Motivation, Metacognition, and Performance

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DECLARATION

I hereby declare that this research report is my own independent work, and has not been presented for any degree at any other academic institution, or published in any form.

It is submitted in partial fulfilment of the requirements for the degree of Master of Education in Educational Psychology at the University of the Witwatersrand.

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Signed by: Candice Cronk Date

ABSTRACT

Pintrich (2000) notes three core areas of self-regulation namely: cognitive and metacognitive skills and knowledge, motivational/affective dimensions, and behavioural components. Self-regulated learning hinges on the ability of an individual to take active control over their learning such that they can plan, monitor, evaluate and regulate their cognitions, behaviours, beliefs, thoughts, and affects (Zimmerman, 2009). Learners, in particular at the tertiary education level, need to be able to adapt to changing contexts and conditions, and thus must develop the capacity to be self-reflective and autonomous in their learning (Valle, Nunez, Cabanach, Gonzalez-Pienda, Rodriguez, Rosario, Cerezo, & Munoz-Cadavid, 2008). The role of metacognition and motivation in academic performance has been well documented (Al-Harthy & Was, 2010; Boekaerts, Pintrich & Zeidner, 2000; Carvalho, 2010; Coutinho 2007; 2008; Linnenbrink & Pintrich, 2002; Schunk & Zimmerman, 2008; Sungur 2007a; 2007b; Wolters, 2003). Research has also shown that a learner's capacity to self-regulate can be altered and taught through instruction (Watson, McSorley, Foxcroft, & Watson, 2004). It is therefore imperative to investigate the role, and interplay, of metacognition and motivation in academic performance, particularly at the tertiary level as this area seems to be less well researched (Coutinho, 2008).

The aim of this research was to examine the nature and extent of the relationships between metacognition, motivation, and academic performance. These variables have not been studied widely in the South African context and thus investigation into their interplay at the tertiary level was warranted. Specifically, the role of metacognition and motivation, as well as the demographic variables of home language, socio-economic status, and type of schooling, were examined in terms of their capacity to predict academic performance. Performance in this study was not just taken from an overall weighted average, but also included a range of formative, summative, and combined formative-summative assessments tasks, in the form of two essays, two tests, and an examination.

The sample was comprised of two hundred and sixty eight first-year university students, enrolled in the Psychology One course offered at the University of the Witwatersrand. Each participant completed a self-developed demographic questionnaire, the Metacognitive Awareness Inventory (MAI), and the Motivated Strategies for Learning Questionnaire (MSLQ).

Findings of the correlational analyses in this research revealed that the subscales and majority of the subsections of the MAI and MSLQ were highly inter-related, raising questions as to whether the

variables of metacognitive awareness, motivation, and cognitive and metacognitive learning strategies could be examined and operationalized as separate constructs. In terms of the relationships between the key variables of metacognitive awareness, motivation, and academic performance there were some unexpected findings. The MAI overall scale and Regulation of Cognition subscale showed no significant correlations with performance across the different assessment tasks, while the Knowledge of Cognition subscale only showed a significant relationship with performance on both tests and the overall weighted average. For both the Regulation of Cognition and Knowledge of Cognition subscales, however, key relationships were identified between some of the subsections and performance on certain assessment tasks. Correlations between the MSLQ Cognitive and Metacognitive Learning Strategies subscale and the academic performance variables were also minimal. However, there were a few key relationships that emerged between the Resource Management Strategies and the performance variables. The MSLQ Motivation subscale showed no significant relationships with academic performance.

The results overall suggested that the key variables of metacognition, and motivation, were on the whole not significant predictors of performance across the different assessment tasks. The only exceptions to this were that the Metacognitive Awareness aspect of Knowledge of Cognition played a small predictive role in performance on the first test and in overall weighted average; and Resource Management Strategies served to explain a small proportion of the variance in performance on both tests, as well as in overall weighted average. These findings allude to possible issues with regard to the measurement of the constructs of metacognition, and motivation; and also raise questions as to the psychometric applicability of the instruments within the South African context. In terms of the demographic variables as predictors of performance across the different assessment tasks the following results were obtained: home language was a significant predictor across all the performance variables; and in each case was the strongest predictor. Type of school predicted performance across all the performance variables, and in particular it was the only significant predictor of essay performance. Socio-economic status was generally not a predictor of performance across the different assessment tasks; except for the second test which was more factually-laden and biologically-based. These findings highlight the need for further investigation into the variables of metacognition and motivation as they link to academic performance across different tasks. They also allude to the need for the instruments assessing these variables to be scrutinised psychometrically in general, but also for use in the South African context. The findings in this research, while preliminary, provide useful content for future research efforts and offer key information that can be used to guide development initiatives and instruction practices.

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CHAPTER ONE: INTRODUCTION AND RATIONALE

Academic performance stems from a myriad of environmental factors, such as teaching styles, instruction methods, and learning settings; as well as from personal factors, which include both cognitive and non-cognitive elements (Furnham, Chamorro-Premuzic, & McDougall, 2003; Vermunt, 2005). In terms of the latter, effective learning and resulting academic performance requires the presence of domain-specific knowledge and cognitive skill that can lead to mastery; the ability to effectively control and evaluate one's cognitive processes and engage in active learning; and, lastly, motivational aspects linked to task performance. Those learners who are able to manage the cognitive, metacognitive, affective, and behavioural determinants of their learning engage in self-regulatory activities and generally outperform those who do not engage in such regulatory behaviours (Alderman, 1999; Boekaerts et al., 2000).

There is a wide body of research which has investigated the relationship between different learning variables, such as performance goals, self-efficacy, metacognition, and learning styles, and the resultant influence they have on academic performance (Boekaerts et al., 2000; Coutinho, 2007; 2008; Schraw & Dennison, 1994; Schunk & Zimmerman, 2008; Sungur, 2007b; Veenman, Van Hout-Wolters, & Afflerbach, 2006; Wolters, 2003). Academic performance has also been linked to motivational variables, including: intrinsic and extrinsic orientation, achievement goals, task value, test anxiety, control of learning beliefs, and self-efficacy (Al-Harthy & Was, 2010; Bandura, 1997; Harackiewicz, Barron, Tauer, & Elliot, 2002; Palos, Munteanu, Costea, & Macsinga, 2011; Paulsen & Gentry, 1995; Pintrich, 1999; 2004; Schunk & Zimmerman, 2008). Performance has also been positively associated with the learning strategies of elaboration and organisation, metacognition, and time, study, and effort regulation (Paulsen & Gentry, 1995).

Although learning and academic performance are clearly multi-faceted constructs influenced by numerous factors, they thus seem to be highly dependent on cognitive skill, metacognitive skill, and will/ motivation (Mayer, 2001). In acknowledging the central role of metacognition and motivation as key personal variables in self-regulated learning; this research chose to focus specifically on metacognition and motivation with regards to their role in predicting academic performance.

In accordance with the Social Cognitive view, metacognition and motivation can be viewed as inter-dependent (Pintrich & Schunk, 2002). Learners who are metacognitively aware, and who apply their metacognitive skills consistently, have been shown to demonstrate good academic performance.

Furthermore, students provided with metacognitive skills training are more likely to enhance their performance (Coutinho & Neuman, 2008). Metacognitive awareness and strategy use however does little to contribute towards performance if not coupled with motivation to sustain strategy usage and foster perseverance in the face of challenges (Sungur, 2007b). Motivation directly influences achievement behaviour. The cognitive interpretations of one's success or failure affect the choice of activities and strategies, effort invested in a task, degree of persistence, and the cognitive resources an individual is willing to ascribe to a particular activity. Motivational dimensions such as self-efficacy, task value, and achievement goals seem to underpin student engagement and give rise to the identification and use of appropriate cognitive and metacognitive strategies required to achieve goals (Palos et al., 2011). Motivational beliefs have been found to have a direct impact on the metacognitive strategies employed by learners (Boekaerts et al., 2000; Lynch, 2010; Pintrich & De Groot, 1990; Schunk & Zimmerman, 2008; Sungur, 2007a; 2007b; Valle et al., 2008). An individual's perceived competence, expectations regarding success, and overall sense of control also seem to be closely associated with metacognitive strategy use, as well as the effort invested in performance (Sungur, 2007a). Higher self-efficacy beliefs have also been linked to higher metacognitive strategy usage and higher effort regulation (Sungur, 2007b).

Bandura (1997) noted that the development of capabilities for self-directedness and self-regulation are essential in fostering intellectual growth beyond formal education leading to lifelong learning. Self-regulatory strategies can act as mediators between personal and contextual factors and actual performance and achievement (Pintrich, 2004). This is of particular salience in the current climate in which individuals need to rapidly acquire knowledge and adjust to changing technological competencies in order to prosper under highly competitive conditions (Bandura, Barabaranelli, Caprara, & Pastorelli, 1996). Students need to not only develop the cognitive aspects of their intellectual functioning, but they also need to develop the skills required to regulate the motivational, affective, and social determinants thereof (Bandura, 1997). However some research has shown that tertiary education students often lack self-monitoring processes (Lan, 1996; Pressley & Ghatala, 1990). It can be argued that training students such that they can acquire skills that will allow them to regulate their own learning should be a fundamental objective of formal education (Bakracevic Vukman & Licardo, 2010). In order to tailor instruction to suit the needs of the students, it is first necessary to understand the relationship between the various components of self-regulated learning, of which two key aspects are metacognition and motivation. Pintrich (2004) noted that research into tertiary student motivation and performance should always have the dual objective of providing scientific understanding and practical application.

Much of the previous research in this area has typically focused on children in primary and secondary level education (Coutinho, 2008). Many learning variables, however, are posited to change with maturity. In terms of general cognitive development, tertiary level students are considered to have better capabilities for metacognition and self-regulation than their younger counterparts (Hofer, Yu, & Pintrich, 1998). More mature individuals are also considered to have better capacities for reflection and self-awareness (Bakracevic Vukman, 2005); and metacognition is thought to become more explicit and commanding with age (Kuhn, 2000). It is theorised that self-efficacy and metacognitive awareness improve and become more automatized with age (Coutinho, 2008); some metacognitive skills, such as monitoring and evaluation are thought to only mature much later on in one's development (Veenman et al., 2006). In addition, while metacognitive knowledge is deemed to be task-specific initially, it is thought that older students have the flexibility to generalise their metacognitive skills across a variety of tasks and in new learning (Schraw, 2001). Furthermore, some studies suggest that there is not great variability in adult students' metacognitive knowledge, but rather in their ability to regulate and control their metacognitive skills (Young & Fry, 2008). There is a continual dissemination of information at the tertiary level, and students need to learn to apply their skills in dynamic and innovative ways. The pace and workload thus necessitate that students clearly distinguish between knowledge which has already been mastered, and that which still has to be learned, such that they can approach their learning in a considered and strategic manner (Everson & Tobias, 1998).

Relative to their cognitive development, tertiary level students are therefore perceived as having a greater capacity for metacognition and self-regulation (Hofer et al., 1998). However, while students are expected to become more self-directed in their learning as they mature, this does not always seem to be the case (Bandura, 1997). At the tertiary level, some students are proactive and highly self-directed in their learning, and know how to apply their skills and knowledge effectively. In contrast, other students invest much effort into tasks and show awareness of their strengths and weaknesses, but fail to adequately manage and control their learning; and others are passive recipients in learning and utilise minimal self-regulatory strategies (Young & Fry, 2008). Even certain high-achieving students do not engage in effective self-regulation during learning (Boekaerts et al., 2000). Educators are constantly faced with the challenge of how to motivate and impart skills that will enable learners to become proactive and self-regulating, such that their learning can extend beyond their formal careers (Paulsen & Gentry, 1995). It is therefore of value to examine the status of learning variables such as motivation and metacognition as they link to academic performance in university students as this can allow one to gauge the degree to which the students are self-regulated in their learning and also to ascertain their unique learning needs. Learners with high and low metacognitive awareness seem to differ in the extent to which they benefit from various types of instruction; for example,

learners with low metacognitive skills may find cooperative learning environments, with facilitators, more enriching (Carvalho, 2010). Thus having knowledge of a learners' level of metacognitive skill could potentially be extremely useful in planning and fine-tuning instructional practices.

Examination of metacognition and motivation as two of the core aspects of self-regulated learning is also crucial to examine specifically in first-year tertiary level students as they face different educational challenges and have to adjust to the requirements of a novel educational setting. Research into the predictive ability of metacognition (which is separated in this study into the aspects of metacognitive awareness and the use of cognitive and metacognitive learning strategies) and motivation in terms of academic performance could provide useful insights as to the interplay of variables at this level and add to the body of knowledge in this field. It may also provide key information that could be used to guide instructional processes.

At the tertiary education level, academic performance can be measured in different ways and by different types of assessments. It is hypothesised that the different forms of assessments make different demands on the students. Pintrich (2004) noted that students may not only use different strategies for different courses, but their motivation levels may also vary considerably across courses. This research therefore chose to gauge academic performance on the basis of students' overall weighted average marks, as well as on three different assessment forms in a Psychology first-year course. These were multiple choice questions taken from the examination (a summative assessment); and marks obtained from essays (primarily formative in nature although with one or two summative aspects) and short-answer test questions (both formative and summative). In evaluating the role of metacognition and motivation in predicting academic performance on these different assessment formats, as well as overall on the course, it was felt that useful information pertaining to students' personal differences could be explicated. The interplay of variables for different assessment tasks could also yield pertinent information regarding academic performance across assessment methods.

Understanding the contribution of metacognition and motivation to academic performance at the tertiary level could be useful in highlighting first-year students learning needs and the types of learning environments in which they might flourish. In addition, the use of a South African sample is likely to provide novel insights, as there seems to be minimal research published regarding these learning and academic performance variables within the South African context, and specifically at the tertiary education level. This study therefore attempted to contribute to the existing body of knowledge by exploring how metacognition and motivation predicted academic performance on a variety of assessment tasks in a tertiary student sample.

CHAPTER TWO: LITERATURE REVIEW

Introduction

Bandura (1997) noted that academic performance is the result of implementing one's cognitive capabilities through motivational and other self-regulatory skills. While early research tended to separate out the cognitive and motivational dimensions of learning and achievement, researchers over the last three decades have focused more intently on the inter-relation between these constructs (Linnenbrink & Pintrich, 2002). This research adopts the Social Cognitive view of learning and performance.

Social Cognitive Theory of Learning and Performance

Social Cognitive Theory emphasises the importance of social influences on behaviour and infers that individuals act on the basis of their judgements, goals, beliefs, and values. Motivation, personal (cognitive and affective factors), and contextual (socio-environmental) factors are all seen as key determinants in learning and performance (Schunk, 1989b, as cited in Pintrich & Schunk, 2002). Bandura (1997) stated that these factors impact on one another and play key roles as determinants in human agency. Through being proactive, self-organising, self-reflecting, and self-regulating, learners become active participants in their own learning. During performance, these factors all interact in a reciprocal manner and exert relative influence based on the type of activity, presenting circumstances, and appropriateness of timing. For example, an individual's self-efficacy beliefs for a task, as well as their task value and performance goals, can act as a mediator of motivation influencing the outcome-expectations and active engagement in a task (Alderman, 1999).

Bandura's (1997) conceptualisation of learning is founded on three core assumptions. First, there is the interaction between personal, behavioural, and environmental factors. Second, there is a prominent relationship between learning and motivation. Lastly, the process of learning occurs via enacting others and observing models. Social Cognitive Theory distinguishes between learning and performance, but both are based on the notion of the presence of a reflexive relationship between the individual and their context. Learning is thought to occur when an individual observes a model and acquires associated knowledge and skill. Performance, on the other hand, is not necessarily something that is demonstrated at the time of learning, but rather at a stage when the individual believes it is appropriate to apply their skills and knowledge and when they feel sufficiently motivated to do so (Pintrich & Schunk, 2002). Thus, despite the acquisition of competence, and depending on the specificities of the situation, an individual may or may not choose to display their competence

(Pintrich & Schunk, 2002). Performance is thus conceived to be jointly influenced by the anticipation that a particular behaviour will lead to a stated outcome, as well as the desirability of the outcome (Bandura, 1997). Having the skill to complete a task is thus only one aspect of performance; individuals need to be confident in their ability to succeed, they must believe in the merits of their pursuits, they need to muster up sufficient determination to complete tasks, and must constantly monitor and adjust their approach (Pintrich & Schunk, 2002).

The discussion above illustrates that performance includes a crucial motivational aspect. The inclusion of motivational factors in the explanation of performance has been facilitated by a shift in perspective of motivational theories from traditional achievement models to Social Cognitive models. This shift has allowed motivation to be conceptualised as a dynamic, multi-faceted construct that is not an either/or dimension but rather something that occurs along a continuum and is context-specific (Linnenbrink & Pintrich, 2002; Schunk & Zimmerman, 2008). The thoughts and beliefs individuals hold are therefore crucial in either serving as enabling or constraining factors during performance. From this view, individuals are conceived as active regulators in determining performance, in that it is their thoughts about their motivation and learning that appear to mediate engagement and lead to eventual achievement (Boekaerts et al., 2000; Linnenbrink & Pintrich, 2002).

Academic Performance

In line with Social Cognitive Theory, academic performance is thought to stem from an interaction between factors within the individual and factors emanating from the individual's context. Individual factors can include subjective determinants, personality traits, knowledge, and abilities; while contextual factors include teaching styles, course characteristics, learning outcomes, and mode of instruction (Furnham et al., 2003; Vermunt, 2005). Variations in performance are thus determined by a multitude of factors, many of which are inter-related. Researchers have long been interested in understanding the nuances of academic performance so as to better understand the interplay of different predictor variables (Chamorro-Premuzic & Furnham, 2008). Insight into the workings of academic performance not only allows for a better understanding of individual differences, but is also useful in tailoring instruction and developing supportive interventions for at-risk learners (Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011). It also proves valuable in understanding retention rates at the tertiary education level (DeBerard, Scott, Spielmans, & Julka, 2004).

Intelligence has been well established as a prime predictor of academic performance; however it does not explain the total variance (Busato, Prins, Elshout, & Hamaker, 2000; Chamorro-Premuzic &

Furnham, 2008; Farsides & Woodfield, 2003). Other key variables associated with academic performance serve to create an additive effect on top of that which is explained by intelligence (Minnaert & Janssen, 1999). These variables include: motivation (Boekaerts et al., 2000; Palos et al., 2011; Schunk & Zimmerman, 2008; Wolters, 2003); metacognition (Coutinho, 2007; 2008; Minnaert & Janssen, 1999; Pintrich & De Groot, 1990; Schraw & Dennison, 1994); effective effort investment and time management (Mwamwenda, 2004); effective work habits (Schunk & Zimmerman, 2008), self-discipline and self-control (Fraser & Killen, 2005), and self-efficacy (Bandura, 1997; Schunk, 2009). An individual's approach to learning is also considered an important aspect in academic success; prior education experiences set up expectations regarding future performance efforts and influence an individual's approach to a task. These experiences inform attributions of success or failure which the individual ascribes to new tasks. Task perceptions in turn are impacted by the learning context which can encompass the nature of the work, learning outcomes, teaching processes, and assessment methods (Duff, Boyle, Dunleavy, & Ferguson, 2004; Schunk & Zimmerman, 2008; Vermunt, 2005). The ability to effectively manage an increased workload, to stay up-to-date with new work demands, and to persevere in the face of challenges all seem to be pivotal to academic success at the university level (Potter & Van Der Merwe, 1994). More recently, the 'Big Five' personality traits of Extraversion, Conscientiousness, Agreeableness, Neuroticism, and Openness to Experience have been studied in terms of their relationship to academic performance; however findings seem to be inconsistent regarding their overall predictive validity (Busato et al., 2000; Farsides & Woodfield, 2003; Furnham et al., 2003). Of the variables linked to academic performance, gender is noted to not predict academic performance consistently (DeBerard et al., 2004; Naderi, Abdullah, Hamid, & Sharir, 2008). This variable has therefore not been evaluated in this study.

Academic performance at school level is often used as a predictor of performance at the tertiary level; however research findings show inconclusive results; some studies suggest that school performance is a good predictor of achievement in higher education (Harackiewicz et al., 2002; Fraser & Killen, 2005; Potter & Van Der Merwe, 1994), while other studies indicate a limited predictive capacity (Fraser & Killen, 2005; Naderi et al, 2008).

Furthermore, good literacy and verbal comprehension skills, as well as the ability to communicate effectively, have been noted as crucial aspects when considering the academic performance of learners whose medium of instruction is not the same as their home language (Fraser & Killen, 2005). These learners take time to decode and understand the language, and often find it difficult to express their ideas (Stephen, Welman, & Jordaan, 2004). They also often resort to rote learning strategies which suggest that they may adopt a more surface processing approach (Stephen et al., 2004). English

language proficiency has in fact been found to be a key moderator in the academic success of second language learners (Stephen et al., 2004).

In addition, the home environment, specifically parental education level, income, and family size, has been found to play a primary role in academic performance as it can ensure the availability of resources, the provision of a stimulating home-learning context, access to quality education, and the promotion of values and ideals consistent with achievement and education. The type of school and aspects of the schooling environment such as teacher-child ratio, access to learning materials and facilities, and appropriately qualified teachers can also have both direct and indirect effects on academic performance (Huysamen, 1996; Mwamwenda, 2004; Sirin, 2005; Zaaiman, Van Der Flier, & Thuys, 1998). In addition, parental support has been highlighted as a crucial aspect in performance (DeBerard et al., 2004; Griffith, 1996). The impact of socio-economic status on academic performance generally lies in its effects on academic efficacy and educational objectives. Increases in socio-economic status have been linked to higher parental achievement strivings for their children, as well as a higher sense of efficacy to play a role in influencing their children's academic development; which generally stems from the parents' own educational experiences. Such parents tend to advocate learning activities and promote social and self-regulatory skills conducive to learning (Bandura et al., 1996; Sirin, 2005). Socio-economic status also generally dictates access to educational resources, learning opportunities, and supportive networks (Sirin, 2005). However, it must be noted that parents from lower socio-economic backgrounds who value education, are actively involved in their child's learning, and encourage high education goals tend to have children who will perform well academically (Bandura et al., 1996).

Such results allude to the multi-dimensional nature of academic performance and suggest the importance of understanding each variable and its unique contribution, as well as the relationship between variables. Within the current fast-paced technological climate, access to knowledge is immense and change is inevitable and thus the need to become a self-directed learner, who can manage and control all aspects of learning, is ever important. Learners need to become proactive and must strive to master learning and performance beyond formal education; such that they can adapt effectively to a changing context and stay abreast of trends and new knowledge (Bandura et al., 1996). Given that self-regulated learning hinges on cognitive, metacognitive, and motivational aspects; and the fact that self-regulated learners have been shown to perform better academically (Bandura et al., 1996); this study chose to focus specifically on the role of motivation and metacognition in predicting academic performance. Further, in reviewing some of the other key variables impacting performance, the study also examined the role of socio-economic status, home language, and type of school

attended in predicting academic performance; as an understanding of these variables is thought to be crucial within the South African context.

Academic Performance across Different Assessment Tasks

While academic performance depends on the interplay of personal and contextual variables, it is also shaped by the type and requirements of different assessment tasks. There generally tend to be two broad types of assessments. Summative assessments are created for the purpose of signifying a level of attainment at a specific point in a course; with the primary purpose being to allocate a grade and determine learning progress. Formative assessments, on the other hand, have an essential feedback component and the intention is to contribute to student learning by commenting on performance (Boud & Falchikov, 2006; William & Black, 1996; Yorke, 2003). Some assessments are clearly distinct, while others have both formative and summative functions (Yorke, 2003). Formative assessments focus more on the process of assessment; using feedback to guide learners such that competence can be improved and trial-and-error approaches minimised (Taras, 2005). Summative assessments focus on the product of assessment; yet are crucial in gauging the quality of a learner's work (Taras, 2005).

When considering performance across tasks, it is important to note that different types of assessment tasks promote different approaches to learning (Busato et al., 2000). A deep processing approach occurs when a learner ascribes meaning to their work by critically appraising it, and linking it to their own experiences. A surface processing approach, on the other hand, is evoked when information needs to be learnt by memory and facts can be recalled in isolation (Duff et al., 2004). It is thought that essays and short-test questions may evoke more deep processing strategies, while multiple choice questions (MCQ's) may tend towards more surface processing approaches in that there is a cueing element inherent within the answer options (Duff et al., 2004). Furthermore, the conditions under which different assessment tasks take place also require consideration. Exams are generally written under highly stressful conditions (Furnham et al., 2003). They tend to evoke a lot of anxiety as they account for a greater proportion of the overall year mark. Essays and short-answer tests require a lot more effort expenditure as individuals are required to gather and read large quantities of material; understand, integrate and apply content; critically appraise the work; and memorise key facts (Furnham et al., 2003).

Prior to detailing the variables of motivation and metacognition as they link to different types of academic performance, it is first necessary to understand the aspects of self-regulated learning, of which the inter-relation of motivation and metacognition is a crucial component.

Self-Regulated Learning

The notion of self-regulation is crucial in understanding learning and academic performance. Self-regulation is thought to be the process whereby students "…activate and sustain cognitions, behaviours and affects" that are geared towards ensuring successful goal attainment (Zimmerman, 1989, as cited in Pintrich & Schunk, 2002 pp. 176). While definitions of self-regulated learning vary based on the dominant theoretical orientation adopted, the majority of definitions emphasise a students' use of particular processes, strategies, and responses for the purpose of improving their academic performance. The self-regulated learner actively directs their own learning and is mindful of the potential impact of their self-regulation strategies on their academic performance. A distinct feature of self-regulated learning, common to most definitions, is the presence of a feedback loop in which an individual continually evaluates the effectiveness of their chosen learning strategies. The ensuing feedback then prompts the learner to alter or adapt their responses, either changing their behaviour or strategies, or making more covert changes, for example, to their self-perception or feelings of self-efficacy in particular areas (Zimmerman, 2009). Self-perceptions and motivation are paramount in self-regulated learning. Learners may either choose or choose not to adopt self-regulation processes on the basis of their belief in the efficacy of a particular strategy in a specific context, as well as their belief in their ability to successfully execute a desired self-regulation response. The motivation to attain a specific learning goal is also a fundamental driver, as self-regulation necessitates extra planning time, heightened self-awareness and sustained effort (Schunk, 2009). The capacity to self-regulate underpins the ability to adapt to changing milieus (Boekaerts et al., 2000) and it is thus considered a constructive and metacognitive process (Winnie, 1996).

The Social Cognitive view of self-regulated learning emphasises that students' efforts to direct their own learning stems from an interplay of personal (cognitive and affective), environmental, and behavioural events (Schunk, 2009). Learning and academic performance never occur in a void and at any stage a myriad of factors can influence and determine one another. Personal factors can even show within-person interaction, for example, the use of a strategy promotes acquisition of skills, which then leads to increased feelings of self-efficacy, which in turn re-inforces the use of certain strategies (Pintrich & Schunk, 2002). Learning and mastery thus entails repeated attempts at trying to direct and manage these factors, all of which are dynamic, and bear influence upon each another. Self-awareness and self-perceptions are central in the learning process, as the ability to accurately self-

observe provides key information that is used to guide subsequent regulatory efforts. The motivation to self-regulate is thought to derive from two sources: goal and outcome expectations, and self-efficacy. Social cognitivists deem that individuals are motivated by the outcomes they expect to receive and the resultant consequences thereof, rather than by actual rewards (Schunk & Zimmerman, 2008).

In essence, students need to develop cognitive skills, while simultaneously developing the skills required to actively regulate the motivational, affective, and social determinants of intellectual functioning (Zimmerman, 1986, 1990a, as cited in Zimmerman, Bandura, & Martinez-Pons, 1992). The self-regulated learner constantly monitors their effectiveness (Zimmerman, 1998) and assumes control of their learning through self-observation, self-judgement, and self-reaction (Bandura, 1997; Boekaerts et al., 2000; Pintrich & Schunk, 2002; Zimmerman, 1998). In every aspect of learning an individual needs to impose their self-influence and generate thoughts, feelings and actions required to ensure successful goal attainment (Bandura, 1997; Zimmerman, 2009). The cornerstones of self-regulation thus include: active participation, a planful approach to learning, and self-awareness of performance (Alderman, 1999). Self-regulated learners generally display the following traits: adaptive attributional beliefs, a willingness to take responsibility for their own learning, high self-efficacy, a commitment to invest effort, and the ability to set effective goals. In addition, these learners display effective cognitive and metacognitive strategies, and the effective use and management of their time and resources (Alderman, 1999).

The development of self-regulatory skills is thought to be progressive. With time and maturity, individuals develop a greater aptitude for reflective and self-aware actions (Bakracevic Vukman, 2005; Kuhn, 2000). Greater precision in self-monitoring and self-evaluation occurs, and the individual comes to assume more control of their cognitive, motivational, and emotional functioning, used to guide their efforts (Bakracevic Vukman & Licardo, 2010). As self-regulatory capacities develop, so does the tendency to be more planful and strategic. The development of self-regulatory skills seems to be linked to the growth of certain regions in the frontal lobe of the brain, associated with attentional networks and the executive control function; and is also linked to increased social interaction and support (Bakracevic Vukman & Licardo, 2010). In terms of gender differences, it seems that girls tend to be more self-regulated during primary school years, but this tendency gradually dissipates and evens out during adolescence (Bakracevic Vukman & Licardo, 2010). Gender differences in adults are therefore not expected.

According to the Social Cognitive perspective, the acquisition of self-regulation occurs in stages. Initially, children's learning occurs through observation; they observe the skills of a suitable model, and also associated self-regulatory practices involved in performing a task. The perceived similarity to a model plays a role in motivating the child to develop the skill themselves (Boekaerts at al., 2000). Children then start to emulate and re-enact the behaviours of others, until they reach the point where their performance approximates that of the model. The child then progresses to the point where they assume control and feel comfortable to use their acquired skill outside the original setting and away from the model. At this stage, the focus tends to be on mastering procedural elements, rather than on achieving outcomes. The capacity for full self-regulation is achieved when learners adapt their performance in the face of changing personal and contextual factors. The focus shifts to outcomes, and the individual directs their own actions through varying strategies (Boekaerts et al., 2000).

