels of engagement. Individuals who are mentally tough are therefore inclined to be more engaged with their work. However, this researcher argues that the presence of certain types of job demands may moderate the relationship between personal resources and engagement in a manner differing what has been previously suggested. The JD-R model accepts that every job has several job demands that employees are required to manage daily. Excessive job demands or imposing, hindrance job demands consume resources and require a great deal of effort from individuals, leaving little energy which may be required for employees to be engaged with their work. Individuals only have a certain degree of resources at their disposal.

Demands that are excessive or imposing in nature impact individual resource levels and use both time and energy resources resulting in a decrease in overall energy and, consequently a decreased ability to fully engage with their work. According to Bakker and Demerouti (2007), job demands necessitate psychological and physiological energy from individuals, which are likely to decrease their capacity to utilise their personal resources to their full extent. Given the relationship between personal resources and engagement, an inability to fully utilise personal resources could therefore result in a decrease in engagement.

Literature that focuses on the potentially negative moderating effect of hindering job demands on the personal resource – work engagement relationship is scarce.

In a study by Montgomery et al. (2015), the burnout and engagement psychological reactions that develop when individuals are in a work environment, each with its own distinctive collective of job resources and job demands, were highlighted. These authors tested the JD-R model primarily to determine the main and moderating impacts of teamwork effectiveness among 1156 nurses (Montgomery et al., 2015).

From the results it was found that specific demands including workload (one dimension of job demands), emotional demands, and organisational demands were positively associated with emotional fatigue and depersonalisation (Montgomery et al., 2015). The findings also showed that the same demands were negatively associated to the vigour component of engagement (Montgomery et al., 2015). Furthermore, emotional demands and organisational demands were negatively related to the dedication component of engagement (Montgomery et al., 2015).

From the above it can be ascertained that certain demands elicit outcomes such as emotional exhaustion and decrease specifically the vigour and dedication dimensions of the engagement construct. Decreasing not only one but two dimensions of a construct will undoubtedly decrease the overall construct. As such, certain job demands, especially when they are imposing job demands, can be thought to not only increase exhaustion but also decrease engagement. Crawford et al. (2010) observed that challenging demands were positively correlated with engagement. Demands that are deemed threatening, imposing, or hindering are often negatively associated with engagement.

Since mentally tough individuals are more likely to perceive demands as challenging rather than threatening or hindering. Individuals with a high personal resource supply such as individuals with the MT resource are better able to cope with high demand levels for extended periods before running out of energy or experiencing negative outcomes from persisting high or imposing job demands. High levels of MT are linked to a greater likelihood of interpreting demands as challenging rather than hindering or imposing.

A study performed amongst nurses measured the enhancing impact of personal resources. Results from the study demonstrated that emotional job demands had a strengthening impact on the effect of personal resources on work engagement (Van Stenis et al., 2015). These studies show that the demands present in the relative work environments assessed are either objectively challenging or perceived as a challenge rather than a hindrance demand.

In this study, imposing job demands are hypothesised to have a negative and

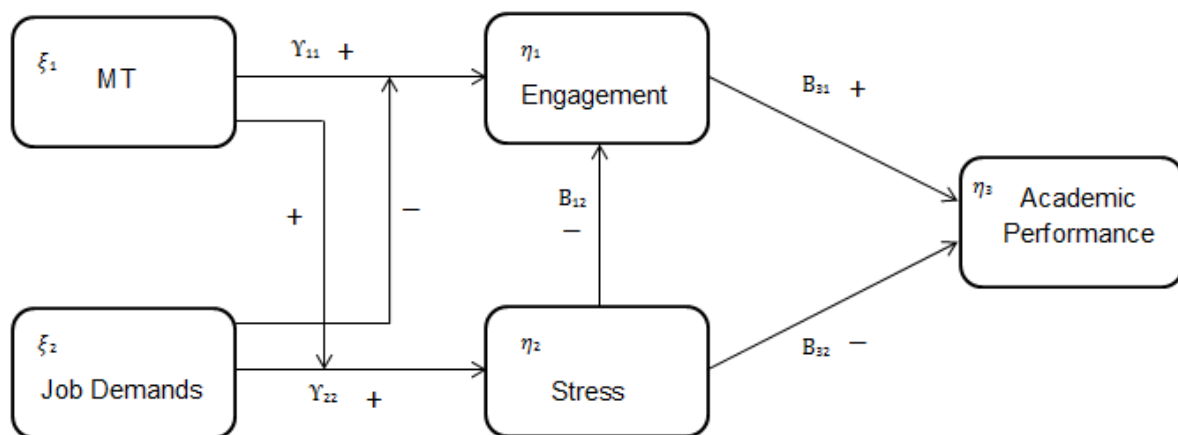
significant dampening impact on the relationship between MT and engagement. During this process, the gradual decline in resource levels will decrease employee engagement. In other words, imposing job demands will require individuals to expend greater amounts of resources to deal with these demands, which will ultimately lead to lower individual engagement levels.

Hypothesis 7: Imposing job demands have a significant dampening effect on the relationship between MT and engagement.

The hypotheses developed in Section 2.3, are visually presented in the hypothesised conceptual model below.

Figure 2.2

Conceptual Model



2.6 Hypothesised Conceptual Model

The conceptual model was formed from the seven hypotheses created after the relevant literature sources were consulted in the review. Figure 2.2 illustrates the proposed conceptual model that provides an outline of the potential direct and indirect relationships that are theorised between the various identified latent variables. It must be noted that the variables included in this study are by no means exhaustive, and that a number of other variables may be influential in these processes.

2.7 Chapter Summary

The literature review (Chapter 2) has provided a comprehensive account of the existing theory on academic performance; the JD-R model and theory; and the variables identified as likely antecedents to academic performance in tertiary education. The literature review proposed and discussed the identified variables and the intricate relationships between these variables within the JD-R framework with the goal of providing insight into the academic performance of tertiary students. Relationships between the constructs were hypothesised from the theoretical information that was gathered and interpreted on the basis of theoretical links made. The theorising process resulted in the creation of seven hypotheses. These hypotheses are visually depicted in the conceptual model (Figure 2.2) displaying the complex network of interactions between the variables. The seven hypothesised relationships were examined and tested in this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The current chapter elaborates on the research methodology of this study. The ethical considerations taken throughout the research process are also discussed.

Babbie and Mouton (2001) explain that the research methodology of a study provides an explanation for the various selected procedures, tools, and sampling methods etc, utilised during the process of conducting research. According to these authors, the research methodology of any research proposal is crucially important and should seek to serve the epistemic ideal (Babbie & Mouton, 2001). The epistemic ideal is described as the search for true knowledge (Prinsloo, 2012). In the process of serving the epistemic ideal, the scientific method, as a method of inquiry, serves this search for true knowledge.

Objectivity and rationality are inherent characteristics of the scientific method (Babbie & Mouton, 2001), allowing the approach to provide for more objective evaluations and a means to identify inaccuracies that could threaten the validity and credibility of derived conclusions (Prinsloo, 2012). A threat to the validity and credibility of derived conclusions are ultimately a threat to the epistemic ideal (Prinsloo, 2012).

According to Prinsloo (2012) the validity and credibility of the research hypotheses as well as the relationships suggested to exist between the variables that the hypotheses endeavour to explain (see the Structural Model in Figure 3.1), are largely reliant on the method utilised to reach these explanations.

The validity and reliability of any inferences drawn from the research data depend on the way in which the research is conducted. Valid and reliable inferences can only be drawn if research is conducted in a scientific and meticulous manner. Deriving valid and credible explanations from a model consisting of several hypothesised relationships is therefore regarded as a function of the scientific method.

Given its objective nature, the scientific method of inquiry was utilised in this study to allow for valid and credible interpretations of the hypothesised relationships.

Chapter 3 elaborates on the study's objectives and are expressed as substantive, path-specific, and statistical research hypotheses. The chapter further reiterates the goals of this research study, outlines the statistical techniques utilised, provides an explanation for the choice of research design, explains the rationale behind the data collection process, elaborates on the psychometric properties of the chosen measuring instruments, explains the choice of sample and sampling procedures, describes the reasoning behind the nature of the research conducted, and outlines the procedures followed for missing values.

3.2 Research Hypotheses

The substantive and path-specific research hypotheses are discussed in the sections below.

3.2.1 Substantive research hypotheses

The proposed research methodology of a study must aim to meet the objectives set for the study.

The overarching objective of this study is to create a network of the most salient variables that influence tertiary academic performance in students in South Africa and empirically test a structural model outlining the precursors of variance in academic performance.

The primary goal of this study is to establish whether the combination of identified antecedents significantly impacts the tertiary academic performance of students, drawing from the framework of the JD-R model.

The secondary objectives of the study are i) to determine the types of relationship that exist between the identified latent variables; ii) the strength of these relationships; iii) the effect of identified moderating or mediating variables on these relationships; and iv) whether the proposed nomological network of variables can effectively explain unique variance in tertiary academic performance outcomes.

3.2.2 Path-specific research hypotheses

Hypothesis 1: Stress surplus has a significant and negative relationship with academic performance.

Hypothesis 2: Engagement has a significant and positive relationship with academic performance.

Hypothesis 3: Stress surplus has a significant and negative relationship with engagement.

Hypothesis 4: Imposing job demands have a significant and positive relationship with stress surplus.

Hypothesis 5: MT has a significant and positive relationship with engagement.

Hypothesis 6: MT has a significant buffering effect on the relationship between imposing job demands and stress surplus.

Hypothesis 7: Imposing job demands have a significant dampening effect on the relationship between MT and engagement.

3.3 Research Design

This segment elaborates on the choice of research design for this research study.

The research design of any research enquiry can be described as the 'research plan' since the chosen research design stipulates how the research will occur and how the data collection process will be performed.

When a research investigation is undertaken, the investigation comprises two stages, namely a planning stage and an execution stage. Herbert (2011) highlighted the crucial role that the planning stage plays in the research process and describes the planning stage as an essential component to the success of the execution stage.

Babbie and Mouton (2001) specified that the selected research design of a study provides the structure of the study and explains the approach that will be utilised for data collection. Furthermore, the research design of a study provides the strategy by which the testing of hypotheses, variance control, and the derivation of an answer will be directed (Babbie & Mouton, 2001). The research design makes up a critical part of the research methodology of any study and must serve the search for truth of scientific inquiry (Babbie & Mouton, 2001). Therefore, the research design should provide unambiguous and scientific evidence.

When a research design is chosen for any research investigation, it is not a random decision. A specific research design is selected on the basis of several considerations. These considerations include the type of research-initiating question (RIQ) posed, the nature of the research problem, and the empirical evidence that is necessary to successfully test the hypotheses in the study (Prinsloo, 2012). Prinsloo (2012) further states that the research design can be used to determine the merit of the substantive and path-specific research hypotheses of a study.

The most appropriate research design selected for this study and the reasoning behind the selection is subsequently discussed.

The research design selected for this research study is a non-experimental ex post facto correlational design.

A non-experimental design is characterised specifically by the measurement of exogenous variables and does not involve the experimental manipulation of variables. Non-experimental research designs are popular in the fields of psychology and social science, as the bulk of phenomena of importance cannot or should not be controlled or manipulated (Nell, 2015).

In an ex post facto design, the relationships that are hypothesised to exist between variables are based on theoretical frameworks, such as the JD-R model from this study, and relevant, peer-reviewed literature. Herbert (2011) further elaborates that an ex post facto correlational design is utilised when a researcher hopes to observe relationships between variables as they currently exist.

Correlational designs are a type of ex post facto design used to observe the independent and dependent variables in a sample of individuals to determine the extent to which they correlate. Significant correlation findings between variables provide evidence for the existence of a relationship between these variables.

It is important to note that a correlation between variables should not be interpreted as causation (Burger, 2012). In other words, evidence of correlation cannot be used to infer that one variable causes another. This is considered a disadvantage of correlational designs since correlational evidence can only demonstrate the existence of a relationship between variables but cannot be used to determine whether a variable causes or is caused by another.

One advantage of correlational designs is that they allow for the investigation of research questions that would not be possible using experimental procedures (Tabachnick & Fidell, 2007). Furthermore, correlational designs allow for the strength of the relationship between variables to be identified (Tabachnick & Fidell, 2007).

An ex post facto correlational design also proposes that data are collected at one instance in time and are not used when attempting to understand changes that occur within variables or between variables over time (i.e., longitudinal studies) (Simon & Goes, 2013).

The reasoning behind the choice of a non-experimental ex post facto correlational design follows.

First, the design does not involve the experimental manipulation of variables, which is relevant since the bulk of phenomena of importance in the field of psychology cannot or should not be controlled or manipulated. This is appropriate for this research study as the research aims to measure phenomena as it currently exists.

Second, the relationships hypothesised to exist between the variables are based on theoretical knowledge and frameworks. This is appropriate given the theoretical base of the study and the use of the JD-R model and theory as the framework for this study.

Third, the design allows for the determination of correlation between different variables as well as the strength of these relationships. This is appropriate to determine correlation and the strength of the relationships that are posited in the nomological network of variables portrayed by the theoretical and structural models in this study.

Fourth, the data are collected at a single point in time. The data in this study are not centred on changes that occur within variables or between variables over time. Instead, the variable being measured is based on the phenomena occurring at a specific point when the research was conducted. Therefore, the collection of longitudinal data did not support the aim of the study.

Lastly, *ex post facto* correlational designs can maximise systematic error variance, minimise error variance, and control for extraneous variance. Thus, the design can increase the odds of offering evidence that is unambiguous and empirical, against which the proposed hypotheses of this study can be tested. This is appropriate given the preference for the scientific method of inquiry and the search for true knowledge. The non-experimental *ex post facto* correlational research design is therefore regarded as the most appropriate research design for this study.

3.4 Schematic Representation of the Ex Post Facto Correlational Design

The *ex post facto correlation research design* suggested for this study is schematically illustrated below:

$$\begin{array}{ccc}
 [X_{11}] & \dots\dots & [X_{13}] \\
 [X_{21}] & \dots\dots & [X_{23}] \\
 : & \dots\dots & : \\
 [X_{i1}] & \dots\dots & [X_{i3}] \\
 : & \dots\dots & : \\
 [X_{n1}] & \dots\dots & [X_{n3}]
 \end{array}
 \qquad
 \begin{array}{ccc}
 [Y_{11}] & \dots\dots & [Y_{14}] \\
 [Y_{21}] & \dots\dots & [Y_{24}] \\
 : & \dots\dots & : \\
 [Y_{i1}] & \dots\dots & [Y_{i4}] \\
 : & \dots\dots & : \\
 [Y_{n1}] & \dots\dots & [Y_{n4}]
 \end{array}$$

3.5 Statistical Hypotheses

According to Prinsloo (2012), the statistical hypotheses of a research study display the logic underlying the structural model that was developed, represents the reasoning behind the choice of research design, and the logic associated with the chosen statistical analysis techniques related to an ex post facto correlational research design. The statistical hypotheses posed below therefore display the underlying logic of the developed structural model.

The statistical hypotheses are particular to the selected research design and the method used to statistically analyse the data. In this instance, the chosen statistical analysis technique, one which is often used for ex post facto correlational design research, was that of partial least squares (PLS) structural equation modelling (SEM) (Nell, 2015).

The statistical hypotheses for each of the individual relationships proposed in this study, and analysed using PLS-SEM, are presented below. These relationships are also visually depicted in the structural model (Figure 3.1).

The statistical hypotheses for each relationship in the structural model are presented below:

Hypothesis

1:

H₀₁: $\beta_{32} = 0$ (Stress surplus will have no relationship with academic performance)

H_{a1}: $\beta_{32} < 0$ (Stress surplus will have a significant and negative relationship with academic performance)

Hypothesis 2:

H₀₂: $\beta_{31} = 0$ (Engagement will have no relationship with academic performance)

H_{a2}: $\beta_{31} > 0$ (Engagement will have a significant and positive relationship with academic performance)

Hypothesis 3:

H₀₃: $\beta_{12} = 0$ (Stress surplus will have no relationship with engagement)

H_{a3}: $\beta_{12} < 0$ (Stress surplus will have a significant and negative relationship with engagement)

Hypothesis 4:

H₀₄: $\gamma_{22} = 0$ (Imposing job demands will have no relationship with stress)

H_{a4}: $\gamma_{22} > 0$ (Imposing job demands will have a significant and positive relationship with stress)

Hypothesis 5:

H₀₅: $\gamma_{11} = 0$ (MT will have no relationship with engagement)

H_{a5}: $\gamma_{11} > 0$ (MT will have a significant and positive relationship with engagement)

Hypothesis 6:

H₀₆: $\gamma_{13} = 0$ (MT has no buffering effect on the relationship between imposing job demands and stress surplus)

H_{a6}: $\gamma_{13} < 0$ (MT has a significant buffering effect on the relationship between imposing job demands and stress surplus)

Hypothesis 7:

H₀₇: $\gamma_{23} = 0$ (Imposing job demands have no dampening effect on the relationship between MT and engagement)

H_{a7}: $\gamma_{23} > 0$ (Imposing job demands have a significant dampening effect on the relationship between MT and engagement)

The number of statistical hypotheses will equal the number of paths presented in the

structural model. In this study, there are seven paths in the model and therefore seven statistical hypotheses were formed (H_{01} - H_{07}).

Furthermore, the direction of the sign (< / >) shown in the alternative hypotheses depends on underlying theoretical argument hypothesised to exist between variables. In other words, the direction of the preceding sign will signify whether the hypothesised relationship between variables is positive or negative in nature. A positive relationship between variables implies, for example, that as one variable increases, the other variable in the relationship increases as well. This is the case for decreases as well. A relationship would still be regarded as positive if a decrease in one variable is associated with a reduction in the other variable in that relationship. Therefore, positive relationships refer to variables in a relationship that vary in the same direction (i.e., both variables increase or both variables decrease).

A negative relationship refers to the opposite scenario. In other words, a negative relationship will be seen to exist if the variables in the relationship move in the opposite direction (i.e., when one increases then the other one will decrease).

The above hypotheses are shown as a matrix equation below, which defines the developed structural model:

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} = \begin{bmatrix} 0 & \beta_{12} \\ 0 & 0 \\ \beta_{31} & \beta_{32} \end{bmatrix} \times \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} + \begin{bmatrix} \gamma_{11} & 0 & \gamma_{13} \\ 0 & \gamma_{22} & \gamma_{23} \end{bmatrix} \times \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \end{bmatrix}$$

ψ is defined as a diagonal matrix

All off – diagonal elements in ϕ are free to be estimated

The matrix equation was then translated into a set of equations as follows:

$$\eta_1 = \beta_{12} \eta_1 + \gamma_{11} \xi_1 + \gamma_{13} \xi_1 + \zeta_1$$

$$\eta_2 = \gamma_{22} \xi_2 + \gamma_{23} \xi_2 + \zeta_2$$

$$\eta_3 = \beta_{31} \eta_3 + \beta_{32} \eta_3 + \xi_3 + \zeta_3$$

3.6 Structural Model

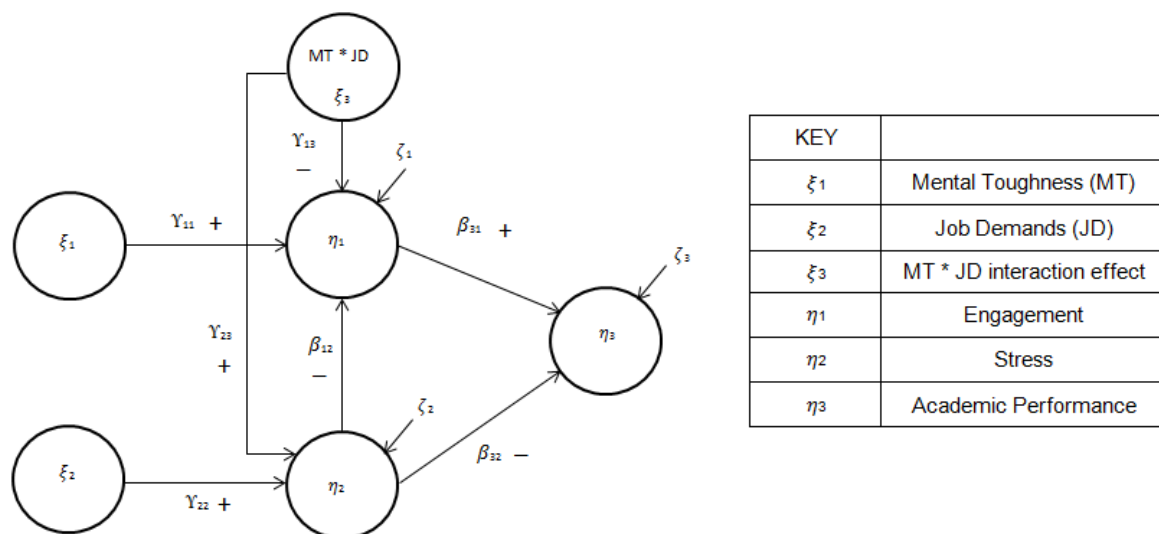
When comparing the conceptual model (Figure 2.2) and the structural model (Figure 3.1) noticeable differences between the two are apparent. Due to these differences, the moderating effects proposed can only be investigated using SEM if these moderating effects are first isolated and an independent model is created. Two models would therefore need to be created and tested. Unfortunately, this process will have an effect on the validity of the inferences that are drawn from the hypothesised relationships.