In explicating the core aspects of self-regulation, it is necessary to understand how cognition, motivation, and behaviour are monitored and controlled. First, learners engage in strategies that allow them to plan, evaluate, and regulate their cognition. Metacognitive strategies are subsumed within this component, as learners need to think about their own cognition in order to effectively evaluate and regulate their actions. Key metacognitive strategies include activating prior knowledge, setting goals, using rehearsal, elaboration and organisation strategies, activating metacognitive knowledge, and employing reasoning, problem solving and critical thinking skills (Pintrich, 2004). Second, learners need to assume control of their motivational beliefs, and do so by setting goals, and by making judgements about personal capability, task value, and interest. Extrinsic motivation can be increased through setting rewards, and intrinsic motivation can be raised by making the work more relevant to one's future career. Negative emotions, such as shame and guilt, may even be evoked by the learner, as a means to sustain motivation to persist on a task (Wolters, 1998). Attempts to control affect and emotions can also occur through various coping mechanisms aimed at alleviating anxiety or negative affects for example, positive self talk (Boekaerts et al., 2000). A key aspect of regulating motivation is through making attributions about performance that will guide future efforts (Pintrich 2004). Lastly, behavioural regulation comprises all actions aimed at managing one's overt behaviours to ensure that persistence is maintained despite low task value, difficulty, or challenge. This can include time management, effort control, and help-seeking behaviours. Good students realise when they need to elicit help, and are more astute in knowing who to ask for help (Pintrich, 2004). The ability to self-regulate becomes important at the tertiary education level, which is characterised by immense workloads, changing demands, and time pressures (Pintrich, 2004).

There are various phases in the cycle of self-regulation, each of which impacts activities in previous or subsequent phases (Schunk & Zimmerman, 2008). In the *forethought phase*, students analyse and create a personalised conceptualisation of the task, which invariably includes affective reactions and motivational correlates. They enter the learning situation with a performance goal, and plan which strategies to use. Goals derive from task perception and comprise actions to be taken, forms of cognitive engagement, and changes in motivation. The learner's approach will be based on their interest, perceived knowledge, and sense of self-efficacy informing their tasks expectations. At this stage prior knowledge is activated, as is metacognitive knowledge that learners have about themselves or the task. The *performance phase* is where learners strive to control their actions and performance through implementing various strategies. Learners need to be cognisant of all their goals, be they behavioural, cognitive, or motivational, and need to select appropriate strategies and methods to achieve each. As they proceed, learners engage in self-observation, self-instruction, and self-monitoring behaviours that directly impact their motivation and learning. This monitoring generates a type of hyper-vigilance in which the individual is constantly sizing up the effectiveness of their chosen strategies, and gauging the fit with the learning context. This state of alertness leads to decisions regarding alternate strategy selection and the re-organisation of environmental conditions to optimise learning (Lan, 1996). Individuals also tend to compare themselves to their peers to elicit normative information, and they constantly seek feedback. Metacognitive awareness becomes evident, as learners evaluate aspects of the self, the task, and their context, with a view to ensuring heightened regulation and control through modifying behaviour and adapting strategies. The final, *self-reflection phase* concerns evaluations about the entire process and prepares learners for future efforts to achieve mastery. Performance is gauged against goals and progress is appraised. Learners compare themselves against set criteria or standards, which then act as catalysts for behavioural, affective, and/or cognitive change. Attributions about the meaning of results are made, and the learner makes adjustments accordingly. These self-reflections come to inform the forethought for future learning endeavours, thereby restarting the cycle (Ellis & Zimmerman, 2001; Pintrich, 2004; Pintrich & Schunk, 2002; Schunk, 2009; Schunk & Zimmerman, 2008; Zimmerman, 1998). Progression through these phases is dynamic and several aspects can occur simultaneously as feedback is received and goals, attitudes, and reactions change (Pintrich, 2004).

Pintrich added to Zimmerman's cyclical self-regulation model by including a phase of *control*. In his emphasis on an interaction between the person and environment during learning, he posited that monitoring is a separate aspect from regulation and control (Boekaerts et al., 2000). Pintrich also hypothesised about the aspects of metacognitive that are involved in the various self-regulated learning phases. He deemed that metacognitive knowledge is involved in the *forethought* phase and is activated in an instinctual or automatic fashion through the use of metacognitive skills. He thought

that judgments of learning are activated in the *monitoring* phase; and these judgements are infused with metacognitive awareness that provide input to be used during the *control* phase. The cognitive and metacognitive strategies surface during the *control* phase. Lastly, cognitive judgements of performance occur in the *self-reflection* phase (Efklides, 2011). While this model captured the essence of the core components of self-regulation; it was criticised for separating out the regulation of behaviour from the regulation of cognition and motivation; thus not focussing on the interactions between metacognition, motivation, and affect (Efklides, 2011). It is clear that ongoing research on the connections between motivation and metacognition is required (Efklides, 2011).

Optimal performance thus rests on the development of cognitive and metacognitive skills, as well as positive emotions, attitudes, and motivation that foster self-regulatory behaviours (Hartman, 2001). While theories of self-regulation differ in some respects; most posit that self-regulated learning comprises goal-setting, metacognition, and the use of metacognitive strategies (Vrugt & Oort, 2008). While some debate exists as to the exact relationship between metacognition and self-regulation, the Social Cognitivists conceive self-regulation to be superordinate to metacognition as it encompasses motivational and social-emotional processes (Veenman et al., 2006).

Self-regulation has shown positive correlations with intrinsic motivation (Pintrich & De Groot, 1990), self-efficacy (Zimmerman et al., 1992), academic attainment, challenge-seeking behaviours in learning contexts, and overall self-awareness (Lan, 1996). In addition, self-regulation has been positively linked to goal orientation and learning strategies (Paulsen & Gentry, 1995; Winnie, 1996).

Self-regulation is clearly a complex, dynamic process that is crucial in academic performance. Learners that are better able to control and regulate their own learning are more likely to perform better (Zimmerman, 2009). The capacity to self-regulate during learning is not only useful in understanding academic performance, but also contributes to an understanding of the overall adjustment of students.

In acknowledgment of the inter-dependence on the variables of motivation and metacognition in self-regulated learning, published research in the international domain has examined the relationships and interactions between these variables, namely: the role of metacognition, motivation and affect in the process of self-regulated learning (Efklides, 2006; 2011); motivational beliefs, metacognitive strategy use and effort regulation (Sungur, 2007a: 2007b); achievement goals, self-efficacy, metacognitive self-regulation and performance (Al-Harthy & Was, 2010; Coutinho, 2007; 2008; Vrugt & Oort,

2008); and the influence of cognitive, metacognitive, motivational, and emotional self-regulation on academic performance (Bakracevic Vukman & Licardo, 2010). Published research examining the interaction of these variables within the South African context appears more limited. One such study examined the motivation orientation and learning strategies of first-year tertiary students; results revealed that high achievers were generally more motivated and likely to employ effective learning strategies (Watson et al., 2004).

Academic Adjustment at University Level

Academic adjustment is conceptualised as a dynamic process in which the individual is required to collaborate with others in their environment, in order to achieve a goodness of fit (Ramsay, Barker, & Jones, 1999). Students need to learn to fit in with the academic context; they need to acquire a range of knowledge and skills that will enable them to cope effectively, and must align their social, emotional and academic functioning (Hong-Nam & Leavell, 2011). As with all self-regulated actions, the student needs to constantly evaluate their situation and make adjustments to overcome obstacles or to ensure a better fit with their environment, especially when this is new (Bakracevic Vukman & Licardo, 2010). As the student learns more about the environment, and their personal resources, they are able to make adjustments; and as with all learning, this is comprised of inter-related behavioural, cognitive, and affective dimensions. Affective responses and reactions in particular play a central role in facilitating or constraining adjustment (Ramsay et al., 1999).

Academic adjustment is an important consideration when dealing with first-year university students as they have had to transition from the sheltered confines of the schooling system to a tertiary system that makes more demands in terms of independent learning and self-directed actions. Without the capacity to direct their own learning, many of these students' may be unsuccessful in their academic pursuits at this level (Hong-Nam & Leavell, 2011). First-year students need to adjust to a new context and they do this through learning and by engaging in self-regulatory activities. It is presumed that those first-year students that engage in more self-regulated actions will have adjusted better to the requirements of university. The motivation to learn is reliant on the students' knowledge of strategies, self-perceptions, and the belief in their abilities (Hong-Nam & Leavell, 2011). The continued use of self-regulatory strategies and level of engagement required at tertiary education level is likely to be demanding and will depend to a large extent on the student's motivation (Pintrich, 1999). It is therefore hypothesised that learners who are motivated and metacognitively aware, and thus more able to engage in self-regulated learning, may transition better in their first-year of university as they will be more able to control their own learning and sustain their efforts.

The role of metacognition and motivation in self-regulated learning has clearly been explicated. A detailed discussion of the two core variables in this study, metacognition and motivation, will now follow; in particular as they link to academic performance.

Motivation

Individuals approach achievement settings with broad, contextual affective propensities. These general affective tendencies stem from both biologic and social influences and they exert a powerful impact (Elliot & Pekrun, 2007). Varied affective dispositions ensure either a positive or negative approach, which in turn prompts different achievement strivings. Individuals who display a high need for achievement are driven by both the need to succeed and to experience the positive feelings afforded thereof, and thus they tend to adopt self-regulatory strategies geared towards attaining positive outcomes (Elliot & Pekrun, 2007). Motivation is at the core of self-regulated learning; the more motivated an individual, the more cognisant they are likely to be of their learning processes and outcomes (Schunk & Zimmerman, 2008). Every action is motivated in some way and centres on the learner's knowledge, the feedback they create or receive, and their thoughts and reflections about themselves and their environment (Schunk & Zimmerman, 2008). While one can teach learning strategies and self-monitoring techniques, an individual needs to be motivated to attend to their feedback, such that they can initiate and sustain self-regulatory behaviours (Schunk & Zimmerman, 2008).

Bandura (1997) defined motivation as an all-encompassing construct comprised of a system of self-regulatory mechanisms. Motivation fuels the process in which an individual selects, activates, and directs behaviour towards a set goal. It is either constrained or reinforced through the expectations of the predicted outcomes of one's actions, as well as one's self-efficacy to perform such actions (Pintrich & Schunk, 2002). The beliefs an individual houses about their capacity to succeed and to direct their actions not only impacts behaviour, but also the cognitive and affective processes underlying such behaviour (Schunk & Zimmerman, 2008). When trying to understand the source of motivation it is therefore important to identify the determinant of behaviour, as well as any interacting factors (Bandura, 1991b, as cited in Bandura, 1997). In line with the Social Cognitive view of motivation, for any given task, an individual can be motivated in a multitude of ways, each of which interacts in a reciprocal fashion and bears influence on overall performance (Linnenbrink & Pintrich, 2002).

Aspects of motivation are intricately intertwined; they promote investment and engagement in academic activities and occur at each juncture of the self-regulation process. In regulating motivation, individuals actively initiate or sustain their desire to start, continue, or complete a task (Schunk & Zimmerman, 2008; Wolters, 2003). The motivational component of self-regulated learning comprises variables such as self-efficacy beliefs, performance goal setting, task value, intrinsic motivation, outcome expectations, and affective states linked to self-appraisals and reflections (Bandura, 1997; Linnenbrink & Pintrich, 2002; Schunk & Zimmerman, 2008). While motivation is primarily an intrinsic factor, it can also derive from external sources, such as parental praise, educator modelling, or rewards (Schunk & Zimmerman, 2008). A discussion of these aspects of motivation follows.

Self-efficacy is perhaps the most fundamental motivational variable. Bandura (1997) postulated that self-efficacy is the conviction that one has about their capacity to successfully execute actions, necessary to attain achievement at particular levels. Self-efficacy creates the impetus for an individual's task selection and motivation to acquire skills. It fuels the energy and effort required for successful goal attainment and fosters persistence (Schunk, 2009). Self-efficacy is less about actual skill, and more about the belief in one's ability to achieve success with the skills one does possess. It constitutes a dynamic conception of the self and its potentialities; and is continually shaped by experience; it is context-specific and quite resistant to temporary setbacks (Bong & Skaalvik, 2003). Learners obtain information to appraise their self-efficacy from their own experiences, through observing others, by paying attention to their physiological reactions during tasks, and through receiving reinforcement from others (Schunk & Zimmerman, 2008). Self-efficacy links to an individual's affective states, motivation, and performance (Bandura, 1997). Self-efficacy has been found to facilitate task engagement, self-monitoring, goal-setting, determination to succeed, perseverance, intrinsic motivation, and overall performance. It has also been found to predict cognitive and self-regulatory processes as self-efficacious learners adopt active learning strategies and utilise more cognitive and metacognitive strategies (Bong & Skaalvik, 2003; Linnenbrink & Pintrich, 2003; Pintrich & De Groot, 1990; Schunk & Zimmerman, 2008). These findings are relatively stable across age, education level, gender, and ethnic groups (Bandura, 1997; Pintrich & Schunk, 2002). Linnenbrink and Pintrich (2002) linked high self-efficacy to the use of adaptive strategies and appropriate study skills; suggesting that efficacious learners readily adopt self-regulatory strategies. Relative to the tertiary domain, self-efficacy beliefs are linked to career ambitions and pursuits (Bandura et al., 1996); achievement and persistence (Gore, 2006); and adjustment as these learners tend to be more adaptable (Brady-Amoon & Fuertes, 2011).

Self-efficacy also links to attributions, which are essential aspects of self-monitoring and self-reflections. Assumptions about performance are made based on previous experience and current performance. These attributions incorporate personal and environmental factors, and are based on perceptions of success or failure, perceived stability and controllability of pertinent factors, and perceived capacity to affect change (Linnenbrink & Pintrich, 2002). These attributions become infused with affective reactions and serve to inform future expectations and self-efficacy beliefs (Linnenbrink & Pintrich, 2002). Attributions of success, linked to one's own hard work, effort, and the correct use of strategies, ensure higher levels of self-efficacy (Schunk & Zimmerman, 2008).

Achievement goals tend to be based on one's self-efficacy for a task. These goals provide focus and direction, and are associated with adaptive attributional patterns, higher self-efficacy, and greater levels of perceived competence (Wolters, Yu & Pintrich, 1996). Research by Wolters et al. (1996) found that learning goals are positive predictors of task value, and cognitive and self-regulatory strategy use. There are two types of achievement goals. Mastery goals focus on learning and the need to become competent in a subject area; they are associated with intrinsic motivation and link to an individual's value for learning and their tendency to attribute success to their own efforts. Performance goals are grounded in an extrinsic orientation and focus on a learner's desire to prove their competence, achieve good grades, and compete with others (Al-Harthy & Was, 2010; Wolters et al., 1996). Mastery goals link to higher self-efficacy, good metacognition and performance, and the use of elaboration and organisation strategies, which are thought to be deep processing strategies (Coutinho, 2007; Wolters et al., 1996). Learners can adopt a range of goals from both types, all of which can positively impact task engagement, motivation, adaptation, and performance (Al-Harthy & Was, 2010; Coutinho, 2007; Wolters et al., 1996).

Another key aspect of motivation is outcome expectations. The ascription of a positive outcome to a task is a necessary pre-condition for even a highly efficacious learner to attempt a task (Schunk & Zimmerman, 2008). Perceived task value is also immensely pertinent, as the more a learner values a task, the more likely they are to sustain their attentiveness, employ various cognitive and metacognitive strategies, and see the task through to completion (Linnenbrink & Pintrich, 2003). Task value seems to be an important aspect of college students' academic performance (Paulsen & Gentry, 1995).

Intrinsic motivation is conceived of as the desire to perform a task for the purposes of learning and gaining a sense of competence and mastery. Extrinsic motivation on the other hand, is the desire to complete the task for a specific purpose, such as a reward. Generally, those learners that are

intrinsically motivated tend to have a higher degree of personal interest in the task (Linnenbrink & Pintrich, 2002; Pintrich & Schunk, 2002).

The theoretical framework for conceptualising student motivation in this research is based on an adaptation of a general expectancy-value model of motivation (Pintrich & De Groot, 1990; Schunk & Zimmerman, 2008). The model proposes three core aspects of motivation in the context of self-regulated learning, namely: value components, expectancy components, and affective components. *Value components* encompass students' goals and beliefs regarding the ascribed importance and degree of interest in a task. They refer to the different beliefs students may have about the reasons to perform a task, the costs and benefits thereof, as well as the perceived importance of successfully completing the task. *Expectancy components* relate to an individual's perception of their ability to perform a task and their expectations regarding their perceived competence. The *affective component* encompasses a student's emotional reactions toward a task (Pintrich & De Groot, 1990; Pintrich & Schunk, 2002; Schunk & Zimmerman, 2008).

The *value component* of motivation is comprised of three dimensions: intrinsic goal orientation, extrinsic goal orientation, and task value. *Intrinsic goal orientation* focuses on an individual's internal drive to complete a task based on their need for challenge, curiosity or mastery, or other relevant reasons. Intrinsically motivated individuals will conceive the reasons for participation as an end in itself, rather than seeing participation as a means to an end. *Extrinsic goal orientation* compliments intrinsic goal orientation and encompasses external reasons for performing a task, for example, rewards, marks, competition, or evaluation by others. Participation may thus be seen as a means to an end. *Task value* concerns students' perception of the importance and usefulness of a task, as well as their associated interest in the task (Pintrich, 1999; Pintrich, Smith, Garcia, & McKeachie, 1991).

The *expectancy component* centres on a student's belief in their ability to perform a task and take control over performance in order to ensure a desired outcome. This component has been linked to students' metacognition, their use of cognitive strategies, and the degree of effort invested in a task (Pintrich & De Groot, 1990). It includes the dimensions of control of learning beliefs and self-efficacy for learning and performance. *Control of learning beliefs* encompasses a belief in the notion that the amount of effort invested in a task will be directly related to a positive outcome. *Self-efficacy* is founded on the beliefs one has regarding their ability to produce certain outcomes, and thus it includes an expectancy for success (Bandura, 1997; Pintrich et al., 1991). Self-efficacy is not only a judgement of capability, but also the capacity to select the appropriate behaviours and skills required to achieve competent performance (Pintrich & Schunk, 2002). Students with high self-efficacy tend to more

effectively utilise cognitive strategies, manage their time and resources better and monitor and regulate their learning more closely (Bandura, 1997). Research shows a direct link between self-efficacy and academic performance (Bandura et al., 1996; Caprara et al., 2011; Linnenbrink & Pintrich, 2002; Paulsen & Gentry, 1995).

The affective component of motivation encompasses all the emotional reactions an individual has to a particular task (Paulsen & Gentry, 1995). The most common measure of such emotional responses is *test anxiety*, which is conceptualised as an individual's emotional reaction to a test based on their concern about possible negative consequences and perhaps even failure (Pintrich & Schunk, 2002). Test anxiety generally shows a negative relation to academic performance (Nie, Lau, & Laiu, 2011; Paulsen & Gentry, 1995). However the relationship between these two variables is complex; while test anxiety can deplete the resources required for the effective processing of information, and can interfere with motivation; good study strategies and test-taking skills can offset the negative effects of anxiety to some extent (Paulsen & Gentry, 1995). This then re-iterates the importance of imparting skills and strategies that can allow students to control and manage their own learning, even in the wake of negative affective responses.

The role of motivation in academic performance is clearly documented in the international literature (Boekaerts et al., 200; Linnenbrink & Pintrich, 2002; Schunk & Zimmerman, 2008; Zimmerman et al., 1992). Various aspects of motivation, including goal orientations, self-efficacy, and motivational beliefs, have been examined with regards to their role in academic performance and self-regulated learning (Lynch, 2010; Palos et al., 2011; Wolters et al., 1996). The capacity to regulate one's motivation, as a crucial aspect of self-regulated learning, has also been examined (Wolters, 2003). In the South African domain, there is some, although seemingly minimal published research investigating the role of motivation in performance: in particular with regards to effective strategies beyond the outcomes-based curriculum (Todd & Mason, 2005); and in terms of the motivation orientation of first-year university students (Watson et al., 2004). Research has also examined the prevalence of ethnic differences in motivation and strategies for learning amongst secondary school learners (Watkins, McInerney, Akande, & Lee, 2003). In an unpublished Master's thesis, Coetzee (2011) examined the relationship between academic self-concept, motivation, and academic performance with tertiary students.

Metacognition

Flavell (1979) broadly conceptualised metacognition as the ability to think about and reflect on one's own thought processes. This encompasses awareness of how an individual learns, their degree of comprehension, knowledge of how and why to use strategies and information resources, accurate judgements of the cognitive demands of a task, and constant monitoring of one's performance and progress (Gourgey, 2001; Coutinho, 2008). Metacognitions are considered to be second-order cognitions (Weinert & Kluwe, 1987). The key distinction between cognition and metacognition lies in that cognition comprises all the skills an individual draws upon when executing a task, while metacognition encompasses those skills utilised when an individual reflects and gains insight into how they performed a task (Schraw, 2001). Cognitive strategies allow an individual to build up their knowledge base and progress through learning tasks; metacognitive strategies enable an individual to improve upon their progress by monitoring, evaluating their degree of comprehension, and transferring knowledge to different contexts (Flavell, 1979; Gourgey, 2001). Through metacognition, learners not only draw on information pertaining to effective strategy use, but also contemplate their own strengths and weaknesses relevant to a given task, muster up motivational aspects to complete the task, and activate relevant contextual knowledge to ensure successful task completion (Pintrich, 2002). They also select which goals to pursue (Bakracevic Vukman & Licardo, 2010).

Metacognition is a strong predictor of academic accomplishment (Coutinho, 2007; Schraw & Dennison, 1994). There is a wide body of published international literature documenting the role of metacognition in self-regulated learning and academic performance. Such research has shown that top performing students generally possess more metacognitive awareness and are able to strategically employ self-regulatory strategies that lead to successful goal attainment (Boekaerts et al., 2000; Hartman, 2001). Through being able to better plan, sequence, and monitor their own learning, metacognitively aware learners are more able to guide their learning efforts and sustain their focus (Garner & Alexander, 1989; Pressley & Ghatala, 1990). The ability to regulate one's learning and accurately focus on new learning enables students with sound metacognitive strategies to concentrate on new content and adjust their learning goals (Everson & Tobias, 1998). The metacognitive evaluations and judgements that an individual makes both before and during task completion are essential in ensuring effective learning and academic performance, as these judgements inform the choice of self-regulatory actions, allocation of resources, change in strategy use, and choice to persist (Carvalho, 2009; 2010). Studies with college students have found that they are often over-confident in their self-chosen study strategies relative to their academic performance (McCabe, 2011); the fact that students may not be precise in estimating their own learning and knowledge is problematic as it suggests that they may not be able to make accurate decisions regarding strategy usage and knowledge areas requiring development (McCabe, 2011). Test outcomes have been linked to pre-test

judgments of competence and perceived success, which are considered aspects of metacognitive knowledge (Young & Fry, 2008). Researchers have also started to investigate the relationship between metacognitive skills and changes in self-regulation processes and performance under different testing conditions (Carvalho, 2010).

While there has been widespread international research examining the different aspects of metacognition and its role in academic performance, comparatively there appears to be fairly limited published researched in this area within the South African context. Some studies have however been conducted at the secondary education level examining the: use of metacognitive strategies as a means to facilitate mathematics learning and performance (Du Toit & Kotze, 2009; Van Der Walt & Maree, 2007); and the impact of metacognitive skills and non-verbal ability on academic performance (Maqsud, 1997). Research at the tertiary level has examined metacognitive development within a specific engineering course designed to promote deeper processing and conceptual understanding (Case & Gunstone, 2002). Several unpublished theses at the Masters level have examined aspects of metacognition and performance, namely: the use of metacognitive strategies in a sample of children with learning difficulties (Van Rooyen, 1997); and the use of metacognitive strategies and processes within Natural Science teaching (Butterfield, 2012).

Metacognition has inherent monitoring and control aspects; however it is a multi-faceted construct and thus the distinction between the monitoring and control functions often becomes blurred (Efklides, 2006). Metacognitive knowledge, experiences, tasks, and strategies are subsumed within the definition of metacognition (Flavell, 1979). Metacognitive knowledge encapsulates one's self-knowledge pertaining to a task in terms of relative strengths and weaknesses, general knowledge about tasks, knowledge that certain tasks require different cognitive strategies, and knowledge of the array of cognitive strategies at one's disposal. It encompasses all those beliefs about cognitive processing; which factors in intra-individual variations, inter-individual variations, knowledge about task demands, and other universals of cognition (Flavell, 1979). Metacognitive experience, on the other hand, captures the conscious experience a person has when completing a task; infused with all the thoughts and affects about one's own thinking during task progression. Flavell (1979) acknowledged that metacognitive knowledge and metacognitive experience are intertwined and both can have influences on the other. Tasks refer to the objectives an individual pursues, while strategies are the actual tactics used to attain these (Flavell, 1979).

Metacognitive awareness concerns all the complex, executive processes required in learning that enable an individual to define a task, devise a learning plan, select and implement the most

appropriate strategies to solve problems, allocate resources, and draw on the use of prior knowledge as a key reference. It allows for an appraisal of one's performance, which takes relevant feedback into account and allows one to reflect on the extent of their learning (Coutinho, 2008; Gourgey, 2001). Researchers typically differentiate between two aspects of metacognitive awareness: *knowledge of cognition* and *regulation of cognition,* both of which are intricately intertwined and are of necessity when performing a task (Schraw, 2001).

Knowledge of cognition encompasses three domains – declarative knowledge, procedural knowledge, and conditional knowledge – all of which broadly refer to individuals' knowledge about their cognition and include the knowledge individuals have regarding the strategies they can deploy in a task (Brown, 1987, as cited in Schraw, 2001; Efklides, 2006; Schraw & Dennison, 1994; Schraw & Moshman, 1995). *Declarative knowledge* includes the insight individuals have about themselves as learners and what factors generally impact their performance; *procedural knowledge* comprises the knowledge individuals have pertaining to how best to perform an activity whilst being cognisant of the myriad of strategies in their repertoires; this encompasses their metacognitive skills; and *conditional knowledge* concerns the knowledge required to adapt to changing situations and includes the ability to construct explicit knowledge about when and why to deploy one's knowledge resources and strategies (Schraw, 2001). Conditional knowledge is thought to comprise two key aspects: an objective component that determines whether a strategy fits with the task and conditions of the setting; and a motivational component that propels the individual to change their strategy or approach (Schraw & Moshman, 1995; Winnie, 1996). Feedback regarding the effectiveness of strategy usage is thought to derive either from external sources, or from an individual's metacognitive experiences which comprise experiential judgements and feelings about task performance (Efklides, 2006; Flavell, 1979).

Regulation of cognition concerns the active control individuals exert on their learning by focusing their attention, effectively implementing strategies, and showing awareness of the need to break large tasks into more manageable and easily understandable segments (Schraw, 2001). While some debate exists as to the exact number of regulatory skills, there is generally some consensus that there are three primary regulatory skills, namely, planning, monitoring, and evaluation (Jacobs & Paris, 1987, as cited in Schraw, 2001). In the *planning phase* individuals identify and select appropriate strategies and effectively deploy resources; the *monitoring phase* encapsulates the process whereby individuals' actively test their understanding and closely observe their task performance; the *evaluation phase* centres on an individual's appraisal of the products of their learning, as well as the efficiency with which they have attempted and accomplished said tasks (Schraw, 2001). These phases of cognitive

regulation therefore ensure that an individual is able to plan efficiently and deploy resources (planning), use skills of organisation and elaboration to process information more meaningfully (information management), monitor awareness and understanding of information (monitoring), correct performance errors (debugging), and reflect on the effectiveness of strategies and performance efficiency post learning (evaluation) (Sungur, 2007a). Research with tertiary students has shown that there tend to be bigger discrepancies in regulation of cognition rather than knowledge of cognition; it seems that even when students have the necessary knowledge to regulate their performance, at times they do not translate this into effective metacognitive monitoring strategies and regulatory actions (Carvalho, 2010). This points to the importance of motivation in propelling the self-regulation process. It also indicates that while some students are inherently metacognitively aware and make use of effective strategies, others require a lot more prompting and a facilitative environment (Carvalho, 2010; Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Lin & Lehman, 1999).

An explication of the learning strategies harnessed by the self-regulated learner follows. Three broad categories of strategies are identified including: *cognitive and metacognitive learning strategies*, *metacognitive self-regulatory strategies*, and *resource management strategies* (Pintrich & De Groot, 1990; Pintrich, 1999). These strategies are employed as a means to select, categorise, and assimilate new information into an existing knowledge base (Paulsen & Gentry, 1995). In terms of *cognitive and metacognitive learning strategies*, rehearsal, elaboration and organisational strategies are considered to be of great significance within learning environments (Pintrich, 1999; Pintrich & De Groot, 1990). *Rehearsal* involves the repetition (often verbal) of items one has to learn; while not a very sophisticated strategy, it is useful in assisting a student to attend to specific information and keep such information in working memory. The passive highlighting or underlining of text could also be considered a rehearsal strategy (Hofer et al., 1998). *Elaboration* strategies refer to a type of active note-taking in which the individual re-frames and captures the main ideas in a text, connects ideas and makes links, explicates concepts to another learner, and proactively engages in questioning and answering techniques. It also encompasses the ability to incorporate new information into acquired knowledge structures (Paulsen & Gentry, 1995). *Organisation* includes the ability to pinpoint the main idea in a text and create a sense of structure by clustering and organising themes and main concepts (Pintrich, 1999). Elaboration and organisation are considered to be strategies that allow for deeper information processing (Wolters et al., 1996). Pintrich et al. (1991) further identified *critical thinking* as an important cognitive learning strategy. This strategy concerns the degree to which an individual is able to draw on the use of their previous knowledge as a reference when solving problems in novel contexts.