In order to overcome this issue, Little et al. (2006) proposed a resolution. These authors suggested the creation of ‘dummy’ variables made specifically to test moderating effects. To create ‘dummy’ variables, the indicator variables of the corresponding moderating variable and the exogenous variable must be multiplied. This is illustrated in the structural model below. These ‘dummy’ variables will have a direct effect on the endogenous variable.

The moderating variables in the structural model should therefore be seen as follows: $\xi_3 = (MT * JD)$, which influences both engagement (η_1) and stress (η_2).

Figure 3.1

Structural Model



ψ is defined as a diagonal matrix

All off – diagonal elements in ϕ are free to be estimated

3.7 Data Collection

In this research study, quantitative data were gathered from undergraduate tertiary students across departments at Stellenbosch University. Data were collected from a sample of approximately 600+ undergraduate students. There were a total number of 2996 students who commenced with the study. Of the 2996 students, 939 students (i.e., 31.34%) completed the survey, and 2057 students (i.e., 68.66%) did not complete the survey. There were 939 responses that were extracted from the SUNSurvey database and 634 of these were included in the final data. As such, 305 surveys were discarded.

The Department of Institutional Permissions at Stellenbosch University distributed an email link for a self-administered online questionnaire. The department was given the criteria for the sample target group of this study and the email link was subsequently distributed to students who met the criteria. In the email, students were encouraged to complete a voluntary self-administered online questionnaire. Clear and concise instructions were given to participants throughout the process. The questionnaire also required participants to provide informed consent for participation. Furthermore, participants were presented with the opportunity to enter into a Lucky Draw competition upon completion of the questionnaire. All collected data have been and will remain strictly confidential and anonymous. The ethical considerations are elaborated on below.

The self-administered questionnaire that was utilised consisted of six sections. Section 1 contained biographical information including age, and year of study. Section 2 requested participants to provide average academic performance information of their Grade 12 National Senior Certificate as well as the latest average results from their latest completed tertiary semester. Sections 3 to 6 consisted of questions that measured the four latent variables of job demands (workload), personal resources (mental toughness), stress surplus, and engagement. These four sections comprised questions from valid and reliable measuring instruments used to measure the specific latent variables of this study.

The questions for these four sections consisted of questions extracted directly from

existing questionnaires of the constructs with the necessary permission obtained from the authors and/or developers/distributors of the measures. Slight adjustment to the wording of some of the questions were made, especially in the Job Demands section, to ensure that the questions were regarded as relevant and applicable to the context and sample group of this study. One example of this would be that of an original question that contained the word 'work' which was replaced with the word 'studies', given that this research focuses on students and not employees. Another example is the replacement of the word 'workplace' with 'tertiary institution'.

The researcher contends that these minor alterations should not have a significant impact on the meaning of the questions and therefore should not alter the interpretations made from the results. Given the need to make slight alterations to the wording of the questionnaire does, however, bring to light the point that the chosen questionnaire may not have been the optimal choice for a student population.

However, in this study the researcher was considering the studies that tertiary students engage in at tertiary institutions to be highly similar to the work employees engage in at their place of work. It is however not assured that the slight word changes will have no impact on the results, and this may need to be considered as a possible limitation.

Details of the remaining four sections are provided below:

Section 3 contained questions from the Job Demands-Resources Scale (JDRS), focussing only on those questions used to measure job demands or 'study demands' in this case (Rothman et al., 2006). Only the items in the scale that pertain to job demands, specifically work overload, were included in the questionnaire.

Section 4 consisted of questions from the Mental Toughness Questionnaire Lite (MTQ Lite) which is a shortened version of the MTQ48 and is used to measure overall MT (Clough et al., 2002; Gucciardi et al., 2015). The longer MTQ48 consists of 48 questions and can provide a breakdown of MT into four distinct sections. However, the researcher regarded this to be too lengthy in nature and opted instead for the use of the MTQ Lite version which provides only an overall measure of MT.

Section 5 consists of items from the shortened version of the Stress Overload Scale (SOS-S) which is used to measure stress levels, and specifically whether individuals experience an overload of stress which could result in burnout if left unmanaged (Amirkhan, 2012).

Section 6, the final section, contained questions from the Utrecht Work Engagement Scale (UWES-17) which measures work engagement (Schaufeli & Bakker, 2003).

3.8 Measuring Instruments

This section provides detailed information on the measurement instruments utilised in this study to measure engagement, stress surplus, job demands, mental toughness, and academic performance. Valid and reliable measuring instruments were utilised to measure these latent variables and the full questionnaires were utilised for all measures with the exception of the job demands items. Only the job demand items relating to workload from the Job Demands – Resources Scale (JDRS) were utilised to measure job demands in this study.

Furthermore, the measurement approach utilised in the measurement of tertiary academic performance in the study was elaborated on.

Details of the measurement instruments follow below.

3.8.1 The Job Demands-Resources Scale (JDRS)

The Job Demands-Resources Scale (JDRS), which was developed by Jackson and Rothmann (2005), was created to measure job resources and job demands in a manner reflective of the JD-R model and theory. The scale was originally utilised as a measure of the job demands and job resources of educators but later evolved into a measure to determine the perceptions that a variety of employees in a variety of occupations hold about their experience of job-related pressures and support (Asiwe et al., 2015).

The creators constructed the JDRS after conducting a substantial review of literature

and performing rigorous scientific research on behalf of the authors of the JD-R model and theory. The authors researched job resources and job demands across different occupations and industries and consulted multiple studies that considered the different combinations of job demands and resources that could occur. This extensive research review in combination with multiple interviews conducted by the authors and creators of the scale led to the development of the JDRS in 2005.

The JDRS contains 48 items, and it is scored on a four-point Likert scale, on which 1 refers to “always” and 4 refers to “never” (Jackson & Rothmann, 2005). Examples of the type of question items from the JDRS are “Do you need to be more secure that you will keep your current job in the next year?” and “Do you know exactly what other people expect of you in your work?” (Rothmann & Joubert, 2007).

After the development of the scale in 2005, Rothmann and Joubert (2007) recognized five factors that constitute the five sub sections of the JDRS, namely; work overload, job insecurity, growth opportunities, advancement, and organisational support.

In this study, the job demands of students were considered and measured using the JDRS. Work overload and job insecurity are the two sub sections of the JDRS that measure job demands (Rothman et al., 2006). Job insecurity was not considered relevant to students, as they are not likely to experience a sense of insecurity with regard to losing their position or ‘job’ at the university. Therefore, the work overload sub section of the JDRS was used to assess student job demands during tertiary education.

The work overload factor consists of items relating to the rate and quantity of work tasks, psychological load, and emotional load experienced. The scoring keys for the work overload job demands sub section of the JDRS are as follows: work overload is measured by items 1 to 9 of the JDRS, where item 3 is reverse scored. As such, 9 items from the larger JDRS scale were utilised to measure student ‘job’ demands.

Items from the job demands work overload sub section of the JDRS have been found to be reliable, as can be seen by the Cronbach Alpha coefficients for work overload ($\alpha = 0.75$) (Asiwe et al., 2015). Acceptable internal reliability of the JDRS as a whole

has also been found, with alpha coefficients ranging from .75 to .92 (Rothmann et al., 2006).

3.8.2 Mental Toughness Questionnaire Lite (MTQ Lite)

Clough et al. (2002) developed the four Cs model of MT. Their model proposed that MT consists of four dimensions: (a) control over one's emotions and over one's life; (b) commitment; (c) challenge; and (d) confidence in one's ability and in interpersonal relationships.

Confidence is often referred to as the foundation of MT and reflects a high sense of belief in oneself as well as persisting trust in one's own ability to succeed (Crust, 2008; Sheard, 2010). Clough et al. (2002) developed their conceptualisation of MT from theory in the health psychology domain, and though the measure has received criticism from some authors (Gucciardi et al., 2012), MTQ48 scores correlate significantly with other variables in the positive psychology realm. This includes positive psychological constructs like life satisfaction, self-esteem, and optimism to name a few.

Based on their theorisation and the conceptualisation of the construct, the authors developed an instrument to measure MT based on the theoretical 4 C's model (Clough et al., 2002). This measure of MT was appropriately termed the Mental Toughness Questionnaire 48 (MTQ48) (Clough et al., 2002) and is currently the most often used measure of MT (Gucciardi et al., 2012).

The MTQ48 measures mental toughness as a multidimensional construct. Most definitions of MT are multidimensional in nature and pertain to a collection of values, emotions, attitudes, and thoughts that enable individuals to consistently reach their performance goals despite obstacles. Although some studies have regarded MT as a unidimensional construct, most studies support the notion of MT as multi-dimensional; consisting of several positive psychological variables.

The MTQ48 measures every aspect of the 4C's model, and it has been proven to have construct validity, criterion validity (Crust & Clough, 2005) as well as factorial validity (Perry et al., 2013). Furthermore, the MTQ48 has shown good reliability (Dewhurst et

al., 2012). According to Clough et al. (2002), the MTQ48 has an internal reliability of .90 (i.e., coefficient alpha). In a study by Horsburgh et al. (2008) the reliabilities of the different dimensions of MT were assessed in addition to overall MT reliability. The reliabilities ranged from a coefficient alpha of .74 for the challenge and control dimensions to .92 for overall MT.

With regards to the MTQ48 test items, test-takers are required to give a response to various statements that follow a 5-point Likert scale. The Likert scale ranges from (1) referring to strongly disagree to (5) referring to strongly agree. Examples of questions from the MTQ48 include: "I believe in my ability to achieve my goals"; "I strive for continued success"; and "I am able to regulate my focus when performing tasks" (Gucciardi et al., 2015).

The measure provides scores for overall MT, the 4C factors (i.e., control, challenge, commitment, and confidence), and scores for the two subscales of Control and Confidence (i.e., life control, emotional control, confidence in abilities, and interpersonal confidence).

The MTQ48 was developed to use on scholars and/or students ranging from the ages of 11 to 25. Therefore, the use of the MTQ48 measure, or a variation thereof, was considered appropriate for this study consisting of a sample of students aged 18 to 22.

One variation of the MTQ48 that stood out in particular is the MTQ Lite. This tool was developed and distributed by the same organisation that developed the MTQ48 and is described as a shortened eight-item version of the MTQ48 questionnaire. The MTQ Lite, which was utilised in this study, provides an overall MT score, but does not provide separate scores for the four subscales. The use of the full MTQ48 did not prove to be cost- or time-effective to warrant its use in this study.

The MTQ Lite was chosen as the measurement tool for MT in this study over the MTQ48 due to its brevity, affordability, and its capacity to provide a valid and reliable overall score of MT. Since this research study did not break down the construct of MT into its sub dimensions, a scale such as the MTQ Lite providing an overall MT score was sufficient.

According to Gucciardi et al. (2015), analyses indicate that the shortened version of the MTQ (i.e., the MTQ Lite) fits the data incredibly well, shows strong factor loadings, and displayed good internal reliability. Gucciardi et al. (2015) further state that the brevity of the MTQ Lite and its direct approach is both practically and academically appealing. The eight-item questionnaire makes the assessment of MT more time-effective and convenient when compared to the 48 item MTQ.

The shortened eight-item MTQ Lite is scored positively (Gucciardi et al., 2015). Furthermore, the eight items are also rated by the test-taker on the same 5-point Likert scale used in the MTQ48, where 1) refers to strongly disagreeing with the statement and 5) refers to strongly agreeing with the posed statement. Example items of the MTQ Lite version include: "I am able to use my emotions to perform the way I want to"; "I effectively execute my knowledge of what is required to achieve my goals"; and "I strive for continued success" (Gucciardi et al., 2015).

3.8.3 Stress Overload Scale - Shortened (SOS – S)

The shortened version of the Stress Overload Scale (SOS) was selected for use in this study.

The original SOS is the only stress scale that is entirely empirically constructed. The process followed a series of factor analyses and other related psychometric investigations. The SOS is different to other stress measures because it is a psychometrically strong measure of stress, specifically in terms of its validity; it is appropriate to use in community research because of its brevity and its ability to fit a broad demographic; and lastly it is unlike other stress measures because of its unique ability to allow for a cross-sectional division of individuals into different categories of risk (Amirkhan, 2012).

The SOS measure is therefore not only psychometrically feasible and empirically derived, but is also consistent with available literature, is practically useful, and can be utilised across diverse groups; including differences in factors such as age cohorts, and differing genders, ethnicities, and socio-economic statuses (Amirkhan, 2012; Amirkhan et al., 2015).

The SOS consists of 30 items designed to measure “stress overload”. Stress overload refers to a state that occurs when an individual’s demands exceed their available resources. In the SOS, the respondents again make use of a 5-point Likert scale where 1) refers to not at all and 5) refers to a lot. This provides the assessor with an indication of the subjective feelings and thoughts experienced by the test-taker over the past week.

The SOS scale is titled, “A Measure of Day-to-Day Feelings”. This was done in order to mask the true nature of the test as a measure of stress and to thereby limit the number socially desirable responses and/or negativity biases from the respondents. Example questions from the SOS include: “In the past week, have you felt like nothing was going right?”; “In the past week, have you felt like things kept piling up?”; “In the past week, have you felt like your life was ‘out of control?’” (Amirkhan et al., 2012).

The stress overload construct is made up of two underlying factors, namely Personal Vulnerability (PV) and Event Load (EL). These two factors are measured by two different but related subscales. The 12 even-numbered items in the scale make up the EL factor, a subscale used to determine the perceived demands that individuals experience. EL can be defined as feeling burdened by one’s work duties, work stressors, and work demands (Amirkhan et al., 2012).

The 12 odd-numbered items (item 5 being reverse scored) make up the PV factor (Amirkhan et al., 2015). The PV subscale identifies the perceived inability that individuals experience in their capacity to handle perceived demands (Amirkhan et al., 2015). PV can be understood as feeling weak, inadequate, as well as feeling unsuccessful (Amirkhan et al., 2012). Furthermore, there are also 6 ‘filler’ items in the scale that are not scored but are included to discourage negative response sets and counteract the negative impacts that may accompany stress questionnaires.

The 24 items from the two subscales can be added together to reach an overall stress score, where high overall stress scores represent high levels of stress overload, or the two subscales can be divided at their means and crossed to provide stress scores that then fall into one of four possible categories. This approach results in a diagnostic matrix consisting of four categories. The four categories are as follows: High Risk

which is a combination of high EL and high PV, Low Risk, which is a combination of low EL and low PV, Challenge which is a combination of high EL and low PV, or Fragile which is a combination of low EL and high PV (Amirkhan et al., 2015). Participants who fall into the High-Risk category are seen to be at the highest risk for pathology.

The internal consistency of the SOS is excellent with Cronbach alpha values falling above .94 for the total measure as well as the two subscales. The Cronbach alpha coefficients for the measure also showed good internal consistency for the full measure (.89), as well as for the Personal Vulnerability (.89) and the Event Load (.91) subscales (Amirkhan et al., 2015). Furthermore, the test-retest reliability of the SOS was good with average coefficients of around .75 taken over a week. The construct validity of the measure has also been shown by significant correlations between the SOS and other stress/illness measures. The SOS also has criterion validity which is displayed by the measure's ability to predict ill health and abnormal cortisol levels after a stressful situation or event.

The Stress Overload Scale (SOS) has therefore proved its validity in forecasting pathological stress responses, however, given that the measure consists of 30 items, it is a lengthy process, and practically the length of the measure may be discouraging to both researchers and practitioners considering using the scale (Amirkhan, 2016).

In the 2016 study by Amirkhan, the 10-item Stress Overload Scale–Short (SOS-S) was tested against the SOS. In this study, the SOS and SOS-S were compared in a study consisting of a sample of 391 individuals (Amirkhan, 2016). The results from the comparison displayed that the SOS-S was equivalent to the SOS with regards to its reliability as well as its concurrent and predictive validities (Amirkhan, 2016). It was however found that the SOS-S was not as sensitive at picking up bodily symptoms when compared to the full-length SOS (Amirkhan, 2016). Given the primarily favourable comparison findings, the SOS-S was considered a more viable and more practical choice as a measure of stress and risk in this study.

The SOS-S was constructed by a selection process identifying the strongest SOS items (Amirkhan, 2016) From these selected items, items were further narrowed down and chosen based on their respective psychometric strength (i.e., reliability and

validity) from the full SOS (Amirkhan, 2016). From these items, the final 10 items were then selected based on their comprehensibility as shown from a diverse group of SOS respondents (Amirkhan, 2016). The SOS-S was limited to the 10 items from the SOS parent measure which were seen to best satisfy these conditions or requirements.

3.8.4 Utrecht Work Engagement Scale (UWES – 17)

Arnold Bakker and Wilmar Schaufeli developed the Utrecht Work Engagement Scale (UWES) (2003). The UWES gained popularity due to the enthusiasm of scholars with regards to the positive psychology approach of the scale. In the positive psychology approach, the UWES made it possible to identify the conditions under which employees flourished at work rather than the factors and conditions that were not working or causing them not to flourish (Schaufeli & Bakker, 2003).

The Utrecht Work Engagement Scale (UWES) is a measure of individual Work Engagement levels. There are several different versions of the UWES that exist, with different lengths and different target groups (Schaufeli & Bakker, 2003). This study utilised the 17 item UWES-17 version.

The UWES-17 is measured with a 7-point frequency scale that ranges from 0) referring to never, to 7) referring to always. The engagement scale measures the three factors underlying engagement, namely: vigour; dedication; and absorption. The vigour factor is measured by 6 of the 17 items. Examples of vigour items are: “At my work, I feel bursting with energy” and “When I get up in the morning, I feel like going to work” (De Bruin et al., 2013).

The dedication factor is measured by 5 of the 17 items. Examples of the items used to measure dedication are: “I find the work that I do full of meaning and purpose” and “My job inspires me” (De Bruin et al., 2013). Lastly, the absorption factor is measured by the remaining 6 out of 17 items with examples including: “Time flies when I'm working” and “When I am working, I forget everything else around me” (De Bruin et al., 2013).

The UWES is a very well-researched measure and studies have shown that the instrument has factorial validity which supports the three-factor structure of

engagement used in the UWES. Furthermore, the Cronbach alpha coefficients for the three underlying factors are also high with values of 0.88 (vigour); 0.91 (dedication); and 0.85 (absorption). Correlations between the factors were also acceptable, with the correlation between vigour and dedication being $r = 0.86$; the correlation between vigour and absorption being $r = 0.79$; and the correlation between dedication and absorption being $r = 0.79$ (De Bruin et al., 2013).

As such, given its sound psychometric properties and the fact that the instrument is widely used, very popular, and internationally recognised, the UWES-17 was considered appropriate for the use in this study.

3.8.5 Average Student Academic Performance

Student academic performance is the fifth and final latent variable that was measured.

In this study, academic performance was considered objectively. As has been mentioned, objective performance can be assessed and is expressed in a tangible manner by means of certain performance indicators including academic grades, sales, and race times as example (Gucciardi et al., 2015). The consideration of objective over subjective performance information provides data that is empirical in nature and less biased when compared to data obtained by means of a subjective approach.

Objective performance results as example would be more impartial than subjective performance appraisals since they reflect the empirical results of an individual, in the form of standardised results. Objective performance data therefore provides a standardised indication of the quality of work of an individual on the basis of empirical results. This standardisation of results in turn allows for more accurate inferences to be drawn.

In order to achieve this, performance data had to be collected. However, unlike the other latent variables in this study (i.e., job demands; engagement; stress surplus; and mental toughness), student academic performance data could not be collected using a measuring instrument. As such, the collection of student academic performance data followed a different approach.

To obtain student academic results, participants in the study were asked to self-report their average academic results from their secondary and tertiary studies. Specifically, Section 2 of the online questionnaire, labelled Academic Performance Information, prompted participants to provide their average academic results from both their Grade 12 National Senior Certificate and their latest completed Tertiary Academic Semester.

In the questionnaire, the two questions under Academic Performance Information of students were; “What was the average of your Grade 12 National Senior Certificate results?”; “What was your average result of your latest completed Semester?”. Participants were provided with multiple tick boxes under each question, with an average academic grade next to each tick box for them to select. The average academic grades were provided in the following intervals; 20% - 30%; 31% - 40%; 41% - 50%; 51% - 60%; 61% - 70%; 71% - 80%; 81% - 90%; and 91% - 100%. Both questions allowed only one box to be ticked.

Since this study aimed to determine the validity of the theoretically posited trend showing a significant decline in student academic performance from secondary to tertiary education, the researcher did not find it necessary to request more specific grades from participants. Instead, average academic grades (e.g., 20% - 30%; 71% - 80%) were regarded as sufficient to determine the presence of a significant downward trend. Through the use of average academic performance information, it was possible to determine whether a change in student academic performance occurred when comparing average secondary and tertiary academic results.

This researcher posited that a request for average over specific academic performance results, in conjunction with the anonymity of participants, was likely to result in participants feeling more comfortable divulging sensitive performance information and could therefore lead to lower levels of self-report bias. As such, average student academic performance, albeit self-reported, was the ‘measuring stick’ used to establish academic performance in this study. This approach is supported by the available research.