Meta-cognitive self-regulatory strategies comprise planning, monitoring, and regulating and refer to the ability to control the self-regulation aspects of metacognition, thus excluding metacognitive knowledge (Pintrich et al, 1991). *Planning* strategies enable a learner to determine how best to deploy their cognitive strategies. Planning involves task analysis, setting goals, and priming appropriate aspects of prior knowledge in order to facilitate comprehension and organisation. Planning may include such activities as setting study goals, skimming a text before reading, analysing a task prior to completing it, and generating questions before reading a chapter. *Monitoring* includes such elements as actively tracking one's attention and comprehension during reading or listening exercises, testing one's understanding of content, and utilising test-taking strategies such as monitoring time and pacing oneself during examinations. Continual and active monitoring exposes lapses in concentration or comprehension as one always evaluates against a set criterion, this then allows a learner to re-focus and correct their behaviour through the use of *regulation* strategies, for example, slowing the pace when reading difficult material that has not been understood during the initial reading, or reviewing course material that has not been fully grasped (Hofer et al., 1998; Pintrich, 1999). The meta-cognitive self-regulatory strategies overlap with and link very closely to the metacognitive awareness component of *regulation of cognition*, in that they represent the practical strategies one can deploy to enact the awareness and thus the most common actions by which such awareness is evaluated.

Finally, *resource management strategies* encompass all the strategies used to oversee and control one's environment to ensure successful adaptation and to accommodate changes in order to present a better fit with stated goals and needs, for example, controlling one's time, study environment, effort expended, and making use of more-knowledgeable others when required, such as peers and teachers. It also comprises support systems, which includes help-seeking behaviour (Pintrich, 1999). The use of resource management strategies has been directly linked to performance at the tertiary level (Borg, Mason, & Shapiro, 1989; Paulsen & Gentry, 1995).

Table 1: The organisation of learning strategies in the Motivated Strategies for Learning Questionnaire (MSLQ)

Cognitive and Metacognitive Strategies	**Metacognitive Self-Regulation**	**Resource Management Strategies**
Rehearsal Strategies	Planning Strategies	Time and Study Environment Management
Elaboration Strategies	Monitoring Strategies	Effort Regulation
Organisation Strategies	Regulating Strategies	Help Seeking
Critical Thinking		Peer Learning

Metacognition is clearly a multi-faceted construct (Schraw, 2001). As the discussion shows it broadly encompasses one's knowledge of their thought processes; awareness of how to control and regulate these thought processes; and the ability to deploy strategies that enable active engagement in the learning process through self-observations, monitoring, and reflections and control over one's learning and desired academic performance. The metacognitively aware learner has a wealth of information and knowledge regarding how best to understand and control their learning and thinking processes. With this crucial knowledge at their disposal, and with self-regulation as their objective, they are able to deploy a range of cognitive, metacognitive, and resource management strategies that enable them to proactively control and regulate their learning, all the while being influenced by motivational facets of learning. Carvalho (2010) notes that deficits in metacognitive knowledge can impede effective monitoring, evaluation, and regulation of learning activities.

Metacognition is deemed to encompass both monitoring and control aspects, yet the distinction between these two components often becomes blurred; importantly, metacognitive knowledge and experiences are seen as the manifestations of the monitoring function (Flavell, 1979), while the use of metacognitive strategies is thought to be an aspect of the control function (Brown, 1978, as cited in Efklides, 2006). In attempting to differentiate between metacognitive awareness and cognitive and metacognitive learning strategies, there appears to be considerable overlap between the two, particularly when comparing the *regulation of cognition* aspect of meta-cognitive awareness with *cognitive and meta-cognitive learning strategies*. It is clear that many similar strategies are employed across the two dimensions. However, what is apparent in the discussion is that an individual could not implement specific cognitive and metacognitive strategies without first having knowledge of the intricacies of one's thought processes and in-depth awareness and knowledge of how best to regulate one's cognition in a broader sense. This very awareness of one's ability to engage with their thinking and learning seems to occur at a much deeper meta-level. Metacognitive awareness thus seems to be based on a more considered, measured application of metacognitive knowledge and regulation when compared to the regulation prompted by the metacognitive strategies (Vrugt & Oort, 2008). It thus seems that metacognitive awareness underpins the emergence of the cognitive and meta-cognitive strategies that enable the actualisation of self-regulation.

Contemporary research has highlighted that the distinctions between metacognition, self-regulation, and self-regulated learning often become blurred, as these constructs are so highly inter-related and all tap the domain of self-awareness, self-reflection, and purposeful action. A common thread in each is the desire to monitor one's thoughts and judgements and gain control over one's actions. However intertwined though, each construct has subtle nuances that should make it meaningfully distinct

(Kaplan, 2008). Metacognition seems to be more confined to the cognitive realm and the individual's mind is considered the catalyst for judgements and appraisals whereas self-regulation focuses more on the dynamic interaction between the person and their environment, and it is the environment that is thought to trigger self-awareness and regulatory action. The construct of self-regulated learning contextualises the processes of metacognitive and self-regulation strategies within the academic sphere and most models of self-regulated learning subsume metacognition and self-regulation as key processes influencing learners' endeavours (Al-Harthy & Was, 2010; Dinsmore, Alexander, & Loughlin, 2008). Thus while such constructs should not be viewed as interchangeable, it seems plausible to conceive of them as falling under a broader overarching conceptual term of self-regulated human action (Kaplan, 2008).

Research has shown that metacognitive knowledge contributes to successful problem-solving over and above that of IQ and task-relevant strategies. There appears to only be a modest correlation between metacognitive knowledge and ability, which suggests that an individual could possess high regulatory knowledge, no matter what their level of ability (Schraw, 1998; 2001). This finding is promising in light of efforts to teach metacognitive and self-regulation strategies as it implies that all learners can benefit from such instruction. In accordance, other research has shown that metacognitive skills are closely associated with performance over and above intellectual ability; in such studies intellectual ability was noted to account for ten percent of the variance in learning, while metacognitive skills accounted for a further seventeen percent of the variance in learning; together, intellectual ability and metacognitive skills account for an additional twenty percent of the variance in learning. This finding is linked to learners of different ages and backgrounds, and for various tasks and domains. These results suggests that learners may be able to use their metacognitive skills, to some degree, to compensate for lowered inherent cognitive abilities (Veenman & Spaans, 2005; Veenman et al., 2006). Research findings of this nature generally favour a mixed model conceptualisation of intelligence. These models postulate that metacognitive skills and knowledge are closely associated with intellectual ability, but only up to a point, as they seem to have value on top of intellectual ability in terms of predicting learning. Rather than being conceived of as a part of intellectual ability, it is hypothesised that metacognition develops alongside intellectual ability (Veenman & Spaans, 2005). While the relationship between intellectual ability and metacognition is not yet conclusive and debates are ongoing as to how the constructs are conceptualised, findings of this nature continue to re-iterate the importance of metacognition in performance.

Metacognition, Motivation, and Academic Performance across Different Assessment Tasks

In understanding metacognition as adaptive, it seems plausible that the use of one's metacognitive skills may depend on the requirements or the context of the task. Learners may engage in more metacognitive processes for tasks requiring higher levels of critical appraisal and reasoning; and the use of their metacognitive strategies may enable them to better regulate their actions. Short-answer questions, for example, require more self-observation, evaluation, and processing as the individual formulates their answer, whereas in multiple-choice questions the individual merely has to rely on information retrieval and then selects the appropriate alternative (Carvalho, 2010).

Motivation to achieve can also be impacted by the nature and setting of the task. Research has shown that high performers with high metacognitive skills tend to be more precise and consistent in their confidence judgements, pre- and post-testing, across multiple-choice, short answer, true-or-false, and essay-type questions (Carvalho, 2010). Low achieving learners tend to be over-confident in their performance predictions pre- and post-testing (Carvalho, 2010), which suggests that they may not see the need to actively self-regulate and control their actions. Metacognitively high learners also tend to engage in more effective test preparation practices, show better performance, and make use of more efficient attributional, regulatory and monitoring processes overall as compared to learners with low-metacognitive skills (Carvalho, 2009). In a cyclical fashion, a learner's metacognitive skills play an important role in making evaluations and attributions; thereby impacting motivation and the choice to engage in different strategies; all of contributes significantly to performance on different assessment tasks (Carvalho, 2010).

Much of the research on academic performance has either focused on performance overall, or on performance as measured by a specific task. In being interested in better understanding the role of metacognition and motivation in predicting academic performance across various assessment tasks, this research aimed to gauge academic performance on a Psychology One course from numerous sources including: an overall weighted average; multiple-choice questions (MCQ's) taken from the mid-year examination; short questions drawn from two tests; and performance as gleaned from two essays. The overall weighted average and multiple choice questions (exams) are considered to be summative in nature. The essays are considered primarily formative in nature with some summative elements in that feedback is provided and is then meant to be used to guide future efforts. Similarly, short-test questions are both summative and formative in nature, as they both assess performance outcomes and provide feedback for examination performance. It is posited that different assessment formats may play a role in determining academic performance, especially when comparing learners who are metacognitively aware and motivated to succeed and learners who are less motivated and less

metacognitively aware. Findings from this research could also allude to the importance of assessing learners via various methods and formats.

Conclusion

While there has been much research carried out on learning and performance variables, as well as the components of self-regulated learning, these processes are complex and multi-faceted and thus require ongoing investigation to ascertain the unique relationships between core variables, as well as the nuances between different individuals. It is evident that the key in understanding academic performance lies in evaluating the intricate and dynamic relationships between those components deemed essential in regulating and sustaining learning. Metacognition and motivation are at the core of learning and performance. Metacognition is a key predictor of learning (Wang, Haertel, & Walberg, 1990); and is linked to performance at all levels of education (Bakracevic Vukman & Licardo, 2010). Metacognitively aware learners are more actively and cognitively engaged, suggesting that they will think deeply and critically about the content of a task, the strategies at their disposal, and their own ability to complete the task (Linnenbrink & Pintrich, 2003). Motivation has been shown to impact student behaviour and task engagement through influencing task selection, effort investment, and perseverance (Schunk & Zimmerman, 2008). The motivational variables of self-efficacy, achievement goals, and intrinsic goal orientation have been shown to bear influence on an individual's selection of cognitive and metacognitive strategies (Palos et al., 2011). The need to examine the complex relationships between metacognition and motivation in predicting performance has been explicated. Such information will be pivotal in gaining a better understanding of learners and the various strategies they employ. It will also lead to useful information that could be used to guide instruction. There seems to be minimal research on such variables within the South African context, and particularly at the tertiary education level; and thus, this study is in a position to offer insights that can add to the existing literature base.

The Current Study

Metacognition and motivation are fundamental aspects of the self-regulated learning process, and are clearly linked to enhanced performance; hence they are the core focus of this study. In light of the importance of these variables in the educational realm, this research aimed to initially investigate the relationship between metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation. While metacognitive awareness and the use of cognitive and metacognitive learning strategies are closely tied together, and both represent measures of metacognition overall; these two variables were separated out in this research due to the fact that they purport to measure different aspects: metacognitive awareness encompasses knowledge of cognition and regulation of

cognition which underpin self-regulation at a deeper meta-level; while the use of cognitive and metacognitive learning strategies examines the actual strategies individual employ when self-regulating – it is posited that metacognitive awareness underpins the use of strategies at a much deeper meta-level. These variables were also measured by independent instruments; which purport to measure different aspects of cognition; and thus allowed for these variables to be examined separately.

A second aim was to better understand the nature and strength of the relationship between each of the variables - metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation – as they pertain to academic performance. Based on a review of the research findings, it was hypothesised that these variables would be positively related to academic performance.

A third objective was to examine whether each of these variables play a role in predicting academic performance on different assessment tasks for first-year Psychology students. Performance was gleaned from various assessment tasks, namely: two essays, multiple-choice questions taken from the examination, and short-questions taken from two tests, as well as an overall weighted average. It was hypothesised that performance, and the use of metacognition and metacognitive strategies and motivational variables, might differ based on the requirements of the assessment task. In light of research findings indicating the importance of socio-economic status, type of schooling (public government or private school), and home language in impacting academic performance, these variables were also included in terms of ascertaining their role in predicting academic performance on the different assessment tasks.

CHAPTER THREE: METHODOLOGY

Research Design

This research employed a non-experimental, correlational research design (Welman & Kruger, 2001). Such designs are considered advantageous in that they provide a realistic account of the nature of variables as they play out within a given context and thus serve to extend knowledge of multivariate relationships however, the lack of random assignment, manipulation of variables, and intervention within such designs limits the ability to make causal inferences (Johnson, 2001; Welman & Kruger, 2001). When knowledge pertaining to a particular subject area is quite immature in nature, it is appropriate to first conduct correlational analyses to determine the nature and extent of the relationships between variables; such information allows for the generation of hypotheses that can then be examined in follow-up experimental-type research (Thompson, Diamond, McWilliam, Snyder, & Snyder, 2005). As the core intention in this research was to explore the existing relationships between metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation, as well as how these relate to academic performance, a correlational research design was deemed most appropriate. In addition, the research sought to investigate the role of each variable in predicting academic performance across different assessment tasks. The variables in this study were not manipulated in any way, and there was no intention to draw causal inferences.

This study also made use of questionnaires to gather the data; questionnaire-based research allows ease of access to a large sample, and also ensures the anonymity of participants (Rosenthal & Rosnow, 1991). The self-report nature of the questionnaires is useful in eliciting specific information pertaining to the use of variables in particular contexts; however a major disadvantage is that participants may not have the self-awareness and self-knowledge to provide accurate reports (Welman & Kruger, 2001).

Sample

This study made use of a non-probability, convenience, volunteer sample of first-year university students (Welman & Kruger, 2001). First-year Psychology students were selected as this course generally attracts a diverse cohort of students from various faculties and fields of study. Based on the researcher's aim to examine whether metacognitive awareness, use of cognitive and metacognitive learning strategies, and motivation play a role in predicting academic performance in students who are learning to adjust to the requirements of tertiary education, Psychology One was selected as the course of choice, as it attracts a large number of new students from various faculties. In addition, the

course offers a range of assessments appropriate for examining different types of academic performance. This research did not impose restrictions as to who could participate; any students willing to volunteer to participate were permitted to do so, and the only requirement was that the student was registered for Psychology One. In line with Psychology Department practice, any first-year student participating in this research project was eligible to obtain a stipulated course credit. Students were thus aware of the course credit prior to volunteering to participate; this factor was taken into consideration in terms of its potential effects on the generalizability of the research findings.

The final sample consisted of 268 first-year students from the University of the Witwatersrand, enrolled in the Psychology One course. As shown in Table 2 below, the students ranged between 17 and 55 years, with the mean age of 19.41 years. There was a preponderance of females as they comprised 78% of the sample. The sample was made up of a larger percentage of black participants (60.82%), and thereafter white participants (23.88%). Of the sample, 42.91% indicated that English was their home language. There were a host of other home languages that were reported which are presented in order from highest to lowest frequency including: Zulu (14.93%), Sepedi (7.46%), Sesotho (7.09%), Setswana (5.60%), Shona (4.85%), Xhosa (4.48%), Xitsonga (3.73%), Siswati (2.24%), Venda (2.24%), Swahili (1.49%), Afrikaans (1.12%), Ndebele (1.12%), Chinese (0.37%), and Serbian (0.37%). Most of the participants were from the Faculty of Arts (71.70%); some participants were also drawn from the Faculty of Science (14.34%), and the Faculty of Law (11.32%). For the majority of the sample (80.52%), it was the first time they were completing their first year of university. In addition, the vast majority (97.75%) were completing Psychology One for the first time. For 42.11% of the students, Psychology was their major. In response to a question that asked about how well they were coping with the requirements of the year, 46.62% reported a good capacity to cope, while 38.35% claimed to be coping only fairly well. Participants were also required to provide an estimate of their previous academic performance. Of the sample, the majority (31.02%) recorded previous academic performance ranging between 65-70%; a further 22.04% noted previous academic performance between 70-75%; 18.78% cited previous academic performance between 60-65% and a further 15.92% noted previous performance between 75-80%.

The distribution of the sample with regards to type of school attended (public or private school) revealed that the majority (61.60%) attended a government school, while 38.40% attended private schooling. Estimated socio-economic status was coded to represent two categories – high (48.47%) and low (51.53%) (NESES). Home language (NHLANG) was coded in a nominal fashion, representing English (42.91%) and Non-English (57.09%) as the two categories. Type of Schooling

(TYPE SCHOOL) was also nominal representing Public (61.60%) and Private schools (38.4%) as the two categories.

Table 2 – Sample Demographics

Age	Mean	Std Dev	Minimum	Maximum		
	19.4	3.15	17	55		
Gender	Male	Female	N			
Frequency	59	209	268			
Percent	22.01	77.99				
Race	Asian	Black	Coloured	Indian	White	Other
Frequency	5	163	19	15	64	2
Percent	1.87	60.82	7.09	5.60	23.88	0.75
Degree	Arts	Commerce	Science	Law	Health Sciences	
Frequency	190	6	38	30	1	
Percent	71.70	2.26	14.34	11.32	0.38	
Home Language	English	Zulu	Sepedi	Sesotho	Setswana	Shona
Frequency	115	40	20	19	15	13
Percent	42.91	14.93	7.46	7.09	5.60	4.85
Type of School	Public	Private		**Socio-Economic Status**	High	Low
Frequency	162	101			127	135
Percent	61.60	38.40			48.47	51.53

Instruments

The study made use of three instruments: a self-developed demographic questionnaire, the Metacognitive Awareness Inventory (MAI), and the Motivated Strategies for Learning Questionnaire (MSLQ).

Demographic Questionnaire

The demographic questionnaire (Appendix B) gleaned information used to describe the sample and within certain analyses. Information requested included: age, gender, race, home language, degree being studied, type of schooling attended (public or private), and socio-economic status (estimated using parental occupation and level of education). The measure used to estimate socio-economic

status in this research was the Barratt Simplified Measure of Social Status (BSMSS). This measure is based on Hollingshead measure of social status which was based on marital status, employment status, educational level, and occupational prestige. For the Simplified Measure, certain changes were made to Hollingshead's measure including that the list of occupations was updated; and that the parent's educational and occupational level were combined with the individual's own family's educational and occupational level. The measure does not purport to provide an absolute account of SES, but rather an estimate; the data yielded is also of a purely ordinal nature. The nature of the data ensures that it can be used successfully in regression analyses (Barratt, 2006).

The participants were also required to respond to additional questions that centred on: (a) their motivation to complete the first-year Psychology course – whether for credit purposes or as part of their chosen Major; (b) whether or not it was their first time as a first-year student; (c) if it was the first time they were completing Psychology One and (d) how well they felt they were adjusting/had adjusted to the academic requirements of university. In addition, participants were asked to provide a self-estimation of their general academic performance. This question was in the form of a forced-choice response. Additionally, participants were asked to provide a list of their Grade 12/Matric subjects taken and symbols/marks achieved. The information about previous and estimated academic performance served to provide important background information about the participants.

The performance variable in this research was determined by accessing students' mid-year marks for Psychology One both overall and on three types of assessment tasks. These assessment tasks included: multiple choice questions taken from the examination which were summative in nature, two essays which were primarily formative in nature yet also contained a summative aspect, and short questions taken from two tests which were both formative and summative in nature, as they provided feedback that was then meant to be taken heed of.

As a means to gain access to students' marks, participants were asked to provide their student numbers. A separate student number sheet appeared on the first page of the demographic questionnaire. This page contained a random participant number and was detached and then given to a third party who used the student number to access the respective participant's marks. Marks were then linked to the appropriate participant number and the student number discarded. Thus, at no stage was the researcher able to link specific participants' identities with their respective marks.

Metacognitive Awareness Inventory (MAI)

The Metacognitive Awareness Inventory (MAI) (Appendix C) is used to measure students' metacognitive awareness. This 52-item, self-report inventory is categorised into eight subcomponents subsumed under two broad categories: K*nowledge of Cognition* and R*egulation of Cognition*. The Knowledge of Cognition subscale assesses an individual's awareness of their strengths and weakness, as well as their knowledge about strategies and when best to deploy these. It includes three subcomponents, namely, Declarative Knowledge, Procedural Knowledge, and Conditional Knowledge. Regulation of Cognition gives insight into the way in which individuals plan, implement strategies, monitor and make amendments, and evaluate their learning overall. This scale includes five subcomponents, namely: Planning, Information Management, Comprehension Monitoring, Debugging, and Evaluating. Originally participants were required to respond to the questions on a True-False scale however the scale has subsequently been used with multiple response formats (Bendixon & Hartley, 2003; Kincannon, Gleber & Kim, 1999: Schraw & Dennison, 1994). In this study, participants were asked to respond on a five-point Likert-type scale ranging from 'Always true of me' to 'Never true of me'.

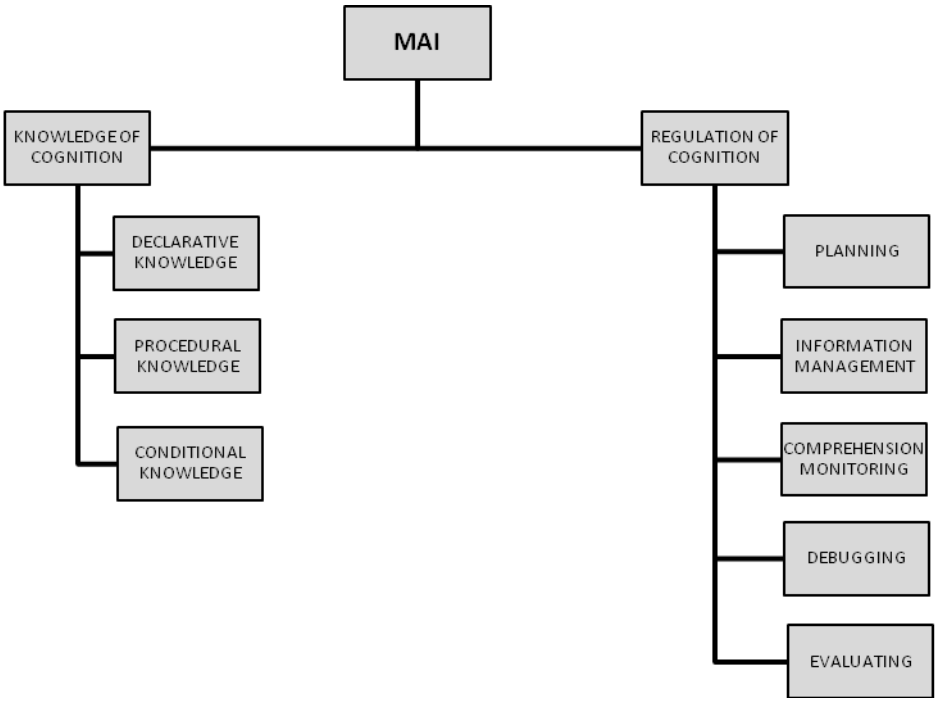

Figure 1: Metacogntive Awareness Inventory (MAI) Structure

The internal consistencies of the two subscales, Knowledge of Cognition and Regulation of Cognition, range between 0.93 and 0.88 (Schraw & Dennison, 1994; Sungur, 2007a). In a study conducted by Kleitman and Stankov (2007) the MAI showed a high reliability estimate of Alpha equals 0.93 and in the study conducted by Bendixon and Hartley (2003) the Alpha obtained was 0.86.

The scale is widely used to assess metacognitive awareness and has been shown to be both reliable and valid (Sungur, 2007b). Research conducted by Young and Fry (2008) found significant correlations between the MAI and broad measures of academic achievement; results also linked the knowledge of cognition factor with end of year grades and GPA; both of which provided support for the validity of the MAI in terms of its association with academic measures. The MAI does not seem to have been utilised widely within the South African context and hence it was imperative to assess the reliability of this instrument within the current study.

Motivated Strategies for Learning Questionnaire (MSLQ)

The Motivated Strategies for Learning Questionnaire (MSLQ) (Appendix D) seeks to identify tertiary-level students' learning strategies and motivational orientations as they pertain to a specific course. The questionnaire is based on a general cognitive view of motivation and learning strategies; learners are conceived as active information processors whose affective states, beliefs, values, and cognitions play a crucial mediating role (Pintrich, Smith, Garcia, & McKeachie, 1993). Taking into account the fact that learning strategies and motivation levels may vary across different tasks and courses, thus exposing the difficulty in assessing global self-regulation and motivation, the MSLQ provides a measure at the course level, thereby ensuring more generalizability than would be gained from an analysis at the task level (Pintrich, 2004).

The questionnaire is an 81-item, self-report measure that comprises two main subscales. The Motivation subscale is based on a social cognitive model and consists of 31 items that assess students' goals and value beliefs for a particular course. The Learning Strategies is based on a general cognitive model of learning subscale and includes 31 items that centre on students' use of various cognitive and metacognitive strategies and a further 19 items that tap into students' management of various learning resources (Kivinen, 2003; Pintrich et al., 1993). Each subscale is comprised of various subsections:

The *Motivation* subscale is comprised of the following subsections*:*

> *Value Components* focus on the reasons why learners engage in particular academic tasks. It includes *intrinsic goal orientation* (a focus on learning and mastery), *extrinsic goal orientation* (a focus on external affirmation, rewards, or grades), and *task value* (perceptions of how useful, interesting, and important the material is to the student).
>
> *Expectancy Components* centre on the student's perceptions of their ability to successfully complete a task. It is comprised of *control of learning beliefs* and *self-efficacy for learning performance.*

Affective Components tap into an individual's feelings of worry and concern about a task and consists of *test anxiety.*

The *Learning Strategies* subscale is comprised of the following subsections*:*

Cognitive and Metacognitive Strategies - cognitive strategies tap into a learners' use of basic and complex strategies for processing information, which include: *rehearsal*, *elaboration*, *organisation,* and *critical thinking.* Metacognitive self-regulation strategies centre on those strategies the learner uses to help control and regulate their own cognition, including *planning*, *monitoring,* and *regulating*.

Resource Management Strategies tap into the regulatory strategies for controlling resources other than cognition and include *time and study environment management* and *effort regulation.* The ability to use others as a key resource during learning is tapped by the subscales of *peer learning* and *help seeking* (Pintrich et al., 1993).

The MSLQ is in a Likert-type format and participants were required to respond to each item on a 5-point scale ranging from '(1) *not at all true of me,* to' (5) *very true of me'.*

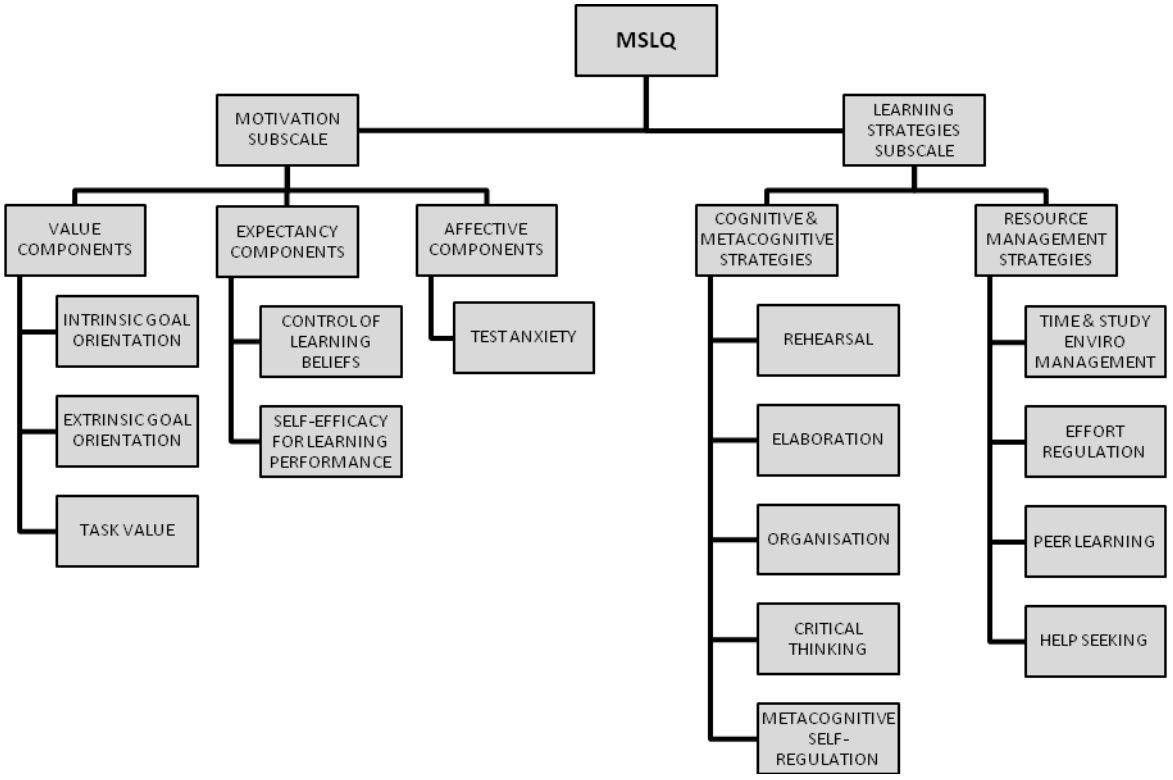

Figure 2: Motivated Strategies for Learning Questionnaire (MSLQ) Structure

The internal consistency scores for the Motivation subscale have been found to range widely - 0.90 (Task Value), 0.93 (Self-efficacy), 0.80 (Test Anxiety), 0.74 (Intrinsic Goal Orientation), 0.62 (Extrinsic Goal Orientation) and 0.68 (Control of Learning Beliefs); while the latter two subscales show more variability the overall factor analysis revealed that the model of motivational components consisting of six scales was a sound representation of the data (Pintrich et al., 1993). The internal consistency scores for the Learning Strategies subscale generally recorded Alpha coefficients above 0.70; however the following subscales showed more variability: 0.69 (Effort Regulation and Rehearsal), 0.64 (Organisational strategies), and 0.52 (Help Seeking). In other research, internal consistency scores range between 0.45 and 0.91 for the various components (Kivinen, 2003). In a study conducted by Artino (2007, as cited in Magwaza, 2009) internal consistency estimates of reliability ranged from 0.7 for nine of the fifteen subscales for learning and performance, with the largest Alpha obtained was 0.93 for self-efficacy. The remaining six scales recorded Alpha Coefficients of between 0.7 and 0.52. The MSLQ has also been used in numerous research studies in the South-African context. In a study conducted by Magwaza (2009), results for internal consistency reliability ranged between 0.72 and 0.9 for eleven of the fifteen subscales of the MSLQ and between 0.61 and 0.67 for three of the remaining four subscales, with only one subscale (Time and Study Environment (Alpha equals 0.40) not showing good internal consistency. Cronbach's Alpha Coefficients calculated by Payne (2008) showed 0.86 for the Motivation subscale, 0.89 for the Learning Strategies subscale, and 0.91 for the complete scale. In a study by McSorley (2004), the total reliability for the Motivation subscale was 0.73, while for the Learning Strategies subscale it was 0.88.

The validity of the scale has been assessed in the form of correlations with final grades. Correlations varied from -0.27 for Test Anxiety to 0.32 for Effort Regulation (Kivinen, 2003). In addition, correlations among the MSLQ scales revealed the following: the Value and Expectancy subscales, and subsections of Intrinsic and Extrinsic Goal Orientation, Task Value, Control of Learning Beliefs, and Self-efficacy were all positively correlated with one another with correlations ranging from 0.14 to 0.68. Test Anxiety was negatively correlated with Intrinsic Goal Orientation ($r = -0.15$), Task Value ($r = -0.14$), Control of Learning Beliefs ($r = -0.10$) and Self-efficacy ($r = -0.37$), but positively correlated with Extrinsic Goal Orientation ($r = 0.23$). All the Cognitive strategy and Resource Management scales were positively related to one another with correlations ranging from 0.1 to 0.7. Peer Learning and Help Seeking tended to be more weakly correlated with the Cognitive strategies and Resource Management strategies scales and ranged from -.10 to 0.28. The Motivational and Learning Strategies subscales were correlated in the expected directions. Furthermore, the motivational beliefs of Intrinsic Goal Orientation, Task Value, Self-efficacy, and Control of Learning Beliefs were positively associated with the use of Cognitive, Metacognitive, and Resource

Management strategies. Lastly, Test Anxiety was negatively related to the use of Cognitive, Metacognitive, and Resource Management strategies (Pintrich et al., 1993).

Procedure

Following ethical clearance granted by the University of the Witwatersrand Human Research Ethics Committee, the researcher obtained formal permission to conduct the research from the University of the Witwatersrand's Psychology first-year course co-ordinator and relevant lecturers. Once permission had been granted, the researcher drew up a summary of the research aims and placed it on the first-year noticeboard and blog in order to inform students about the research and generate interest in participation. Participants were informed that completion time would be in the vicinity of thirty to forty-five minutes and that they would be asked to reflect on their Psychology classes when completing the questionnaires. In consultation with the first-year course co-ordinator and lecturers, the researcher scheduled dates on which to attend the end of the lecture period for various first-year Psychology classes; the researcher then took between five and ten minutes to introduce the aims of the research and note conditions for participation and the rights of participants in the study. The process by which to obtain a proof of participation form, to be used for the purposes of obtaining course credit, was explained. Questionnaire packs were handed out immediately to interested participants.

The questionnaire packs contained a participant information sheet (Appendix A) detailing the specifics of the study as well as the participants' rights, the Demographic Questionnaire, the Motivated Strategies for Learning Questionnaire (MSLQ) and the Metacognitive Awareness Inventory (MAI). Participants were able to take their questionnaire packs away with them. Participants were informed at the time of handing out the questionnaire packs that they could return completed packs on stipulated days and times at a designated location in the Psychology department. Notification of the questionnaire hand-back dates, times, and location was placed on the first-year noticeboard and blog. In terms of following the process required for students to obtain credit for participation in a postgraduate research project, the researcher was stationed at the designated location during hand-back and completed a proof of participation slip with the student by filling in their student number and signing the form. Students were then asked to place their completed questionnaires in a sealed box, thus ensuring anonymity. If students did not wish to obtain proof of participation, they were informed that they could return the questionnaire directly to a sealed box in a central location in the Department of Psychology. Return of the completed questionnaire was considered as informed consent to take part in the study. Students were also informed that a summary of the results would be posted on the first-year noticeboard and blog once the research was completed.

Each questionnaire pack was assigned a random participant number as a means for identification. The only information that linked the participant pack to the specific participant was the student number, captured on the student number sheet of the demographic questionnaire. The student number sheet was detached from the rest of the questionnaire and was given to the third party who then accessed the participants' marks from a generated spread sheet listing the marks by student number only. Marks were then assigned to the appropriate participant number by the third party and the student number was removed. The third party had no access to the rest of the data, while the researcher at no time had simultaneous access to student numbers and participants' marks, thereby ensuring confidentiality of the participants.

Ethical Considerations

Ethical clearance for this study was obtained from the University of the Witwatersrand Human Research Ethics Committee – Clearance Certificate Protocol Number MEDP/12/005IH.

Participants in the study were provided with a participant information sheet that detailed the requirements of the study and conditions for participation; it also informed participants of their rights in the study (Appendix A). It was clearly stated upfront that participation in the study was completely voluntary. In line with stipulations as laid down by the first-year Psychology course co-ordinator and Psychology Department, students would be awarded some agreed-upon credit for participation in any postgraduate research project in the current academic year. Therefore participation in the study advantaged students in this way however students were not obliged to partake in this particular research project for the provision of the credit and thus participation remained strictly voluntary. Furthermore, the participant information sheet clearly stated that participation in the study was in no way mandatory, and that participants could withdraw from the study at any time up until the point when they handed in their completed questionnaire packs with no negative consequences. Participants were also clearly instructed in relation to the requirements for participation and time commitment involved.

The reason for the provision of student numbers as a means to obtain students' marks, and thus a measure of performance, was stated upfront. Participants were informed that the provision of their student number was in no way mandatory and that they could continue to participate in the study even if they chose not to provide their student number. The request for student number sheet (Appendix B) appeared as a separate page in the demographic questionnaire. Participants were informed that the provision of their student number would serve as a means to give permission to the researcher to have

a third party gain access to their Psychology One assessment marks recorded by student number only. Each completed questionnaire pack was assigned a random participant number which appeared on the student number sheet and respective pages of the demographic questionnaire. On collection of the data, the student number sheet was given to the third party to access the participants' marks. Marks were then given back to the researcher with the only identifying feature being the participant number. Thus, the researcher was in no way able to link participants with their respective marks. This process served to ensure that students' confidentiality and anonymity was upheld. After retrieving the participants marks, the student number sheets were destroyed. Contact details for the researcher and research supervisor were provided on the participant information sheet in the event that the participants required further information. The participant information sheet was detachable and thus participants were able to keep the sheet for their perusal. Completion and hand-in of the questionnaire packs by participants was regarded as informed consent to take part in the study.

No individual feedback was provided to the participants in the study. However, participants were informed on the participant information sheet that following completion and final hand-in and grading of the research report, a one-page summary of the main findings of the research will be placed on the Psychology first-year noticeboard and blog; central locations that all students can readily access. Those participants who might be interested in obtaining a more in-depth version of the research findings were informed that they could do so by emailing the researcher at the email address provided on the participation information sheet and requesting such feedback. Feedback would then be emailed to the participant. No individual feedback would be available, as responses in this research were anonymous.

The information obtained in this research was not considered to be of a highly sensitive nature and thus no harm to participants was expected. Regarding the storage of raw data, the researcher has ensured that all completed questionnaires are securely stored in a locked cupboard. These will be destroyed on completion of the research and publication, although a coded spreadsheet capturing the data anonymously will be maintained indefinitely.

Data Analysis

Descriptive statistics were used to describe the data set and sample; frequencies, means, minimum and maximum range scores, and standard deviations were used. It was first necessary to examine the data in detail before running any in-depth analyses (Howell, 2002). Prior to conducting the technical

analyses, it was necessary to establish whether the data was suitable for parametric statistical analysis and whether the instruments in the study (MAI and MSLQ) were reliable and valid.

Checks on Parametric Assumptions

In order to answer the research questions, the study intended to use parametric statistical analyses- Pearson's correlations and regressions. It was therefore imperative to check whether the data met the criteria for conducting parametric statistical analyses.

The first assumption for parametric correlation and regression is that the key variables produce interval-scale data (Howell, 2002). Both instruments used in this study were based on a 5-point Likert type scale; the MAI measure ranged from 'Always true of me' to 'Never true of me', while the MSLQ measure ranged from 'Not at all true of me' to 'Very true of me'. The MAI has a total of 52 items and the MSLQ has a total of 81 items. In both the MAI and MSLQ subsections there are a minimum of 4 items per section, with the only exception being the Peer Learning subsection on the MSLQ which has a total of 3 items. Due to the number of items per subsection, it is assumed that the subsections, subscales, and total scale had at least an interval scale of measure. Thus, the data from each instrument was deemed to be interval in nature. In addition, the marks obtained for academic performance were obtained in the form of percentages, which are interval in nature. It was therefore assumed that all of the key variables in the study were interval in nature and that the first parametric assumption was met.

The second parametric assumption is that the data must be normally distributed (Howell, 2002). The MAI and MSLQ data were checked by running Kolmogorov-Smirnov tests for normality. The performance measures for this research, captured by the test marks, examination mark and essay marks, as well as an overall weighted average, were also checked for normality using Kolmogorov-Smirnov tests. The p-values of the Kolmogorov-Smirnov tests were examined and values that indicated p-values greater than 0.05 were categorized as normal (Ahad, Yin, Othman, & Yaacob, 2011; Wilcox, 1997). Histograms for the data sets were also closely examined to see whether the data revealed a normal distribution. Normally distributed data displays a symmetric bell-curved shape, with the highest frequency in the middle, and lower frequencies tapering towards the extremes (Ahad et al., 2011). Overall, the results revealed that the majority of the data was normally distributed; however there were some results indicating data that was skewed. In these instances, the histograms, skewness, and kurtosis measures were carefully scrutinised. Overall the data did not seem to be skewed to a great extent. Further, in accordance with the central limit theorem that states that

distribution will approach normality as the sample size increases (Howell, 2002); the sample size in this research was deemed large enough to compensate for the slightly skewed nature of some of the data. Overall the data was assumed to have an acceptable level of normality to run the parametric analyses.

The third parametric assumption is that the variance between the groups is equal (Howell, 2002). However, it is noted that this assumption is not necessary for regression and correlation analyses. The final parametric assumption is that the sample is both random and independent (Howell, 2002). This research made use of a non-probability, convenience volunteer sample. In light of ethical constraints such as informed consent and the impracticality of random selection, it is acknowledged that it is extremely difficult to obtain a random, independent sample in a psychological research study. As is common in psychology, this criterion has therefore been assumed to be met in order to allow parametric statistical analyses to be run (Welman & Kruger, 2001).

Based on the evaluation of the parametric criteria overall, it was deemed appropriate to run parametric analyses with the data.

Reliability and Validity of the Instruments

Prior to conducting the parametric analyses, it was first necessary to check the reliability and validity of the research instruments; especially in light of the fact that while the MAI and MSLQ have been used extensively in the international research market, they still seem to have fairly limited usage in the South African context. Cronbach's Alpha Coefficients were calculated for the subscales of each of the main scales for both the MAI and MSLQ. These coefficients report on the internal consistency of the items, and thus the degree to which each item is related to all other items in the same scale (Rosenthal & Rosnow, 1991). An Alpha co-efficient of 0.7 or higher is considered to be an indicator of acceptable reliability (Miles & Banyard, 2007).

Statistical Analyses to Answer the Research Questions

Pearson's correlations and regression were deemed appropriate to answer the research questions. In order for these analyses to be conducted, several additional assumptions needed to be met. The first criterion was homogeneity of variance, which assumes that variance in the dependent variable for each value of the independent variable/s is constant (Howell, 2002). The second assumption was that the data was normally distributed. The distribution of the data was examined by looking at the

Kolmogorov-Smirnov scores, as well as the histograms. Both of these assumptions were assumed to be met in this study.

In order to answer the research question that aimed to understand the relationships between metacognitive awareness, use of cognitive and metacognitive learning strategies, and motivation, the study made use of Pearson's Product Moment Correlations. In answering the research question that aimed to understand the nature of the relationships between each of these variables and academic performance, Pearson's Product Moment Correlations were also used. These correlations were run with data obtained from the MSLQ and MAI in order to give an indication of the nature of the relationships between metacognitive awareness and academic performance; use of cognitive and metacognitive learning strategies and academic performance; and motivation and academic performance both overall and across the range of assessment tasks. Correlations range between -1.00 and +1.00 and indicate the extent to which a change in one variable is associated with a change in the other variable. A value of +1.00 indicates a perfect positive relationship suggesting that an increase in the one variable would bring about a predictable increase in the other variable; in contrast, a value of -1.00 would suggests a negative relationship and thus an increase in the one variable would elicit a predictable decrease in the other (Rosenthal & Rosnow, 1991).

The final research question aimed to investigate the role of metacognitive awareness in predicting academic performance; use of cognitive and metacognitive learning strategies in predicting academic performance; and motivation in predicting academic performance on different types of assessment tasks. In order to answer this research question, regression analyses were conducted. Multiple regression was selected as the statistical technique as this enabled an analysis of the predictive value of several independent variables to a dependent variable; it also gave further insight into how variables were related in terms of their strength and direction as a predictor (Howell, 1999; Welman & Kruger, 2001). In this study, regressions were run with the performance marks (examination mark, test marks, essay marks, and overall weighted average) as the dependent variable and the independent variables included demographic variables, MSLQ subsections, subscales, and overall total, and the MAI subsections, subscales, and overall total. The demographic variables included in this study were home language, estimated socio-economic status, and type of schooling (public or private). These variables were also examined in terms of their predictive ability with regards to academic performance across different assessment tasks. An important consideration when conducting multiple regression is the extent of correlation among the predictors themselves; if the predictors are highly correlated, multicollinearity can occur; in such an instance, the regression equation is deemed quite unstable and the value of interpretation is hampered as the predictors are too closely related (Howell,

1999). Multicolinearity between the predictor variables in the study was assessed using the results of the correlations and multicolinearity analysis in the regression.

In all the analyses for this study, the significance level was assumed to be 0.05. All statistical analyses were conducted using the statistics programme SAS Enterprise Guide 4.3. This programme allowed for the coded data to be imported from Microsoft Excel and thereafter a range of statistical analyses to be run.

CHAPTER FOUR: RESULTS

This chapter provides an overview of the results obtained in the statistical analyses in this study. Initially, descriptive statistics are presented in order to describe the interval variables of the data set. The means, standard deviations, and range of minimum and maximum values are provided. Descriptive statistics, as well as the Kolmogorov-Smirnov p-values, are provided to show the data that the evaluation of normality was based on. Thereafter, to answer the first research question, the results of the correlation analyses are provided to detail the extent and nature of the relationships between metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation. In answering the second research question, correlations are presented to show the nature and extent of the relationships between each of the variables - metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation - and academic performance on different assessment tasks. Finally, through multiple regression analyses, the research examines the role of each of the variables - metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation - in predicting academic performance on different assessment tasks. The regression analyses also take into account the predictive role of the following demographic variables - estimated socio-economic status, type of schooling (public government or private), and home language – with regards to predicting academic performance on different assessment tasks. (In reviewing the data in the Tables and Appendices, please refer to Appendix E for a list of Abbreviations).

Summary Statistics

Summary statistics in this study are provided for the performance variables and the two instruments. The Kolmogorov-Smirnov p-values are reported alongside other descriptive statistics to show the data upon which the evaluation of normality was based. In addition, histograms are presented in Appendix F to illustrate the distribution of the data for each of the instruments and their subscales and subsections, as well as the performance variables.

Performance in this study was gleaned from different assessment tasks (two essays, multiple choice questions taken from the examination, and short questions taken from two tests), as well as an overall weighted average. The descriptive statistics for the performance variables provide the mean, standard deviation, minimum, and maximum ranges for each of these variables. As seen in Table 3 below, the average performance on the mid-year examination ($M = 59.28$; $SD = 16.28$) was much lower than the average performance on any of the tests or essays. This is expected given that the examination carries more weight in terms of the year mark overall, and is typically associated with more diverse content

areas, more stringent assessment conditions, and increased pressure and anxiety. The range of scores for the examination fell between 19.74 and 94.74. There was not a lot of disparity between the means for Test 1 (M = 68.71; SD = 16.79) and Test 2 (M = 66.94; SD = 16.81). The mean for Essay 2 (M= 70.63; SD = 15.10) was however marginally higher than that of Essay 1 (M = 67.85; SD = 11.44). The mean for the weighted average was 65.46, with a standard deviation of 11.79. The range of scores for the overall weighted average for Psychology One students ranged between 29.37 and 93.91. When examining performance on the essays and tests it is useful to note that the first test and essay are generally considered to cover more basic, introductory Psychology and research concepts and constructs; the second test and essay, on the other hand, are rooted in Cognitive Psychology concepts and deal with the more complex constructs and principles of Neuropsychology. The lack of difference in performance between the first and second test is thus quite surprising; the difference between the essays seems more plausible as students would have received some feedback from their first essay to guide their efforts on the second essay and thus some increase in performance would be expected; essays also do not have the imposition of time pressure as tests do.

Table 3: Summary statistics for the performance variables

Variable	Mean	Std Dev.	Minimum	Maximum	N	Kolmogorov-Smirnov p-value
Test 1	68.71	16.79	0	100	268	0.0290
Test 2	66.94	16.81	16	98	268	0.0170
Essay 1	67.85	11.44	0	98	268	< 0.010
Essay 2	70.63	15.10	0	98	268	< 0.010
Examination	59.28	16.28	19.74	94.74	268	> 0.150
Weighted Average	65.46	11.79	29.37	93.91	268	> 0.150

The descriptive statistics for the main subscales, subsections, and overall totals for the two assessment instruments, the MAI and MSLQ, follow.

For the MAI (please refer to Table 4 below), the Knowledge of Cognition subscale ranged between 32 and 82, with a mean of 64.18 and a standard deviation of 8.60; while the Regulation of Cognition subscale ranged between 56 and 167, with a mean of 126.01 and a standard deviation of 18.85. Results for the MAI scale overall showed a range between 95 and 247, with a mean of 190.20 and a standard deviation of 26.07. The summary statistics for each subsection of the subscales is detailed below.

Table 4: Summary statistics for the MAI

Variable	Mean	Std Dev.	Minimum	Maximum	Kolmogorov-Smirnov p-value
Knowledge of Cognition	64.18	8.60	32	82	0. 0410
Declarative Knowledge	30.30	4.23	15	40	< 0.0100
Procedural Knowledge	14.82	2.64	5	20	< 0.0100
Conditional Knowledge	19.05	3.03	11	25	< 0.0100
Regulation of Cognition	126.01	18.85	56	167	> 0.1500
Planning	24.46	5.03	9	35	0.0250
Information Management	36.93	5.72	15	50	< 0.0100
Comprehension Monitoring	24.52	4.77	9	35	< 0.0100
Debugging	19.76	2.97	9	25	< 0.0100
Evaluation	20.31	4.14	7	30	< 0.0100
MAI Overall	190.20	26.07	95	247	> 0.1500

For the MSLQ (please refer to Table 5 below), the summary statistics indicated that the Motivation subscale ranged between 50 and 147, with a mean of 119.37 and a standard deviation of 14.63; while the Learning Strategies subscale ranged between 78 and 238, with a mean of 166.86 and a standard deviation of 25.31. The MSLQ overall scale showed a mean of 286.24 with a standard deviation of 34.38; scores ranged between 143 and 377. The summary statistics for each subsection of the subscales is detailed below.

Table 5: Summary statistics for the MSLQ

Variable	Mean	Std Dev.	Minimum	Maximum	Kolmogorov-Smirnov p-value
Motivation	119.37	14.63	50	147	< 0.010
Value Components	55.81	8.01	18	70	< 0.010
Intrinsic Goal Orientation	13.95	2.98	3	20	< 0.010
Extrinsic Goal Orientation	16.85	3.03	4	20	< 0.010
Task Value	25.00	4.07	7	30	< 0.010
Expectancy Components	46.44	6.82	17	60	< 0.010
Control of Learning Beliefs	16.33	2.92	4	20	< 0.010
Self-Efficacy	30.11	5.41	13	40	< 0.010
Affective Components	17.11	4.49	5	25	< 0.010
Test Anxiety	17.11	4.49	5	25	< 0.010

Learning Strategies	166.86	25.31	78	238	> 0.150
Cognitive-Metacognitive Strategies	105.17	17.99	44	155	0.1450
Rehearsal	13.89	3.11	4	20	< 0.010
Elaboration	21.95	4.35	7	30	0.0440
Organisation	13.83	2.97	4	20	< 0.010
Critical Thinking	15.53	3.76	5	25	< 0.010
Metacognitive Self-Regulation	39.96	7.50	20	60	0.0300
Resource Management Strategies	61.68	9.89	30	88	0.1320
Time & Study Environment	28.05	5.24	13	40	0.1410
Effort Regulation	15.27	3.06	5	20	< 0.010
Help Seeking	10.90	3.33	4	20	< 0.010
Peer Learning	7.44	2.98	3	15	< 0.010
MSLQ Overall	286.24	34.38	143	377	> 0.150

The Kolmogorov-Smirnov p-values for the two instruments and the performance variables indicated that a number of the variables did not meet the criterion for being considered normal (p-values above 0.05); and thus according to this test were not normally distributed. Variables that were shown to be normally distributed included: examination performance, overall weighted average performance, Regulation of Cognition, overall MAI performance, Learning Strategies, and MSLQ overall performance, as well as several other MSLQ subscales. However, Kolmogorov-Smirnov tests are renowned as being a very stringent means for establishing normality and thus the histograms (Appendix F) for each of the variables needed to be closely scrutinised to determine whether the data was sufficiently normally distributed to permit parametric analyses to be used despite the results of the Kolmogorov-Smirnov tests.

On examination of the histograms for the performance variables, it became apparent that the examination and overall weighted average displayed normal distributions. The distributions for Test 1, Essay 1 and Essay 2 were only slightly skewed, and this appeared to be caused by only a few outliers. Outliers are those values that are separated from the rest of the data, and they can often distort the overall picture of variability within the data set (Howell, 2002). In this instance the outliers represented a few extreme scores obtained on the test or essays. The data for Test 2 was found to be somewhat more skewed. The histograms for the subscales and subsections of the MAI and MSLQ indicated that the majority of the variables approximated a normal distribution, even in those cases where slight skewed data was detected. This was with the exception of MSLQ: Extrinsic Goal

Orientation, Task Value, Value Components subsection, and the Motivation subscale overall, where relatively highly skewed data was detected.

Despite certain skewing evident in the histograms, the general patterns evident indicated that none of the data was skewed to an extreme that would strongly affect correlations or regressions, which are relatively robust parametric techniques (Howell, 2002). In addition, the relatively large sample size (n = 268) suggested that Central Limit Theorem would factor in; this theorem states that distribution will approach normality as the sample size increases (Howell, 2002). The pattern of data in the histograms and large sample size in this research thus supported the use of parametric techniques – this was independently confirmed through expert consultation. Thus it was determined that the data was sufficiently normal to conduct the parametric statistical analyses proposed to address the research questions.

Tests for Reliability and Validity

Prior to conducting the statistical analyses used to answer the research questions, the internal consistency reliability of the instruments in the study was ascertained.

Metacognitive Awareness Inventory (MAI)

The Cronbach Alpha Coefficients for the MAI overall scale, subscales, and subsections are given in Table 6 below. The Alpha coefficient for the Knowledge of Cognition subscale was 0.84, while for the Regulation of Cognition subscale it was 0.92. The Alpha coefficient for the complete MAI scale was 0.94. Overall the Alpha coefficients for the subsections ranged between 0.58 and 0.78.

Table 6: Cronbach Alpha Coefficients for the MAI

Section	Alpha	Section	Alpha
Overall MAI Scale	**0.94**	**Regulation of Cognition**	**0.92**
Knowledge of Cognition	**0.84**	Planning	0.78
Declarative Knowledge	0.73	Information Management	0.76
Procedural Knowledge	0.61	Comprehension Monitoring	0.78
Conditional Knowledge	0.58	Debugging	0.78
		Evaluation	0.67

As shown in Table 6 above, the Cronbach Alpha Coefficients for the overall MAI scale and subscales are generally very strong. The coefficients for the subsections of the Knowledge of Cognition subscale are quite varied; a good value was obtained for declarative knowledge ($\alpha = 0.73$); however weaker, more moderate values were obtained for procedural and conditional knowledge ($\alpha = 0.61$ and $\alpha = 0.58$ respectively). The values for the subsections of the Regulation of Cognition subscale were fairly consistent overall and showed good values ranging between 0.76 and 0.78; except for the Evaluation subsection which showed only a moderate value ($\alpha = 0.67$). Overall, the results indicated sound internal consistency reliability. The overall MAI scale, Knowledge of Cognition and Regulation of Cognition subscales in particular were highly internally reliable. While there were reasonable Cronbach Alpha Coefficients obtained for the majority of the subsections of the MAI; it was clear that some of the subsections were not highly reliable; thus, in this research, only the overall MAI and two subscales were used to address the research questions due to their high reliability.

Motivated Strategies for Learning Questionnaire (MSLQ)

The Cronbach Alpha Coefficients for the MSLQ overall scale, subscales, and subsections are given in Table 7 below. The Alpha coefficient for the overall MSLQ scale was 0.93. The coefficient for the Motivation subscale was 0.87, while for the Learning Strategies subscale it was 0.91. The coefficients for the subsections ranged between 0.53 and 0.91.

Table 7: Cronbach Alpha Coefficients for the MSLQ

Section	**Alpha**	**Section**	**Alpha**
Overall MSLQ Scale	**0.93**	**Learning Strategies**	**0.91**
Motivation	**0.87**	**Cognitive & Metacognitive Strategies**	**0.91**
Value Component	**0.83**	Rehearsal	0.63
Intrinsic Goal orientation	0.58	Elaboration	0.76
Extrinsic Goal Orientation	0.69	Organisation	0.61
Task Value	0.78	Critical Thinking	0.72
Expectancy Component	**0.83**	Metacognitive Self-Regulation	0.79
Control of Learning Beliefs	0.63	**Resource Management Strategies**	**0.76**
Self-Efficacy	0.86	Time & Study Environment	0.68
Affective Component	**0.72**	Effort Regulation	0.58
Test Anxiety	0.72	Help Seeking	0.53
		Peer Learning	0.67

The Cronbach Alpha values for the MSLQ total scale and subscales are very strong, suggesting high internal consistency. Furthermore, each of the subsections showed good to strong coefficient values that ranged between 0.72 and 0.91. The values on the subsections and subcomponents of the Motivation subscale ranged from 0.58 to 0.86; while these values were somewhat erratic, they were still indicative of adequate to good internal consistency between the items. The values on the subsections and subcomponents of the Learning Strategies subscale ranged between 0.53 and 0.91. Again, the values tended to be somewhat erratic, but also generally showed at least adequate relations between the items. Overall, the internal consistency of the MSLQ instrument was judged to be adequate. While there were reasonable Cronbach Alpha Coefficients obtained for the majority of the subsections of the MSLQ; it was clear that some of the subsections were not highly reliable; thus, in this research, only the overall MSLQ, the two main subscales (Motivation and Learning Strategies) and main subsections (Value Component, Expectancy Component, Affective Component, Cognitive and Metacognitive Strategies and Resource Management Strategies) were used to address the research questions due to their good to high reliability.

Correlations

The following section presents the correlational analyses that were conducted in order to gain a better understanding of the nature and extent of the relationships between the variables in this study. Pearson's Product Moment Correlations were run on the data in order to answer the relevant research questions.

Metacognitive Awareness, Use of Cognitive and Metacognitive Learning Strategies, and Motivation

The first research question aimed to ascertain the relationships of the core variables in this study to each other. The first aim of the study was thus to gain an understanding of the nature and extent of the relationships between metacognitive awareness (taken from MAI), the use of cognitive and metacognitive learning strategies (taken from MSLQ), and motivation (taken from MSLQ).

The Relationship of the MAI variables to each other

The first set of correlations examined the relationship between all the MAI subscales and subsections with each other. These variables were expected to be highly correlated, given that they are posited to work in unison to promote academic performance (Schraw & Dennison, 1994). As expected, the results (please refer to Table 8) indicated that the Knowledge of Cognition subscale was significantly, positively, and strongly related to the Regulation of Cognition subscale ($r = 0.77$; $p < 0.0001$) and to

the MAI scale overall ($r = 0.88$; $p < 0.0001$). The Regulation of Cognition subscale was also significantly, positively, and strongly related to the MAI overall ($r = 0.97$; $p < 0.0001$). The detailed correlation matrix (Appendix G) suggested that all of the MAI subscales and subsections were significantly and highly correlated; results showed moderate to high correlations, with r-values between 0.89 and 0.43.

Table 8: Pearson's Correlation Coefficients for the MAI Subscales and Overall

	Pearson Correlation Coefficients N=268		
	Knowledge of Cognition	**Regulation of Cognition**	**MAI Overall**
Knowledge of Cognition	1.0000		
Regulation of Cognition	0.7727 < 0.0001	1.0000	
MAI Overall	0.8885 < 0.0001	0.9778 < 0.0001	1.0000

The Relationship of the MSLQ Variables to each other

Pearson's correlations were also used to examine the relationship between the MSLQ subscales and subsections. Separate correlations were run for the Learning Strategies subscale (Appendix H) and the Motivation subscale (Appendix I).

Results from the correlation matrix examining the relationships between variables within the Learning Strategies subscale (Appendix H) suggest that the majority of the variables were significantly and positively correlated with one another. Peer Learning was not significantly correlated with Time and Study Environment Management ($r = 0.09$; $p = 0.13$) or Effort Regulation ($r = 0.01$; $p = 0.75$) however all the other subsections and subscales of the Learning Strategies subscales were found to be significantly and positively correlated; with r-values ranging from 0.15 to 0.95, indicating weak to very strong relationships. As expected, the Learning Strategies subscale showed a significant, strong, and positive relationship with the Cognitive and Metacognitive Strategies subsection ($r = 0.95$; $p < 0.0001$), the Resource Management Strategies subsection ($r = 0.82$; $p < 0.0001$), and MSLQ scale overall ($r = 0.92$; $p < 0.0001$).