Researchers who have considered academic performance in their own work, regard student Grade Point Average (GPA) to be the preferred measure of academic

performance (Narad & Abdullah, 2016; Singh et al., 2016). According to Kumar et al. (2021), Grade Point Average (GPA) is considered a standard, universally accepted, and acclaimed measure of the academic performance of students. From this literature student academic performance is equated with a final, average grade for a year, a course, or even a degree as example.

3.9 Sampling

Sampling is the selection of a portion of the larger population of interest (Babbie & Mouton, 2001). It involves the selection of several participants such as a group of individuals, institutions, or organisations from a broader population. Through the examination of the sample, it is therefore the goal that the results from the study can be generalised and applied, with caution, to the larger population. Therefore, in the sampling process, it is important that the chosen sample is as representative as possible with regards to the total population. This is necessary to allow for more accurate inferences to be drawn and for the inferences drawn from the sample to be as applicable as possible to the overall population. The sections below provide details regarding the target population of this study and the steps that will be followed to select and recruit the sample of participants to participate in the questionnaire.

3.9.1 Target population and sample

Quantitative data were collected from undergraduate tertiary students for this study. Participants from Stellenbosch University (SU) in South Africa were contacted via email by the Department of Institutional Permission at SU once permission had been granted.

Only South African citizens enrolled as tertiary students at SU were invited to participate in this study. Only South African students were contacted in order to gather statistical information relevant to the South African tertiary environment. Only students from SU were included in this study, due to the predicted increased likelihood of accessibility to and potential for high response rates from students.

Furthermore, only participants between the ages of 18 and 22 years were included in the study. It is in this age group that individuals usually transition from secondary to tertiary education. In other words, this age group coincides with the transitional period from secondary to tertiary education.

The total number of first- and second-year undergraduate students at Stellenbosch University who met the criteria for the study was 16647 at the time the research was conducted. Surveys were sent to all 16647 students in 5 groups due to the size of the population, with every group containing around 3300 to 3500 students.

The main consideration with any sample centres around how representative the sample is of the larger population. With this in mind, invitations were sent to all students who met the criteria for the study. Due to the fact that only willing participants' information was included in the final data, the sample was not random.

This matter is however a difficulty that often arises with questionnaires / surveys and when there is a lack of data in the form of biographical information of the larger population group (e.g., male/female ratio, age distribution etc), one has to assume that the final sample is representative of the population group.

The size of the sample is more critical for the statistical analysis process, and in that regard the sample size was considered sufficient. Specifically, the current, sample consisting of 31.34% of the population group, is viewed as an adequate representation of the population.

3.9.2 Motivation for choice of sample

This study aimed to determine which factors contribute to differences in student academic performance. The choice of South Africa as the country for research is based on the location of the researcher as well as the highly unique South African environment.

One feature of the South African society that makes higher education in the country so different, and makes transformation so urgent, is the relative underdevelopment of

the country's economy (Council of Higher Education, 2016). In recent years, South Africa has reached a new height of economic and political instability. In the current unstable environment, it is of increased importance for individuals to acquire the highest possible academic qualifications for personal, organisational, and national benefits. Individuals need to separate themselves from the masses, improve their employability, and increase their job security.

The choice for the focus on tertiary institutions in this study was based on the tertiary educational environment being characterised by high stress, burnout, and physical and mental strain. The environment of tertiary education is a high-performance environment that requires students to maintain high levels of performance under high pressure and to face high demands (Gucciardi et al., 2015). Facing unforgiving circumstances and needing to handle different stressors, challenges, and adversities is a reality in spheres that demand sustained high performance levels (Gucciardi et al., 2015).

Therefore, the South Africa tertiary environment presented a fitting environment to determine antecedents to student academic success. Tertiary institutions in South Africa were also considered based on convenience and location.

Undergraduate students were selected as the target group for this study due to a potentially higher rate of this cohort experiencing a decrease in academic performance and an increase in dropouts. The transitional period is the one in which most students experience the most significant decline in performance and when most course failures and drop-outs occur.

In terms of sample size, researchers and scholars agree that it is more probable that stable correlations between variables will be produced in a larger sample and that greater 'replicability' of outcomes will be displayed (Babbie & Mouton, 2001).

According to Bagozzi and Yi (2012), a sample should consist of no less than 100, and preferably above 200 participants in order to conduct SEM. Two specific risks are associated with small sample groups. Firstly, patterns of co-variance can be unstable because the factor of chance can have a significant impact on the correlations

between items when participant to item ratios are low. Secondly, small samples may not accurately represent the larger population (Bagozzi & Yi, 2012). To avoid these risks, a sample of at least 200 heterogeneous undergraduate students was the goal. This study obtained feedback from more than 600 undergraduate students.

All the above-mentioned factors make the South African tertiary reality an appropriate context in which to examine antecedents of tertiary academic performance in undergraduate students. The sample of participants was drawn from this population group using the sampling method described below.

3.9.3 Sampling method

There are two techniques that can be used when sampling. These techniques are 'probability sampling' and 'non-probability sampling' (Van Heerden, 2012). To avoid any biases and to keep the sample as representative as possible, the non-probability sampling technique was chosen for this study.

Non-probability sampling techniques are unique in that the sample is chosen based on the subjective judgement of the researcher, as opposed to a process of random selection. Random selection is the core attribute underlying probability sampling techniques. In other words, participants for this study were not selected at random but rather they were selected on the basis of a criteria identified by the researcher as important for this particular study.

The type of non-probability sampling used in this study was convenience sampling. Convenience sampling is a non-probability or non-random sampling technique used by researchers to choose a sample from a larger population (Etikan et al., 2016). This sampling technique is useful when randomisation is not possible, in the case of a very large population group as example. One example of convenience sampling that is often used to describe the technique is that of 'captive participants' like students who attend the same institution as the researcher for example.

3.10 Missing Values

The incidence of missing values needed to be considered and dealt with before the data from the investigation could be analysed. Missing values impact the data as it

affects the acceptability of the inferences drawn from the gathered data. A missing value can refer to an incomplete questionnaire or to a lack of response. If the number of questionnaires that are sent out does not equal the number of questionnaires that are returned/completed, the concept of missing values must be dealt with (Neill, 2015).

Missing values were addressed before the data analysis commenced and results were drawn up because missing values can negatively affect the efficiency of the indicator variables. If not handling missing values properly, inferences drawn can be erroneous. Due the fact that in all cases where there were missing data, no responses were given on any of the items, no missing data imputation was done. Respondents with no responses were case wise deleted.

The next section will elaborate on the ethical considerations and guidelines which were adhered to throughout the research process. This is particularly relevant to the data collection, storing, and analysis processes.

3.11 Ethical Considerations

When any research study is performed, it is crucial to consider possible ethical risks. Benefits from a proposed research study should outweigh any potential costs to participants. In terms of Standard Operating Procedure (2012), the costs experienced by research participants should be less than the benefits of this study to society. As such, it must be determined whether the benefits that the outcome of a research study could provide to society, participants, and tertiary education outweigh costs that may be experienced by the participants involved. This evaluation had to be completed in order to justify conducting the research study.

According to the National Health Act, Act 61 of 2003 (2003), all research involving human participants must have ethical clearance provided by an ethics committee that is registered with the National Health Research Ethics Council. In the case of this study, the request for ethical clearance was submitted to the Departmental Ethical Screening Committee (DESC) of the Department of Industrial Psychology at Stellenbosch University.

This study did not proceed before ethical clearance was obtained from the Departmental Ethical Screening Committee (DESC) of the Department of Industrial Psychology. Ethical complications that arose during the completion of this study were dealt with following the proposed procedures and best practice guidelines.

Requirements for ethical research practice are elaborated on below.

3.11.1 Voluntary participation

Participation in this study was wholly voluntary and participants were duly informed of the voluntary nature of the research. Participants had the right to decide whether they desired to participate in the research questionnaire. Participants were also informed that they could stop participating at any point in time without consequence. The right to not participate or stop participating at any given point was clearly communicated to all participants.

Furthermore, participants also had the option to take part in a voluntary Lucky Draw competition following the questionnaire. The voluntary nature of the Lucky Draw was also emphasised, and participants were assured that their decision to partake or not in no way affected their participation in the questionnaire.

3.11.2 Informed consent

Candidate participation involved the 'signing' of an electronic Informed Consent Form which contained a description of the ethical considerations of the study for candidate awareness.

In order to make an informed decision regarding their participation in this study, participants were informed of: (1) the purpose and objectives of the research study; (2) what participation in the research meant for the participant; (3) how research results would be distributed and used; (4) who the researcher was; (5) what the affiliation of the researcher was; (6) where participants could make inquiries regarding any aspect of the research; (7) what the rights of the participants are; and (8) where more information regarding participant rights could be obtained (Standard Operating Procedure, 2012).

From a legal perspective, South Africa is a democratic state wherein human dignity, equality, as well as the advancement of human rights are respected, promoted, and protected by the Constitution of the Republic of South Africa, 1996 (The Constitution).

Specifically, Section 27(1) guarantees citizens the right of access to health care services, and section 12(2) protects against possible research abuse by ensuring that:

‘Everyone has the right to bodily and psychological integrity, which includes the right:

- (a) to make decisions concerning reproduction;
- (b) to security in and control over their body; and
- (c) not to be subjected to medical or scientific experiments without their informed consent’.

Ethically speaking, Annexure 12 of the Ethical Rules of Conduct for Practitioners Registered under the Health Professions Act (Act No. 56 of 1974) (Republic of South Africa, 2006) requires that any psychologist conducting research first enter into an agreement with the participants of the study. This agreement concerns the nature of the research, participants responsibilities, and researcher responsibilities. In terms of the agreement, the participants provide their informed consent. This consent must meet the following requirements as set out in Annexure 12 of the Ethical Rules of Conduct for Practitioners (Republic of South Africa, 2006):

“(1) A psychologist shall use language that is reasonably understandable to the research participant concerned in obtaining his or her informed consent.

(2) Informed consent referred to in sub-rule (1) shall be appropriately documented, and in obtaining such consent the psychologist shall –

- (a) Inform the participant of the nature of the research;
- (b) Inform the participant that he or she is free to participate or decline to participate in or to withdraw from the research;
- (c) Explain the foreseeable consequences of declining or withdrawing;
- (d) Inform the participant of significant factors that may be expected to influence his or her willingness to participate (such as risks, discomfort, adverse effects, or exceptions to the requirement of confidentiality);

- (e) Explain any other matters about which the participant enquires;
- (f) when conducting research with a research participant such as a student or subordinate, take special care to protect such participant from the adverse consequences of declining or withdrawing from participation;
- (g) When research participation is a course requirement or opportunity for extra credit, give a participant the choice of equitable alternative activities; and
- (h) In the case of a person who is legally incapable of giving informed consent, nevertheless –
 - (i) Provide an appropriate explanation; (ii) obtain the participant's assent; and (iii) obtain appropriate permission from a person legally authorized to give such permission.'

Annexure 12 of the Ethical Rules of Conduct for Practitioners Registered under the Health Professions Act (Act No. 56 of 1974) (Republic of South Africa, 2006, p. 41) also requires that psychological researchers obtain institutional permission from the organisation or institution from which research participants would be sourced:

'A psychologist shall –

- a) obtain written approval from the host institution or organisation concerned prior to conducting research;
- b) provide the host institution or organisation with accurate information about his or her research proposals; and
- c) conduct the research in accordance with the research protocol approved by the institution or organisation concerned."

The researcher obtained informed consent from all participants. Informed institutional permission that is needed prior to the commencement of the research was obtained from the Department of Institutional Permissions at Stellenbosch University, since students from Stellenbosch University formed the sample. An individual from the Information Technology Department at Stellenbosch University acted as 'gate keeper' to the list of student email addresses that were used to contact the relevant students.

Furthermore, the measurement instruments and the relevant test items used to collect

the data from the participants were only utilised after written consent was obtained from the test creators / distributors. The SOS-S, JDRS, and the UWES-17 are freely available for academic research purposes. The MTQ Lite instrument was made available for a once-off administrative fee of £50 by the distributors. Average academic performance information was obtained directly from participants in a self-report manner.

3.11.3 Confidentiality and anonymity

Participants in this study consisted of undergraduate students from Stellenbosch University. Given the fact that students were contacted and requested to complete an online questionnaire from the researcher, also based at Stellenbosch University, participants may have been cautious about the information they provided. For example, participants may have questioned whether their answers would adversely affect them in any way at the university. Any uncertainty and distrust from the side of the participant could lead to hesitation to participate or cause participants to distort answers (e.g., faking good). This uncertainty could however be present in any research study for different reasons.

Given the above and considering the ethicality, it was of utmost importance that participants were made acutely aware of the confidentiality of the information they provided and their maintained anonymity throughout the research process. Matters of confidentiality and anonymity were clearly communicated to participants and strictly upheld throughout the research process.

Participants were informed of the confidential and anonymous nature of the study prior to providing consent and agreeing to participate. To ensure that anonymity was upheld, participants were encouraged not to divulge their names and/or surnames on the questionnaire. No provision was made in the questionnaire for applicants to provide their name, surname, or any other identifiable information. As such, the researcher was not privy to any identifiable information. The questionnaires remained anonymous since the researcher did not contact the participants directly, but rather through the Information Technology Department at Stellenbosch University. Therefore, the researcher did not have any access to information which could link responses to any participating student.

Regarding disclosure of information, Annexure 12 of the Ethical Rules of Conduct for Practitioners Registered under the Health Professions Act (Act No. 56 of 1974) (Republic of South Africa, 2006, p. 41) confidential information may be disclosed by a psychological researcher under specific conditions.

“A psychologist may disclose confidential information:

- a) only with the permission of the client concerned;
- b) when permitted by law to do so for a legitimate purpose, such as providing a client with the professional services required;
- c) to appropriate professionals and then for strictly professional purposes only;
- d) to protect a client or other persons from harm; or
- e) to obtain payment for a psychological service, in which instance disclosure is limited to the minimum necessary to achieve that purpose.”

3.11.4 Risk assessment

The purpose of ethical and risk evaluation and obtaining ethical clearance for a research study is to ensure that the human rights of all participants are protected and upheld. Adherence to ethical legislation is crucial to safeguard the dignity, safety, security, and well-being of all participants during the entire research process. Any empirical behavioural research requires either active or passive involvement from human beings. This involvement in and of itself is enough to infringe on the dignity, rights, safety, security, and potentially the well-being of participants. Therefore, every such study requires justification regarding the objectives of the research.

It was expected that participants in the study would be exposed only to low risk.

One possible risk factor was that candidates could find it uncomfortable or unpleasant to divulge their academic results/percentages, especially in the case of a notable decline in their academic performance from secondary to tertiary education. In order to mitigate this risk, candidates were asked to provide only an average of their academic results in the form of 10% brackets (e.g., 60% - 70%). This approach made

divulging the information less specific, and therefore participants would potentially experience less discomfort when divulging this information.

The approach also increased the likelihood of participants falling within the same performance bracket. Although this reduced the specificity of the performance information gathered from participants, the participants would likely be less impacted by the need to divulge potentially sensitive information. In this study, only a notable decline in academic performance was considered important, as such when weighing the cost to the participant against the benefit of obtaining specific performance information, this researcher found it unnecessary to put participants in a state of unnecessary discomfort.

Candidates were also clearly informed that, on average, a notable decline in academic performance is evident among first- and second-year students when compared to secondary academic performance, and that this study aimed to identify factors that could be contributing to this decline in academic performance in order to: a) inform future research; b) gain insight into possible causes of performance decline; and c) potentially develop greater support structures and performance interventions for future students who may be at risk for a decrease in performance when transitioning from secondary to tertiary education.

Another risk factor would be that participants could experience concern regarding the use of the collected research information and whether the data they provide could be linked to them; be provided to any other/third parties; or affect them in any negative manner. In addressing this concern, the confidentiality of participant information was expressed explicitly as mentioned above. Participant anonymity was maintained by urging participants not to provide their names or surnames on the questionnaire and given the fact that the questionnaire information was gathered anonymously, the information provided could not be linked to any specific participant. The aim of the study was clearly communicated to participants so that they were completely aware that the information they provided and the results from the study would be used strictly for research, academic, and educational purposes.

With regards to the self-administered, online questionnaire, the questionnaire and all

related information was clearly worded and easy to understand. This made the process of answering the questionnaire as quick as possible for participants to grasp and complete. For the purpose of brevity and respect for the time of the participants, the shortened versions of measuring instruments were utilised when these instruments proved to be both valid and reliable measures of the construct of choice. This was done so as to not to impinge too heavily on the time of the participants and cause discomfort.

Given the fact that the student participants who formed the sample group in this study were at a psychologically vulnerable age (18-22), participants may have felt slight discomfort with expressing or revealing information regarding personal and emotional variables in the study, such as answering questions related to Stress and Mental Toughness.

The measuring instruments utilised, the SOS-S and the MTQ Lite, were not explicitly named as measures of stress or mental toughness. As such, participants may not experience as negative an impact when answering questions relating to stress or mental toughness given that they would be unaware of the construct being measured. However, a degree of emotional toll on participants was expected. Participants were provided with the contact information of the Student Counselling Centre (SCC) in Stellenbosch and encouraged to immediately stop their participation in the study if experiencing any stress or discomfort and contact the Counselling Centre as soon as possible.

Furthermore, participants were provided with email contact information of the researcher and, as such, could communicate any concerns, questions, or queries before, during, and/or after completing the questionnaire. Questions, concerns, and/or queries were addressed appropriately following recommended, best-practice procedures.

Given the identified potential risks, this researcher opined that this research study presented a low level of risk. Participants were not exposed to any substantial risk, harm, or discomfort other than the possible risks mentioned and addressed above, and the time taken for participants to complete the online questionnaire. The time to

complete the questionnaire had also been limited as much as possible by making use of shortened versions of available measures in order to save participant time. Furthermore, participants were provided with the option of entering a Lucky Draw at the end of the questionnaire as a way of showing appreciation for their time and effort.

After the data collection, data analysis took place. The statistical analysis techniques that were used in this study are discussed in more detail below.

3.12 Statistical Analyses

Various statistical techniques were utilised to analyse the data, prior to the various hypotheses of the study being tested. The specific statistical techniques that were utilised in this study to analyse the accumulated data are: Item Analysis (IA); Confirmatory Factor Analysis (CFA); Exploratory Factor Analysis (EFA); and Partial Least Squares (PLS) Structural Equation Modelling (SEM). These statistical techniques are discussed in more detail below. Reliability analyses (Cronbach alpha's) were done using Statistic 14.0. Confirmatory Factor Analyses (CFA) was done using the R package "lavaan version 0.6-7". PLS-SEM was done using SmartPLS version 3.

3.12.1 Item Analysis

The measurement instruments utilised to measure the latent variables in this study were selected to measure individual standings on each of the variables and each measuring instrument was used to measure a specific latent variable through a number of items. Items from the selected measuring instruments were extracted and compiled to form one composite online questionnaire which was sent to the research sample group.

A number of well-researched, peer-reviewed reliable and valid measuring instruments were available to the researcher for the purpose of this study. These measuring instruments were proven to be reliable and valid across contexts, including the context of higher education. The researcher made use of strict criteria of reliability and validity before deciding on the most suitable measure for each variable in this study.

Although the selected measures have shown reliability and validity in multiple contexts, item analysis was necessary. Through the use of the item analysis statistical technique, it was possible for the researcher to gain an understanding of the validity and reliability of the individual items from the chosen measuring instruments. This step in the data analysis process was crucial to gain an understanding of the utility of the chosen measuring instruments in this specific study. Given the well-researched nature of the measurement instruments, the researcher only found it necessary to address and comment on measures which displayed questionable items.

An item analysis was therefore performed on the measuring instruments to determine whether each respective item in the various measuring instruments provided a realistic representation of the specific latent variables in this study.

Specific items (questions) of each measuring instrument act as a stimulus to cause behavioural responses from participants. Responses to these specific items record the behaviour that underlies the variable in question and makes it 'observable' as data. As a result, items can be poor at provoking accurate behavioural responses. Prinsloo (2012) stated that there are a number of reasons why items can be referred to as 'poor'. Specifically, poor items can be items that are insensitive, that are inconsistent, or items that poorly portray the construct it is meant to measure (Prinsloo, 2012).

Item analysis can be performed in order to identify any poor items, and to determine both the quality and the internal consistency of the items from the respective measurement instrument utilised in research studies. In this study, following the item analysis procedure, the researcher made the decision to remove some of the poor items from the final composite questionnaire. This is discussed in more detail in Chapter 4.

3.12.2 Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) CFA permits the researcher to develop and empirically test the hypotheses from the underlying factor structure of the relevant latent variable. The measurement model in this regard reflects the researcher's created hypotheses. CFA therefore allows the researcher to examine the created

hypotheses of the existing factor structure of each variable (Buys et al., 2007). Each measuring instrument is analysed separately to produce a CFA model for each of the latent variables. This statistical analysis method is performed to determine whether the data support the existing latent structures of the latent variable models.

3.12.3 Exploratory Factor Analysis (EFA)

If it is found that the existing latent structure does not fit the data well, an Exploratory Factor Analysis (EFA) is usually performed to determine what the structure of the items would be if no existing latent structure is imposed on the data. An EFA allows for the creation of a potential new factor structure with the goal of achieving a structure which fits the data better.