When reviewing the correlation matrix for the Motivation subscale (Appendix I), it was apparent that the majority of the variables were significantly correlated. However, it was evident that the Affective Component of Motivation (which is comprised solely of Test Anxiety) was not significantly correlated with several variables, namely: Intrinsic Goal Orientation ($r = 0.05$; $p = 0.41$); Task Value ($r = -0.002$; $p = 0.97$); and the Expectancy Components subsection ($r = -0.07$; $p = 0.21$). Test Anxiety and the Affective Component subsection were also just out of the requirements for a significant relationship with the subsection of Value Components ($r = 0.11$; $p = 0.055$). The fact that test anxiety was not significantly correlated to many variables suggests that the Affective Component of Motivation was somewhat separate to the other aspects of motivation (the Value and Expectancy Components). The majority of the other subsections and variables showed significant, positive relationships with r-values ranging from 0.11 to 0.92; showing weak to strong relationships. The only significant negative relationship was found between Test Anxiety and the Affective Components subsection with Self-efficacy for Learning Performance ($r = -0.17$; $p = 0.005$); however this relationship was weak. Overall, the Motivation subscale showed a significant, strong, and positive relationship with the Value Components subsection ($r = 0.92$; $p < 0.0001$), the Expectancy Components subsection ($r = 0.84$; $p < 0.0001$) and the MSLQ scale overall ($r = 0.75$; $p < 0.0001$) however the Motivation subscale showed only a weak, significant, positive relationship with the Affective Components subsection ($r = 0.33$; $p < 0.0001$).

The correlation set examining the nature and extent of the relationships between all the variables in the Learning Strategies and Motivation subscales of the MSLQ revealed the presence of several correlations. There were generally significant, positive relationships overall; with the relationships generally being weak to moderate in nature. Control of Learning Beliefs showed a significant, negative, and weak relationship with Help Seeking ($r = -0.12$; $p = 0.04$) and Peer Learning ($r = -0.15$; $p = 0.01$). Test Anxiety and Affective Components also showed significant, negative relationships with the Resource Management Strategies subsection ($r = -0.14$; $p = 0.02$); Effort Regulation ($r = -0.12$; $p = 0.04$); and Time and Study Environment Management ($r = -0.21$; $p = 0.0005$); these were very weak relationships. Test Anxiety and Affective Components on the Motivation subscale and Help Seeking and Peer Learning on the Learning Strategies subscale showed the fewest correlations overall; only those having already been mentioned. Furthermore, Peer Learning and Help Seeking were not significantly related to the Motivation subscale overall. Control of Learning Beliefs, Test Anxiety, and Affective Components showed no significant relationship with the Learning Strategies subscale overall. For a detailed presentation of the correlations reported above, please refer to Appendix J.

The correlations between the MSLQ subscales and main subsections are given in Table 9 below. As expected, the Value Components ($r = .092$; $p < 0.0001$) and Expectancy Components ($r = 0.84$; $p < 0.0001$) showed strong, positive, significant relationships with the Motivation subscale. The Affective Components subsection was significantly linked to the overall Motivation subscale but showed only a weak, positive relationship ($r = 0.33$; $p < 0.0001$). Value Components also showed a strong, positive, and significant relationship with Expectancy Components ($r = 0.72$; $p < 0.0001$). Although marginal, it was not statistically linked to Affective Components ($r = 0.11$; $p = 0.0553$). Value Components showed significant, weak to modest relationships with the Cognitive Metacognitive Strategies subsection ($r = 0.51$; $p < 0.0001$); the Resource Management Strategies subsection ($r = 0.30$; $p < 0.0001$) and also the Learning Strategies subscale ($r = 0.48$; $p < 0.0001$). Expectancy Components showed significant, yet weak relationships to the Cognitive Metacognitive Strategies subsection ($r = 0.40$; $p < 0.0001$); the Resource Management Strategies subsection ($r = 0.27$; $p < 0.0001$) and also the Learning Strategies subscale ($r = 0.39$; $p < 0.0001$). The Affective Component showed a significant, negative, weak relationship to Resource Management Strategies ($r = -0.14$; $p = 0.02$). As expected the Cognitive and Metacognitive Strategies subsection showed a significant, strong, positive relationship with the Learning Strategies subscale ($r = 0.95$; $p < 0.0001$), as did the Resource Management Strategies subscale ($r = 0.82$; $p < 0.0001$).

Table 9: Pearson's Correlation Coefficients for the MSLQ Overall, Subscales, and Main Subsections

Pearson Correlation Coefficients N = 268								
	Value Components	**Expectancy Components**	**Affective Components**	**Motivation**	**Cognitive Metacog Strategies**	**Resource Mang Strategies**	**Learning Strategies**	**MSLQ Overall**
Value Components	1.0000							
Expectancy Components	0.7265 < 0.0001	1.0000						
Affective Components	0.1172 0.0553	-0.0761 0.2143	1.0000					
Motivation	0.9222 < 0.0001	0.8406 < 0.0001	0.3357 < 0.0001	1.0000				
Cognitive Metacognitive Strategies	0.5156 < 0.0001	0.4076 < 0.0001	0.0324 0.5972	0.4823 < 0.0001	1.0000			
Resource Mang Strategies	0.3062 < 0.0001	0.2761 < 0.0001	-0.1400 0.0218	0.2534 < 0.0001	0.6161 < 0.0001	1.0000		
Learning Strategies	0.4861 < 0.0001	0.3976 < 0.0001	-0.0316 0.6056	0.4418 < 0.0001	0.9514 < 0.0001	0.8286 < 0.0001	1.0000	

Pearson Correlation Coefficients N = 268								
	Value Components	**Expectancy Components**	**Affective Components**	**Motivation**	**Cognitive Metacog Strategies**	**Resource Mang Strategies**	**Learning Strategies**	**MSLQ Overall**
MSLQ Overall	0.7503	0.6504	0.1195	0.7508	0.9057	0.7179	0.9242	1.0000
	< 0.0001	< 0.0001	0.0506	< 0.0001	< 0.0001	< 0.0001	< 0.0001	

The correlations of the main subsections and subscales with the MSLQ overall scale yielded primarily significant results (please refer to Table 9 above). The overall MSLQ scale was found to have a strong, positive relationship with Value Components ($r = 0.75$; $p < 0.0001$); the Motivation subscale ($r = 0.75$; $p < 0.0001$) and the Resource Management Strategies subscale ($r = 0.71$; $p < 0.0001$). Furthermore, it showed very strong, positive relationships with the Cognitive and Metacognitive Strategies subsection ($r = 0.90$; $p < 0.0001$); and the Learning Strategies subscale ($r = 0.92$; $p < 0.0001$). The relationship with Expectancy Components was modest ($r = 0.65$; $p < 0.0001$). While marginal, the relationship with Affective Components was not found to be statistically significant ($r = 0.11$; $p = 0.0506$). Further, the Motivation subscale showed a moderate, positive, significant relationship with the Learning Strategies subscale ($r = 0.44$; $p < 0.0001$), and the Cognitive Metacognitive Strategies subsection ($r = 0.48$; $p < 0.0001$); but it showed only a weak relationship with the Resource Management subsection ($r = 0.25$; $p < 0.0001$). The two subsections of the Learning Strategies subscale, Resource Management and Cognitive Metacognitive Strategies, showed a significant, moderate, and positive relationship ($r = 0.61$; $p < 0.0001$).

<u>The Relationship between Metacognitive Awareness, Cognitive and Metacognitive Learning Strategies, and Motivation</u>

In order to determine the relationships between metacognitive awareness (taken from the MAI), cognitive and metacognitive learning strategies (taken from the MSLQ), and motivation (taken from the MSLQ), a further series of Pearson's correlations were run, using the subscales and subsections across both instruments.

From the results presented in Table 10 below, it is evident that the MAI overall scale, which signifies metacognitive awareness, was significantly correlated with the MSLQ overall scale ($r = 0.64$; $p < 0.0001$) showing a moderate, positive relationship; and with the MSLQ subscales of Motivation ($r = 0.30$; $p < 0.0001$) and Learning Strategies ($r = 0.69$; $p < 0.0001$), showing a weak and a moderate relationship respectively. Furthermore, the MSLQ overall scale showed moderate, positive, and significant relationships with the MAI Knowledge of Cognition subscale ($r = 0.51$; $p < 0.0001$) and

the Regulation of Cognition subscale ($r = 0.65$; $p < 0.0001$). In terms of evaluating motivation, it seems that the MSLQ Motivation subscale showed significant, positive, yet weak relationships with MAI Knowledge of Cognition ($r = 0.23$; $p = 0.0001$) and Regulation of Cognition ($r = 0.31$; $p < 0.0001$). In addition, the MSLQ Learning Strategies subscale was significantly and positively related to the MAI subscales of Knowledge of Cognition ($r = 0.56$; $p < 0.0001$) and Regulation of Cognition ($r = 0.70$; $p < 0.0001$). The results suggested that the two instruments were highly correlated; which further suggests that the constructs of metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation are all highly inter-related; which raises the questions as to whether such aspects are distinct variables, or whether they are components of a broader construct.

Table 10: Pearson's Correlation Coefficients for the MAI and MSLQ Overall and Subscales

	Pearson Correlation Coefficients N = 268					
	MAI Overall	**MSLQ Overall**	**MSLQ Motivation**	**MSLQ Learning Strategies**	**MAI Knowledge of Cognition**	**MAI Regulation of Cognition**
MAI Overall	1.0000					
MSLQ Overall	0.6408 < 0.0001	1.0000				
MSLQ Motivation	0.3046 < 0.0001	0.7508 < 0.0001	1.0000			
MSLQ Learning Strategies	0.6943 < 0.0001	0.9242 < 0.0001	0.4418 < 0.0001	1.0000		
MAI Knowledge of Cognition	0.8885 < 0.0001	0.5158 < 0.0001	0.2327 0.0001	0.5661 < 0.0001	1.0000	
MAI Regulation of Cognition	0.9778 < 0.0001	0.6510 < 0.0001	0.3152 < 0.0001	0.7020 < 0.0001	0.7727 < 0.0001	1.0000

In order to understand the relationship between cognitive and metacognitive learning strategies and metacognitive awareness in more detail, correlations examining the MSLQ Cognitive and Metacognitive Strategies subsection and the MAI Knowledge of Cognition (please refer to Table 11) and Regulation of Cognition (please refer to Table 12) have been provided.

Table 11: Pearson's Correlation Coefficients for the MSLQ Cognitive and Metacognitive Strategies subsection with the MAI Knowledge of Cognition subscale

Pearson Correlation Coefficients N = 268				
	MAI Declarative Knowledge	**MAI Procedural Knowledge**	**MAI Conditional Knowledge**	**MAI Knowledge of Cognition**
MSLQ Rehearsal	0.1886	0.3558	0.3320	0.3193
	0.0019	< 0.0001	< 0.0001	< 0.0001
MSLQ Elaboration	0.2992	0.4280	0.3673	0.4084
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Organisation	0.3001	0.4381	0.3419	0.4029
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Critical Thinking	0.3109	0.4079	0.3405	0.3985
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Metacognitive Self-Regulation	0.4344	0.5385	0.5066	0.5580
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Cognitive Metacognitive Strategies	0.4011	0.5478	0.4857	0.5371
	< 0.0001	< 0.0001	< 0.0001	< 0.0001

From the results presented in Table 11 above, it can be seen that there were significant relationships between all components of the MAI Knowledge of Cognition subscale and the MSLQ Cognitive and Metacognitive Strategies subsection. The correlation values ranged from 0.18 to 0.55 which suggest weak to moderate relationships overall. Most notably, Knowledge of Cognition showed a significant, positive, and moderate relationship with both Metacognitive Self-regulation ($r = 0.55$; $p < 0.0001$), and Cognitive and Metacognitive Strategies ($r = 0.53$; $p < 0.0001$). While some degree of correlation was expected, the degree of correlation between all variables on the MAI Knowledge of Cognition subscale with all variables of the MSLQ Cognitive and Metacognitive Strategies subscale was not anticipated.

Table 12: Pearson's Correlation Coefficients for the MSLQ Cognitive and Metacognitive Strategies subsection with the MAI Regulation of Cognition subscale

Pearson Correlation Coefficients N = 268						
	MAI Planning	**MAI Information Management**	**MAI Comprehension Monitoring**	**MAI Debugging**	**MAI Evaluating**	**MAI Regulation of Cognition**
MSLQ Rehearsal	0.3475	0.3747	0.3767	0.3311	0.4082	0.4441
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Pearson Correlation Coefficients N = 268						
	MAI Planning	**MAI Information Management**	**MAI Comprehension Monitoring**	**MAI Debugging**	**MAI Evaluating**	**MAI Regulation of Cognition**
MSLQ Elaboration	0.4435	0.5316	0.4344	0.4398	0.4850	0.5661
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Organisation	0.4614	0.5107	0.3918	0.4003	0.4071	0.5304
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Critical Thinking	0.4546	0.4319	0.5216	0.3371	0.5232	0.5531
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Metacognitive Self-Regulation	0.5739	0.5795	0.6405	0.5412	0.6000	0.7090
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Cognitive Metacognitive Strategies	0.5785	0.6103	0.6117	0.5264	0.6154	0.7133
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

The results presented in Table 12 above indicated significant correlations between all variables on the MAI Regulation of Cognition subscale and the MSLQ Cognitive and Metacognitive Strategies subsection. Correlations ranged from 0.33 to 0.71, which is indicative of weak to moderate-good relationships. The MAI Regulation of Cognition subscale was significantly and positively related to Metacognitive Self-Regulation ($r = 0.70$; $p < 0.0001$) and Cognitive and Metacognitive Strategies ($r = 0.71$; $p < 0.0001$); and these relationships were reasonably strong.

The results overall suggest a high level of inter-relationships between the MAI and MSLQ components indicating that metacognitive awareness, use of cognitive and metacognitive learning strategies, and motivation were all highly related to each other within this sample. Furthermore, the strong nature of the inter-relationships raises questions as to what extent these can be treated as separate variables. For a full review of the correlation matrices for the MAI Knowledge of Cognition subscale and the MSLQ, and the MAI Regulation of Cognition subscale and the MSLQ, please refer to Appendices K and L respectively.

The Relationship between Metacognitive Awareness, the Use of Cognitive and Metacognitive Learning Strategies, Motivation, and Academic Performance

The second research question was threefold, and sought to better understand the relationships between metacognitive awareness and academic performance; the use of cognitive and metacognitive learning strategies and academic performance; and lastly, motivation and academic performance.

Metacognitive Awareness and Academic Performance

Pearson's correlation coefficients were used to understand the relationships between metacognitive awareness, taken from the full MAI scale, and academic performance on different assessment tasks, which included performance on two tests, two essays, the examination, and an overall weighted average. From the results presented in Table 13 below, it is evident that the Knowledge of Cognition subscale of the MAI was significantly and positively related to performance on Test 1 ($r = 0.12$; $p = 0.04$) and Test 2 ($r = 0.13$; $p = 0.02$), as well the overall weighted average ($r = 0.14$; $p = 0.019$). However, these relationships were very weak. From the Knowledge of Cognition subscale, it is the subsection Declarative Knowledge that showed the most relationships with performance; Declarative Knowledge was significantly and positively related to performance on Test 1 ($r = 0.18$; $p = 0.002$), Test 2 ($r = 0.15$; $p= 0.013$), Essay 1 ($r = 0.15$; $p = 0.009$), the examination ($r = 0.17$; $p = 0.003$), and the overall weighted average ($r = 0.2$; $p = 0.0007$); however these relationships were all weak in nature. Further, Procedural Knowledge was significantly and positively related only to performance on Test 2 ($r = 0.13$; $p = 0.02$) but again the relationship was weak. Information Management was significantly and positively related to performance on Test 2 ($r = 0.12$; $p = 0.03$) but again the relationship was weak. Debugging showed a statistically significant, yet weak, positive relationship with performance on the examination ($r = 0.13$; $p = 0.02$). Evaluating showed a significant, weak, yet negative relationship with performance on Essay 1 ($r = -0.12$; $p = 0.04$). Conditional Knowledge, Planning, and Comprehension Monitoring, as well as the subscale of Regulation of Cognition, showed no significant relationships with performance. The MAI overall scale also showed no significant correlations with performance on different assessment tasks. Overall, performance on Test 2 seemed to have the highest number of significant correlations, albeit weak relationships, which suggests that this test may be tapping into something slightly different from the other assessment tasks.

Table 13: Pearson's Correlation Coefficients for the MAI scale and Performance Variables

	Pearson Correlation Coefficients N=268					
Variable	**Test 1**	**Test 2**	**Essay 1**	**Essay 2**	**Examination**	**Weighted Average**
Knowledge of Cognition subscale	0.1250 0.0409	0.1327 0.0298	0.0967 0.1140	0.0690 0.2601	0.1127 0.0654	0.1424 0.0197
Declarative Knowledge	0.1813 0.0029	0.1515 0.0130	0.1582 0.0094	0.0981 0.1091	0.1777 0.0035	0.2060 0.0007
Procedural Knowledge	0.0967 0.1141	0.1329 0.0296	0.0520 0.3962	0.0649 0.2891	0.0757 0.2168	0.1106 0.0705

Conditional Knowledge	0.0171	0.0490	0.0081	0.0022	0.0056	0.0198
	0.7805	0.4241	0.8938	0.9712	0.9264	0.7458
Regulation of Cognition subscale	-0.0004	0.0731	-0.0346	-0.0039	-0.0173	0.0025
	0.9937	0.2329	0.5721	0.9486	0.7770	0.9666
Planning	-0.0013	0.0221	0.0270	0.0455	-0.0700	-0.0133
	0.9830	0.7182	0.6595	0.4574	0.2530	0.8279
Information Management	0.0404	0.1287	-0.0228	-0.0547	0.0379	0.0419
	0.5102	0.0351	0.7098	0.3717	0.5365	0.4943
Comprehension Monitoring	-0.0238	0.0640	-0.0677	0.0202	-0.0277	-0.0105
	0.6980	0.2966	0.2695	0.7410	0.6513	0.8635
Debugging	0.0618	0.0675	0.0596	-0.0298	0.1359	0.0963
	0.3130	0.2706	0.3306	0.6264	0.0260	0.1155
Evaluating	-0.0735	0.0054	-0.1239	0.0004	-0.1122	-0.0872
	0.2301	0.9296	0.0425	0.9942	0.0667	0.1545
MAI Overall	0.0409	0.0966	0.0068	0.0199	0.0246	0.0488
	0.5050	0.1145	0.9108	0.7455	0.6882	0.4257

Use of Cognitive and Metacognitive Learning Strategies and Academic Performance

Pearson's correlations were also used to determine the relationship between cognitive and metacognitive learning strategies, taken from the MSLQ, and academic performance on different assessment tasks. As can be seen from the results presented in Table 14 below, there were minimal significant correlations between these variables, with only one significant relationship identified. Organisation was shown to have a significant, positive relationship with performance on Test 2 ($r = 0.14$; $p = 0.01$); however this relationship was weak in nature. Metacognitive Self-Regulation was also found to have a positive relationship with performance on Test 2 ($r = 0.11$; $p = 0.05$) but this relationship fell just outside of the significance level.

Table 14: *Pearson's Correlation Coefficients for the MSLQ Cognitive and Metacognitive Learning Strategies subsection and the Performance Variables*

Pearson Correlation Coefficients N=268						
Variable	**Test 1**	**Test 2**	**Essay 1**	**Essay 2**	**Examination**	**Weighted Average**
Cognitive & Metacognitive Strategies	0.0073	0.0991	-0.0354	-0.0085	-0.0226	0.0077
	0.9049	0.1054	0.5631	0.8898	0.7115	0.8994

Rehearsal	0.0049	0.0513	0.0013	-0.0629	-0.0561	-0.0253
	0.9352	0.4022	0.9826	0.3045	0.3602	0.6797
Elaboration	-0.0170	0.0751	-0.0551	-0.0287	-0.0260	-0.0130
	0.7807	0.2200	0.3685	0.6389	0.6711	0.8318
Organisation	0.0541	0.1422	-0.0107	0.0566	-0.0060	0.0543
	0.3770	0.0198	0.8611	0.3554	0.9209	0.3752
Critical Thinking	-0.0444	-0.0006	-0.0981	-0.0361	-0.0801	-0.0703
	0.4685	0.9916	0.1091	0.5553	0.1908	0.2510
Metacognitive	0.0262	0.1166	-0.0001	0.0181	0.0266	0.0504
Self-Regulation	0.6686	0.0566	0.9987	0.7670	0.6639	0.4110

Furthermore, on examining the relationship between the MSLQ Resource Management Strategies and performance variables (Appendix M), it was evident that Time and Study Environment Management showed significant, positive, yet weak relationships with all the performance variables, except Essay 2. Effort Regulation showed weak, positive, significant relationships across all performance variables. Help Seeking was related to performance on Test 2 ($r = 0.13$; $p = 0.02$) and the overall weighted average ($r = 0.12$; $p = 0.04$); although these relationships were significant and positive, they were weak in nature. Peer Learning was related to performance on Test 1 in a significant, positive, yet weak manner ($r = 0.16$; $p = 0.0067$).

Motivation and Academic Performance

Lastly, Pearson's correlations were used to examine the nature and extent of the relationships between motivation and academic performance on different assessment tasks. From Table 15 below, it can be seen that the Motivation subscale overall showed no significant relationships with performance. Extrinsic Goal Orientation showed a significant, negative relationship with performance on the examination ($r = -0.12$; $p = 0.04$) and the overall weighted average ($r = -0.12$; $p = 0.03$); however both of these relationships were weak in nature. The Expectancy Component showed a weak, positive, significant relationship with performance on Test 2 ($r = 0.12$; $p = 0.04$). Self-efficacy showed a weak, positive, and significant relationship with performance on Test 2 ($r = 0.14$; $p = 0.01$) and a positive, weak relationship with overall weighted average ($r = 0.11$; $p = 0.05$), however this relationship just fell out of the significance range. As expected, test anxiety was inversely related to performance as the more test anxiety, the worse the performance. Results indicated that Test Anxiety (and thus the Affective Component) showed significant, negative relationships to performance on Test 1 ($r = -0.19$; $p = 0.001$); performance on Essay 1 ($r = -0.12$; $p = 0.04$), the examination ($r = -0.18$; $p = 0.0022$), and the overall weighted average ($r = -0.19$; $p = 0.0015$); these relationships were all weak in nature.

Table 15: Pearson's Correlation Coefficients for the MSLQ Motivation subscale and Performance Variables

Pearson Correlation Coefficients N=268						
Variable	**Test 1**	**Test 2**	**Essay 1**	**Essay 2**	**Examination**	**Weighted Avg**
Motivation subscale	-0.0433	0.0466	-0.0550	-0.0416	-0.0231	-0.0269
	0.4796	0.4473	0.3691	0.4968	0.7058	0.6610
Value Component	-0.0420	0.0212	-0.0606	-0.0294	-0.0025	-0.0216
	0.4934	0.7292	0.3225	0.6311	0.9667	0.724
Intrinsic Goal orientation	-0.0541	0.0351	-0.0576	-0.0170	0.0030	-0.0155
	0.3774	0.5673	0.3470	0.7809	0.9606	0.7999
Extrinsic Goal Orientation	-0.1012	-0.0778	-0.0857	-0.0730	-0.1211	-0.1265
	0.0980	0.2041	0.1616	0.2336	0.0476	0.0384
Task Value	0.0324	0.0739	-0.0132	0.0089	0.0828	0.0629
	0.5974	0.2274	0.8292	0.8846	0.1761	0.3042
Expectancy Component	0.0876	0.1216	0.0350	0.0214	0.0759	0.0952
	0.1524	0.0467	0.5677	0.7265	0.2150	0.1200
Control of Learning Beliefs	-0.0029	0.0169	-0.0117	-0.0767	0.0419	0.0049
	0.9616	0.7831	0.8481	0.2107	0.4945	0.9357
Self-Efficacy	0.1120	0.1440	0.0505	0.0684	0.0730	0.1172
	0.0671	0.0183	0.4102	0.2639	0.2331	0.0552
Affective Component	-0.1994	-0.0707	-0.1244	-0.1158	-0.1862	-0.1935
	0.0010	0.2486	0.0418	0.0583	0.0022	0.0015
Test Anxiety	-0.1994	-0.0707	-0.1244	-0.1158	-0.1862	-0.1935
	0.0010	0.2486	0.0418	0.0583	0.0022	0.0015

For a detailed review of all the correlations for the MAI, MSLQ, and performance variables, please refer to Appendix N.

Multiple Regression Analyses

Having examined the relationships between the variables in this study, it was possible to move on to answering the third research question which aimed to understand the role of the following variables - metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation - in predicting academic performance on different assessment tasks. In order to answer this research

question, a series of multiple regression analyses were run. In order to ascertain which of the independent variables were the strongest predictors in the regressions; standard estimates were used. These estimates are interpreted in much the same way as a correlation coefficient however the sign is not factored in (Howell, 2002).

Due to the presence of several significant correlations between the MSLQ overall scale, Learning Strategies and Motivation subscales, and subsections, issues of multicollinearity emerged. The issue of relatedness between variables suggest that it is difficult to use such variables together to make predictions with regards to the dependent variable, as the variables are so inter-related that it is difficult to gauge the specific contribution of each variable in the prediction (Howell, 2002). Similarly, the degree of correlation between the MAI overall scale and subscales also raised issues of multicollinearity. Furthermore, strong correlations were present between the MAI overall and MSLQ overall scales, as well as the subscales of Learning Strategies, Motivation, Knowledge of Cognition, and Regulation of Cognition; this degree of relationship was not anticipated across the instruments. While Motivation (MSLQ) was expected to be related to strategy use in some way, it was not expected to be as closely related to metacognitive awareness. Furthermore, while some degree of correlation was anticipated between Regulation of Cognition and the Cognitive and Metacognitive Strategies, the degree of correlation between metacognitive awareness and the use of cognitive and metacognitive learning strategies overall was not expected, especially because in the literature these two scales purport to measure different aspects of metacognition. The MAI measures Metacognitive knowledge of cognition and regulation of cognitions; while the MSLQ Cognitive and Metacognitive Strategies encompass the actual strategies used in the regulation of metacognition; and are thought to be preceded by metacognitive awareness and knowledge (Vrugt & Oort, 2008).

Due to the highly inter-related nature of the variables in this study, the degree of which was not expected in terms of the literature, the regression analyses could not be run using the scales as a whole; rather separate regressions needed to be run with the individual subscales and subsections in order to answer the research questions relevant in this research. Thus, for the MAI: separate regressions were run with the Knowledge of Cognition subscale and the Regulation of Cognition subscale. For the MSLQ: separate regressions were run with the Motivation subscale, and then also the Cognitive and Metacognitive Strategies subsection, and Resource Management subsection.

Further, as socio-economic status, type of schooling (public or private), and home language have been found to play an important role in predicting academic performance (Bandura et al., 1996; Huysamen, 1996; Mwamwenda, 2004; Sirin, 2005; Zaaiman et al., 1998); these variables were included in the

regressions as independent variables to determine their relative predictive power in light of performance across different assessment tasks. The measure used to estimate socio-economic status (ESES) in this research was the Barratt Simplified Measure of Social Status (BSMSS). The measure provides an estimate of SES, and the data is of an ordinal nature (Barratt, 2006). Estimated socio-economic status was coded to represent two nominal categories (high and low). Home language was also coded in a nominal fashion, representing English and Not-English as the two categories. Type of Schooling was also nominal representing public and private schools as the two categories. Each of these three dichotomous nominal variables was used as a dummy variable within the regression (Howell, 2002).

Performance Variable: Overall Weighted Average

Knowledge of Cognition as a Predictor

The model predicting overall weighted average based on Knowledge of Cognition and the demographic variables was significant ($F_{4, 252} = 21.82$; $p < 0.0001$). It explained approximately 26% of the variance ($R^2 = 0.2572$), suggesting a reasonable predictive model within the context of the study as many alternate predictors of academic performance were not included. As shown in Table 16 below, socio-economic status was not found to be a significant predictor in this regression while knowledge of cognition, home language, and type of schooling were significant predictors of overall weighted performance. Of the predictors, home language accounted for the most variance (standard estimate = 0.37) while Knowledge of Cognition played a relatively small role (standard estimate = 0.13)

Table 16: Knowledge of Cognition, Demographics, and Overall Weighted Average

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	10.78	< 0.0001	0
HLANG	**1**	-6.46	< 0.0001	-0.37351
TYPE SCHOOL	**1**	3.91	0.0001	0.23096
ESES	**1**	-1.23	0.2185	-0.06934
KNOWCOGT	**1**	2.29	0.0227	0.12512

Regulation of Cognition as a Predictor

The model predicting overall weighted average based on Regulation of Cognition and the demographic variables was significant and accounted for a reasonable proportion of variance explained ($F_{4, 252} = 20.17$; $p < 0.0001$; $R^2 = 0.2425$). As shown in Table 17, Regulation of Cognition and socio-economic status were not significant predictors of overall weighted performance. Of the predictor variables, home language and type of school, home language accounted for the largest proportion of variance (standard estimate = 0.37).

Table 17: Regulation of Cognition, Demographics, and Overall Weighted Average

Variable	DF	t -value	p-value	Standardized Estimate
Intercept	**1**	13.03	< 0.0001	0
HLANG	**1**	-6.34	< 0.0001	-0.37184
TYPE SCHOOL	**1**	3.94	0.0001	0.23491
ESES	**1**	-1.07	0.2873	-0.06048
REGCOGT	**1**	0.51	0.6121	0.02806

Motivation as a Predictor

The model predicting overall weighted average based on Motivation and the demographic variables was significant; accounting for a reasonable proportion of the variance explained ($F_{4, 252} = 20.19$; $p < 0.0001$; $R^2 = 0.2427$). As shown in Table 18, the significant predictors in this model were home language (standard estimate = 0.36) and type of school (standard estimate = 0.23). Socio-economic status and Motivation were not found to be significant predictors in this model.