The specific EFA techniques that were used in this study are parallel analysis and oblimin rotation. Following the EFA, a second CFA is usually run, in order to determine whether the fit of the EFA model is an improvement on the original model.

EFA is a means with which to identify both the variable that is being measured by a specific instrument and its related items, as well as identifying the underlying dimensions of that variable. Prinsloo (2012) stated that EFA is a technique used to determine the degree to which the items of a specific measurement instrument measures the underlying dimensions of the variable that it claims to. Since the goal of any measuring instrument is essentially to measure a specific variable, along with the subscales of that variable, EFA is used to determine whether the items in the various subscales load onto the relevant factors comprising the larger variable.

In the case of items not loading onto the intended factors, it may be necessary for items to be removed or different factor(s) (dimensions) to be recognised and transformed to form new subscale(s).

3.12.4 Partial Least Squared Structural Equation Modelling

The statistical analysis technique considered most appropriate for the analysis of data accumulated from an ex post facto correlational research study is PLS SEM.

For this study, the researcher therefore utilised PLS modelling. The PLS methodology demands a two-pronged process of testing both the inner and outer models (Hair et al. (2014). The first step in the process is the evaluation of the outer, or measurement, model to assess the relationships that exist between indicator variables and their matching constructs. The primary goal of testing the measurement model is to determine the quality of the measurement of the variables used in the process of testing the inner, or structural, model.

Reliability analysis is performed to scrutinise the measurement model fit and the reliability of latent variable scales. Composite reliability and average variance extracted (AVE) techniques were used to evaluate and interpret reliabilities of each of the latent variables in the study.

Following this, the discriminant validities of the various scales were assessed by means of the Heterotrait-Monotrait ratio method and a PLS bootstrapping analysis can be conducted as a final assessment of the reliability of all items comprising the latent variables.

Various analyses are required to determine acceptable fit of the measurement model before the commencement of the PLS modelling estimation.

After acceptable measurement model fit is established, PLS SEM can then be used to determine the significance and strength of the paths between variables in the structural model. The structural (or inner) model shows the paths/relationships posited between the various latent variables. The PLS structural model analysis consists of the testing for R square values and multicollinearity (VIF) and, lastly, examining and interpreting both the main and moderating relationships.

The structural model aims to relate latent variables with one another. A bootstrapping sampling procedure should then be conducted to assess the statistical significance and strength of the main and interaction relationships.

3.13 Chapter Summary

This chapter provides the research hypotheses, the choice of research design for the study, and the statistical hypotheses. It also describes the nature and size of the sample and the sampling method used to select and recruit participants. The measurement instruments that were utilised in the study are also discussed. This section then introduces the hypothesised structural model, the matrix equation and the set of equations explaining the matrix. Lastly, the process of data collection and the various statistical analyses techniques utilised in the study are discussed.

CHAPTER 4: RESULTS

4.1 Introduction

Chapter 4 provides and elaborates on the statistical results obtained from the statistical analyses performed in this study. A brief explanation of the statistical techniques and the order in which the techniques were applied is provided below.

The first statistical technique utilised in this study is item analysis. Item analysis is used to determine the reliability of different measuring instruments which measure the latent variables. In other words, item analysis allows for the determination of how psychometrically sound, and specifically how reliable, the chosen measurement instruments and their relating items are.

Item analysis was performed on all the items extracted from the various measurement instruments (i.e., The Job Demands-Resources (JD-R) Model, The Stress Overload Scale-Short (SOS-S), The Utrecht Work Engagement Scale (UWES), and the Mental Toughness Questionnaire Lite (MTQ-Lite)) which were included in the composite questionnaire formulated for this study.

Following the item analysis, Confirmatory Factor Analysis (CFA) was performed. CFA allows the researcher to develop and test hypotheses from the underlying factor structure of the variables. Each measuring instrument was analysed separately to produce a CFA model. In this way, CFA was performed separately for each of the latent variables of relevance in this study. This was done to determine whether the data supports the existing structures of the latent variable models.

From the findings of the CFAs, if an existing latent structure does not fit the data well, an Exploratory Factor Analysis (EFA) is performed to determine what structure the items would follow if no existing latent structure is imposed on the data. An EFA allows for the creation of a potential new factor structure which is expected to fit the data better when compared to the existing model.

In this study, it was necessary to perform EFA on one of the latent variables. The

specific EFA techniques used were parallel analysis and oblimin rotation. Following EFA, a second CFA should then be performed to determine whether the fit of the EFA model is better than the fit of the original model.

Finally, in order to obtain both further support for the reliability of the chosen measuring instruments and to investigate the relationships in the structural model, one of two approaches can be utilised. These approaches are Partial Least Squares (PLS) Structural Equation Modelling (SEM) and Covariance Structural Equation Modelling (SEM). In this study, the analysis that was utilised was Partial Least Squares (PLS) Structural Equation Modelling (SEM).

PLS (SEM) was performed as a means to support initial reliability findings of the measurement instruments and to investigate the relationships between the variables in the structural model (i.e., path coefficients). PLS (SEM) therefore allows for the analysis and investigation of the paths between latent variables in the structural model.

4.2 Validating the Measurement Model

The first step in the statistical analysis of the data is the process of validating the measurement model. The results from the statistical techniques utilised in this study are provided and explained in the relevant sections below.

4.2.1 Item analysis

Item analysis is performed for the purpose of identifying poor items and to determine the quality and internal consistency reliability of measurement subscales or their items. Item analysis was performed on all items from the various measuring instruments that were included in the composite questionnaire of this study.

Table 4.2 provides a summary of the results from the item analysis performed on the measuring instruments and their relevant subscales as included in the composite questionnaire of this study. The tabulated summary includes information on the Cronbach Alpha values and the Average Inter-Item Correlation of the items measuring the related latent variables. These constructs and their values are explained below.

Table 4.1*Cronbach Alpha Values and Average Inter-item Correlation*

Scale	Sample Size	Number of items	Cronbach alpha	Average inter-item correlation
JD_work load	634	3	0.23	0.09
JD_mental load	634	3	0.61	0.35
JD_emotional load	634	3	0.50	0.25
ST_personal vulnerability	634	5	0.89	0.61
ST_event load	634	5	0.90	0.64
EN_vigour	634	6	0.73	0.33
EN_dedication	634	5	0.73	0.39
EN_absorption	634	6	0.76	0.35
MT	634	10	0.79	0.29

The Cronbach Alpha value of a construct or its sub-scale explains the internal consistency of the scale. According to Vaske et al (2015), a Cronbach Alpha value that falls between 0.65 and 0.80 is considered sufficient in the field of Human Resources. Nell (2015) considers a Cronbach Alpha value of 0.70 as acceptable in terms of explaining internal consistency. As can be seen from Table 4.2, the Cronbach Alpha values of internal consistency for Stress (ST), Engagement (EN), and Mental Toughness (MT) were all acceptable (>. 70).

The Job Demands items that were extracted from the Job-Demands Resources Scale (JDRS) however proved to be problematic. Table 4.2 shows that the Cronbach Alpha values for all three subscales of the Job Demands items from the JD-R Scale were lower than the recommended < 0.70.

JD_mental load showed the highest Cronbach Alpha value at 0.61. Given this, even when considering Vaske et al.'s (2015) recommended Cronbach Alpha value range of 0.65 to 0.80, the JD_mental load subscale still fell outside of the criteria for internal consistency.

The JD_workload subscale showed particularly poor internal consistency, with a Cronbach Alpha value of 0.23. Therefore, the JD_workload subscale also failed to meet the criteria for internal consistency.

Finally, the JD_emotional load subscale had a Cronbach Alpha value of 0.50, which again falls outside the criteria for internal consistency.

Cronbach Alpha values are further supported by average inter-item correlations. Inter-item correlations are a type of internal consistency reliability. In terms of this measure, items from the same measuring instrument should show high inter-item correlation, because they are meant to be measuring the same underlying variable.

Peters (2014) states that average inter-item correlation values that fall between 1.00 and 0.50 are regarded as excellent, while values between 0.50 and 0.00 are viewed as acceptable in terms of internal consistency reliability. Vaske et al. (2015) explained that inter-item correlation values should be as close to 1.00 as possible. The closer the value is to 1.00 the more the items are seen to be measuring the same underlying construct (Vaske et al., 2015).

The average inter-item correlation value for MT was lower (0.29) in comparison to the average inter-item correlation for the two stress subscales ST_personal vulnerability (0.61) and ST_event load (0.64) and the three engagement subscales EN_vigour (0.33), EN_dedication (0.39), and EN_absorption (0.35). However, the inter-item correlation for MT was still acceptable (M. Kidd, personal communications, October 2020).

The average inter-item correlation for the three job demands subscales showed varied results. The JD_mental load subscale displayed an average inter-item correlation of 0.35. This value is still regarded as acceptable (M. Kidd, personal communications, October 2020). In conjunction with the Cronbach Alpha value of the JD_mental load subscale falling just outside of the parameter for internal consistency reliability, the average inter-item correlation, and Cronbach Alpha values, in conjunction, support the JD_mental load subscale as indicating sufficient internal consistency reliability.

The JD_workload subscale had a very low average inter-item correlation value of 0.09, thereby reflecting poor internal consistency reliability. Based on both the Cronbach Alpha and average inter-item correlation values, the reliability of the JD_workload subscale was not regarded as acceptable.

Furthermore, the average inter-item correlation for the JD_emotional load subscale was 0.25. Based on both the Cronbach Alpha and average inter-item correlation values of this subscale, the JD_emotional load subscale was not considered to show sufficient internal consistency reliability.

Given the relatively poor internal consistency reliability findings from two of the three job demands subscales, further investigation and analysis was required to address the apparent presence of poor items.

Since item analysis is performed to identify poor items and determine the quality and internal consistency reliability of measurement scale subscales or items, it was necessary to explore the results from the item analysis further.

Findings showed that two items from the JD workload subscale were particularly poor, namely items JD2 and JD3 (reversed). These items showed item-total correlations of 0.12 and 0.03 respectively. The poor results on the JD3 item provided the first indication that participants in this study appeared to struggle with reversed items.

Table 4.2

Item analysis Job Demands - Work Load

Cronbach's alpha and 95% CI: 0.23 (0.11, 0.33)		
Summary for scale:		
Mean = 9.41640		
Standard Deviation = 2.03914		
Valid N: 634		
Standardized alpha: 0.22		
Average inter-item correlation: 0.09		
Variable	Itm-Totl Correl.	Alpha if deleted
JD1	0.23	0
JD2	0.12	0.18
JD3 (reversed)	0.03	0.35

4.2.2 Job demands

Following the unfavourable results related to the job demands items, further analyses were performed. These are explained in greater detail below.

4.2.2.1 Confirmatory Factor Analysis (CFA)

CFA was performed on the job demands measurement instrument to provide further information on whether the data supported the existing latent structure of the measurement model. CFA was therefore conducted to determine what items belong to which subscale.

The fit of the measurement model was evaluated from the fit indices to determine whether the existing latent structure showed acceptable fit. The fit was interpreted by considering four fit indices namely; Root Mean Square Error of Approximation (RMSEA), goodness of fit index (gfi), non-normed fit index (nnfi), and Standardized Root Mean Square Residual (SRMR) (Hooper, 2008). These indices were considered in a holistic manner to determine the fit of the job demands CFA model and are explained in greater detail below. A summary of the combined impact of the four fit indices is provided below the individual sections.

4.2.2.1.i Root Mean Square Error of Approximation (RMSEA)

The RMSEA value provides some evidence regarding the measurement model fit (e.g., excellent, good, mediocre, or poor fit) (Hooper, 2008). An RMSEA value of 0.081 was found for the existing job demands latent structure. For good fit, the RMSEA value should be below 0.05, however a value of 0.08 is still regarded as acceptable (Hooper, 2008; M. Kidd personal communications, January 2021). As such, the RMSEA value for the existing job demands latent structure fell on the cusp and was therefore deemed to show acceptable fit in this regard (M. Kidd personal communications, January 2021).

4.2.2.1.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further evidence regarding the measurement model fit. A gfi value of 0.958 was found for the job demands latent structure. This value should be above 0.9 to show acceptable model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, the model therefore shows acceptable fit.

4.2.2.1.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the job demands latent structure showed a value of 0.75. This value should be above 0.9 to display acceptable model fit (Hooper, 2008; M. Kidd personal communications, January 2021). Therefore, according to this fit index value, the model did not show acceptable fit.

4.2.2.1.iv Standardized Root Mean Square Residual (SRMR)

The SRMR is a measure of fit that refers to the standardised difference between observed correlations and predicted correlations. The SRMR value for the job demands latent structure was 0.07. For a model to be regarded as having acceptable fit, the SRMR value should be below 0.09 (Hooper, 2008) According to this fit index value, the model showed acceptable fit.

Considering all of the above fit indices, the RMSEA, the gfi, nnfi, and the SRMR, the existing job demands latent structure showed *acceptable* but not good fit. The data thus supports the existing latent structure to some degree, but the fit could be improved.

These findings provide further support for the findings from the item analysis which showed that some of the job demands items showed questionable reliability. Given the findings of both the item analysis and the CFA analysis, it was necessary to conduct a further analysis in the form of an EFA.

4.2.2.2 Exploratory Factor Analysis (EFA)

Following the results from the item analysis and the CFA, the researcher – in conjunction with the Statistical Analyst – decided to delete the JD3 (reversed) job demands item which showed poor reliability (Hair, undated; M. Kidd personal communications, October 2020).

EFA was then performed on the job demands items to explore which items loaded onto which subscales without an imposed, predetermined latent structure,

Exploratory Factor Analysis (EFA) is performed to determine the number of subscales that exist within the larger scale, and to ascertain whether the items in the various subscales load onto the relevant factors.

In terms of the number of subscales within the job demands scale, results from the EFA provided support for the existence of three job demands subscales. The existing latent structure also divided the larger job demands scale into three subscales. As such, the EFA structure and the existing latent structure both support the division of the larger scale into three subscales.

In order to determine how many sub-scales exist within the larger scale parallel analysis was performed with results from the scree plot confirming the findings.

The Eigenvalues Cumulative Percentage of 54% indicated that 54% of the variance in the new EFA structure was explained by the three subscales. It is recommended that this percentage be greater than 50% (Hair, undated; M. Kidd personal communications, January 2021).

Following the parallel analysis, and the interpretation of the scree plot and Eigenvalue results, oblimin rotation was performed to determine which items load onto which of the three EFA structure subscales. The higher the factor loading value of the item, the more strongly the item loads onto the relevant subscale (Hair, undated; M. Kidd personal communications, January 2021). Factor loadings are considered in relation to one another, as explained below.

Table 4.3*Oblimin Rotation Factor Loadings – Job Demands*

Variable	Subscale 1 - Personal	Subscale 2 - Attention	Subscale 3 - Pressure
JD1	-0,17	-0,07	0,77
JD2	-0,22	-0,02	0,42
JD3 (reversed)	0,56	-0,2	0,52
JD4	-0,55	0,1	0,25
JD5	-0,72	-0,09	0,16
JD6	-0,78	-0,06	0,02
JD7	-0,11	0,74	-0,03
JD8	0,14	0,78	0,03
JD9	-0,01	0,42	0,65

As shown in Table 4.3, JD1 and JD9 loaded strongly onto subscale 3 (Pressure) of the EFA model. The items JD4, JD5, and JD6 displayed strong loadings onto subscale 1 (Personal) of the EFA. Items JD7 and JD8 clearly and strongly loaded onto subscale 2 (Attention). This analysis indicated that items JD2 and JD3 did not clearly or strongly load onto one factor, instead both items loaded to some degree onto both subscales 1 and 2.

The JD2 item loaded slightly more onto subscale 3 than subscale 1 and was therefore regarded as acceptable even though the loading was not as strong as the loadings of the other items onto their respective subscales (M. Kidd personal communications, January 2021). From a theoretical point of view, the JD2 item content regarding studying under time pressure is also better suited to fall under the Pressure subscale.

The loadings of JD3 provided further evidence that the item was problematic as it did not load strongly onto either subscale 1 or 3. This showed that it did not clearly measure either of these subscales and provided further support for the decision to remove the item from the study.

4.2.2.3 Second Confirmatory Factor Analysis (CFA)

Following the EFA, a second CFA was performed on the job demands EFA measurement model to determine the fit of the new EFA model. From the fit indices,

the fit of the EFA model was evaluated to determine whether it displayed better fit than the existing latent structure.

The model fit was again interpreted by considering the four fit indices of Root Mean Square Error of Approximation (RMSEA), the goodness of fit index (gfi), the non-normed fit index (nnfi), and the Standardized Root Mean Square Residual (SRMR), which were considered holistically. In addition to this, standardised estimates, composite reliability, and average variance extracted values were also interpreted and considered in the final decision-making process regarding the fit of the measurement model.

4.2.2.3.i Root Mean Square Error of Approximation (RMSEA)

An RMSEA value of 0.07 was found for the EFA model. For good fit, the RMSEA value should be below 0.05 although a value of up to 0.08 is still regarded as acceptable (M. Kidd personal communications, January 2021). As such, the RMSEA value for the EFA job demands measurement model fell just within the range for acceptable fit (M. Kidd personal communications, January 2021). The RMSEA value did improve in the EFA model, albeit marginally.

4.2.2.3.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further evidence regarding the EFA model fit. A gfi value of 0.96 was found for the job demands EFA model. Acceptable model fit requires this value to be above 0.90 (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, the model therefore still showed acceptable fit. Again, this fit index did improve slightly when compared to the existing latent structure.

4.2.2.3.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the job demands EFA model showed a value of 0.80. This value should be above 0.90 to display acceptable model fit (Hooper, 2008; M. Kidd personal communications, January 2021).

As such, according to this fit index value, the EFA model did not show acceptable fit. Therefore, neither the existing latent structure nor the EFA model showed acceptable fit according to this fit index.

4.2.2.3.iv Standardized Root Mean Square Residual (SRMR)

The SRMR value for the job demands EFA model was 0.06. For a model to be regarded as having acceptable fit, the SRMR value should be below 0.09. As such, according to this fit index value, this model shows acceptable fit. Again, the model fit showed slight improvement in fit compared to the existing structure.

4.2.2.3.v Standardised estimates, composite reliability, and average variance extracted

Factor loadings were investigated as further support for the EFA model fit. Factor loadings should be higher than 0.70, although values higher than 0.40 are still regarded as acceptable (Hooper, 2008; M. Kidd, personal communications, October 2020). The values for all items were acceptable, except for the standardised estimate value of the JD2 item which, at 0.31, fell below the acceptable value. However, this loading was still statistically significant and an attempt to remove this item worsened the goodness-of-fit (M. Kidd personal communications, February 2021). For these reasons, a decision was made to retain the JD2 item.

Composite reliability and average variance extracted (AVE) techniques were used to evaluate and interpret the reliabilities of each of the job demands subscales. AVE values indicate the extent to which the amount of variance of an indicator variable is explained by common factors. An AVE value of at least 0.50 is considered ideal (Hair et al., 2014; Hooper, 2008; M. Kidd, personal communication, January 2021). AVE values should be above 0.50, while composite reliability values should fall above 0.70 (Hooper, 2008; M. Kidd, personal communications, October 2020).

None of the job demands subscales met the criteria for AVE or composite reliability. The relatively low AVE values indicated that some of the item loadings were below 0.70. However, all but one of the loadings were still acceptably above 0.4. For this

reason, the low AVE values could be regarded to be a limitation in this study (M. Kidd, personal communications, February 2021).

Considering all of the above fit indices, the RMSEA, the *gfi*, *nnfi*, and the SRMR, the EFA model showed acceptable fit, with most of the fit indices having improved slightly when compared to the existing latent structure. The data therefore supported the EFA model slightly more than the existing latent structure.

4.2.3 Stress surplus

Following the achievement of improved fit of the job demands EFA model, focus was shifted to the other variables in this study. Further analyses of the stress surplus scale were performed after the initial item analysis process and are explained in more detail below.

4.2.3.1 Confirmatory Factor Analysis (CFA)

The fit of the stress surplus measurement model was evaluated from the fit indices to determine whether the existing latent structure fitted the data well.

The model fit was interpreted by considering the four fit indices of Root Mean Square Error of Approximation (RMSEA), the goodness of fit index (*gfi*), the non-normed fit index (*nnfi*), and the Standardized Root Mean Square Residual (SRMR), which were considered holistically. In addition to this, standardised estimates, composite reliability, and average variance extracted values were also interpreted and considered in the ultimate decision-making process regarding the fit of the stress surplus measurement model.

4.2.3.1.i Root Mean Square Error of Approximation (RMSEA)

An RMSEA value of 0.08 was found for the existing stress surplus latent structure. For good fit, the RMSEA value should be below 0.05, but a value of 0.08 is still regarded as acceptable (Hooper, 2008; M. Kidd personal communications, January 2021).

As such, the RMSEA value for the existing stress surplus latent structure fell on the

culp of the desired range for this index. The latent structure fit could still be regarded as acceptable; however, this is dependent on the results from the other fit indices (M. Kidd personal communications, January 2021).

4.2.3.1.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further evidence regarding the measurement model fit. A gfi value of 0.94 was found for the stress surplus latent structure. This value should be above 0.90 to show good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, the existing measurement model fitted the data well.

4.2.3.1.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the stress surplus latent structure showed a value of 0.95. This value should be above 0.90 to display good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this fit index value, the model therefore fitted the data well.

4.2.3.1.iv Standardized Root Mean Square Residual (SRMR)

The SRMR value for the stress surplus latent structure was 0.04. The SRMR value should be below 0.09 for a model to be regarded as having good fit. As such, according to this fit index value, the model fitted the data well.

4.2.3.1.v Standardised estimates, composite reliability, and average variance extracted

As further support for the fit of the stress surplus model, standardised estimate values were considered. Standardised estimate values should ideally be higher than 0.70, although values higher than 0.40 are still regarded indicators of good model fit (Hooper, 2008; M. Kidd, personal communications, October 2020). The standardised estimate values for all of the stress surplus items were above 0.70. As such, according to these criteria, the existing stress surplus structure fitted the data well.

Composite reliability and average variance extracted (AVE) techniques were used to evaluate and interpret the reliabilities of the stress surplus model. The AVE values should be above 0.50, while the composite reliability values should fall above 0.70 (Hooper, 2008; M. Kidd, personal communications, October 2020). The AVE values of both stress surplus subscales were above 0.50 and the construct reliabilities fell above the 0.70 value as well.

Considering all the above fit indices, the RMSEA, the gfi, nnfi, SRMR, the AVE, and the composite reliability, the existing stress surplus latent structure fitted the data well. In other words, the data supported the existing stress surplus latent structure.

4.2.4 Engagement

Further analyses were also performed on the engagement measurement model after the initial item analysis process. The findings are explained in greater detail below.

4.2.4.1 Confirmatory Factor Analysis (CFA)

The fit of the measurement model was evaluated from the fit indices to determine whether the existing latent structure showed acceptable fit. These indices were considered in a holistic manner to determine the fit of the CFA model and are explained and interpreted below.

4.2.4.1.i Root Mean Square Error of Approximation (RMSEA)

An RMSEA value of 0.10 was found for the existing engagement latent structure. For good fit, the RMSEA value should be below 0.05, although a value of 0.08 is still regarded as acceptable (Hooper, 2008; M. Kidd personal communications, January 2021). As such, the RMSEA value for the existing engagement latent structure fell outside the desired range.

On the basis of this fit index value and depending on the results from the other fit indices, it would not be seen to show acceptable fit in this regard (M. Kidd personal communications, January 2021).

4.2.4.1.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further evidence regarding the measurement model fit. A gfi value of 0.82 was found for the engagement latent structure. This value should be above 0.90 to show good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, this model therefore did not show acceptable fit.

4.2.4.1.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the engagement latent structure showed a value of 0.77. This value should be above 0.90 to display good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this fit index value, the model therefore did not fit the data well.

4.2.4.1.iv Standardized Root Mean Square Residual (SRMR)

The SRMR value for the engagement latent structure was 0.09. For a model to be regarded as having good fit, the SRMR value should be below 0.09 (Hooper, 2008). As such, according to this fit index value, the model fell on the cusp for good model fit.

Given the poor fit found from the CFA results, an EFA was consequently performed for the engagement measure.

4.2.4.2 Exploratory Factor Analysis (EFA)

The results from the item analysis and the CFA revealed that a number of engagement items displayed poor reliability. EFA was therefore performed on the engagement items to explore which items loaded onto which subscales, in the absence of a predetermined latent structure.

As has been mentioned, an Exploratory Factor Analysis (EFA) is performed to determine the number of subscales in the scale, and to ascertain whether the items in the various subscales load onto the expected factors.

The results from the EFA found support for three engagement subscales, as was posited by the existing latent structure. Parallel analysis was used in the process to determine the number of subscales for engagement and the scree plot confirmed the existence of three subscales.

The Eigenvalues Cumulative Percentage of 53%, showed that 53% of the variance was explained by the new EFA subscale structure. This was greater than the recommended 50% (M. Kidd personal communications, February 2021). As such, 53% of the variance of the EFA structure was explained by the three subscales. Following the parallel analysis, and the interpretation of the scree plot and Eigenvalue results, oblimin rotation was performed to determine which of the items loaded onto which of the three EFA subscales. Furthermore, the higher the factor loading value of the item, the more strongly the item loads onto the relevant subscale (Hair, undated; M. Kidd personal communications, January 2021).

Table 4.4

Oblimin Rotation Factor Loadings - Engagement

Variable	Subscale 1 – Dedication	Subscale 2 - Absorption	Subscale 3 - Vigour
EN3	-0.33	-0.38	-0.04
EN6	-0.22	-0.54	-0.06
EN9	-0.47	-0.31	0.00
EN11	-0.50	-0.40	0.06
EN14	0.04	-0.74	0.00
EN16	0.10	-0.69	0.05
EN2	-0.86	0.11	0.01
EN5	-0.79	0.02	0.12
EN7	-0.84	-0.04	-0.01
EN10	-0.46	-0.26	0.19
EN13	0.25	-0.43	-0.01
EN1	0.05	0.50	0.92
EN4	-0.06	-0.04	0.83
EN8	-0.25	-0.02	0.59
EN12	-0.07	-0.71	-0.10
EN15	-0.04	-0.59	0.18
EN17	0.11	-0.42	0.38

As shown in Table 4.4, EN2, EN5 and EN7 loaded strongly onto subscale 1 (dedication) of the EFA model. However, EN10 and EN13 did not load clearly or strongly onto the dedication subscale. The items EN6, EN14, EN16, EN12, AND EN15 loaded strongly onto subscale 2 (absorption). Item EN3, EN9, and EN11 did not load strongly onto the absorption subscale as per the existing latent structure.

Furthermore, EN1, EN4, and EN8 loaded strongly onto subscale 3 (vigour). In this case, EN12 and EN15 loaded onto the absorption subscale and not the vigour subscale as per the existing latent structure. EN17 furthermore did not load strongly onto the vigour subscale as per the existing latent structure.

The researcher, in conjunction with the Statistical Analyst, identified items that showed poor reliability. The engagement items which showed poor reliability and did not load onto the expected subscales were the EN12, EN13, EN15, and EN17 (M. Kidd personal communications, February 2020). These items were consequently removed from the existing engagement latent structure.

Following the removal of the items showing poor reliability, a second CFA model was fitted to determine whether the removal of items EN12, EN13, EN15, and EN17 improved the model fit.

4.2.4.3 Second Confirmatory Factor Analysis (CFA)

Deletion of poor items from the engagement latent structure was followed by reinterpreting the fit of the model in the absence of these items by considering the four fit indices of Root Mean Square Error of Approximation (RMSEA), the goodness of fit index (gfi), the non-normed fit index (nnfi), and the Standardized Root Mean Square Residual (SRMR), which were considered holistically.

In addition to this, standardised estimates, composite reliability, and average variance extracted values were also interpreted and considered in the ultimate decision-making process regarding the fit of the measurement model.

4.2.4.3.i Root Mean Square Error of Approximation (RMSEA)

An RMSEA value of 0.08 was found for the new engagement structure after the relevant items were removed. For good fit, the RMSEA value should be below 0.05, however a value of 0.08 is still regarded as acceptable (M. Kidd personal communications, January 2021). The RMSEA value for this engagement structure has improved when compared to the existing latent structure, and the model, on the basis of this fit index, just meets the criteria for acceptable model fit.

4.2.4.3.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further evidence regarding the measurement model fit. A gfi value of 0.92 was found for the new engagement structure. This value should be above 0.90 to show good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, the new model therefore fits the data well.

4.2.4.3.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the new engagement structure showed a value of 0.88. This value should be above 0.90 to display good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this fit index value, the model therefore fell just outside the range for good fit although the fit had improved from the fit of the existing latent structure. The fit could however still be regarded as acceptable, especially when considering the results from the other fit indices (M. Kidd personal communications, January 2021).

4.2.4.3.iv Standardized Root Mean Square Residual (SRMR)

The SRMR value for the new engagement structure was 0.06. For a model to be regarded as having good fit, the SRMR value should be below 0.09 (Hooper, 2008). As such, the model shows good model fit according to this fit index value.

4.2.4.3.v Standardised estimates, composite reliability, and average variance extracted

Standardised estimate values were considered to gather further evidence regarding the new engagement model fit. These values should be higher than 0.70 to show good model fit, although values higher than 0.40 are still regarded as acceptable (M. Kidd, personal communications, October 2020). The standardised estimate values for all remaining engagement items were above 0.40, thus showing acceptable fit of the new engagement structure.

Composite reliability and average variance extracted (AVE) techniques were also used to evaluate and interpret the reliabilities of the new engagement model. AVE values should be above 0.50, while the composite reliability values should fall above 0.70 to show good model fit (Hooper, 2008; M. Kidd, personal communications, October 2020). The AVE values of two of the three engagement subscales (i.e., EN_Vigour and EN_Dedication) were above 0.50, but the EN_Absorption subscale AVE value was 0.34. While EN_Absorption subscale seemed to show potential issues regarding the AVE value, the construct reliabilities of all engagement subscales fell above the desired 0.70 value for composite reliability. Therefore, based on this criterion, the new engagement model showed good fit.,

Considering all of the above fit indices, the RMSEA, the gfi, nnfi, SRMR, the AVE, and the composite reliability, the new engagement structure showed better data fit than the existing latent structure. Therefore, after the removal of the problematic items, the new engagement structure was found to fit the data well.

4.2.5 Mental toughness

Further analyses were also performed on the mental toughness measurement model after the initial item analysis process. The findings are explained in greater detail below.

4.2.5.1 Confirmatory Factor Analysis (CFA)

The fit of the measurement model was evaluated from the fit indices to determine whether the existing latent structure showed acceptable fit. These indices were considered in a holistic manner to determine the fit of the CFA model and are explained and interpreted below.

4.2.5.1.i Root Mean Square Error of Approximation (RMSEA)

A RMSEA value of 0.09 was found for the mental toughness latent structure. For good fit, the RMSEA value should be below 0.05, although a value below 0.08 is still regarded as acceptable (Hooper, 2008; M. Kidd personal communications, January 2021). The RMSEA value for mental toughness did not meet the criteria for either good or acceptable model fit. According to this fit index, the mental toughness model therefore did not seem to fit the data well based on the information from this first fit index. However, consideration of the results from the other fit indices also needed to be considered.

4.2.5.1.ii Goodness of fit index (gfi)

The goodness of fit index (gfi) provides further information regarding the measurement model fit. A gfi value of 0.93 was found for the mental toughness latent structure. This value should be above 0.90 to show good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). According to this index value, the model showed good fit.

4.2.5.1.iii Non-normed fit index (nnfi)

The non-normed fit index (nnfi) for the mental toughness latent structure showed a value of 0.81. This value should be above 0.9 to display good model fit (Hooper, 2008; M. Kidd personal communications, January 2021). The model therefore fell slightly outside the range for good fit according to this fit index value, but the fit could still be regarded as acceptable (M. Kidd personal communications, January 2021).

4.2.5.1.iv Standardized Root Mean Square Residual (SRMR)

The SRMR value for the mental toughness latent structure was 0.06. The SRMR value should be below 0.09 for a model to be regarded as having good fit. According to this fit index value, the model thus showed good fit.

4.2.5.1.v Standardised estimates, composite reliability, and average variance extracted

The standardised estimate values were considered for further evidence regarding the mental toughness model fit. These values should be higher than 0.70 for good model fit, but values higher than 0.40 are still regarded as acceptable (Hooper, 2008; M. Kidd, personal communications, October 2020). The standardised estimate values for most of the mental toughness items were above 0.40.

Two of the reverse scored mental toughness items had values that fell below this. This showed that most of the items of the mental toughness model were acceptable. This also provided further evidence that the participant group had difficulty with reverse scored items.

Composite reliability and average variance extracted (AVE) techniques were used to evaluate and interpret the reliabilities of the mental toughness model. AVE values should be above 0.50, while the composite reliability values should fall above 0.70 (M. Kidd, personal communications, October 2020). The AVE value for mental toughness was 0.30, which is below the desired value for good fit. This could still be considered as falling in the range of acceptable rather than good fit. The construct reliability fell above the desired 0.70 value, thereby showing good fit.

Considering all of the above fit indices, the RMSEA, the *gfi*, *nnfi*, SRMR, the AVE, and the composite reliability, the mental toughness model showed average data fit, with some indices displaying good fit, some indices showing acceptable fit, and some indices showing questionable fit. From this it was concluded that the data did not show very strong support for the one factor model of mental toughness.

Two poor items of mental toughness specifically were identified. A researcher may be tempted to delete these poor items. However, given the unidimensional nature of the MT construct and the number of items measuring mental toughness well, deleting the two poor items would not have a significant impact on the overall results. As such, no items were removed from this scale.

4.2.6 Decision regarding the reliability of the latent variable scales

Since the aim of the item analysis process is to assess the functioning of constructs in this study and to determine whether or not the indicator variables of the appropriate latent constructs were psychometrically acceptable. The Cronbach Alpha values of internal consistency for Stress (ST), Engagement (EN), and Mental Toughness (MT) were all acceptable ($>.70$). These findings were supported by acceptable average inter-item correlations.

The Cronbach Alpha values for all three subscales of the Job Demands Scale were lower than the recommended <0.70 . Of the three subscales, JD_mental load showed the highest Cronbach Alpha value at 0.61. Given this, even when considering Vaske, Beaman and Sponarski's (2015) recommended Cronbach Alpha value range of 0.65 to 0.80, the item fell just outside the criteria for internal consistency. These findings were further supported by relatively low inter-item correlations. Therefore, all three subscales of the job demands scale displayed questionable reliability, with two items from the JD_work load subscales presenting as psychometrically unsound.

Following further analysis, one job demands item consistently showed poor reliability and was removed. The scale was re-structured to form a new model structure. While the data supported the new model slightly better than the existing latent structure, the scale did not appear to fit the data particularly well, Results involving this scale should therefore be interpreted with caution as the job demands items from the JD-R scale may not be measuring what it is intended to measure.

4.3 PARTIAL LEAST SQUARE (PLS) ANALYSIS

The PLS methodology demands a two-pronged process of testing both the inner and outer models (Hair et al., 2014). The first step in the process is the evaluation of the outer, or measurement, model to assess the relationships that exist between indicator variables and their matching constructs (Leguina, 2015). The primary goal of testing the measurement model is to determine the quality of measurement of the variables used in testing the inner, or structural, model. The inner (structural) model reflects the relationships between the latent variables in the study (Leguina, 2015).

After the reliability of the latent variable scales were ascertained, showing measurement model fit, the path coefficients were evaluated in order to determine both the significance and strength of the hypothesised relationships. The above steps are discussed in more detail below.

4.3.1 Evaluation and interpretation of the measurement model

Reliability analysis is performed in order to scrutinise the fit of the measurement model and the reliability of the latent variable scales. Composite reliability and average variance extracted (AVE) techniques were used to evaluate and interpret reliabilities of each of the latent variables in the study.

As mentioned, composite reliability is used to measure whether there is satisfactory reliability of the different latent variable scales. Satisfactory or acceptable reliability refers to a value of at least 0.70 or higher (Hair et al., 2014; M. Kidd, personal communication, January, 2021).

AVE values indicate to what extent the variance of an indicator variable is explicated by common factors. An AVE value of at least 0.50 is considered to be the ideal (Hair et al., 2014; M. Kidd, personal communication, January, 2021). This AVE value indicates that 50% of the variance of an indicator variable is explained by common factors and that the indicator variables measure the respective constructs sufficiently. AVE is one of the more rigorous measures of reliability; however, it can still be compared to other reliability scores.

Table 4.5 shows that the composite reliability values of all the latent variables were greater than 0.70 and could therefore be regarded as satisfactory. While three of the four AVE values were greater than 0.50, mental toughness presented the lowest AVE value of 0.35 but was still regarded as acceptable.

Table 4.5

Reliability Statistics of the PLS Model

Scale	Composite reliability (CR)	Average variance extracted (AVE)
Engagement	0.93	0.82
Job demands	0.85	0.65
Mental Toughness	0.84	0.35
Stress	0.97	0.94

Following the above, the discriminant validities of the various scales were assessed with the use of the Heterotrait-Monotrait ratio method criteria (Leguina, 2015; M. Kidd personal communications, January 2021). Each latent variable was compared with the others in the study to determine whether each could be regarded as a separate and unique variable, thus being discriminant when compared to the other items, and therefore providing evidence that there is no significant overlap between the measurement scales.

The Heterotrait-Monotrait ratios should fall below 1.00 (Leguina, 2015; M. Kidd personal communications, January 2021). The 95% upper values also need to fall below 1.00 to ensure discriminant validity between the latent constructs of this study (Leguina, 2015; M. Kidd personal communications, January 2021).

It was determined that all relationships between the latent variables showed clear discriminant validity; it could therefore be concluded that all latent variables were separate and unique constructs that did not correlate highly with any of the other constructs in this study.

A PLS bootstrapping analysis was conducted as a final assessment of the reliability of

all items comprising the latent variables in the study. A bootstrapping analysis is performed to ascertain whether or not item loadings are found to be significant. This required an assessment of the factor loadings.

In order to evaluate factor loadings, it was necessary to determine whether zero fell in the 95% confidence interval. Factor loadings are considered statistically significant if zero does not fall in this confidence interval. Rather, if zero falls within this interval, factor loadings would not be considered to be statistically significant (Langenhoven, 2015; M. Kidd personal communications, January 2021).

Table 4.6

Outer Loadings

Manifest Variable	Latent Variable	Loading	Significant	p-value
EN_ absorption	Engagement	0.92	yes	<0.01
EN_ dedication	Engagement	0.94	yes	<0.01
EN_ vigour	Engagement	0.86	yes	<0.01
JD_ attention	Job demands	0.61	yes	<0.01
JD_ personal	Job demands	0.82	yes	<0.01
JD_ pressure	Job demands	0.95	yes	<0.01
MT1	Mental toughness	0.56	yes	<0.01
MT10	Mental toughness	0.70	yes	<0.01
MT2 (reversed)	Mental toughness	0.35	yes	<0.01
MT3 (reversed)	Mental toughness	0.60	yes	<0.01
MT4	Mental toughness	0.68	yes	<0.01
MT5	Mental toughness	0.64	yes	<0.01
MT6 (reversed)	Mental toughness	0.49	yes	<0.01
MT7 (reversed)	Mental toughness	0.41	yes	<0.01
MT8	Mental toughness	0.74	yes	<0.01
MT9	Mental toughness	0.61	yes	<0.01
ST_ event load	Stress	0.97	yes	<0.01
ST_ personal vulnerability	Stress	0.97	yes	<0.01
TE	Academic performance	1		

Table 4.6 presents the outer loadings from which the strength of the relationships between the latent variables could be determined. All outer loadings should ideally be higher than 0.70, however, item loadings higher than 0.40 would still be regarded as acceptable (Leguina, 2015; M. Kidd personal communications, January 2021).

All loadings, except for the MT2 (reversed) loading were above the 0.40. The MT2 (reversed) value fell below the acceptable 0.40 at 0.35. Again, this signified that participants struggled with reversed score items, which may require investigation in future research. Given the MT2 loading, consideration was given to the potential of removing this item. However, as mentioned, given the one-dimensional nature of the MT model and the fact that all other MT items had strong loadings, removing this item was unlikely to influence the results (M. Kidd personal communications, January 2021). From the information above, it was found that all other paths between the items and their relevant latent variables were statistically significant.

4.3.2 Evaluation and interpretation of the structural model

After acceptable measurement model fit was established, PLS SEM was used to determine the significance and strength of the paths between the latent variables of the structural model. The structural, or inner, model shows the paths/relationships posited between the various latent variables in the study (Leguina, 2015). This was done in order to determine structural model fit and ascertain to what degree latent constructs in the structural model relate to one another. The structural model was first fitted without the moderating variables, and then a separate moderator model was fitted to determine the relationship between the moderator variables and the main path coefficients. The PLS structural model analysis consisted of testing for R square values, multicollinearity, and, lastly, the examination and interpretation of the main and the moderating relationships in the study. A discussion of these processes follows below.

4.3.2.1 Evaluation and interpretation of the R Square value

The first step to determining structural model fit is to consider the R Squared values of the three endogenous latent variables (i.e., academic performance, engagement,

and stress). The R Squared value indicates how much variance in the endogenous latent variable is explained by the full SEM model (Leguina, 2015). Table 4.7 shows the R square values for the endogenous variables.

Table 4.7

R Square Values for the Endogenous Latent Variables

Scale	R Square	R Square Adjusted
Academic Performance	0.11	0.11
Engagement	0.26	0.26
Stress	0.35	0.35

As seen in the table above, academic performance presented an R square value of 0.11, which means that the full SEM model explained 11% of the variance in academic performance. This meant that 89% of the variance in academic performance was not declared in this model.

Although this value seems low, it could not practically be expected that more variance could be explained by a model focussed primarily on psychological and personality aspects of an individual which were hypothesised to influence academic performance outcomes. Possible factors that influence academic performance are broad and multiple other factors falling outside the scope of personality likely influence academic performance in reality. The contribution is however still valuable.