Table 18: Motivation, Demographics, and Overall Weighted Average

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	10.31	< 0.0001	0
NHLANG	**1**	-6.33	< 0.0001	-0.36951
TYPE SCHOOL	**1**	3.98	< 0.0001	0.23809
NESES	**1**	-0.94	0.3475	-0.05379
MSLQ_MOTIVT	**1**	0.56	0.5762	0.03124

Cognitive and Metacognitive Strategies as a Predictor

The model predicting overall weighted average based on Cognitive and Metacognitive Strategies and the demographic variables was significant ($F_{4, 252} = 20.16$; $p < 0.0001$), explaining approximately 24% of the variance ($R^2 = 0.2425$). As depicted in Table 19, the only two variables found to be significant were home language (standard estimate = 0.37) and type of school (standard estimate = 0.23). Socio-economic status and Cognitive and Metacognitive Strategies were not found to be significant predictors in this model.

Table 19: Cognitive and Metacognitive Strategies, Demographics, and Overall Weighted Average

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	13.78	< 0.0001	0
NHLANG	**1**	-6.34	< 0.0001	-0.37026
TYPE SCHOOL	**1**	3.94	0.0001	0.23486
NESES	**1**	-1.03	0.3035	-0.05833
MSLQ_COGMCST	**1**	0.50	0.6200	0.02726

Resource Management Strategies as a Predictor

The regression model predicting overall weighted average on the basis of Resource Management Strategies and the demographics revealed a significant predictive relationship ($F_{4, 252} = 22.20$; $p < 0.0001$; $R^2 = 0.2606$). As shown in Table 20 below, the variables of home language, type of school and Resource Management Strategies were all found to be significant predictors; with home language again having the most predictive power (standard estimate = 0.35). Socio-economic status was not a significant predictor variable.

Table 20: Resource Management Strategies, Demographics, and Overall Weighted Average

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	11.69	< 0.0001	0
NHLANG	**1**	-6.12	< 0.0001	-0.35447
TYPE SCHOOL	**1**	3.42	0.0007	0.20559
NESES	**1**	-1.04	0.3009	-0.05793
MSLQ_RESMGST	**1**	2.54	0.0118	0.14240

Performance Variable: Examination

Knowledge of Cognition as a Predictor

The model predicting examination performance based on Knowledge of Cognition and the demographics was significant ($F_{4, 252} = 22.99$; $p < 0.0001$), accounting for 26% of the variance explained ($R^2 = 0.2674$). Of the variables, only home language and type of school were significant predictors; with home language explaining the greatest proportion of the explained variance (standard estimate = 0.43).

Regulation of Cognition as a Predictor

The model predicting examination performance on the basis of Regulation of Cognition and the demographic variables was significant, showing a reasonable predictive capacity ($F_{4, 252} = 21.95$; $p<.0001$; $R^2 = 0.2583$). Of the variables, only home language (standard estimate = 0.43) and type of school (standard estimate = 0.16) were significant predictors. Regulation of Cognition and socio-economic status did not add significant predictive value.

Motivation as a Predictor

The regression model predicting examination performance on the basis of Motivation and the demographic variables was significant ($F_{4, 252} = 22.08$; $p < 0.0001$), accounting for 25% of the variance explained ($R^2 = 0.2595$). Of the variables, only home language and type of school were significant predictors, with home language explaining the greatest proportion of the variance (standard estimate = 0.43). Motivation and socio-economic status were not significant predictors of examination performance.

Cognitive and Metacognitive Strategies as a Predictor

The model serving to predict examination performance on the basis of Cognitive and Metacognitive Strategies and the demographic variables was significant overall ($F_{4, 252} = 21.93$; $p < 0.0001$), accounting for some 25% of the variance explained ($R^2 = 0.2582$). Those variables found to be significant were again home language and type of school, with home language accounting for the greatest proportion of the explained variance (standard estimate = 0.43).

Resource Management Strategies as a Predictor

The model predicting examination performance based on Resource Management Strategies and the demographic variables was significant ($F_{4, 252} = 22.91$; $p < 0.0001$; $R^2 = 0.2667$), explaining a reasonable proportion of the variance. The only two significant predictor variables were home language (standard estimate = 0.42) and type of school (standard estimate = 0.14). Resource Management Strategies were not a significant predictor variable.

In summary, when reviewing the models predicting examination performance it was apparent that there was a general pattern of prediction; for each regression model, only home language and type of school were significant predictors, accounting for 25% to 26% of the variance explained and thus showing a reasonable predictive capacity. In each model, none of the key variables showed a significant predictive capacity. For a review of the regressions for examination performance please refer to Tables 21 to 25 in Appendix O.

Performance Variable: Essays

When reviewing the results of the regressions models for essay performance it was apparent that these were much poorer at predicting essay performance than models accounting for overall and examination performance. In examining the R-squared scores, it was evident that the models predicting essay performance accounted for between 4% and 8% of the variance explained, whereas the models predicting both examination performance and overall weighted average accounted for between 24% and 26% of the variance explained. This suggests that in terms of essay performance, even those variables that were found to be significant explained only a very small proportion of the variance, and thus they generally had weak predictive power. For a review of the regression models for the essays please refer to Tables 26 to 35 in Appendix P.

Knowledge of Cognition as a Predictor

The models predicting essay performance based on Knowledge of Cognition and the demographics were significant for both Essay 1($F_{4, 252} = 3.40$; $p = 0.0099$) and Essay 2 ($F_{4, 252} = 5.61$; $P = 0.0002$). The model accounted for 5% of the variance explained in Essay 1 ($R^2 = 0.0512$), and 8% of the variance explained in Essay 2 ($R^2 = 0.0818$). Of the variables, only type of school was found to be a significant predictor for both Essay 2 (standard estimate = 0.23) and Essay 1 (standard estimate = 0.14). Knowledge of Cognition was not a significant predictor for either of the essays.

Regulation of Cognition as a Predictor

The models seeking to predict performance across the two essays on the basis of Regulation of Cognition and the demographic variables were significant, albeit that they showed a weak predictive capacity: Essay 1 (F4, 252 = 2.93; p = 0.0215; R^2 = 0.0444) and Essay 2 ($F_{4, 252}$ = 5.22; p = 0.0005; R^2 = 0.0765). The only variable found to have predictive value for both essays was type of school; Essay 1 (type of school standard estimate = 0.14) and Essay 2 (type of school standard estimate = 0.23). Regulation of Cognition was not a significant predictor variable.

Motivation as a Predictor

The models predicting essay performance based on Motivation and the demographic variables were significant for both Essay 1 ($F_{4, 252}$ = 2.90; p = 0.0226), and Essay 2 ($F_{4, 252}$ = 5.21; p = 0.0005); with approximately 4% of the variance explained in Essay1 (R^2 = 0.0440), and approximately 7% of the variance explained in Essay 2 (R^2 = 0.0764). Motivation was not found to be a significant predictor. Of the variables, the only significant predictor was type of school (Essay 1: standard estimate = 0.14; Essay2: standard estimate = 0.23).

Cognitive and Metacognitive Strategies as a Predictor

The regression models predicting essay performance based on Cognitive and Metacognitive Strategies and the demographic variables were significant overall: Essay 1 ($F_{4, 252}$ = 2.93; p = 0.0214; R^2 = 0.0445), and Essay 2 ($F_{4, 252}$ = 5.21; p = 0.0005; R^2 = 0.0764). The predictive capacity of these models was however relatively weak. The only significant predictor variable explaining performance on both essays was type of school (Essay 1: standard estimate = 0.14; Essay 2: standard estimate = 0.23). Cognitive and Metacognitive Strategies was not found to be a significant predictor variable.

Resource Management Strategies as a Predictor

The models predicting essay performance on the basis of Resource Management Strategies and demographic variables were significant, albeit weak in nature. For Essay 1 ($F_{4, 252}$ = 3.05; p = 0.0176), the model accounted for 4% of the variance explained (R^2 = 0.0462). For Essay 2 ($F_{4, 252}$ = 5.75; p = 0.0002), the model explained approximately 8% of the variance (R^2 = 0.0837). Resource Management Strategies were not found to be a significant predictor on either essay. Type of school was the only significant predictor for Essay 1 (standard estimate = 0.13) and Essay 2 (standard estimate = 0.21)

In contrast to performance on the examination and overall weighted average, home language fell away as a significant predictor variable in essay performance, and type of school became the only significant predictor. The key variables again showed no significant predictive capacity in terms of essay performance.

Performance Variable: Tests

Knowledge of Cognition as a Predictor

The models predicting performance on the tests based on Knowledge of Cognition and the demographics yielded significant results for Test 1 ($F_{4, 252} = 11.26$; $p < 0.0001$) and for Test 2 ($F_{4, 252} = 11.97$; $p < 0.0001$). The models accounted for approximately 15 % of the variance in both Test 1 ($R^2 = 0.1516$) and Test 2 ($R^2 = 0.1597$). The significant predictor variables for Test 1 were type of school, home language, and Knowledge of Cognition; with home language as the strongest predictor (standard estimate = 0.26). For Test 2, home language, type of school, and socio-economic status were all significant predictors; with home language again explaining the greatest proportion of the variance (standard estimate = 0.32). Knowledge of Cognition was not a significant predictor for Test 2. Results are presented in Tables 36 and 37 below.

Table 36: Knowledge of Cognition, Demographics, and Test 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.08	<.0001	0
NESES	**1**	-1.50	0.1348	-0.09013
TYPE SCHOOL	**1**	3.21	0.0015	0.20273
NHLANG	**1**	-4.23	< 0.0001	-0.26154
MAI_KNOWCOGT	**1**	1.99	0.0482	0.11581

Table 37: Knowledge of Cognition, Demographics, and Test 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.09	< 0.0001	0
NHLANG	**1**	-5.22	< 0.0001	-0.32104
TYPE SCHOOL	**1**	2.27	0.0240	0.14272
NESES	**1**	-2.14	0.0332	-0.12802
MAI_KNOWCOGT	**1**	1.71	0.0886	0.09923

Regulation of Cognition as a Predictor

In examining the model evaluating whether Regulation of Cognition and the demographic variables predicted test performance, significant results were obtained for Test 1 ($F_{4, 252} = 10.16$; $p < 0.0001$ $R^2 = 0.1389$) and for Test 2 ($F_{4, 252} = 11.71$; $p < 0.0001$; $R^2 = 0.1568$). For Test 1, type of school and home language were the only significant predictors; with home language explaining the greatest proportion of the variance (standard estimate = 0.25). The significant predictor variables for Test 2 were home language, type of school, and socio-economic status; with home language explaining the greatest proportion of the variance (standard estimate = 0.32). Regulation of Cognition was not a significant predictor of performance on either test. Results are presented in Tables 38 and 39 below.

Table 38: Regulation of Cognition, Demographics, and Test 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.93	< 0.0001	0
NESES	**1**	-1.35	0.1776	-0.08176
TYPE SCHOOL	**1**	3.25	0.0013	0.20645
NHLANG	**1**	-4.15	< 0.0001	-0.25974
MAI_REGCOGT	**1**	0.40	0.6881	0.02368

Table 39: Regulation of Cognition, Demographics, and Test 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.09	< 0.0001	0
NHLANG	**1**	-5.28	< 0.0001	-0.32657
TYPE SCHOOL	**1**	2.29	0.0231	0.14394
NESES	**1**	-2.10	0.0369	-0.12552
MAI_REGCOGT	**1**	1.43	0.1535	0.08346

Motivation as a Predictor

The models predicting test performance based on Motivation and the demographic variables was significant for Test 1 ($F_{4, 252} = 10.11$; $p < 0.0001$; $R^2 = 0.1383$) and for Test 2 ($F_{4, 252} = 11.57$; $p < 0.0001$; $R^2 = 0.1551$). The results in Tables 40 and 41 indicate that Motivation was not a significant predictor of performance in either test. In both tests, home language and type of school were the significant predictors, with home language explaining most of the variance in each test (Test 1: standard estimate = 0.25; Test 2: standard estimate = 0.31).

Table 40: Motivation, Demographics, and Test 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.42	< 0.0001	0
NESES	**1**	-1.31	0.1899	-0.08014
TYPE SCHOOL	**1**	3.25	0.0013	0.20712
NHLANG	**1**	-4.13	< 0.0001	-0.25706
MSLQ_MOTIVT	**1**	-0.02	0.9876	-0.00092503

Table 41: Motivation, Demographics, and Test 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.10	< 0.0001	0
NHLANG	**1**	-5.18	< 0.0001	-0.31914
TYPE SCHOOL	**1**	2.41	0.0168	0.15197
NESES	**1**	-1.80	0.0734	-0.10852
MSLQ_MOTIVT	**1**	1.24	0.2145	0.07337

Cognitive and Metacognitive Strategies as a Predictor

The model predicting test performance based on Cognitive and Metacognitive Strategies and the demographic variables was significant for Test 1 ($F_{4, 252} = 10.15$; $p < 0.0001$) with the model explaining 13% of the variance ($R^2 = 0.1387$), and for Test 2 ($F_{4, 252} = 12.15$; $p < 0.0001$) with the model accounting for approximately 16% of the variance ($R^2 = 0.1617$). Type of school and home language were significant predictors of performance on Test 1; with home language explaining the greatest proportion of the variance (standard estimate = 0.25). Home language, socio-economic status, and type of school were significant predictors of performance on Test 2; with home language again as the strongest predictor (standard estimate = 0.32). Cognitive and Metacognitive Strategies was not a significant predictor of performance for either test. Results are presented in Tables 42 and 43 below.

Table 42: Cognitive and Metacognitive Strategies, Demographics, and Test 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.48	< 0.0001	0
NESES	**1**	-1.33	0.1862	-0.07995
TYPE SCHOOL	**1**	3.25	0.0013	0.20653
NHLANG	**1**	-4.15	< 0.0001	-0.25821
MSLQ_COGMCST	**1**	0.34	0.7376	0.01964

Table 43: Cognitive and Metacognitive Strategies, Demographics, and Test 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.40	< 0.0001	0
NHLANG	**1**	-5.26	< 0.0001	-0.32344
TYPE SCHOOL	**1**	2.28	0.0237	0.14287
NESES	**1**	-2.00	0.0465	-0.11904
MSLQ_COGMCST	**1**	1.88	0.0608	0.10879

Resource Management Strategies as a Predictor

The models predicting test performance on the basis of resource management Strategies and the demographic variables were significant for Test 1 ($F_{4, 252} = 11.61$; $p < 0.0001$; $R^2 = 0.1556$), and for Test 2 ($F_{4, 252} = 13.26$; $P < 0.0001$; $R^2 = 0.1739$). Performance on Test 1 was predicted by type of school, home language, and Resource Management Strategies; with home language being the strongest predictor (standard estimate = 0.24). Socio-economic status was not a significant predictor of performance in Test 1. Predictors of performance for Test 2 were home language, which was the strongest predictor (standard estimate = 0.30), socio-economic status, and Resource Management Strategies. Type of school was not a significant predictor of performance on Test 2. Results are presented in Tables 44 and 45 below.

Table 44: Resource Management Strategies, Demographics, and Test 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.63	< 0.0001	0
NESES	**1**	-1.33	0.1841	-0.07955
TYPE SCHOOL	**1**	2.78	0.0059	0.17830
NHLANG	**1**	-3.94	0.0001	-0.24347
MSLQ_RESMGST	**1**	2.27	0.0240	0.13627

Table 45: Resource Management Strategies, Demographics, and Test 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.24	< 0.0001	0
NHLANG	**1**	-4.92	< 0.0001	-0.30119
TYPE SCHOOL	**1**	1.77	0.0778	0.11252
NESES	**1**	-2.01	0.0454	-0.11880
MSLQ_RESMGST	**1**	2.70	0.0073	0.16049

In summary, the models predicting test performance explained between 13% and 17% of the variance, which suggests a reasonable to fair predictive capacity. What is interesting in the results is that the pattern of prediction is different for the first and second tests. This seems to suggest that these tests focused on different aspects and imposed different requirements. For the first test, type of school and home language determined performance primarily, but Knowledge of Cognition and Resource Management Strategies did play some predictive role, albeit a rather small one. In each case, home language was the strongest predictor of test performance. For the second test, on the other hand, home language, type of school, and socio-economic status all determined performance. The emergence of socio-economic status as a predictor on the second test, which was focused on biological constructs, may allude to the role of one's exposure, background and access to resources as playing a potential role in predicting performance in assessments tapping this content. Home language was again the strongest predictor of performance on the second test. Resource Management Strategies were also found to predict performance for this test.

CHAPTER FIVE: DISCUSSION

This section of the research report will critically examine the results of the statistical analyses, in light of the theoretical framework presented earlier in the research. This research had three main objectives: the first being to understand the relationship between metacognitive awareness, the use of cognitive and metacognitive strategies, and motivation. Thereafter, the research aimed to understand the relationship of these variables to academic performance. Lastly, the research aimed to understand whether any of these variables played a role in predicting academic performance across different assessment tasks. This chapter will begin with a basic discussion of the summary statistics and reliabilities obtained, as well as a review of some of the key aspects of the sample. Thereafter the results of the correlations and multiple regressions will be discussed.

Reliability of the Scales

The Metacognitive Awareness Inventory (MAI) subscales and overall scale showed good internal consistency reliability. The Cronbach Alpha coefficients for the subsections showed more variability, and thus some of the subsections were less highly reliable. Such findings are in line with research that has been conducted in the international arena in which high reliability has been found for the overall scale and subscales of the MAI (Bendixon & Hartley, 2003; Kleitman & Stankov, 2007; Schraw & Dennison, 1994; Sungur, 2007a). These findings are important to note within the South African context, in which the instrument has fairly limited usage.

The Motivated Strategies for Learning Questionnaire (MSLQ) overall scale and main subsections showed good internal consistency reliability. The subcomponents of the subsections showed more variability, and thus showed less strong reliability overall. These findings are in line with other research conducted in the international sphere (Kivinen, 2003; Magno, 2011; Pintrich et al., 1993). Within the South African context, findings of good internal consistency reliability in the overall scale and subscales have been echoed in other research (McSorley, 2004; Payne, 2008). Variability in the reliabilities of some of the subsections has been noted in previous South African research (Magwaza, 2009).

The Sample

Considering key aspects of the sample is likely to be useful in making sense of and interpreting some of the results. Descriptive statistics revealed that the mean age of participants was 19.4 years. The

majority of the sample was in their first year of university, completing Psychology One for the first time; suggesting that the results could potentially be used to make inferences about the adjustment of first year students to university. Participants were primarily from the Arts Faculty. In terms of reasons for undertaking psychology, 42.11% of the participants indicated that psychology was their major; 39.47% were taking the course for credit purposes, and 7.14% noted that they were completing the course as it was prescribed for their particular degree. The remainder of the sample cited other reasons for completing the course, including interest in the subject matter, the fact that it was an elective, and indecision regarding the subject and wanting to find out more. The sample showed an over-representation of females, which was expected due to the fact that Psychology as a course generally tends to attract more female students; it is also stipulated as a compulsory course in a range of degrees, many of which also tend to be female-dominated. In terms of home language, the data was coded to represent two nominal categories, namely English and Non-English; there was a fairly even sample split with 42.91% falling into the English category, and 57.09% citing a language other than English as their home language. Estimated socio-economic status was coded into two categories, high and low: 51.53% of the sample fell into the low category, while 48.47% were in the high category. The majority of the sample (61.60%) had attended a government, public school. The specific make-up of the sample in this research is important when considering the overall generalisability of the results. It also serves to provide context to the nature of the findings which is imperative when interpreting the results.

Summary Statistics

Although the data was deemed sufficiently normal to support parametric analyses based on sample size and the specific statistical techniques applied in the study, there were nevertheless patterns indicating different ranges of academic performance and distributions of the key variables in the sample evident in the summary statistics and histograms.

In relation to academic performance, the overall weighted average obtained was 65.46. The normal distribution of this variable was expected given that it was comprised of marks obtained from the two essays, two tests, and the examination. High variability in the range of scores was also expected as it captured below-average to above-average performance across the participant group. Average performance in the examination was 59.28; which was substantially lower than that achieved for the tests or essays. This was expected given that the examination covers numerous content areas which require more time and effort investment in studying. Exams are also generally associated with time pressure and high levels of anxiety (Furnham et al., 2003). The fact that this would have been one of the first few exams written at the tertiary level would also likely have exacerbated anxiety levels; as

would the fact that the examination contributes more proportionately to the overall mark. The examination is a multiple-choice format and while items have inherent cueing within them in terms of the alternatives provided, students are still required to have detailed knowledge of the constructs (Duff et al., 2004). The multiple-choice format is often thought to promote more surface learning approaches, in which individuals try to memorise facts and learn by rote due to the amount of content, whereas this is less prominent in essays and tests which cover more specific content areas (Furnham et al., 2003).

Generally, the average performance across Test 1 (68.71) and Test 2 (66.94) was quite consistent, although a slightly higher average was achieved on Test 1, which was expected given that this test covered more introductory and general Psychology concepts, whereas test 2 covered more detailed, content-rich Cognitive and Neuropsychological constructs. Test 2 thus required more conceptual, holistic understanding of the material, such that it could be integrated and applied effectively. The average performance for Test 1 would thus have been expected to have been even higher, however the fact that the first test was one of the students' first tests at university level suggests that anxiety may have possibly impacted performance (Furnham et al., 2003). Test 2 data was also more skewed, indicating a wider range of scores than for Test 1. Average performance for Essay 1 was 67.85, while for Essay 2 it was 70.63. The essays followed a similar structure to the tests in that the first essay was based on more general, introductory psychological constructs, while Essay 2 is based on biologically-based, Neurocognitive psychological content. Performance for Essay 1 would thus have been expected to be substantially higher than performance in Essay 2, which was not the case. However one has to consider the role of anxiety in impacting performance on Essay 1; as this would have been one of the first essays written at university level. The type of school also becomes an important consideration in this regard, as it lends itself to the question of background exposure, and access to resources and learning opportunities consistent with essay type of assessments. The formative nature of essays, and the crucial role of feedback, also requires consideration. Hattie (1992) notes that feedback is one of the most influential factors in performance. Feedback that is aimed at the students' ongoing development, and which aims to address faulty hypotheses, serves to provide positive reinforcement and encouragement (Todd & Mason, 2005). Each Psychology One essay comes with extensive comments linked to more effective structuring and application of the material. It seems that perhaps the feedback received in Essay 1, guided the further efforts of students; in particular as essays do not have stringent time pressures imposed and thus students could ponder over feedback and fine-tune their efforts.

The MAI Knowledge of Cognition subsection and all of the sub-components indicated slight skewing to the left due to the presence of a few outliers, suggesting that slightly more participants reported higher levels of declarative, procedural, and conditional knowledge in the sample. The Regulation of Cognition subsection was essentially normally distributed, although with very slight skewing to the left, as were the sub-components of Planning and Comprehension Monitoring. The sub-component of Evaluation was normally distributed, while Information Management and Debugging were skewed to the left, indicating higher reported levels of these regulation strategies in the sample. The overall MAI score was essentially normally distributed, although again with very slight skewing to the left. These findings suggest that generally participants reported slightly higher levels of awareness of cognition and average to slightly higher capacities to regulate their cognition.

For the MSLQ, in terms of the Motivation subscale, the Affective component and its sub-component Test Anxiety showed evidence of slight skewing to the left, while the Expectancy component and sub-components of Self Efficacy for Learning Performance and Intrinsic Goal Orientation were skewed to the left. The Value component and sub-components of Extrinsic Goal Orientation, Task Value, and Control of Learning Beliefs were more heavily skewed to the left. The Motivation subscale overall was also negatively skewed. This suggests that participants generally reported higher levels of internal orientation to succeed and engage in learning, belief in their own effectiveness and ability to control their learning efforts, as well as anxiety pertaining to performance across the sample. This, in turn, suggests that most participants seemed to be motivated to attain a good mark on the course, possibly for reward purposes or to out-perform others (Pintrich et al., 1991); this seems to link to the fact that a large percentage of the sample (39.47%) were merely completing the course for credit purposes and thus wanted to simply get through the course and obtain a pass mark; yet also, for those completing the course as a major (42.11%), the impetus to out-perform and compete with others may have been a motivating force, in conjunction with their desire to master the contents of their course for their own purposes. Findings also suggest that the majority of participants showed a degree of interest and utility in the course material. This links with findings that participants either opted to take the course as an elective, or pursued the course due to interest in the subject matter and wanting to learn more about Psychology.

The Learning Strategies subscale was essentially normally distributed, although with very slight skewing to the left caused by a few outliers. Cognitive and Metacognitive Strategies and Resource Management Strategies, as well as the subcomponents of Critical Thinking and Metacognitive Self-Regulation, were normally distributed, while Rehearsal, Elaboration, Organisation, and Time and Study Environment were slightly skewed to the left. Effort Regulation was skewed to the left, while

Help Seeking and Peer Learning were slightly skewed to the right. This suggests that participants generally reported average to slightly high use of the cognitive and metacognitive learning strategies, as well as certain of the resource management strategies. It was, however, concerning that participants reported slightly lower average levels of help-seeking and peer learning, two strategies that have been shown to be highly effective in assisting students to cope with academic demands at the tertiary level (Newman, 2002; Williams & Takaku, 2011).

Key Findings from the Correlation Analyses

All of the MAI subscales and subsections showed a high degree of inter-relationships, which was expected given that the aspects of metacognitive awareness are deemed to work together to enable students to self-regulate (Schraw & Dennison, 1994). In particular, knowledge of cognition and regulation of cognition were expected to be correlated given that they both bear influence upon each other; metacognitive knowledge provides the basis upon which strategies are selected and regulation is enacted; however, further metacognitive knowledge also arises out of regulation as learners reflect on their strategies and evaluate their progress (Romainville, 1994).

When reviewing the MSLQ correlations, the following key findings were apparent. Within the Motivation subscale, it was apparent that the Affective Component of motivation was not significantly linked to many other aspects of motivation. This was expected given that the affective aspect seems to tap into something quite different from the value and expectancy aspects of motivation. Current theories of motivation note the importance of causal attributions, perceptions of self-competence, value and task interest, feelings of having agency to determine one's own performance, and purpose for completing the task; these variables all seem to fall within the confines of cognitive constructs (Wolters, 2003; Pintrich & Schunk, 2002). More specifically, the Value Components of motivation assess an individual's objectives, purposes, and drive to pursue a particular task, while the Expectancy Components tap into the expectations around one's capacity to attain success. The Affective component, on the other hand, as measured by the MSLQ, taps into an individual's concern about not performing well (Pintrich, 2004); and seem to elicit information pertaining to an individual's instinctual emotional response to a task. The Affective Component is thus thought to measure a different aspect of motivation as it is not confined to the cognitive realm. The Affective Component showed only a weak, significant relationship with the Motivation subscale overall; while the Value and Expectancy Components showed very strong, significant relationships with the Motivation subscale. The Affective Component was also not significantly linked to the MSLQ scale overall. These findings highlight the complex and multi-faceted nature of Motivation within the academic domain. Motivation emerges as a result of tasks demands, familiarity with the

task, contextual factors that arouse interest and/or attributions, and expectations regarding task outcomes (Ainley, Hidi, & Berndorff, 2002). Motivation is thus a construct that is cognitively-based to the extent that it influences engagement and interest in a task (Palos et al., 2011); yet it is also comprises key emotional components and feelings pertaining to the task, that drive the entire process, from task initiation, to persistence in the face of setbacks, and eventual task completion (Wolters, 2003). Both of these aspects of motivation continually play out and influence one another in the academic context, and there seems to be considerable overlap between the two aspects. When examining motivation it seems important to gauge not only the subjective, cognitive thoughts and beliefs the individual houses, but also the actual strategies of control that an individual uses in order to influence the outcomes of these cognitive-dimensions (Wolters, 2003).

Pintrich (2004) notes that the Motivated Strategies for Learning Questionnaire (MSLQ) assesses five motivational variables (Intrinsic and Extrinsic Goal Orientations, Task Value, Self-efficacy, and Control of Learning Beliefs), but only one emotion (Text Anxiety). He criticises the measure for not including any scales that assess the strategies an individual uses to control their motivation and affect and re-iterates the importance of newer instruments being developed with such dimensions in mind, in order to provide a more dynamic account of motivation. An individual's ability to control aspects of their motivation is deemed a major factor in performance (Wolters, 2003). Pintrich's (2004) critique also highlights the fact that within the MSLQ, the emotional/affective side of motivation is perhaps not assessed adequately enough, relative to the more cognitive components of this construct. The importance of ongoing investigation into the relationship between the cognitive and emotionally-laden aspects of motivation is evident.

When examining the correlations from the MSLQ Motivation and Learning Strategies subscale, it was apparent that Control of Learning Beliefs was significantly but negatively related to Help Seeking and Peer Learning; this relationship would be expected given that the more an individual feels they are able to control their own learning and performance, the less likely they may be to seek help from others. Importantly, a learner's desire to seek out help is based on their acknowledgement of the need for help, an understanding of what type of assistance is needed, and also knowing who best to ask for help (Williams & Takaku, 2011). It is also evident that some students may avoid seeking help as they tend to over-estimate their self-efficacy, and thus seem to feel as though their learning outcomes will be based upon their own efforts; thus perhaps avoiding collaborative efforts and preferring to direct and manage their own learning (Williams & Takaku, 2011); they may also attribute their difficulties to factors beyond their control and thus avoid seeking assistance (Ryan, Pintrich, & Midgley, 2001). Issues of social comparison amongst peers, and not being seen as individually capable, may also deter

learners from engaging in peer learning (Newman, 2002). Furthermore, it was found that Test Anxiety was negatively related to the Resource Management Strategies of Effort Regulation and Time and Study Environment Management; again, this finding was expected as the more anxious an individual feels about task performance, the more difficult it may be for them to persevere and commit to goal completion; their anxious thoughts may also impact their study efforts and capacity to manage their time and organise their workload effectively (Pintrich et al., 1991).