Furthermore, it was found that engagement had an R square value of 0.26, meaning that engagement declared 26% of the variance in the full SEM model. Stress had an R square value of 0.35, therefore showing that stress declared 35% of the variance in the full SEM model. The R² values from all three endogenous latent variables were relatively low, indicating the likelihood of other variables influencing the endogenous latent variables, but not measured or accounted for in this study.

4.3.2.2 Multicollinearity

The second matter that required consideration was the multicollinearity of the predictor variables. Predictor variables ought not correlate highly with each another. Multicollinearity is therefore used to determine whether the latent variables correlate

with one another or not (Leguina, 2015; M. Kidd, personal communication, January 2021).

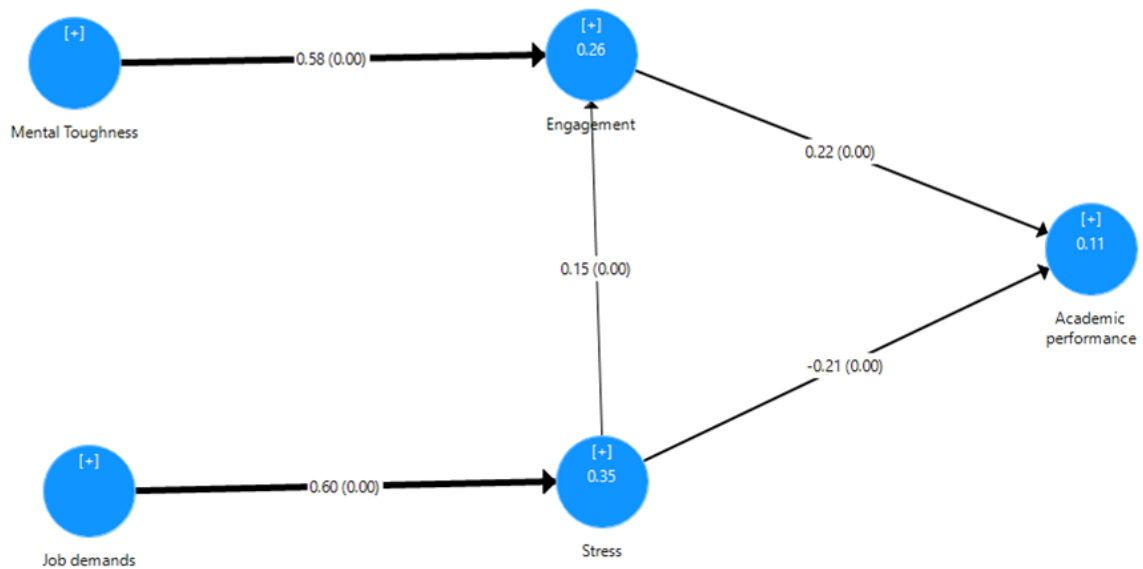
Multiple predictor variables are involved when performing a regression analysis and it should be assumed that the variables do not correlate. If some of the predictor variables correlate too highly, this will cause volatile regressions (Leguina, 2015).

Variance Inflation Factors (VIF) was utilised to test for multicollinearity. VIF measures the extent to which the variance in estimated regression coefficients is increased/inflated in contrast to when predictor variables are not linearly related (Leguina, 2015).

Multicollinearity is regarded as problematic because it requires the setup of the existing measurement model to be reconsidered. This is an issue as it can cause the variance of the regression coefficients to rise, which subsequently leads to unstable regression coefficients that are difficult to interpret (Hair et al., 2011).

There are a number of recommendations regarding acceptable VIF levels. A maximum VIF of 4.00 or 5.00 is suggested; a value of 5.00 or greater would be considered problematic (M. Kidd personal communications, January 2021). None of the variables in this study neared the 5.00 mark and all fell well below 5.00 (M. Kidd personal communications, January 2021). As such, it can be concluded from the multicollinearity analysis that the current study did not present any multicollinearity problems.

With regard to the structural model, the strength of the path coefficients (relationships) between the latent variables was the next aspect to consider. The PLS model (Figure 4.1) is visually depicted below and was considered in the absence of the moderator variables. The strength of the relationships between the variables as seen in the PLS model below will be elaborated on in the sections that follow.

Figure 4.1*PLS Model***4.3.2.3 Evaluation and interpretation of the main relationships**

Once the reliability of every latent variable scale had been established, the path coefficients between the latent variables were investigated to determine whether or not the hypothesised relationships were significant. This was followed by assessing the strength of each of these relationships.

Table 4.8*Path Coefficients between Main Variables*

Path	Path Coefficient	Significant	p-value
Engagement → Academic Performance	0.22	yes	<0.01
Job demands → Stress	0.60	yes	<0.01
Mental Toughness → Engagement	0.58	yes	<0.01
Stress → Academic Performance	-0.21	yes	<0.01
Stress → Engagement	0.15	yes	<0.01

When testing for significance the use of $p < 0.05$ should be used as a guideline (Leguina, 2015; M. Kidd, personal communications, January 2021). Table 4.8 shows that all main relationships in the PLS model were statistically significant. This is evident from the p-values, all of which are smaller than 0.05 and therefore meet the criteria (i.e., $p < 0.05$) for significance. All hypothesised paths were therefore found to be significant.

Hypothesis 1: Stress surplus has a significant and negative relationship with academic performance

The hypothesised negative relationship between stress surplus and academic performance was found to be significant (PLS path coefficient = -0.21). The results shown in Table 4.8 highlight that the relationship is both significant and negative, given the sign preceding the path coefficient value. This finding supports the literature on the stress surplus -academic performance relationship.

Thus, findings from this study suggest that stress surplus has a significant detrimental impact on the academic performance of South African tertiary students at the University of Stellenbosch. Strategies aimed at reducing stress and preventing stress surplus for tertiary students may therefore be highly beneficial in promoting improved academic performance. While stress could be regarded as inherent to tertiary education, stress surplus is counterintuitive and would lead to a decrease in academic performance outcomes. As such, improving stress management and coping strategies of students may be a useful pursuit.

Hypothesis 2: Engagement has a significant and positive relationship with academic performance

The hypothesised positive relationship between engagement and academic performance was significant (PLS path coefficient = 0.22). The results depicted in Table 4.8 highlights the relationship between engagement and academic performance as both significant and positive, given the positive sign preceding the path coefficient value. This finding supports literature on the engagement-academic performance relationship.

Findings from this study therefore suggest that engagement has a significant favourable relationship with the academic performance of South African tertiary students at the University of Stellenbosch. These results thus reveal that engaged students are more likely to perform better academically than unengaged students. Given this, interventions and strategies aimed at increasing student engagement would positively impact academic performance outcomes.

Hypothesis 3: Stress surplus has a significant and negative relationship with engagement

The hypothesised negative relationship between stress surplus and engagement was found to be significant (PLS path coefficient = 0.15). The results presented in Table 4.8 highlight the relationship between stress surplus and engagement as significant but not negative, as one would expect.

Although the positive relationship is not strong, a clear negative relationship was expected, given the literature regarding the stress surplus -engagement relationship. One would expect that students who experience stress surplus would likely be less engaged than those not experiencing stress surplus. This was not displayed in the results.

The findings suggest that the relationship between stress surplus and engagement of South African tertiary students at the University of Stellenbosch was significant, although not very strong. The relationship was however not found to be negative as was expected. As such, this hypothesis was not proven.

Hypothesis 4: Imposing job demands have a significant and positive relationship with stress surplus

The hypothesised positive relationship between job demands and stress surplus was also found to be significant (PLS path coefficient = 0.60). Given the path coefficient value, it can be seen that a strong relationship exists between job demands and stress surplus.

In other words, job demands have a very strong impact on stress surplus. The results shown in Table 4.8 highlight the relationship between job demands and stress surplus as both significant and positive, given the positive sign preceding the path coefficient value. This means that the variables move in the same direction; as job demands increase, so does stress surplus. This finding supports the literature regarding the job demands-stress surplus relationship.

The findings from this study suggest that job demands have a significant relationship with the stress surplus experienced by South African tertiary students at the University of Stellenbosch. From these results, it can be inferred that students who experience a high level of job demands are more likely to experience stress surplus.

In order to address this, job 'study' demands, if it had been possible, could have been decreased in order to prevent stress surplus. However, given the requirements and standards of tertiary education, decreasing academic demands is not necessarily a viable option. Instead, strategies aimed at reducing the *experience* of stress for tertiary students may prove to be a more fruitful approach. If the individual experience of stress as excessive can be decreased to a manageable and activating level through the development of healthy coping strategies as example, students may be more equipped to handle the demands of a tertiary education without interpreting the stress they experience as excessive.

Hypothesis 5: MT has a significant and positive relationship with engagement

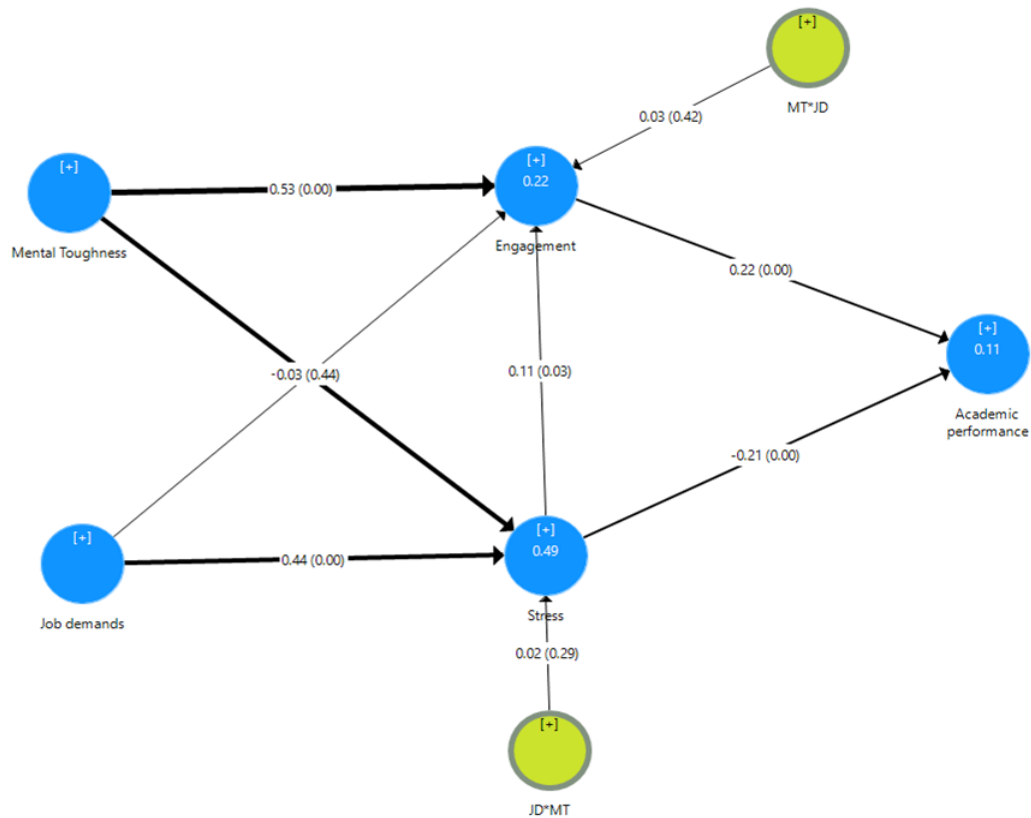
The hypothesised positive relationship between mental toughness and engagement was also found to be significant (PLS path coefficient = 0.58). The path coefficient value reveals a strong relationship between mental toughness and engagement. In other words, mental toughness has a powerful impact on engagement. The results presented in Table 4.8 highlight the relationship between mental toughness and engagement as significant as well as positive, given the positive sign preceding the path coefficient value. This means that the variables move in the same direction; as mental toughness increases, so does engagement. This finding supports the literature regarding the mental toughness/personal resources-engagement relationship.

The findings from this study suggest that the personal resource of mental toughness has a significant relationship with the engagement experienced by South African tertiary students at the University of Stellenbosch. These results can therefore be interpreted as being indicative that students who possess high levels of mental toughness are more likely to be more engaged in their studies. Strategies to develop mental toughness in tertiary students may therefore provide a worthwhile avenue to pursue to improve engagement.

With reference to the structural model, the next important aspect to consider is the strength of the moderator variables. Having considered the PLS model in absence of the moderator variables, the model was subsequently considered with the moderator variables included.

Figure 4.9 depicts the relationships between the exogenous and endogenous latent variables. The blue circles indicate the latent variables, and the green circles depict the moderating effects from the conceptual model presented in Chapter 2. Two moderating variables were hypothesised to moderate the relationships between variables.

The hypothesis that mental toughness moderates the relationship between job demands and stress surplus is captured by the JD*MT green circle. The hypothesis that job demands moderate the relationship between mental toughness and engagement is captured by the green MT*JD circle.

Figure 4.2*PLS Model with Moderators*

4.3.2.4 Evaluation and interpretation of the proposed moderator effects

Following the investigation regarding the strength and significance of the main relationships between the latent variables, the focus was shifted to the proposed moderator effects.

When testing for significance, a $p < 0.05$ is used as guideline (M. Kidd, personal communications, January 2021). Table 4.9, below, shows that neither of the moderator effects were statistically significant. This is evident from the p-values in that the p-values for the two moderator variables were higher than 0.05; a p-value greater than 0.5 indicates that the moderating effect is not statistically significant. Therefore, it can be concluded that neither of the hypothesised moderator effects were found to be significant.

Table 4.9*Path Coefficients between Moderator Variables*

Path	Path Coefficient	Significant	p-value
JD*MT → Stress	0,02	no	0.29
MT*JD → Engagement	0,03	no	0.42

Hypothesis 6: MT has a significant buffering effect on the relationship between imposing job demands and stress surplus.

The p-value of job demands as a moderator in the MT - engagement relationship was 0.42 ($p > 0.05$). This indicates that job demands did not have a statistically significant moderating effect on the relationship between mental toughness and engagement.

Additionally, the PLS path coefficient was 0.03. These findings suggest that the proposed moderating effect of job demands was not statistically significant. Therefore, this study found that job demands were not seen to moderate the relationship between mental toughness and engagement. According to this study, job demands would therefore not moderate the relationship between mental toughness and engagement – a finding that contradicts what was found in the literature study. These findings could be related to the difficulties with the job demands items in this study.

Hypothesis 7: Imposing job demands have a significant dampening effect on the relationship between MT and engagement.

The p-value of mental toughness as a moderator of the job demands - stress relationship was 0.29 ($p > 0.05$). This indicates that the construct of mental toughness did not have a statistically significant moderating effect on the relationship between job demands and stress. Additionally, the PLS path coefficient was 0.02. Further supporting the finding that the proposed moderating effect of mental toughness on the job demands-stress surplus relationship is not statistically significant.

In this study, mental toughness thus was not seen to moderate the relationship between job demands and stress surplus. This finding contradicts what was found in the literature study and could be related to the difficulties with the job demands items

in this study.

To summarise, Hypothesis 1 proposed that stress surplus has a significant and negative relationship with academic performance. From the results, the relationship was indeed found to be both significant and negative in nature, thereby supporting the hypothesis in question.

Hypothesis 2 which proposed that engagement has a significant and positive relationship with academic performance was also found to be significant and the hypothesised positive relationship was evidenced in the results.

Hypothesis 3 suggested that stress surplus has a significant and negative relationship with engagement. The relationship was found to be significant and but was not found to be negative as expected. The findings suggest that the relationship between stress surplus and engagement of South African tertiary students at the University of Stellenbosch was significant, although not very strong. The relationship was however not found to be negative as was expected. As such, this hypothesis was not proven.

Hypothesis 4, referring to imposing job demands having a significant and positive relationship with stress surplus was also found to be both significant and positive as suggested.

Hypothesis 5 that proposed that MT has a significant and positive relationship with engagement was supported by the findings as the results showed that the relationship was both significant and positive.

Neither of the proposed moderating hypotheses, in other words hypothesis 6 and hypothesis 7 were found to be significant. Specifically in terms of Hypothesis 6, MT did not have a significant buffering effect on the relationship between imposing job demands and stress surplus. Regarding Hypothesis 7, imposing job demands were not found to have a significant dampening effect on the relationship between MT and Engagement.

4.4 Chapter Summary

The results from the statistical analyses that were performed are provided and evaluated in this chapter. Item analyses was performed on the subscales of each measuring instrument in order to determine the reliability of test items incorporated in the composite questionnaire.

The item analysis process was followed by CFA on each of the measuring instruments.

After problematic items were identified in one of the measurement instruments during the CFA, an EFA was performed. This led to the removal of the item from the instrument. A second CFA was performed on the new EFA model.

Another measuring instrument presented with four problematic items following the CFA and an EFA was performed. The four items were removed from the instrument and a second CFA was performed.

After item analysis, CFA, and the necessary EFAs were performed, PLS SEM was performed as a way in which to provide further information on the reliability of the measuring instruments and to ascertain the fit of both the measurement and structural models.

The hypotheses of the main and moderating effects were then interpreted. Seven hypotheses were formulated in this research study. Five of these hypotheses involved main interaction effects and two involved moderating effects. All of the main interactions were found to be statistically significant, however, Hypothesis 3 moved in the opposite direction than predicted and was therefore not accepted. Furthermore, neither of the moderating effects were found to be statistically significant. The findings from the research were then discussed.

CHAPTER 5: PRACTICAL IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

5.1 Introduction

This study raises the question as to why there is variance in the academic performance of tertiary students in South Africa. Salient variables were identified and analysed to determine their impact on academic performance in the sample of this study. The effect of mental toughness, imposing job demands, engagement, and stress surplus were specifically considered in relation to their direct, indirect, and/or moderating effect on tertiary academic performance. The analysis of the variables led to further questions regarding the relationships between these variables and how an improved understanding of these relationships could lead to improved academic performance on a tertiary level, which may spill over to improve larger issues such as South Africa's skill misalignment, poverty, unemployment, and income inequality.

In this chapter, a discussion of the results from Chapter 4 was necessary, the objectives of the study were revisited, the limitations of the current study were addressed and recommendations for improvements to these limitations in future research were provided.

Following this, the practical implications of the research findings were explored and suggestions for relevant interventions, strategies, and approaches were proposed. The interventions and strategies suggested focus on improving the wellbeing of undergraduate students by focusing on engagement, fostering mental toughness, managing job demands, and managing stress. Lastly, a chapter summary was presented which was followed by concluding remarks.

A discussion of the results from the statistical analyses follows below.

5.2 Discussion

The aim of this research study was to develop and evaluate an Academic Performance Structural Model for a sample of tertiary students in South Africa. The proposed

nomological network was tested by means of a statistical analysis of the relationships hypothesised to exist between the latent variables of interest in this study. This was done to determine whether the hypothesised relationships were found to be significant within the sample and whether the relationships between the variables in the sample were in line with the positive or negative relationship theorised. Five direct relationships and two moderating relationships were hypothesised to exist in the structural model.

From the analysis, the results regarding the five direct hypothesised relationships posed in this study were as follows.

The hypothesised relationship between stress surplus and academic performance was found to be significant and negative (PLS path coefficient = -0.21). This finding supports the literature on the stress surplus-academic performance relationship which posited that a surplus of stress would have a negative impact on the outcome of academic performance.

As example, when stress is too elevated, it can have a debilitating effect on performance, leaving the stressed individual with a decreased capacity to sustain high levels of performance (Hargrove et al., 2015). This is relevant within the tertiary academic environment where students experience stress and pressure which could be debilitating and prevent sustained levels of academic performance if it becomes excessive.

Findings from this study suggest that stress surplus has a significant and detrimental impact on the academic performance of South African tertiary students from the University of Stellenbosch.

This study therefore proved *Hypothesis 1*:

$H_{a1}: \beta_{32} < 0$ (Stress surplus will have a significant and negative relationship with academic performance)

The hypothesised relationship between engagement and academic performance was

found to be positive and significant (PLS path coefficient = 0.22). This finding supports the literature on the engagement-academic performance relationship which posited that engagement has a positive impact on the outcome of academic performance.

In a study by Vizoso, Rodríguez and Arias-Gundín (2018), the relationships between coping, the three components of academic engagement (consisting of vigour, dedication, and absorption) and academic performance was evaluated. The study consisted of 808 undergraduate university students. The results of relevance to this current study showed academic engagement and academic performance had a positive relationship (Vizoso, Rodríguez & Arias-Gundín, 2018). Furthermore, academic engagement was found to improve academic performance (Vizoso et al., 2018).

The results from this study showed that engaged students are likely to show higher levels of academic performance when compared to unengaged students. Specifically, findings from this study suggest that engagement has a significant and favourable impact on the academic performance of South African tertiary students from the University of Stellenbosch.

This study therefore proved *Hypothesis 2*:

H_{a2}: $\beta_{31} > 0$ (Engagement will have a significant and positive relationship with academic performance)

The hypothesised relationship between stress surplus and engagement was found to be significant, albeit not very strong (PLS path coefficient = 0.15). However, the relationship between stress surplus and engagement was not negative, as was expected. Although the positive relationship found was not strong, a clear negative relationship was expected, given the literature regarding the stress surplus-engagement relationship.

Research by Schaufeli (2011) found that engaged employees are in better physical health, experience more positive emotions, are less inclined to burn out, and sustain

their performance during long workdays when compared to their unengaged peers (Schaufeli, 2011). Kim, Kolb, and Kim (2012) found that increasing employee engagement can decrease stress and burnout outcomes. Alternatively, stressed individuals may be more inclined to experience withdrawal and exhibit a negative attitude towards their job and work, which is likely to result in a decrease in engagement levels (Kim, Kolb & Kim, 2012).

In a study by van Mol, Nijkamp, Bakker, Schaufeli and Kompanje (2018), the focus was placed on the work engagement of 193 Intensive Care Unit (ICU) professionals working at a university hospital. The relationships between engagement, job demands, and personal resources of the sample were explored (van Mol et al., 2018). These authors established that engagement corrects for work-based stress responses (van Mol et al., 2018). In other words, those professionals who were found to be engaged in their work were less susceptible to the adverse impact of work-related stress.

From the findings, a weak but positive relationship was found to exist between the stress surplus and engagement of South African tertiary students at the University of Stellenbosch. One would expect that students who experience a surplus of stress would likely be less engaged than those not experiencing stress surplus. This was not displayed in the results from the current study. In other words, the findings yielded a statistically significant path coefficient, but indicated that a surplus of stress had a slight boosting rather than dampening effect on engagement.

This study therefore showed that stress surplus has a relationship with engagement, however, this relationship is not in the direction that was expected.

The study did not prove *Hypothesis 3*:

H_{a3}: $\beta_{12} < 0$ (Stress surplus will have a significant and negative relationship with engagement)

The hypothesised relationship between job demands and stress surplus was found to be significant and positive (PLS path coefficient = 0.60). Given the path coefficient

value, the relationship between job demands and stress surplus is very strong. In other words, job demands were found to have a very strong impact on stress surplus; as job demands increase, so does stress surplus. This finding supports existing literature regarding the job demands-stress surplus relationship and suggests that job demands have a significant effect on the stress surplus experienced by South African tertiary students at the University of Stellenbosch.

From to the health impairment process in the JD-R theory, demands that exceed an individual's resources can cause adverse outcomes including burnout, high stress, and ill health (De Beer et al., 2013). Job demands are expected to lead to different strain outcomes, like that of stress, burnout, and/or general impaired well-being. As a result, this could lead to withdrawal behaviour and a negative attitude towards work (Bakker et al., 2009; Angelo & Chambel, 2015).

From the results of this study, it can be inferred that students who experience a high level of job demands are more likely to experience stress surplus. This is in line with the proposed literature.

This study therefore proved *Hypothesis 4*:

H_{a4}: $\gamma_{22} > 0$ (Imposing job demands will have a significant and positive relationship with stress surplus)

The hypothesised relationship between mental toughness and engagement was also found to be significant and positive (PLS path coefficient = 0.58). The path coefficient value reveals a strong relationship between mental toughness and engagement. In other words, mental toughness has a powerful impact on engagement; as mental toughness increases, so will engagement.

This finding supports the literature regarding the personal resource-engagement relationship and suggests that the personal resource of mental toughness has a significant effect on the engagement experienced by South African tertiary students at the University of Stellenbosch.

Research studies have begun to focus on a direct path between personal resources and work engagement. Xanthopoulou, Bakker and Fischback (2013) found evidence that personal resources like self-efficacy was positively associated with engagement, especially during times when individuals faced high demands. Researchers have also found that personal resources including active coping style, sense of coherence, self-efficacy, conscientiousness, and resilience, can predict work engagement (Bandura, 1977; Xanthopoulou et al., 2008; Janse van Rensburg et al., 2013).

These results indicate that students who possess high levels of mental toughness are more likely to be more engaged in their studies.

This study therefore proved *Hypothesis 5*:

H_{a5}: $\gamma_{11} > 0$ (MT will have a significant and positive relationship with engagement)

Next, the hypothesised moderating interactions were considered. The results from the two indirect, hypothesised moderator relationships posed in this study were as follows.

Neither of the hypothesised moderator effects was found to be significant.

Firstly, the p-value of job demands as a moderator of the relationship between mental toughness and engagement was 0.42 ($p > 0.05$) and the PLS path coefficient was 0.03. These findings indicate that the construct of job demands does not have a statistically significant moderating effect on the relationship between mental toughness and engagement in this study. In other words, the proposed moderating effect of job demands was not statistically significant in the sample of South African tertiary students at the University of Stellenbosch.

Therefore, job demands were not seen to moderate the relationship between mental toughness and engagement in this study. These findings contradict the literature. From the literature it was found that higher levels of personal resources can render individuals more resistant to the effects of high or excessive demands (Amirkhan et

al., 2015). Research evidence supports the notion that MT is a central resistance resource used to buffer the negative effects of excessive stress, work demands, pressure, and challenge in those life domains that prioritise high performance (Stamp et al., 2015). According to Gucciardi et al. (2015) there is an inverse relationship that exists between MT and the experience of distress. In other words, higher levels of individual MT equate to the experience of lower levels of stress. The researcher posits that these findings could, in part, be related to the problematic job demands items.

The null hypothesis H_{06} could therefore not be rejected since job demands did not have a statistically significant moderating effect on the relationship between mental toughness and engagement. The findings from this study therefore do not support *Hypothesis 6*.

H_{a6} : $\gamma_{13} < 0$ (MT has a significant buffering effect on the relationship between imposing job demands and stress surplus)

The p-value of mental toughness as a moderator of the relationship between job demands and stress surplus was 0.29 ($p > 0.05$) and the PLS path coefficient was 0.02. These results indicate that the construct of mental toughness has no statistically significant moderating effect on the relationship between job demands and stress surplus in this study. In other words, the proposed moderating effect of mental toughness was not statistically significant in the sample of South African tertiary students at the University of Stellenbosch.

Therefore, mental toughness was not seen to moderate the relationship between job demands and stress surplus in this study. These findings contradict the literature. From the literature surrounding the JD-R model, job demands have been suggested as a moderator variable (Bakker, 2011; Demerouti & Bakker, 2011). The connection between job demands and resources is an important factor to consider as it plays a crucial part in the development of engagement (Bakker & Demerouti, 2007). A study performed amongst nurses measured the enhancing impact of personal resources. Results from the study demonstrated that emotional job demands had a strengthening impact on the effect of personal resources on work engagement (Van Stenis et al.,

2015). These studies show that the demands present in the relative work environments assessed are either objectively challenging or perceived as a challenge rather than a hindrance demand.

In this study, imposing job demands are hypothesised to have a negative and significant dampening impact on the relationship between MT and engagement. During this process, the gradual decline in resource levels will decrease employee engagement. In other words, imposing job demands will require individuals to expend greater amounts of resources to deal with these demands, which will ultimately lead to lower individual engagement levels.

The researcher posits that the findings from this study could be related to the problematic job demands items as well as the lack of support for the unidimensional measure of MT.

The null hypothesis H_{07} could therefore not be rejected since mental toughness did not have a statistically significant moderating effect on the relationship between job demands and stress surplus. The findings from this study therefore do not support *Hypothesis 7*.

H_{a7} : $\gamma_{23} > 0$ (Imposing job demands have a significant dampening effect on the relationship between MT and engagement)

The next section will reflect on the proposed objectives of the study.

5.3 Reflecting on the Objectives

It was necessary to reflect on the research objectives presented at the onset of this study, in order to determine whether the study met these objectives.

Firstly, the overarching objective of this study was to develop a nomological network of the most salient antecedents predicted to influence academic performance in tertiary students at Stellenbosch University in South Africa.

A structural model was developed after a comprehensive literature review was conducted, which contained the proposed antecedents of tertiary academic performance. The structural model was then tested empirically.

The results from the analysis found that the full structural model explained 11% of the variance in tertiary academic performance, 26% of the variance in engagement, and 35% of the variance in stress surplus. With regards to tertiary academic performance, 89% of the variance in academic performance could not be declared by the model. Although this value may seem low it could not be practically expected that greater variance could be explained by a model focussed primarily on individual psychological and personality aspects. There are numerous potential factors that could exert influence on academic performance and the range of potential factors is not limited to the fields of psychology and personality. Factors falling outside the fields of personality and psychology are likely to have a significant impact on academic performance. The contribution of the proposed model is therefore still valuable within the fields of personality and psychology.

The results may however signify that an improved understanding of the antecedents and interactions impacting on tertiary academic performance could be useful. Regarding the overall structural model, the findings do not support the claim that the created nomological network of variables consisted of the most salient antecedents of tertiary academic performance. In order for a model to explain the most salient antecedents of tertiary academic performance, multiple factors across a broad range would need to be considered and included. This model would likely be very large. Given the field of study of this research, a model focussed on personality and psychology is regarded as appropriate.

Whilst keeping the constructs of personality and psychology at the forefront, this researcher opines that this study identified four salient antecedents of variance in tertiary academic performance in the sample of students.

Findings from the study showed that within the sample; mental toughness significantly and positively impacts engagement (i.e., an increase in mental toughness leads to an

increase in engagement); engagement significantly and positively impacts on academic performance outcomes (i.e., an increase in engagement leads to an increase in academic performance); imposing job demands have a significant and positive effect on stress surplus (i.e., an increase in imposing job demands leads to an increase in stress surplus); and stress surplus significantly and negatively impacts academic performance outcomes (i.e., an increase in stress surplus leads to a decrease in academic performance).

However, all of the hypothesised relationships were not significant and one hypothesised relationship did not move in the proposed direction.

Neither of the hypothesised moderator effects was found to be significant. Findings indicate that job demands do not have a statistically significant moderating effect on the relationship between mental toughness and engagement in this sample. Mental toughness also has no statistically significant moderating effect on the relationship between job demands and stress surplus in this sample.

Furthermore, it was hypothesised that stress surplus would have a significant and negative relationship with engagement. In contrast, a positive relationship presented between stress surplus and engagement (i.e., an increase in stress surplus lead to an increase in engagement).

Considering the results from the study, this researcher is of the opinion that this study did identify some important antecedents of variance in tertiary academic performance. Specifically, the positive relationship between imposing job demands and stress surplus and the positive relationship between mental toughness and engagement were both significant and strong in nature. The significant and strong impact of mental toughness on engagement and the significant and strong relationship between job demands and stress surplus are therefore considered the two most notable contributions of this study.

Therefore, in terms of the overarching objective of this study, this researcher opines that, although some salient variables were identified, there may be other more

important antecedents for predicting academic performance. Future research should consider other factors within and outside the fields of personality and psychology which may be able to explain additional unique variance in academic performance.

The primary objective of the study was to determine whether the combination of identified antecedents significantly impact tertiary academic performance. This objective aligns with the overarching objective. All main relationships within the model were significant, however, neither of the moderating relationships were significant. Therefore, since all main relationships were significant, and the combination of antecedents explained 11% of variance in the model, the researcher opines that the primary objective of this study was met.

The secondary objectives of this study were i) to determine the types of relationship that exist between the identified latent variables; ii) the strength of these relationships; iii) the effect of identified moderating or mediating variables on these relationships; and iv) whether the proposed nomological network of variables can effectively explain unique variance in tertiary academic performance outcomes. All of the secondary objectives in this study were met.

A reflection on the research objectives allowed the researcher to conclude that the study sufficiently met the research objectives posed. The researcher will now discuss the limitations of the current study and provide recommendations for improvements in future research.

5.4 Limitations and Recommendations for future research

Despite the value offered by this research study, there are certain limitations that were noted and must be addressed. Limitations and recommendations for future research are discussed below.

5.4.1 Self-report bias

Firstly, this study relied on self-report data. One weakness relating to self-reported data is self-report or method bias. Any study making use of self-reported data poses a risk for impression management, where participants manipulate, or attempt to

manipulate, their answers to present themselves more positively. This places the validity of the collected data into question.

In this study, the academic performance information of participants was self-reported. Given the importance of the academic performance construct as the outcome variable of relevance in this study, future researchers should consider accessing the institutionally provided GPAs of the sample group rather than rely on self-reported data. This would circumvent the limitation of self-report bias. Obtaining the actual GPAs of the sample would allow for a more objective, standardised measure of academic performance. This would ultimately allow for a more accurate portrayal of the phenomenon and therefore allow for more accurate inferences to be drawn about tertiary academic performance. Obtaining this information may however not always be possible and could present other complications or limitations in the process.

5.4.2 Cannot be generalised

The second limitation of this study is its focus on only one educational institution. Specifically, this research study considered tertiary students from only one university in South Africa (i.e., Stellenbosch University). Given the limitation of the sample to only one university, the data would not be considered to be highly representative of the larger South African population. As a result, any conclusions or inferences drawn from the results cannot be generalised to the larger population.

Future studies would benefit from a broader sample of participants that include students from other types of tertiary institutions and from different parts of the country for example. It is suggested that a stratified random sample be obtained from a number of tertiary students across South Africa. Data from such a sample will be more representative of the larger population and can therefore be generalised.

5.4.3 Language barrier

Another limitation of this study is the language of the online questionnaire. The online questionnaire was only available in English and not translated into any of the other official South African languages. As a result of this, participants who do not speak

English as a first language may have struggled to understand some of the nuances of the questionnaire items, especially those items denoting emotional constructs (e.g., items from the shortened Stress Overload Scale).

Future research should seek to provide questionnaires to participants in their home languages. This is especially important within the South African context, given that the country has 11 different official languages. As such, the questionnaire would need to be translated into the 11 different official languages. This would likely decrease the impact that the language barrier has on the comprehension of questionnaire items and curtail this limitation.

Since the accurate comprehension of items is highly likely to influence results, increased comprehension would logically lead to more accurate data, and therefore more accurate inferences that can be drawn from the data.

5.4.4 Need for longitudinal data

This study was cross-sectional as opposed to longitudinal in nature. As such, only a snapshot of the reality of the studied phenomena could be obtained. The biggest limitation of cross-sectional studies is that they do not allow for the researcher to draw causal inferences. Future studies could therefore perform longitudinal research instead of cross-sectional research if the time permits. Longitudinal studies can be conducted in waves of time, or a diary approach could be taken as example.

Longitudinal research would improve the accuracy and the consistency of the research findings and consequently allow for more accurate inferences to be drawn. Furthermore, longitudinal data allows for the identification of patterns of behaviour and changes over time. This would be useful to determine, for example, the way in which academic performance fluctuates over an academic year.

5.4.5 Saliency of variables

With regards to the saliency of variables, there may be predictors of tertiary academic performance that are more important and more statistically significant than those

included in this study.

The research-initiating question of this study asked: “What factors best explain variance in the academic performance of undergraduate tertiary students at Stellenbosch University?”

From the results of the study, five of the seven hypotheses were statistically significant and four of the hypotheses supported the research collected on the relationship between the variables. The two moderating effects were insignificant. Findings regarding the two moderating effects and the one main relationship contradict the research that was conducted on these topics.

Multiple potential factors could significantly impact academic performance, and all of the endogenous variables in this study. As such, it is suggested that further research be conducted to identify antecedents of academic performance that are potentially more salient than those identified in this study. Furthermore, future research could also be conducted into other possible moderating effects. This limitation can therefore be addressed by including other theoretically sensible variables in the model and changing and/or expanding on the model as needed.

5.4.6 Measurement tools

Another possible limitation of the study is the choice of two of the measurement instruments. There may be tools more suited to measuring the student engagement and student ‘job’ demand variables in this study.

This researcher opines that this study did identify important antecedents of variance in tertiary academic performance in South Africa, and the significant and strong impact of mental toughness on engagement is one notable contribution in this study. However, the relationship between engagement and academic performance was significant but not very strong in this sample.

This finding may be due to the use of the UWES-17 measure of engagement in the sample of students. The creators of this instrument designed a measuring instrument,

namely the UWES-Student, which specifically measures student engagement. This was an oversight on the part of the researcher as the measure of engagement used is not necessarily the most appropriate measure for the specific sample.

Furthermore, four items were removed from the UWES-17. This may be a result of the items not being directly translatable to the student environment. This scale may have been erroneously chosen and assumed to be transferable to the tertiary academic environment when it may not have been the case. More appropriate measuring instruments specifically aimed at tertiary students and/or the tertiary academic environment should perhaps have been utilised. Future researchers should consider using the UWES-S when measuring student engagement.

Furthermore, the measure of job demands as used in this study proved to be problematic. This was evidenced during the process of interpreting results. This researcher opines that using the items from only one of the two job demands subscales, (i.e., using only the workload subscale items and not the job insecurity subscale items) may have impacted on the measure of job demands. Since there are only two subscales measuring job demands in the JDRS, removing one may have been a key cause of the issues with the job demands measure.

This researcher also considered that job demands may not be as accurately measured when merely extracting the relevant job demand items from the JDRS. Rather, the tool as a whole shows the ability to measure both job demands and job resources. A specific measure of student or academic demands should perhaps have been considered.

Future research could use this model and the theoretical base presented but utilise more appropriate measures for student demands and student engagement.

The practical implications of the study are elaborated on below.

5.5 Practical Implications and Recommendations

Interventions and strategies for the proposed antecedents to academic performance

are discussed in line with the findings from this study regarding the impact on the outcome variable of academic performance.

Due to the nature of this study, and the focus on the JD-R model and theory which underlie this study, the researcher posits that it will be advantageous for tertiary institutions to focus their efforts and possible interventions on both resources and demands, specifically focusing on engagement, mental toughness, student 'job' demands, and stress surplus.

From the results of this study, the researcher presented intervention approaches and strategies which could positively impact student academic performance outcomes. The suggested interventions and strategies are presented below.

5.5.1 A focus on engagement

Firstly, a focus on increasing engagement and selecting students based on their levels of engagement would likely have a positive impact on the tertiary academic performance outcomes of students at Stellenbosch University.

Although the results from the current study did not find a very strong relationship between engagement and academic performance, the bulk of available research shows a strong and significant relationship between work engagement and job performance. Research on the relationship between academic engagement and academic performance has shown similar results.

The results from this study which did not show a very strong relationship between the two variables could therefore be due to factors other than the relationship. Firstly, the use of an ill-suited measure of engagement for the student sample could bear some responsibility. Furthermore, self-report bias in academic performance results could also play a role. It is also possible that the application of the JD-R model and theory in a student context did not translate as seamlessly as expected.

More research focussed specifically on the relationship between academic engagement and academic performance may prove fruitful, but the relationship

between engagement and performance is undeniable. Strategies to address engagement are therefore considered.

Firstly, research suggests that a positive relationship exists between the experience of psychological meaningfulness and engagement (Islam & Noor, 2014). As such, the importance of passion for a particular subject or course should be considered. Students entering a specific field of study should be passionate about the content of what they are studying in order to increase the experience of psychological meaningfulness they derive from their studies. One suggestion would be to include a section on intention or motivation for application in the application process. This would assist in the identification of those students who are truly passionate about their chosen field of study which in turn is likely to result in a pool of more engaged students. Another suggestion would be to include a measure of personality in the application process. The personality factors of extraversion, openness to experience, and conscientiousness have all been found to be valid predictors of engagement. This is significant for the application process as it would assist in the selection of individuals who are predisposed to be more engaged.

Identifying engagement in potential students during the application process may be more effective, and more cost-efficient, than tailored individual interventions aimed at fostering engagement in existing students. Rather than expending resources on engagement interventions after the fact, it is suggested that a selection-centred approach to engagement be given preference.

Improving student engagement on a daily basis, within the classroom or on an e-learning platform for example, by providing engaging content, encouraging constant involvement, and limiting distractions, may also prove beneficial to academic performance outcomes.

Research by Collaço (2017) found that effective teaching methods can inspire student engagement and student engagement is related to positive learning outcomes. Findings from the study posited that to increase student engagement in higher education, teachers should get their students actively involved in the learning experience (Collaço, 2017). This can be achieved by integrating enjoyable activities

into the normal syllabus that promote teamwork and higher levels of interaction between students and their teachers (Collaço, 2017). Creating a safe environment where the learner is the centre of the approach, setting clear goals, having high expectations of students, and providing timely feedback were all found to encourage student engagement (Collaço, 2017).

As such, considering the passion of potential students and their personality traits in the application process for tertiary studies would likely lead to the admission of a pool of more engaged students. Furthermore, once these students commence with their studies, teaching strategies aimed at increasing engagement in the day-to-day environment may also prove beneficial.

5.5.2 A focus on mental toughness

Intervention approaches and strategies to develop mental toughness in tertiary students, and screening for mentally tough applicants could also positively impact student academic performance outcomes.

As has been mentioned, the hypothesised relationship between mental toughness and engagement was found to be significant and positive (PLS path coefficient = 0.58). This provides evidence of a strong and positive relationship between student mental toughness and engagement. Higher levels of mental toughness mean higher levels of engagement, which results in improved tertiary academic performance. A focus on mental toughness may therefore prove worthwhile in the pursuit of increasing academic performance outcomes.

There are numerous approaches that can be taken to increase mental toughness in tertiary students. These are discussed in more detail below.

Firstly, it is suggested that the student application screening process include a section on mental toughness. This approach will result in the selection of students who are inherently more mentally tough. According to Gucciardi et al. (2015), the presence of other similar personal resources including the resources of resilience, self-esteem, and hope have been found to correlate with levels of individual MT. As such, screening

for any of these personal resources could prove effective.