Help Seeking and Peer Learning on the Learning Strategies subscale showed the fewest correlations with the other MSLQ variables; and were not significantly related to the Motivation subscale. This finding is expected to some degree given that the rest of the variables in the MSLQ, and those in the Motivation subscale, specifically seem to be more intrinsically focussed on what strategies the individual employs, and how their motivation influences their approach to a task; whereas Help Seeking and Peer Learning perhaps reflect a more extrinsic orientation and the need to use others as a means by which to regulate performance and gain support (Pintrich et al., 1991). This finding could also possibly be due to the fact that Help Seeking and Peer Learning were the least reported of all the strategies used in the sample.

The significant correlations between numerous aspects of the Motivation (the Value, Expectancy and Affective Components) and the Learning Strategies subscales re-iterates the degree of inter-relation between one's motivation to engage in and pursue a task, and one's capacity to regulate one's efforts and employ effective strategies during task completion.

Metacognitive Awareness, Cognitive and Metacognitive Learning Strategies, and Motivation

The MAI Knowledge of Cognition subscale showed significant correlations with the MSLQ Motivation and Learning Strategies subscales; it also showed significant correlations with the majority of the MSLQ subsections. Of the MSLQ subsections, the only two variables that were not significantly correlated with Knowledge of Cognition were Extrinsic Goal Orientation and Control of Learning Beliefs. Furthermore, the MAI Regulation of Cognition subscale also showed significant correlations with the MSLQ Motivation and Learning Strategies subscales; as well as most of the subsections. A non-significant relationship with the MSLQ Control of Learning Beliefs was noted. Test Anxiety and the Affective Components only showed significant correlations with the Planning aspect of Regulation of Cognition. The MAI Information Management was not significant related to the MSLQ Extrinsic Goal Orientation; and the MAI Comprehension Monitoring was not related to Help Seeking on the MSLQ.

The highly correlated nature of the majority of the subscales and variables on the MAI and MSLQ alludes to the overlap in these self-regulatory strategies; and perhaps even the difficulty in trying to evaluate such constructs as metacognition and motivation in relative isolation from one another (Pintrich & Schunk, 2002). The complex, multi-faceted nature of these constructs and their inter-relation is also highlighted (Efklides, 2011). Schraw and Moshman (1995) note that there are several measurement problems associated with the evaluation of metacognition due to its complex nature. While the instruments in this study purported to measure different aspects of metacognition; with the MAI evaluating metacognitive awareness (knowledge and regulation of cognition) and the MSLQ assessing the use of cognitive and metacognitive learning strategies; some degree of correlation was expected across the MAI Regulation of Cognition aspect, and the MSLQ Cognitive and Metacognitive Learning Strategies, as they both aim to assess facets of the control aspect of metacognition (Vrugt & Oort, 2008); the extent of the correlation between the scales overall however was not anticipated and highlights the complexity of the overlapping nature of these constructs. The correlations seem to allude to the fact that Knowledge of Cognition is related to the use of Cognitive and Metacognitive Strategies, as a learner needs to have knowledge about their cognition and cognition more generally, as well as information pertaining to effective strategy use; before they can operationalize the strategies and attempt to actively regulate and control their performance (Schraw & Dennison, 1994). While there is a positive relationship between metacognitive knowledge and one's ability to regulate that knowledge, this relationship does not occur in the face of inaccurate metacognitive knowledge, in that inaccurate knowledge will inhibit the individual's ability to realise their need to alter their knowledge (Veenman et al., 2006).

Furthermore, once a strategy has been implemented, feedback in terms of evaluating strategy use and progression prompt additional metacognitive knowledge; which then leads to strategy change or adaptation (Carvalho, 2010). The correlations between the Knowledge of Cognition, Regulation of Cognition, and Motivation subscale clearly require further investigation; particularly with regard to investigating the relationship between the variables of metacognitive knowledge, metacognitive experience and motivation (Efklides, 2011).

The highly correlated nature of the MAI and MSLQ scales and subscales poses questions as to whether these variables can be examined or operationalized as separate constructs or variables. There is clearly a need to further psychometrically investigate available measures; to establish to what extent these variables can be distinguished and examined independently, and also to obtain more insight with regard to the extent to which these variables represent aspects of a broader, overarching construct.

In terms of the finding that Knowledge of Cognition was not correlated with Extrinsic Goal Orientation and Control of Learning Beliefs, the following is noted. Intrinsic goal orientation has generally been linked with enhanced academic performance (Pintrich, 1999). In research conducted by Wolters et al. (1996), learners with more of an extrinsic goal orientation reported lower levels of interest and usefulness in a subject overall. They experienced less self-efficacy linked to task performance, and engaged in less self-regulated activity overall. Perhaps this finding links to the fact that around forty percent of the participants in this study were completing Psychology One for credit purposes only; suggesting that they may see performance in this course as a means to an end, and thus possibly lack the interest and motivation to really engage in their learning and optimise their performance. Even those students completing Psychology as a major might not yet have the familiarity with the course needed to promote and sustain their desire to master and really grapple with the course content. It is noted that tertiary students often intentionally evoke extrinsic goals to help sustain their motivation in terms of achieving good marks (Wolters, 1998), and demonstrating their ability and competence to others (Sungur, 2007b); however those with an extrinsic orientation often tend to be more focused on these aspects, to the detriment of a more zoned-in focus on the task (Pintrich et al., 1991). It seems that when learners are more intrinsically motivated to succeed, and when they strive for mastery in a course and believe that their efforts will determine their performance, they are more likely to engage in self-regulation strategies (Pintrich & De Groot, 1990); and thus, the aspects of knowledge and regulation of cognition will be more at the fore of their processing. Students in their first-year of university, who comprised eighty percent of this sample, may be more extrinsically focused overall, as perhaps they do not yet have a clear career trajectory and thus are not yet focused on mastery and the role of their learning in their future careers. Other research has found that Extrinsic Goal Orientation is negatively related to self-regulated learning and performance (Pintrich, 1999).

Declarative Knowledge was not significantly correlated with Help Seeking and Peer Learning. Those with high Declarative Knowledge will tend to have a fair degree of insight about themselves as learners, as well as those factors that are likely to impact their performance (Schraw & Moshman, 1995); and thus they may rely more on their own knowledge and capacity as a learner.

Interestingly, Control of Learning Beliefs was not significantly related to either Regulation of Cognition or the Learning Strategies subscale. Students who believe that through their own efforts they are able to direct and impact their performance, tend to approach their learning in a more strategic and efficient manner (Al Khatib, 2010; Pintrich et al., 1991). These findings were not expected, as one would anticipate that a learner who feels more in control of their learning would

engage in more efforts to regulate and manage their learning through the use of various strategies. Research conducted by Sungur (2007b) suggested that Control of Learning Beliefs significantly predicted a learner's self-efficacy, which then predicted their intrinsic motivation; self-efficacy has been linked to better academic performance (Bandura et al., 1996).

The Affective Component (consisting only of Test Anxiety) of Motivation was found to have a significant relationship with Knowledge of Cognition, but not with Regulation of Cognition, except for the aspect of Planning; whereas the other two aspects of motivation, Value and Expectancy Components, were significantly correlated with both Knowledge and Regulation of Cognition. This seems to suggest that anxiety may be more linked to the outset of task performance, and the cognitions prevalent during task onset; which seems plausible given that learners generally feel anxious leading up to and going into a task. An individual's initial thoughts about a task and their cognitive capacity as a learner, as well as the strategies necessary to ensure successful task completion, are likely to be impacted by anxiety. Learners that feel anxious or nervous, and who anticipate doing poorly even before they begin a task, can set in motion a type of cyclical negative helix that can impact their approach to the task; such feelings will then require that the individual engage in numerous self-regulatory behaviours in order to adapt sufficiently (Bandura, 1997; Boekaerts et al., 2000). This finding was re-iterated in the correlations among the MSLQ items, in which the Affective Component of motivation did not show a significant relationship with the Learning Strategies subscale overall.

Metacognitive Awareness and Academic Performance

In reviewing the significant correlations between the MAI Knowledge of Cognition subscale and academic performance, the following key findings were noted. Knowledge of Cognition showed a significant relationship with performance on both tests and the overall weighted average. Similar findings of correlations between the MAI and broad measures of academic performance were reported in a study by Young and Fry (2008). These and some of the other more detailed findings in this section seem to allude to the fact that learners prepare for their assessments based on their expectations regarding the type of processing required; for example in multiple-choice exams, students may perceive the items to be of a more surface level and thus may study in a rote fashion; whereas for longer and essay type question they may perceive the requirement of a deeper level of processing, and thus accordingly embark on study techniques that match this processing level at a more applied level (Duff et al., 2004). This type of preparation will draw on different aspects of the learner's metacognitive awareness (Ross, Green, Salisbury-Glennon, & Tollefson, 2006).

Declarative Knowledge was significantly correlated to performance on both tests, the first essay, the examination, and overall weighted average; which suggests a connection between what learners know about themselves as learners and the knowledge they have about which strategies work best in different situations (Coutinho, 2008), with performance in high-stakes situations such as tests (short-answer factual recall and applied type questions) and exams (multiple-choice questions). This suggests that students may enter these high-stakes situations (tests and exams) with some strategy in mind about how best to approach the testing situation and types of questions, having given some thought to it, especially in light of the time pressures and imminent anxiety in such assessment conditions. In line with self-regulation theory, prior to embarking on a task learners (in particular more mature, experienced learners) activate relevant prior knowledge (often automatically but also deliberately) which can include knowledge about what the learner knows about the content and how different types of problems can be constructed and represented; this knowledge informs their strategy selection prior to undertaking a task (Pintrich, 2000; Schraw & Moshman, 1995).

Procedural Knowledge only showed a significant relationship with performance on the second test; this test, whilst also being theory-based, centred on biological constructs and cognitive-neuropsychological concepts, and thus seemed to test something quite different from the first test which required the application of constructs and theories and thus seemingly allowed for more latitude in responses. The second test, on the other hand, was located more in the recall of facts and biological theories, which were relatively more set in nature. Performance on the second test thus appeared to require something different from students in terms of task demands; it seems that the different type of content and type of questions required to some extent that an individual knew about which strategies are likely to be most beneficial given the requirements thereof (Coutinho, 2008); the activation of metacognitive knowledge and experiences (again either automatically or more purposefully) plays a role in informing the learner about how variations in the task can influence strategy selection, based on their knowledge of the various strategies and processes (Pintrich, 2000). In addition, perhaps that fact that it was the students' second test at university may have related to the links between performance and procedural knowledge as they may have gained additional experience and understanding over the intervening timeframe.

Conditional Knowledge showed no significant relationship with the performance variables. The idea of knowing when and why to make use of certain strategies (Coutinho, 2008) was expected to be linked to performance. This finding may allude to the difficulty in using a self-report questionnaire which obtains information about a course as a whole; as in this way information pertaining to the knowledge of strategy usage may not be accurately captured as participants are responding more

generally to the questions thinking about the course as a whole, rather than about their performance on specific assessment tasks. Veenman et al. (2006) emphasised the importance of identifying the grain of analysis in metacognitive assessments which range from overall metacognitive skills to course-specific skills and even task-specific skills.

The Regulation of Cognition subscale showed no significant relationship with the performance variables. This control aspect, in which learners monitor their performance, implement strategies, and constantly appraise their progress, was expected to be linked to academic performance (Schraw, 2001). The subsections of Planning and Comprehension Monitoring also showed no significant relationships to performance, yet were expected to show some degree of inter-relation. It seems that the debate as to whether metacognitive processes are automatic or not becomes crucial in understanding these findings. Some researchers have argued that many of the metacognitive processes occur 'behind the scenes'; individuals are thus not necessarily consciously aware of their use of these processes and strategies, that is until an error occurs and the individual is forced to evaluate their strategies and the usefulness thereof (Veenman et al., 2006). Again, the fact that information obtained was course-specific and not task-specific may also be a reason for such findings. Research with tertiary students has shown that even those students with the necessary knowledge to regulate their performance do not always engage in effective regulatory actions and metacognitive strategy use; thereby highlighting the role of motivation and the interplay of these variables in understanding performance (Carvalho, 2010). It seems that some students at the university level may require a different instructional context that will prompt them to utilise their strategies and actively regulate their learning (Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Lin & Lehman, 1999).

Information Management was related to performance on the second test. The fact that this test was assessing a different type of subject matter that was very factual and biologically-based suggests that perhaps the content of this assessment task is linked to a need for information to be processed in a more meaningful and efficient manner through the adoption of various strategies such as selective focusing, summarising, organising, and elaboration (Sungur, 2007a; Zulkiply, Kabit, & Ghani, 2008). Debugging, on the other hand, showed a significant relationship with performance on the examination which comprised multiple-choice questions. Debugging includes strategies that enable a learner to correct their comprehension and performance errors (Zulkiply et al., 2008). The link between different regulation strategies with different assessments formats links to the idea that students tend to adjust their strategies to the demands of the particular task (Ross et al., 2006). Information that requires more deep level processing requires deeper processing strategies such as organisation and elaboration, which are components of Information Management; this was likely required for performance on the

second test given the biological subject matter and need to understand the links between the terms and concepts. Debugging may be a strategy that is more useful when working on multiple-choice examination questions as an individual can use the cues from the alternative options as a means by which to check their comprehension and cue them to possible performance errors. Evaluating, on the other hand, showed a significant negative relationship with performance on the first essay; this finding was completely unexpected and is concerning, given that one would expect that the more an individual evaluates their efforts and strategies, the better their performance. This is true, especially in light of the fact that essays generally provide a good opportunity for learners to reflect on the effectiveness of their chosen strategies and performance efficiency post learning; in particular as these assessment formats are formative in nature and include a feedback component (Sungur, 2007a). There does not seem to be a logical explanation for this finding other than to suggest that perhaps learners did not reflect sufficiently on the effectiveness of their learning strategies post-learning; possibly due to it being the first essay, learners may not have given their efforts sufficient self-reflection.

The MAI overall scale showed no significant correlations with performance across the different assessment tasks, which was unexpected. This alludes to the complex, multi-dimensional nature of metacognitive awareness and the fact that it is probably best studied in terms of the aspects of knowledge of cognition and regulation of cognition. Despite this, this finding was still concerning and warrants further psychometric investigation into the efficacy of the use of the MAI specifically as a measure of metacognitive awareness, but also in terms of psychometrically evaluating other measures of metacognition within the South African context more generally. It is apparent that metacognitive measures need to be scrutinised closely to ensure that they are aligned with the metacognitive variables (Veenman et al., 2006). It is also clear that more research needs to be conducted into the definition of metacognition and its components (Winnie, 1996; Veenman et al., 2006).

Use of Cognitive and Metacognitive Learning Strategies and Academic Performance

Correlations between the Cognitive and Metacognitive Learning Strategies taken from the MSLQ and academic performance were minimal; again this finding was unexpected given that self-regulated learners engage in an array of strategies to regulate their performance (Pintrich, 2000; Zimmerman, 1998). This finding is in contrast to other research that has noted a significant relationship between the Cognitive and Metacognitive Strategies of Rehearsal, Elaboration, and critical thinking with academic performance (Watson et al., 2004). The findings in this study point to the fact that learners may not always be aware of the strategies they are using; perhaps because such strategies are automatic (Veenman et al., 2006), but perhaps also because the self-report instrument failed to elicit specific strategy information per assessment task and thus such information was not captured adequately.

Perhaps it also is indicative of a failure on the part of many learners to actively reflect on the types of strategies they use to complete tasks.

The only significant relationship identified was between Organisation and performance on the second test; again this relationship seems to link to the biologically-based content, which due to its rich factual content requires deeper level strategies such that the information can be processed optimally; the information in this test is demanding factually and seems to require that the learners engage in strategies that will assist them to select key information and make connections between that information (Pintrich et al., 1991). The nature of the work content in this test definitely seemed to tap into something different from the other test.

When examining the relationship between Resource Management Strategies and performance a few key relationships emerged; despite the fact that many of the key issues linked to the evaluation of Cognitive and Metacognitive Learning Strategies as mentioned above, still pertain to this category of Learning Strategies. Time and Study Environment Management was significantly linked to performance on the second essay; this essay, in line with the second test, centred on the cognitive-neuropsychological component of the course and thus reflects many of the same issues as discussed previously with regards to the second test. It seems that the factually-laden, biologically-based material in this essay may have required the individual to invest more time and planning into the way they would go about compiling and writing this essay. Further, as Help Seeking was also related to performance in the second test, it also seems that learners willing to elicit more assistance in trying to understand the content of this work, which can be demanding; in particular if one does not have a background in the brain and its processes, performed better. Help Seeking was also significantly linked to overall weighted average; this is in line with other research conducted by self-regulatory theorists who have found that more self-regulated learners generally know when to seek help and from whom (Pintrich, 2004).

As expected, Effort Regulation was significantly correlated with all the performance variables; as the more energy and commitment one invests in a task, the more they are likely to sustain their motivation and engage in self-regulatory activities; which should contribute to good performance (Sungur, 2007b; Schunk & Zimmerman, 2008; Vrugt & Oort, 2008). This finding supports other research that has shown a significant correlation between effort regulation and academic performance (Watson et al., 2004); suggesting that learners who are determined and persist in their efforts are more likely to succeed. Further, Sungur (2007b) found that higher self-efficacy was associated with more metacognitive strategy use, which then predicted higher levels of effort regulation, all of which links

to performance. Peer learning was significantly correlated with performance on the first test; this may speak in some part to the adjustment of first-year university students; those students with a higher need or more willingness to engage in more collaborative efforts in order to ensure better performance on the first test due to their unfamiliarity with testing at the university level may have performed better; also possibly due to the workload. The use of resource management strategies has been linked to tertiary level academic performance by other researchers (Borg et al., 1989; Pintrich, 1989b, as cited in Paulsen & Gentry, 1995).

Motivation and Academic Performance

The overall Motivation subscale showed no significant relationships with academic performance; again, this finding was not expected given the importance of motivation in self-regulated learning, and hence also in academic performance (Boekaerts et al., 2000; Schunk & Zimmerman, 2008). When examining the subsections of this subscale however the following key significant relationships were noted. Extrinsic Goal Orientation showed a significant, negative relationship with performance on the examination and overall weighted average. This suggested that the more the learner was motivated to achieve simply to get good grades or to outperform others, the less well they were likely to perform. First-year university students who are invested in learning because they believe that it will afford them knowledge and skills that will be invaluable in their professional careers have been found to be more motivated at an intrinsic level (Schunk & Zimmerman, 2008). This would tie in with research that has shown that learners with goals linked to mastery, and thus a more intrinsic orientation, tend to perform better (Coutinho, 2007; Wolters et al., 1996).

The Expectancy Component of Motivation, which includes Control of Learning Beliefs and Self-Efficacy for Learning Performance, showed a significant correlation with performance on the second test. This likely links again to the demanding content of this test, comprising biologically-based, content-rich material, in which in order to regulate their learning effectively, learners would need to believe in their own efforts to achieve successfully on the test, despite the demanding nature of the test (Pintrich et al., 1991). This result also links to findings that students are likely to adjust their approach and study strategies according to the demands of the task; for tasks in which students anticipate the need for deeper level processing, they seem more inclined to employ deeper processing strategies (Ross et al., 2006); also, a students' approach to a task is influenced by their achievement goals, which is in turn based on their self-efficacy for performance (Wolters et al., 1996).

Test Anxiety showed negative yet significant relationships with performance on the first test and essay, the examination, and the overall weighted average; this is line with other research findings which have linked increased anxiety to lower than expected academic performance (Pintrich & De Groot, 1990; Boekaerts et al., 2000). Anxiety has also been linked to an increased desire to want to withdraw from a task and reduce once task-directed efforts (Boekaerts et al., 2000). The more a task is valued, the more a person is also thought to experience anxiety related to their performance (Nie et al., 2011); which may have been the case with the first test and essay written at university level. Anxiety has been thought to block out relevant knowledge, and hence often the ability to effectively self-regulate, and could lead to an intense focus on outcome expectancies (Al Khatib, 2010). Interestingly, the results showed that Test Anxiety was not related to performance on either the second essay or second test. Perhaps this is due to the fact that the students' would have at least had some exposure to the requirements of these different assessments at the university level having completed the first test and essay; they also would have received some feedback from the first test and essay, that could then have then guided their efforts in future attempts on similar tasks (Todd & Mason, 2005); thereby possibly lessening anxiety. Furthermore, lecturers would have been cognisant of the more demanding nature and content of the course material for the second essay and second test, and thus it seems plausible that perhaps they too tried to provide more support, imparted more effective learning strategies, made learning outcomes more explicit, and even promoted some aspects of self-regulation.

Key Findings from the Multiple Regression Analyses

The following section evaluates the results from the multiple regression analyses which aimed to determine the role of metacognitive awareness, use of cognitive and metacognitive learning strategies, and motivation as predictors of academic performance across different assessment tasks (essays, tests, examination, and overall weighted average). Regressions were run with the main subscales of the MAI, namely Knowledge of Cognition and Regulation of Cognition – which separated out the two aspects of metacognitive awareness; then with the Motivation subscale; and lastly, with the main subsections of the Learning Strategies subscale, the Cognitive and Metacognitive Learning Strategies and Resource Management Strategies subsections. As home language, socio-economic status, and type of schooling have been linked to academic performance, particularly in the South African context (Huysamen, 1996; Stephen et al., 2004; Zaaiman et al., 1998); these variables were included in each of the regression analyses.

Knowledge of Cognition and Academic Performance

Knowledge of Cognition, home language and type of schooling were all found to be predictive of overall weighted average and the model explained a reasonable amount of variation within the context of the study; however the predictive capacity of Knowledge of Cognition was relatively weak in nature. Although also a reasonable model in terms of variation explained, only the variables of home language and type of school were found to be predictive of performance on the examination and Knowledge of Cognition was not found to be a significant predictor.

With the regressions for essay performance, a significant overall predictive relationship was found. This relationship was however weak in nature, and only type of school was a significant predictor variable, while Knowledge of Cognition was not found to be predictive of performance on the essays. Much more of the variance in test performance (fifteen percent) was explained by the interaction of Knowledge of Cognition, socio-economic status, home language, and type of school. However, although the model was significant overall, only home language, type of school, and socio-economic status were predictor variables for the second test. For the first test, socio-economic status was not a significant predictor and home language, socio-economic status, and Knowledge of Cognition were predictive. Within all the regressions, home language was the strongest predictor among the significant variables, showing a moderate predictive capacity in all cases. Socio-economic status was not found to be predictive of the overall weighted average, performance on the examination, or the essays. It was however significantly predictive of performance on the two tests.

Thus while Knowledge of Cognition generally showed a weak predictive power; it did show a limited capacity to predict performance on the overall weighted average, as well as on the first test. Its ability to predict performance was expected in light of the fact that it includes self-knowledge, knowledge about tasks, and knowledge about strategies, all of which are used to inform self-regulatory behaviours, which contribute to overall performance in significant ways (Schraw & Moshman, 1995; Sungur, 2007b). Findings were however expected with regards to Knowledge of Cognition being able to predict performance across all of the different assessment tasks, given the fundamental nature of metacognitive knowledge in the self-regulation process (Pintrich, 2000); perhaps this finding links to the fairly automatic nature of some aspects of metacognition (Veenman et al., 2006) and the fact that students may not always report accurate use of metacognitive strategies, as they are not aware of all the strategies they are using (Efklides, 2011). The first test would have likely evoked much anxiety, as for many it was their first test at university level, the learners would probably have entered the testing situation with a strategic plan of how best to approach the situation; prior knowledge and experience with regards to testing would likely have conjured up much metacognitive knowledge as to what

strategies to use and around what one knew about the subject matter (Pintrich, 2000; Schraw & Moshman, 1995); this knowledge would also probably have informed the choice of study techniques (Ross et al., 2006). Romainville (1994) notes that the quantity of one's metacognitive knowledge is not the important issue in performance; rather it is how frequently and effectively a learner is able to implement and apply their strategies and adjust to the demands of the task. The fact that Knowledge of Cognition was not predictive of performance across all assessment tasks may allude to the fact that while an individual can possess metacognitive knowledge, their use of that knowledge in self-regulatory behaviour may not always be consistent due to the presence of stressors and competing demands (Zimmerman, 1995).

Regulation of Cognition and Academic Performance

The regression model was found to be significant in terms of predicting overall weighted average; however home language and type of school were the only significant predictor variables. Home language explained the greatest proportion of variance and showed a moderate predictive capacity. Regulation of Cognition and socio-economic status were not predictive of overall weighted average. In examining the regression model for examination performance, similar results were obtained. Home language and type of school were the only significant predictors of examination performance; with home language showing a moderate predictive capacity. This hints at the notion of some students being more 'test-wise' and well versed in terms of examination conditions, based on their attendance at a private school which tends to have more resources and rich learning opportunities. It is noted that many students who experience difficulty with English comprehension tend to resort to the use of rote learning and memory strategies as study techniques, to compensate for their difficulties (Stephen et al., 2004). These strategies, while surface-level, may be quite effective in a multiple–choice assessment condition such as in the examination, in that cues are provided in the alternatives. However the use of surface level strategies may ensure that the learner does not effectively engage in a host of other, deeper level metacognitive regulation strategies (Duff et al., 2004). This may particularly be the case if the learner lacks the motivation to perform well on the course, especially if the course is being completed for credit purposes only. This may provide an explanation for Regulation of Cognition not being a significant predictor of performance on the examination.

When reviewing the regression model run with the essay data, type of school was found to be the only significant predictor of performance within the significant but weak model. Regulation of Cognition was again not noted to be predictive of performance across both essays. Within the significant interaction between the variables for the second test, home language, type of school, and socio-economic status were noted as significant predictors. In the first test, only type of school and home

language were significant predictors. Regulation of Cognition was not predictive of performance on either test.

The finding that Regulation of Cognition was not predictive of performance across the different assessment tasks was unexpected. Other research has shown that Regulation of Cognition is important in learning; learners who are better able to regulate their strategy usage are generally better able to adapt to different conditions and tend to show better performance overall (Schraw & Moshman, 1995; Wolters, 2003). Reasons for the lack of significant findings may be similar to those mentioned in relation to Knowledge of Cognition regarding use of self-report data and level of conscious application.

Motivation and Academic Performance

The significant regression models for the data predicting overall weighted average and the examination based on motivation and the demographic variables indicated that neither Motivation nor socio-economic status were significant predictors of performance. Home language and type of school again emerged as the significant predictor variables; with home language showing moderate predictive capacity in both models. For the regression model with the essay data, a weak predictive relationship was established, with type of school as the only significant, albeit weak, predictor for both essays. Furthermore, motivation and socio-economic status were not predictive of performance on either essay or the tests. Home language emerged once again as the strongest predictor variable in both tests.

Motivation is noted as a fundamental variable in the self-regulation process due to its capacity to facilitate or constrain the use of one's metacognitive strategies and task engagement (Boekaerts et al., 2000; Schunk & Zimmerman, 2008; Wolters, 2003). In fact, failure to invest sufficient effort can interfere with effective self-regulation of learning and performance (Zimmerman, 1995). Learners who engage in quick learning efforts in order to attain an objective, such as trying to pass a course for credit purposes only, may have reduced capacity to implement effective self-regulation strategies (Zimmerman, 1995). The finding that motivation was not predictive of performance across the different assessment tasks was not expected and was a concerning outcome. Perhaps this result suggests that the participants were not sufficiently self-aware to accurately reflect on their motivational orientations towards the Psychology One course. It could also indicate automaticity of strategies of which the learner is not consciously aware (Veenman et al., 2006). A further possible explanation may be that the questionnaire aimed to elicit general responses regarding the participant's

motivation for the course as a whole; whereas perhaps participants found it difficult to report their motivation in such a general manner, owing to the fact that they experience difference levels of motivation across assessment tasks (Pintrich, 1999). Possible flaws in the instrument in terms of measuring motivation are also alluded to; perhaps motivation is not being accurately measured by the variables, in particular within the South African context, given that only one emotion is included, and the MSLQ does not measure strategies to actively regulate cognition. The need for further research into the measure of Motivation is required especially in terms of how to gauge a more dynamic account of this construct (Pintrich, 2004).

Cognitive and Metacognitive Learning Strategies and Academic Performance

Regressions predicting the overall weighted average and examination data based on cognitive and metacognitive strategies and the demographic variables showed significant predictive models. The only significant variables in these regressions were home language and type of school. Home language was the strongest predictor in each case showing moderate predictive capacity. Socio-economic status and Cognitive and Metacognitive Strategies were not predictor variables for either model. For the regressions with the essay data, the only significant predictor variable was type of school within a weak predictor model. The models for test performance were slightly better but still relatively weak; only approximately sixteen percent of the variance was explained by the variables. Home language, socio-economic status, and type of school were significant variables in predicting performance in the second test; with home language again as the strongest predictor. In terms of the first test, performance was predicted significantly by type of school and home language; with home language again as the strongest predictor. Cognitive and Metacognitive Strategies was not a predictor variable for performance on either test.

Research conducted by Lynch (2010) indicated that learners often believe that rehearsal is the most important strategy, particularly when first entering university; whereas academic staff believe that the deeper processing strategies of elaboration and organisation are more important for success. A learner's knowledge base and strategy usage is often relatively entrenched as it is likely to be something that they have used over the duration of their schooling. University students, particularly when first adjusting to university, may thus not always be aware of the need to change their strategies for learning and performance (Hofer et al., 1998). This points to the fact that learners in their first year at university may resort to the use of the same strategies with which they were familiar at school, as they have as yet been unable to adapt properly to the requirements of university. Perhaps this explains in some part the fact that Cognitive and Metacognitive Strategies were not predictive of performance. Perhaps it could also be that learners are not fully aware of the strategies they are employing across

different tasks and/or are not able to report these effectively in terms of the instrumentation used in the study.

Resource Management Strategies and Academic Performance

With regards to the regression predicting overall weighted average, home language, type of school, and Resource Management Strategies were all significant predictor variables; although home language again emerged as the dominant predictor. Socio-economic status was found not to predict overall weighted average. In the regression predicting the examination data, the only significant predictor variables were home language and type of school. Resource Management Strategies held no significant predictive power. This finding is in opposition to findings from a study conducted by Vrugt and Oort (2008) in which the use of metacognitive strategies and resource management strategies were noted to influence examination performance; especially at the college level (Borg et al., 1989; Pintrich, 1989b, as cited in Paulsen & Gentry, 1995). Failure to adequately coordinate one's study environment and tactics has also been found to impact on an individual's self-regulatory behaviours (Zimmerman, 1995). The lack of predictive power of Resource Management Strategies in predicting examination performance is thus surprising given that one would expect students to utilise such strategies when completing the examination; perhaps the format of the examination, multiple-choice questions, which have often been found to elicit a more surface processing approach, has required students to adopt similar surface approaches in the preparation for, and completion of the examination (Ross et al., 2006); and thus a host of Resource Management Strategies have not been required.