Like engagement, developing mental toughness is likely to prove more time consuming and costly than a screening approach. Identifying mental toughness in potential students during the application process may therefore be more effective, and more cost-efficient, than tailored individual interventions aimed at fostering mental toughness in existing students. Rather than expending resources on mental toughness interventions after the fact, it is suggested that a selection-centred approach to mental toughness be given preference.

If necessary, however, mental toughness can be developed in existing students. Another approach would therefore be to implement interventions aimed at developing mental toughness.

Developing mental toughness is an individual level process that aims to mentally equip an individual to manage the demands and stressors of their environment. Different demands and stressors require different management or coping skills, and as such, tailor-made individual interventions would be most effective in this regard.

Hardy, Bell, and Beattie (2014) stated that development and change in MT is not likely to happen quickly. Instead, it is more likely that MT will develop slowly over a period of time (Hardy et al., 2014). This may bring into question the ability to address MT using short-term intervention strategies. Creating and implementing tailor-made intervention in an academic environment may therefore not be feasible given the required resources of time, money, and effort. Intervention strategies should perhaps be reserved for individual students displaying particular difficulties with mental toughness.

Other approaches are also available. Environmental and relational factors also influence individual mental toughness and could therefore be considered in an attempt to foster mental toughness.

Research by Stamp et al. (2015) found evidence for the influence of certain environmental factors on individual MT levels. Within an academic environment

specifically, the student environment, which can be interpreted broadly as institutionally based or narrowly as classroom based, was found to play a role in the degree of student MT (Stamp et al., 2015). Within this context, the environmental factors of the direct learning environment of the student and the presence of a support structure were specifically found to correlate with an increased level of MT (Stamp et al., 2015). Lecturers and supervisors who provided a supportive and positive learning environment ultimately increased the degree of MT in their students (Stamp et al., 2015). Students should also be encouraged to reach out to peers and family to generate a stronger support structure which could increase individual MT levels.

Stamp et al. (2015) found that, within an academic context, the type of relationship that exists between individuals (e.g., students) and their superiors (e.g., supervisors, lecturers, mentors), and the degree of influence these superiors exert over their subordinates correlate with MT levels. In an academic environment, this relationship is best reflected by the supervisor/lecturer-student relationship.

A positive supervisor-student relationship can create a positive direct learning environment which is likely to result in the provision of greater support from the superior to the subordinate (Lin et al., 2017). The relationship factor appears to be linked to potential changes within the environmental factors, both of which were found to foster greater MT levels.

Efforts to foster and preserve a positive superior-student relationship are regarded as important for increased MT levels. Such a positive relationship is related to the creation of a positive direct learning environment. A positive relationship is also likely to result in the provision of greater support from the superior and is therefore likely to foster greater MT levels.

Students and superiors should therefore be encouraged to develop and maintain quality relationships in order to create a more positive direct learning environment and to create the necessary support believed to assist in the development of individual MT. Furthermore, a mentoring program could be introduced to provide for a greater on-going support structure. The increased development of supportive frameworks within the tertiary institution is considered crucial.

Screening for mental toughness, tailored individual interventions where feasible, a positive direct learning environment, and the creation of a strong support structure are all strategies which can lead to a student population with greater mental toughness.

5.5.3 Managing job demands

Intervention, approaches, and strategies aimed at helping students better manage their 'job' demands could also positively impact student academic performance outcomes.

The hypothesised relationship between job demands and stress surplus was found to be statistically significant (PLS path coefficient of 0.60). The path coefficient displays a strong relationship between job demands and stress surplus. High job demands were therefore found to result in stress surplus in this study. This is aligned with the available literature on the relationship.

On an individual level, interventions and strategies could assist students to reframe their thinking about job demands. A change in the perception of job demands from imposing to challenging as example could prevent or decrease a negative experience of high job demands. This would consequently decrease the negative effects that would accompany the appraisal of job demands as imposing.

From an institutional perspective, reducing the demands of tertiary studies wherever possible and presenting demands in a less 'threatening' manner may improve the experience of students. One example would be to break up large assignments or tasks for students to make the demands appear more manageable. One way in which to reduce the experience of demands through the use of the redesign intervention is to increase the level of support and supervisory coaching offered to students through avenues such as performance feedback.

Another option would be to reduce the workload as much as possible, while still providing enough work to pose a challenge for students. A reduction in the rate and quantity of tasks would likely be most effective. Adhering to approaches that can

reduce demands, or alter the experience of demands, are imperative for promoting tertiary academic success.

One intervention that has been highly effective in organisations and could be transferred to a tertiary educational environment is that of job crafting or job redesign (Bakker & Demerouti, 2018). Redesign is aimed at changing how tasks and roles are structured and modified to impact institutional and individual outcomes.

The process of job crafting, or job redesign could therefore be transferred to the tertiary environment by allowing students more freedom to customise their studies with regard to modules and time slots. The use of this intervention may have been limited in terms of the 'old' way of studying. However, given the realities of the COVID-19 Pandemic and its likely after-effects, studies are likely to become more online based. As such, customisation of courses may become ever more probable and effective.

Helping students to reframe their perception of their study demands, reducing work demands wherever possible, presenting demands in more manageable ways, and allowing more room for crafting and redesign are all strategies which are likely to improve the management of demands in tertiary education.

5.5.4 Managing stress

Intervention approaches and strategies aimed at helping students better manage their stress could also positively impact student academic performance outcomes.

The hypothesised relationship between stress surplus and academic performance was found to be significant and negative (PLS path coefficient = -0.21). This finding supports the literature on the stress surplus-academic performance relationship which posited that a surplus of stress would have a negative impact on the outcome of academic performance. Specifically, findings from this study suggest that stress surplus has a significant and detrimental impact on the academic performance of South African tertiary students from the University of Stellenbosch.

It must be noted that the relationship found was not very strong, therefore stress

surplus was not shown to have a very big negative impact on the tertiary academic performance of the sample. Nonetheless, strategies aimed at preventing stress surplus should still be considered due to its direct, significant, and negative impact on academic performance.

Certain strategies could allow students to manage their stress levels to ensure that their stress remains manageable and activating in nature and to prevent their stress from becoming debilitating. When stress becomes debilitating or dysfunctional, interventions are normally required.

Very high levels of stress accompanied by a lack of sufficient resources can have a number of negative outcomes. These negative outcomes include; poor memory, difficulty with concentration, moodiness, feeling overwhelmed, practicing poor judgement, decreased productivity, increased absenteeism, feeling ill, and experiencing aches and pains (Adriaenssens, De Gucht & Maes, 2015).

Approaches that can assist in the management of stress are discussed below.

One approach to managing stress is to prevent dysfunctional stress. This can be done by identifying the source of stress, through reflection and therapy for example, and not merely treating the symptoms of stress. Individuals under stress also need to know at what point they ought to seek help to prevent the development of more serious complications from debilitating stress. Being able to identify the underlying causes of stress and the point where stress shifts from activating to debilitating may require professional assistance. A popular and often suggested intervention strategy in the treatment of distress is counselling or therapy. Counselling and therapy can assist in the identification of stressors, increase individual awareness regarding the nature of the stress they are experiencing, and the development of coping strategies and habits that can combat dysfunctional stress. It is of great importance that individuals know where to seek professional help if needed.

Other than seeking therapy or counselling, other interventions aimed at increasing job and personal resources have also been found to be effective at decreasing dysfunctional stress. Ideally, the 'job' demands of students should be balanced by their

'job' and personal resources (Adriaenssens et al., 2015; Clark et al., 2014). Dysfunctional stress is more likely to occur when there is a lack of certain job and personal resources.

Specifically, a lack of the following job resources has been found to contribute to dysfunctional stress; a lack of supervisor support, insufficient training in stress coping strategies, limited recovery time between periods of high demand, and a lack of physical resources (Adriaenssens et al., 2015; Clark et al., 2014). Furthermore, the absence of personal resources such as mental toughness, resilience, and hardiness, and ineffective coping mechanisms have also been associated with higher levels of debilitating stress (Adriaenssens et al., 2015; Clark et al., 2014).

Increasing the job and personal resources mentioned are likely to lead to a better balance between student demands and resources, and therefore, a decrease in dysfunctional stress.

Ensuring that students receive the necessary training to develop adequate coping strategies, providing students with the opportunity to develop their personal resources, ensuring that the necessary 'job' resources are available at all times, and allowing for and fostering strong support structures (e.g., encouraging group cohesion, mentor programs, encouraging students to seek support) have all been found to reduce dysfunctional stress (Adriaenssens et al., 2015).

The above approaches have all focussed on preventing dysfunctional stress. However, another approach to managing stress would be to promote functional positive stress.

To promote positive and functional stress, it is very important that superiors ensure that the initial response of their subordinates/students to a stressor be as positive as possible. The initial appraisal of a stressor is crucial to the reaction to the stressor. Furthermore, in order for a stressor to be appraised as positive, the stressor should be seen as relating either to the achievement of a specific task or be related to personal development. Being able to relate the stressor to task achievement or self-development is key to promoting positive functional stress. In this way, individuals do not just avoid or cope with stress, but instead they embrace the stress and are

challenged by it.

This section explored the practical implications of this study by focusing on engagement and mental toughness, and the management of job demands and stress. The next section will provide a summary of the research, followed by concluding remarks.

5.6 Summary

Chapter 1 provided the context for this research study and highlighted the historical and persisting problems of poverty, income inequality, unemployment, and skill misalignment in South Africa. These phenomena have undoubtedly worsened as a result of the COVID-19 pandemic. This researcher posited that any strategy aimed at overcoming these hurdles should include higher education. Specifically, the increased attainment of tertiary qualifications for a greater number of South African citizens should be the end goal. The role of 'academic successes' or high academic performance in the process of obtaining a tertiary qualification was discussed.

Chapter 1 went on to explain the research objectives, the research initiating question, and the motivation for the research study. Lastly, Chapter 1 outlined the structure of the study by providing a brief explanation of the contents of each chapter.

Chapter 2 is the product of a comprehensive literature review process. The literature review provided an in-depth account of the existing theory on academic performance. The chapter provided a historical overview of the development of the JD-R Model and Theory, which was followed by a discussion of the different variables and processes within the JD-R model.

Following this, findings from an in-depth review on each of the latent variables included in this study, were discussed. Specifically, stress surplus, engagement, impairing job demands, and personal resources were identified as potential antecedents to academic performance in tertiary education and reviewed in detail. Various personal protective resources were considered and MT, as the personal protective resource of preference in this study, was discussed. MT and its role in higher education were

highlighted.

The theoretical information that was gathered and interpreted led to hypothesising relationships between the constructs on the basis of the theoretical links between them. The goal of this was to provide insight into the academic performance trends of tertiary students. The theorising process resulted in the formulation of seven hypotheses. These hypotheses were then visually depicted in the conceptual model displaying the complex network of interactions between the variables.

Chapter 3 followed from the literature review and elaborated on the research methodology used in this study. The research methodology of a study consists of an explanation for the measurement tools, procedures, sampling methods etc, used during the research process. The seven path-specific research hypotheses formulated in Chapter 2 were then listed followed by a motivation for the choice of a non-experimental ex post facto correlational research design as most appropriate for this study. The research design was then depicted schematically.

Chapter 3 presented the seven statistical hypotheses, including a matrix equation and set of equations which define the comprehensive structural model. The structural model was subsequently discussed and visually depicted. Next, the data collection process which was followed in this study was explained and the measurement instruments and approaches used were discussed, including the psychometric properties of the tools.

The chapter then provided detail on the sample group selected for the study, including a section on the motivation for the choice of sample and the sampling method that was used to select and recruit participants. The ethical considerations of importance in research studies were then discussed. The manner in which missing values were treated was also touched upon. The relevant statistical analysis techniques that were used to analyse the collected data were discussed. This includes the techniques of Item Analysis, Confirmatory Factor Analysis (CFA), Exploratory Factor Analysis (EFA), and Partial Least Squared Structural Equation Modelling (PLS SEM).

The aim of Chapter 4 was to provide and evaluate the results from the statistical

analyses that were performed. Item analysis was performed on all the items extracted from the various measurement instruments (i.e., The Job Demands-Resources (JD-R) Model, The Stress Overload Scale-Short (SOS-S), The Utrecht Work Engagement Scale (UWES), and the Mental Toughness Questionnaire Lite (MTQ-Lite)) which were included in the composite questionnaire formulated for this study.

The item analysis process was followed by CFA. Each measuring instrument was analysed separately to produce a CFA model. In this way, CFA was performed separately for each of the latent variables of relevance in this study. This was done to determine whether the data supports the existing structures of the latent variable models.

From the findings of the CFAs, if an existing latent structure did not fit the data well, an Exploratory Factor Analysis (EFA) was performed to determine the structure that the items would follow if no existing latent structure was imposed on the data. An EFA allows for the creation of a potential new factor structure which is expected to fit the data better than the existing model.

It was necessary to perform EFA on one of the latent variables. The specific EFA techniques used were parallel analysis and oblimin rotation. Following EFA, a second CFA was then be performed to determine whether the fit of the EFA model is better than the fit of the original model.

Finally, PLS (SEM) was performed as a means to support initial reliability findings of the measurement instruments and to investigate the relationships between the variable in in the structural model (i.e., path coefficients). PLS (SEM) therefore allows for the analysis and investigation of the paths between latent variables in the structural model.

Chapter 5 provided a discussion of the results from Chapter 4. This was followed by a reflection on the objectives of the study as laid out in Chapter 1. In this reflection, the results from this study were considered against the objectives and hypotheses. This was done to determine which expectations of the study were supported and which expectations fell short.

Following this, the observed limitations of the current research study, recommendations for future research and the practical implications of the findings were elaborated on. Possible strategies, approaches, and interventions were proposed for engagement, mental toughness, job demands, and stress. The next section concludes the study.

5.7 Conclusion

From the results of this study, the outcomes from the study pose several potential benefits. The value of gaining more information on possible antecedents of tertiary academic performance can benefit students, tertiary institutions, organisations, and South Africa.

In terms of the benefits to tertiary educational institutions (e.g., Stellenbosch University), the results from this study provide insight into student academic performance and shed light on the antecedents of tertiary academic performance. This study considered both personal and work(study) related aspects thought to influence student academic performance.

An increased understanding of the complex dynamics of tertiary academic performance, and the identification of personal and institutional influencers, allowed for the recommendation of targeted action steps to address any areas that may negatively impact academic performance, and promote factors that have a positive impact on academic performance outcomes.

This criterion can be refined and expanded upon in future, and tertiary institutions would be more equipped to identify and act on risks to poor academic performance. If a risk for poor performance is identified, the necessary assistance and support, provided in a timely and sensitive manner, could address potential performance difficulties in tertiary education. Selecting for aspects that predispose individuals to higher performance could also prove beneficial.

From the results of this research study, the constructs found to have a large and

statistically significant impact on tertiary student academic performance outcomes were considered in the recommendations and practical implications suggested. As a result, educational institutions will become more knowledgeable and therefore better able to address possible academic performance issues that arise in their students.

The South African society could also benefit from this study if efforts are made to address those factors that place students at risk for poor academic performance. As a result, a greater number of graduates from higher education institutions will enter into the workforce. This means that a larger number of skilled and semi-skilled citizens will be able to enter the labour market. As such, the supply of skilled and semi-skilled citizens will increase which will decrease the skill misalignment in the country. As a result, the persisting issues of poverty, inequality, and unemployment rates are likely to improve.

Furthermore, educational institutions could gain an even better understanding of the factors that influence academic success; learn how to identify and address risks to tertiary academic performance, and ultimately boast greater graduation rates and student academic success. The country will also have more tertiary graduates entering the skilled and semi-skilled sectors, which would aid in the goal of addressing the most pressing socio-economic issues still facing present-day South Africa.

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APPENDIX A: ETHICAL CLEARANCE LETTER (REC)**NOTICE OF APPROVAL**

REC: Social, Behavioural and Education Research (SBER) - Initial Application Form

18 May 2020

Project number: 9576

Project Title: Development and evaluation of an academic performance structural model for a sample of tertiary students in South Africa

Dear Miss Kayla Swanepoel

Your response to stipulations submitted on 14 April 2020 was reviewed and approved by the REC: Social, Behavioural and Education Research (REC: SBE).

Please note below expiration date of this approved submission:

Ethics approval period:

Protocol approval date (Humanities)	Protocol expiration date (Humanities)
26 November 2019	25 November 2022

GENERAL COMMENTS:**SUSPENSION OF PHYSICAL CONTACT RESEARCH ACTIVITIES AT SU**

There is a **postponement of all physical contact research activities at Stellenbosch University**, apart from research that can be conducted remotely/online and requires no human contact, and research in those areas specifically acknowledged as essential services by the South African government under the presidential regulations related to COVID-19 (e.g. clinical studies).

Remote (desktop-based/online) research activities, online analyses of existing data, and the writing up of research results are strongly encouraged in all SU research environments.

Please read the REC notice for suspension of physical contact research during the COVID-19 pandemic: <http://www.sun.ac.za/english/research-innovation/Research-Development/sbecovid-19>

If you are required to amend your research methods due to this suspension, please submit an amendment to the REC: SBE as soon as possible. The instructions on how to submit an amendment to the REC can be found on this webpage: [[instructions](#)], or you can contact the REC Helpdesk for instructions on how to submit an amendment: applyethics@sun.ac.za.

INVESTIGATOR RESPONSIBILITIES

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: SBE, the researcher must notify the REC of these changes.

Please use your SU project number (9576) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

You are required to submit a progress report to the REC: SBE before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary).

Once you have completed your research, you are required to submit a final report to the REC: SBE for review.

Included Documents:

Document Type	File Name	Date	Version
Default	CVBillyBoonzaierJanuary2019	03/04/2019	1
Budget	Budget	05/08/2019	2
Informed Consent Form	SU HUMANITIES Consent template_electronic survey	08/08/2019	2
Proof of permission	MTQ Lite invoice	08/08/2019	2
Default	DESC REPORT	08/08/2019	2
Research Protocol/Proposal	Swanepoel April 2019 (Ethical Clearance Submission)	08/08/2019	2
Proof of permission	Capture	08/08/2019	2
Data collection tool	Survey	08/08/2019	2
Default	DESC REPORT Report Kayla Swanepoel 13Sep2019	17/09/2019	2
Default	Institutional Permission_Standard Agreement IRPSD 1506	17/09/2019	1
Default	MTQ-10/Lite QUESTIONNAIRE	17/09/2019	1
Default	Survey PDF	17/09/2019	2
Informed Consent Form	SU HUMANITIES Consent template_electronic survey (3)	25/02/2020	3

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Social, Behavioral and Education Research

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.

The Research Ethics Committee: Social, Behavioural and Education Research complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee abides by the ethical norms and principles for research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research: Principles Structures and Processes (2nd Ed.) 2015. Annually a number of projects may be selected randomly for an external audit.

Principal Investigator Responsibilities

Protection of Human Research Participants

As soon as Research Ethics Committee approval is confirmed by the REC, the principal investigator (PI) is responsible for the following:

Conducting the Research: The PI is responsible for making sure that the research is conducted according to the REC-approved research protocol. The PI is jointly responsible for the conduct of co-investigators and any research staff involved with this research. The PI must ensure that the research is conducted according to the recognised standards of their research field/discipline and according to the principles and standards of ethical research and responsible research conduct.

Participant Enrolment: The PI may not recruit or enrol participants unless the protocol for recruitment is approved by the REC. Recruitment and data collection activities must cease after the expiration date of REC approval. All recruitment materials must be approved by the REC prior to their use.

Informed Consent: The PI is responsible for obtaining and documenting affirmative informed consent using **only** the REC-approved consent documents/process, and for ensuring that no participants are involved in research prior to obtaining their affirmative informed consent. The PI must give all participants copies of the signed informed consent documents, where required. The PI must keep the originals in a secured, REC-approved location for at least five (5) years after the research is complete.

Continuing Review: The REC must review and approve all REC-approved research proposals at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the REC approval of the research expires, **it is the PI's responsibility to submit the progress report in a timely fashion to ensure a lapse in REC approval does not occur**. Once REC approval of your research lapses, all research activities must cease, and contact must be made with the REC immediately.

Amendments and Changes: Any planned changes to any aspect of the research (such as research design, procedures, participant population, informed consent document, instruments, surveys or recruiting material, etc.), must be submitted to the REC for review and approval before implementation. Amendments may not be initiated without first obtaining written REC approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

Adverse or Unanticipated Events: Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the REC within **five (5) days** of discovery of the incident. The PI must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants.

Research Record Keeping: The PI must keep the following research-related records, at a minimum, in a secure location for a minimum of five years: the REC approved research proposal and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence and approvals from the REC.

Provision of Counselling or emergency support: When a dedicated counsellor or a psychologist provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

Final reports: When the research is completed (no further participant enrolment, interactions or interventions), the PI must submit a Final Report to the REC to close the study.

On-Site Evaluations, Inspections, or Audits: If the researcher is notified that the research will be reviewed or audited by the sponsor or any other external agency or any internal group, the PI must inform the REC immediately of the impending audit/evaluation.