Performance on the essays was only predicted by type of school; with the variables of socio-economic status, Resource Management Strategies and home language showing no significant predictive capacity, within a weak overall model. This finding suggests that one's exposure, background learning experiences and opportunities, and access to resources (Mwamwenda, 2004); are likely to contribute to essay performance. Perhaps students who have had the relevant exposure feel adequately equipped to write a good essay, such that they do not need to actively engage in Resource Management Strategies.

The interaction of the independent variables in the test data regressions served to account for a significant proportion of the variance explained. Predictors of performance for the second test were home language, socio-economic status, and Resource Management Strategies; with home language as the strongest, albeit still a moderate, predictor. Performance on the first test was predicted by type of

school, home language, and Resource Management Strategies; again with home language emerging as the strongest predictor. Differences between the first and second test predictors are interesting. In looking at the results of the second test, the fact that socio-economic status was a predictor, which was not the case for the first test, possibly alludes to the fact that on the test that was more demanding in terms of biologically-based content and anatomical concepts. One's background and access to resources and learning opportunities thus became more important in predicting performance. This supports other research that notes the role of socio-economic status in facilitating access to educational resources, learning opportunities, and supportive networks (Sirin, 2005). Furthermore, in the first test, type of school emerged as a significant predictor; this suggests that one's schooling background may play a role in performance (Mwamwenda, 2004) by ensuring a type of 'test-wiseness', and also through increase exposure to effective teaching and learning strategies, as well as learning resources.

Resource Management Strategies did not predict performance on the essays; however, they did predict performance on the two tests. The finding that a student who organises their learning and study environment, manages their time effectively, and is conscientious in their efforts to understand the material is more likely to perform better, has been noted in other research (Watson et al., 2004). The fact that Resource Management Strategies predict performance on the tests and not on the essays seems to point to the emergence of these strategies within time pressured settings, when deeper processing strategies are required. Tests and essays both require a lot of effort to cover diverse content, and to integrate and apply the information effectively; and both are thought to elicit deeper information processing strategies, in contrast to the examination which included multiple-choice questions, that tend to be more surface level (Duff et al., 2004). However, tests have the added feature of time pressure and being aware of this, it seems plausible that students are likely to adapt their learning approaches and focus on utilising more time and study strategies in the build-up to the test (Ross et al., 2006). Tests are generally associated with more anxiety; and hence, a further reason why students may actively engage in Resource Management Strategies in preparation for tests as opposed to essays (Furnham et al., 2003).

Discussion of the Main Findings of the Predictors

Regression results of the data run with the Knowledge of Cognition and Regulation of Cognition subscale data revealed largely similar findings across all performance variables. This again points to the highly inter-related nature of these two elements of metacognitive awareness; it also emphasises the difficulty in measuring such constructs independently, due to the overlap in aspects being measured. Such findings also perhaps point to the importance of using qualitative data in combination

with quantitative data; to elicit more general metacognitive use for a course, and then using observations and reporting techniques to gauge actual knowledge and strategy use during specific task performance (Boekaerts et al., 2000; Pintrich, 2004).

The issue of the automaticity of metacognitive functions was raised in the results (Veenman et al., 2006); as in many cases where significant predictions were expected; these were not found. Questions emerge as to whether the learners were using metacognitive knowledge, capacities, and strategies but are not fully aware of them; or whether they were only using their metacognitive knowledge, capacities, and strategies in certain situations. The question of whether task demands did not evoke the need to self-regulate is also raised (Winnie, 1996); these questions in particular pertain to the findings that Regulation of Cognition, a control component that would be expected highly related to performance, was not found to be a significant predictor across the performance variables. Sungur (2007a) found that Regulation of Cognition was one of the best predictors of academic achievement under consequential test conditions. While it is noted that students may employ less regulation strategies for those tasks that are deemed easy and less cognitively demanding (Pintrich, 2000); it seems unlikely that the majority of learners would view assessment performance in such a manner, given their unfamiliarity with the university context. Clearly more research is required in this regard. McCabe (2011) also noted the dilemma in that if students are not aware of their own learning and knowledge, then it becomes very difficult for them to know how best to allocate their time and resources for studying; students may either over- or under-estimate their capabilities at times, which can impact their choice of strategies and whether they feel the need to improve certain areas.

When comparing the performance variables in this study, and the predictive capacity of the various regressions, it was apparent that a larger proportion of the variance in overall weighted average and examination performance was explained by the interaction of the independent variables; ranging between twenty four and twenty six percent. In contrast, the regression models accounted for thirteen to seventeen percent of the variance in test performance, and only four to eight percent of the variance in essay performance. Thus suggests that essay performance is clearly being influence by many more factors; an area which warrants further investigation. Overall weighted average was predicted by home language and type of school, and to a lesser extent by Knowledge of Cognition and Resource Management Strategies. This alludes to the tendency of first-year students, who are new to the tertiary environment and are trying to adapt adequately, to draw on the strategies and resources as learnt during their schooling career to produce a better fit with the new context (Hong-Nam & Leavell, 2011); those with more access to resources and better learning opportunities would be expected to fare better, as they would feel more equipped to tackle numerous assessment tasks (Mwamwenda, 2004).

Performance on the examination was predicted by home language and type of school. This finding provides support for the role of English language proficiency and access to quality education and teaching strategies and resources as a means to facilitate performance on exams at the tertiary level (Mwamwenda, 2004; Sirin, 2005; Stephen et al., 2004).

Essay performance was only predicted by the type of school; this assessment format seems to tap into something quite different from the other assessments. Essays are noted to be quite conceptually demanding as one needs to present and integrate content and apply theory (Furnham et al., 2003). This suggests that learners with more exposure to prose, and experience with writing and structuring compositions of their own, possibly having learnt effective planning and organising strategies from their teachers, are more likely to perform better on the essays. Essays also evoke deeper processing approaches and require learners to understand and effectively integrate and apply content (Duff et al., 2004); it seems plausible that learners who have had suitable exposure on how best to structure and undertake learning tasks, would perform better in such structured, yet critical assignments as they would be able to transfer their learnings into a new context. There was an expectation that home language would be a significant predictor variable with regards to essay performance as second language learners often take time to re-frame their ideas and thoughts into English; and often struggle to express their ideas adequately (Stephen et al., 2004); however this was not noted. It is also important to note that the models predicting essay performance were particularly weak, and in all cases less than ten percent of the variation was explained. This suggests that other factors not included in the current study determine the vast majority of performance on the essays; this requires further investigation. The fact that home language and socio-economic status falls away as predictors for essay performance, suggests that learners who are equipped with certain strategies, approaches and relevant previous experience on the basis of their schooling, are likely to be just as successful in their performance independent of language proficiency and economic advantage. This finding seems to hint at the importance of teaching self-regulatory strategies to all learners, as it can provide them with the strategies and self-awareness skills necessary to regulate their performance (Boekaerts et al., 2000; Hofer et al., 1998); irrespective of socio-economic status and home language.

Performance on the first test was predicted by type of school, home language, and to a lesser extent Knowledge of Cognition, and Resource Management Strategies. This again suggesting that one's exposure, background, learning experiences and strategies are pivotal in a new learning context, in which learners transfer what they know to a new setting as a means to self-regulate (Bakracevic Vukman & Licardo, 2010). Performance on the second test was predicted by home language, type of school, socio-economic status, and to a lesser extent Resource Management Strategies. The finding

that socio-economic status is a predictor on the second test speaks to the role of socio-economic status in providing certain educational resources and opportunities, which they foster performance in different contexts (Sirin, 2005); this variable only showed predictive power on the second test, which was more factually demanding and biologically based and those with exposure and effective learning experiences would likely have had some advantage in understanding the material.

Support for the importance of home language and type of school in predicting performance was obtained in this research; home language was the strongest predictor variable across all performance variables. These findings re-iterate the contribution of home language as a key performance variable in testing situations (Stephen et al., 2004). This provides further support for findings that have shown that English language proficiency is an important factor in performance (Van Eeden, De Beer, & Coetzee, 2001); which supports the notion that in order for second language students to succeed at the higher education level, they need to be competent enough in the English language such that they can grapple with complexity of the concepts, and show a sound degree of skill in their communicative and expressive abilities. Type of school attended also generally appeared to be important in predicting performance across the different assessment tasks; this is likely due to the extent that it offers good resources and facilities, increases exposure, and affords solid learning experiences and opportunities (Mwamwenda, 2004; Stephen et al., 2004). Learners with adequate exposure will know when to anticipate deeper levels of processing versus more surface processing levels, and they will be more inclined to align their preparation and performance with such expectations (Ross et al., 2006). These findings have particular relevance in the South African context.

Socio-economic status was not found to be predictive of the overall weighted average, performance on the examination, or the essays. It was however significantly related to performance on the two tests. An individual's socio-economic status often determines to a large extent their access to educational resources, learning opportunities, and supportive networks (Sirin, 2005). Perhaps these factors came more into play during test performance which required that the learners were test-wise in terms of how to take a test and how to cope with the anxiety thereof. The tests in the psychology course were likely to have felt quite demanding in that they posed questions that required short answers; however these answers needed to reflect understanding of the content and a sound ability to integrate and apply theory and concepts, and as such, time pressure would have been another contributing factor. This was likely more demanding that the examination questions which comprised multiple-choice questions and thus included an inherent cueing component; or performance on the essays. Although these are also challenging in making demands on the need to assimilate, integrate,

and apply knowledge and theory, learners are given sufficient time to complete essays and thus they would have had more time to plan and strategise about their work.

While the literature suggested that metacognition and motivation influence academic performance; very few of the key metacognitive and motivation variables predicted performance in this study, and in the cases where they did (Knowledge of Cognition predicted Overall Weighted Average and performance on the first test; while Resource Management Strategies predicted Overall Weighted Average and performance across both tests), they were only able to explain a very small proportion of the variance. These findings were thus unexpected. It is unknown as to whether such findings can be attributed to issues in the measurement and definition of the two constructs; concerns regarding the use of a self-report inventory to elicit such information; or whether such results are more indicative of actual practice within the lecturing and classroom setup which may not advocate and foster self-regulated learning practices. What is evident is that this research provides clear evidence of the role of different factors affecting performance on different types of assessments; which therefore warrants further investigation in this regard.

CHAPTER SIX: CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

Conclusion

Self-regulated learning and the inherent aspects thereof, including metacognition and motivation, are crucial for study in that they have been linked to academic performance; and are deemed necessary components in a learner's bid to gain control over and improve their learning (Al Khatib, 2010; Pintrich & De Groot, 1990; Zimmerman, 2009). The connectedness and inter-relation between these two constructs is apparent; as students need both the determination and the skill to become more efficient learners (Pintrich & De Groot, 1990; Zusho & Pintrich, 2003). Without the motivation component even those learners with sufficient metacognitive skills may fail to implement their strategies and adequately self-regulate their learning and performance (Boekaerts et al., 2000). Self-regulatory strategies are thought of as being mediators between one's personal characteristics and the environmental setting (Pintrich, 2000). The implications of studies in this subject area for instruction are immense; in particular as tertiary institutions strive to produce students with life-long learning skills (Bandura, 1997; Bandura et al., 1996). It seems vital to tailor instruction in such a way that it promotes self-regulated learning. While many adults possess effective metacognitive knowledge, they seem to experience some difficulty in describing their cognitions and metacognitive thoughts (Schraw & Moshman, 1995). Bringing such information into conscious awareness is thus likely to promote enhanced capacities for self-reflection.

A review of the literature suggests that self-regulated learning is an area that has received, and continues to receive, widespread attention internationally, based on its prominence within the education realm, across primary, secondary, and tertiary education levels. Published research in this area in the South African context however appears more limited. Investigation and research into the relationships between metacognition and motivation is thus warranted in order to provide insight into the interplay of these variables within this unique context. The main contribution of this research was thus in adding to the body of existing literature examining the relationship between metacognition, and motivation as they link to each other and to academic performance at the tertiary education level, and in particular with first-year students who are adjusting to a new education context. The role of these variables, as well as other key demographic variables, was evaluated in terms of their capacity to predict academic performance, and in particular academic performance across different assessment tasks. It is apparent that certain features of the testing environment as well as of the task itself, can serve to either facilitate or constrain the individual's attempts to self-regulate (Pintrich, 2000). Individuals may also approach different tasks and learning settings with varied motivation which can impact the self-regulation process, and thus performance (Pintrich, 2004). In attempting to find out

more regarding the interplay of different aspects of metacognition and motivation across academic performance tasks, this study gauged performance from an overall weighted average, but also based on results obtained two tests, two essays and an examination; which allowed for an examination of summative, formative, and combined summative-formative assessments.

Some difficulties in the measurement of metacognition and motivation became apparent in this research. The aspects of metacognitive awareness, namely: Knowledge of Cognition and Regulation of Cognition are noted to be inter-related constructs that work together to promote performance (Schraw & Dennison, 1994); however, Knowledge of Cognition seems in many ways to be posited as a necessary pre-cursor to the regulatory aspects and strategies of metacognition and self-regulation (Wolters, 2003). The regulation aspects of metacognition also seem to be inter-related in many ways and thus some overlap between the metacognitive awareness regulatory functions, and the actual metacognitive strategies employed was anticipated (Vrugt & Oort, 2008). Furthermore, as motivation and metacognition are both key aspects of self-regulated learning, some degree of inter-connectedness was also anticipated (Pintrich, 2000). While a degree of inter-connectedness of these variables is acknowledged, and was expected; these constructs are still framed as conceptually different aspects within the literature (Boekaert et al., 2000; Vrugt & Oort, 2008). Findings from this research indicate a high degree of inter-correlation amongst the variables of metacognition and motivation, suggesting tremendous overlap, and difficulties in assessing such constructs independently from one another. Furthermore, the degree of overlap between the measures of metacognition and motivation in this research also pointed to the difficulties in measuring such constructs independently, pointing to the need to evaluate the psychometric properties of such measures more generally, but also in terms of applicability within the South African context. Questions as to the importance of studying these phenomena in a more dynamic manner are also raised (Pintrich, 2004).

A notable finding in this research was that despite a wealth of literature documenting the role of metacognition and motivation in academic performance (Al-Khatib, 2010; Boekearts et al., 2000; Coutinho, 2007: 2008; Palos et al., 2011; Schunk, 2009; Sungur, 2007a: 2007b); virtually none of the key variables in this research were found to be significant predictors of academic performance. Motivation showed no predictive power at all; and the only aspects of metacognition found to have some, although very limited, predictive power were Knowledge of Cognition in predicting overall weighted average and performance on the first test, and Resource Management Strategies in predicting overall weighted average and performance across both tests. These findings were not expected and are in contrast to a plethora of other research supporting the role of metacognition and motivation in academic performance. Findings of this nature allude to issues regarding the

measurement of these constructs, as well as the psychometric applicability of these assessment tools within the South African context. These results could also however be indicative of the learning practices within the classroom.

Self-regulatory strategies can either be quite automatic in nature, or they can be undertaken in a more controlled, deliberate fashion based on the presenting conditions and features of the learning setting (Pintrich, 2000). Questions as to the automaticity of the self-regulatory strategies within this sample were raised (Veenman et al., 2006); as were questions pertaining to whether participants were not fully aware of their self-regulatory actions and behaviours (Schraw & Moshman, 1995). This was due to the fact that in many instances where significant predictions were expected in terms of the variables of metacognition and motivation, these were not found.

This research alluded to some important findings regarding the role of key variables in predicting performance across different assessment tasks. It was interesting that only a small percentage of the variance in essay performance could be explained by the key variables; and it was only predicted by type of school. Home language was not identified as a significant predictor, which was unexpected given that one would anticipate that a written composition at tertiary level would be influenced by proficiency in the English language (Stephen et al., 2004). This finding seems to suggest that a students' performance in the essay is clearly influenced by a host of other factors not evaluated in this research. Essays seem to tap into different learning skills or approaches than the other assessment tasks. The finding also suggests that learners with a sound repertoire of skills and strategies as imparted in their secondary schooling career, would be able to perform well on essays; thus highlighting the importance of relevant knowledge , experience and exposure. The capacity for essays to provide rich, alternative performance information is thus alluded to, and hints at the importance of multiple forms of assessment measures to accurately gauge academic performance (Duff et al., 2004; Furnham et al., 2003; Rollnick, Davidowitz, Keane, Bapoo, & Magadla, 2008).

The variables in this research served to explain approximately a quarter of the variance in overall weighted average and examination performance. Overall weighted average was predicted by home language and type of school, and also, although to a lesser extent, by Knowledge of Cognition and Resource Management Strategies. Performance on the examination was predicted by home language and type of school. The predictors served to explain about fifteen percent of the variance in test performance. Predictors of performance on the first test were: type of school, home language, and to a lesser extent Knowledge of Cognition, and Resource Management Strategies. Performance on the second test was predicted by home language, type of school, socio-economic status, and to a lesser

extent Resource Management Strategies. These findings highlighted the importance of an individual's level of exposure, learning techniques and strategies, and relevant background knowledge and experiences; as such information can be adaptive in allowing students to transfer their skills and knowledge in new contexts (Bakracevic Vukman & Licardo, 2010).

Furthermore, in terms of performance across the different assessment forms, home language emerged as a key predictor; supporting findings from other research that has noted the role of English language proficiency in academic performance (Stephen et al., 2004; Van Eeden et al., 2001). Type of school was also found to play a significant predictive role in performance across the assessment tasks, emphasising the role of access to educational resources and opportunities as a key component of later performance (Mwamwenda, 2004). Type of school was noted as the only predictor of essay performance. Socio-economic status played a predictive role in the second, more conceptually challenging test; interestingly, socio-economic status only become predictive in a situation in which the nature and content of the material lent itself to those students with the appropriate background knowledge and exposure. This finding again hints at the importance of socio-economic status in providing key access to learning facilities and opportunities that can then be translated into other contexts (Sirin, 2005). The role of these predictors needs to continue to be investigated, especially as they play out across different assessment tasks within the South African context. Universities have an obligation to identify those learners that may be more at-risk for moving through the university system, in particular as throughput rates are often poor within South Africa (Nair & Pillay, 2004). Key insights and understanding into the role of metacognition, motivation and key demographic variables such as home language, type of school, socio-economic status, in academic performance are likely to contribute to improving students' success rates; and such information can be valuable in guiding and tailoring instruction, and in developing initiatives for those students defined as potentially at-risk (Rollnick et al., 2008).

Further investigation into the factors predicting essay performance would be useful to guide development initiatives. Continued examination of the different predictors across assessment tasks would also provide useful insights, in particular with regard to different courses and faculties, as different assessment tasks clearly call on different learning approaches and strategies, and also seem to be influenced by a range of external factors

While this research was exploratory in nature, establishing a baseline of information pertaining to the sample's metacognition and motivation in predicting performance for a particular course was useful to elicit preliminary information. Such information could then be used as the basis for further

investigation. This is in particular, in light of the fact that self-regulatory strategies can be taught and used as a key compensatory tool (Hofer et al., 1998; Veenman & Spaans, 2005); the notion that metacognitive knowledge can contribute to performance over and above IQ (Schraw, 1998: 2001; Veenman & Spaans, 2005); and the fact that information pertaining to metacognition and motivational can be used to guide teaching and learning practices (Boekaerts et al., 2000).

Limitations

A key limitation in this research was the degree of overlap found between metacognition and motivation; while some degree of overlap was expected based on reports from previous literature and acknowledgement of the inter-connectedness of metacognitive knowledge and regulation variables (Schraw & Dennison, 1994; Vrugt & Oort, 2008); as well as the inter-relation between the constructs of metacognition and motivation in self-regulated learning (Boekaerts et al., 2000); the extent of the correlations was not anticipated across the two instruments. This raised a number of questions as to: the ability to examine the variables of metacognition and motivation in isolation from one another, and the capacity of a self-report inventory to accurately capture such data given the degree of overlap, The psychometric properties of these instruments was called into question with regard to their ability to distinguish between the different aspects of metacognition and motivation more generally, but also in terms of the capacity of these instruments to accurately assess metacognition and motivation within the South African context.

A long tradition of research has shown that academic performance is influenced by a multitude of variables, most notably intelligence (Busato et al., 2000), but also others factors such as approach to learning (Duff et al., 2004); time invested in studying (Mwamwenda, 2004); availability of resources (Zaaiman et al., 1998); and the ability to handle an increased workload (Potter & Van Der Merwe, 1994); to name but a few. The researcher acknowledged that each of these variables could play a role in predicting academic performance in this study but conceded a limited capacity to assess these given practical and resource constraints. Hence, the research did not seek to determine the capacity of metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation as exclusive predictors of academic performance, but rather aimed to examine the existing relationship between these variables and to note the extent to which they play a role in predicting academic performance. This limitation was taken into account when interpreting the results of the research.

A further limitation concerned the nature of the different forms of assessments used to determine academic performance. While the overall aim of the study was to understand whether metacognitive awareness, the use of cognitive and metacognitive learning strategies, and motivation played a role in predicting academic performance, it was acknowledged that the different forms of assessments used to gauge academic performance not only took place at different stages in the academic year (the essays and tests occurred at various points during the first two teaching blocks of the year, while the examination was mid-year) but were also likely associated with different expectancies, which may have given rise to different affective, motivational, and cognitive states at the time of completion. The inability to control for these differences between the three assessment forms is acknowledged.

Furthermore, while performance in this study was examined across very specific and different assessment tasks, the questionnaires used aimed to elicit more general information pertaining to metacognition and motivation. When completing the questionnaires participants were asked to reflect on their experiences with the Psychology One as course as whole; while an overall picture of their metacognition and motivation was captured for the course, information was not gathered as to their metacognitive and motivational aspects specific to each assessment task. Further research into this area would thus provide useful insights.

Self-report measures are generally associated with a range of positive and negative aspects. Ease of group administration and practicality are two important positives (Pintrich, 2004). These measures also have a tremendous capacity to elicit an individual's beliefs and propensities to use certain strategies. However, self-report measures lose some value in terms of not being able to capture the dynamic processes at work when the individual is required, in the moment, to adopt certain strategies or engage in attempts to control their behaviour or affect while performing a task (Pintrich, 2004; Sungur, 2007a). In using a self-report measure, it is also impossible to be certain that the participants' provided accurate accounts of their metacognitive awareness and motivation as linked to their first-year Psychology course.

The questionnaires used in this study aimed to gain insight into the participants' metacognition and motivation overall; however the information was obtained retrospectively, in that students had to think about their approach to the Psychology One course overall. This ensured an inability to capture the dynamic nature of self-regulated action and the interplay of affective, personal, cognitive, and behavioural responses involved in performance (Dinsmore et al., 2008). This could also have been exacerbated by the fact that self-regulatory strategies often become more automatized in older

students; suggesting that students may be using the strategies but may not be directly aware of them, and thus fail to report them (Bakracevic Vukman & Licardo, 2010; Efklides, 2011).

This research comprised a volunteer sample of first-year Psychology students. While participants were awarded an agreed upon credit for participation in the research, they were in no way obliged to participate in this specific research project to obtain this credit. However, all participants were aware of the credit prior to volunteering to be a participant in the research, which may have influenced their willingness to become involved. Volunteers may have very different characteristics from the rest of the population for which the research aims to gather information and thus results need to be interpreted with a degree of caution (Welman & Kruger, 2001). Furthermore, the majority of participants in this research were female, suggesting an under-representation of information pertaining to these variables and the male population. The generalisability of the results may thus be influenced by these factors.

Lastly, the correlational nature of this research, while beneficial in adding to the existing knowledge base, served to limit the capacity to make any causal inferences (Thompson et al., 2005).

Recommendations for Future Research

This study gauged performance through various assessment tasks including essays, tests with short-questions, multiple-choice questions taken from the examination, and an overall weighted average; however when answering the self-report questionnaires the participants were merely asked to think about their overall approach to the Psychology One course. They did not have to think about their approach to each assessment task. It would be interesting for future research in this area to elicit information from students as to the different types of metacognitive and motivation strategies that they use during each of these assessment tasks, which occur under different conditions. A qualitative study would potentially be more suitable in this regard. Furthermore, as the regression models only explained less than ten percent of the variance in essay performance, it would be useful for further research to examine essay performance more closely to determine the relevant contributing variables. A qualitative investigation into the learning and self-regulatory strategies that students use when completing essays, as opposed to tests and exams, would also prove beneficial.

In light of the fact that self-regulatory strategies are thought to become more automatized with age; and the fact that individuals may not always be consciously aware of the strategies they are employing within any given task (Bakracevic Vukman & Licardo, 2010; Efklides, 2011); future research should

focus on attaining information about the nature, frequency, and intensity of the metacognitive and motivational strategies an individual uses when completing a task (Lan, 1996); this type of investigation would be more suited to work at the task level, rather than at the course level as was undertaken in this study. Cueing and prompting activities or other experimental undertakings may need to be considered to ensure that information pertaining to all strategy and regulatory activity use, be it automatized or not, is elicited. Furthermore, it would be interesting to compare strategy usage across different age groups and levels of study, undergraduate through postgraduate, at the university level.

The MSLQ is limited to the extent that it does not measure learners' attempts to monitor, control, and regulate their motivation or affect. While it provides some measure of motivation and affect in terms of gauging an individual's motivational beliefs and emotion in the form of test anxiety, the measure seems to be quite static. Questions are also raised as to the potential for a range of other affects to emerge during learning and performance. Research on affect has generally focused exclusively on the positive-negative dichotomy, whereas the capacity of affect to arouse, and to activate knowledge and other strategies is also a crucial consideration (Linnenbrink & Pintrich, 2004). Test anxiety has generally been the aspect of affect that is most studied; however a diverse array of emotions are likely to impact task engagement, performance and the use of self-regulated learning strategies (Linnenbrink & Pintrich, 2004). Thus it would be valuable for future research to assess what strategies learners are using to actively control and regulate their affect, as these are crucial in the self-regulation process (Boekaerts et al., 2000; Pintrich, 2004; Wolters, 1998). It would also be useful to determine what other affects emerge during self-regulated learning, other than test anxiety. In addition, further research could also focus on identifying mediators within the learning context and specificities of tasks that serve to either facilitate or constrain both cognitive and emotional motivational aspects (Boekaerts et al., 2000).

Furthermore, a crucial aspect of self-regulated learning is the ability to regulate tasks and the learning environment, which tends to be more difficult to achieve as it is usually out of the direct control of the learner. The MSLQ has included peer learning and regulation of the study environment as a means to tap an individual's regulation of their context; however it is limited in evaluating the different types of strategies and processes used to shape tasks and the learning environment (Pintrich, 2004). Pintrich (2004) criticises the MSLQ for its limited capacity to capture dynamic information pertaining to strategy usage and environmental control; noting that these aspects were less well researched at the time of development of the questionnaire; he urges that new instruments incorporate such crucial aspects. Future research may also be best undertaken by multi-modal approaches that include a

qualitative and quantitative component. Despite these limitations, the MSLQ was chosen as the instrument for this study due to its good reliability and validity properties, its widespread usage in global research efforts, and its usefulness in tapping motivational and learning strategies, and its applicability for use with tertiary level students in evaluating a specific course.

Future research efforts would need to assess performance and regulation strategies - of a metacognitive, affective, motivational, and behavioural nature - at a more dynamic, situational level. Measures that are more process-orientated and qualitative are likely to be beneficial in capturing information pertaining to the actual strategies and regulation aspects evoked during specific tasks. While possibly more time-consuming and less practical; direct observations, reaction times, stimulated recall, and other experiments are likely to yield rich, useful information (Boekaerts et al., 2000; Pintrich, 2004; Valle et al., 2008; Zimmerman, 2008). Mixed models combining quantitative and qualitative data are likely to be best in examining the interplay of different assessment conditions and testing demands, with aspects of motivation and metacognition as they link to performance.

This research found the MSLQ overall scale, subscales, and subsections to be significantly correlated with the MAI overall, subscales, and subsections. Metacognitive awareness, use of cognitive and metacognitive learning strategies, and motivation were treated as separate variables in this research, as while they are thought to be related in some way, as they are acknowledged as key components of self-regulated learning, they were assumed to be evaluating conceptually different aspects. The instruments used in this research also purported to measure different aspects of these variables. Due to the findings of the highly inter-correlated nature of the scales and subscales in the MAI and MSLQ, further psychometric research is warranted on these measures, as well as other measures of metacognition and motivation. Such research needs to investigate whether these constructs can be investigated independently, and to what extent they form part of a larger overarching construct, that is perhaps less easy to separate out.

Further investigation into the measurement of metacognition is warranted given the complex nature of this variable, and the fact that it comprises both knowledge and experiential components. While metacognitive awareness has generally been conceived of as being more confined to the cognitive realm, associated with knowledge about tasks, the array of strategies one can deploy and knowledge of how best to deploy these, and also knowledge about oneself as a learner; it also contains an inherent experiential aspect, in that certain thoughts, reactions, and affects are evoked about one's own thinking as one progress through a task (Flavell, 1992; Sungur, 2007a). In fact, even the thoughts and insights individuals have about themselves as learners are likely to rouse a range of affects that

then influence cognitions and selection of strategies (Schraw & Moshman, 1995). Regulation of cognition requires effort on the part of the individual, and effort is invariably linked to one's motivation to persist (Efklides, 2011). The aspects of metacognition, namely metacognitive awareness, which subsumes metacognitive knowledge and regulation of that knowledge, and the use of metacognitive strategies and skills, need to be examined in more depth to ascertain the unique relationships between these variables, as well as their interconnectedness. Furthermore, the role of metacognitive feelings and experiences in impacting one's motivation needs to be more closely scrutinised. In line with other recent research, it seems that metacognitive feelings and experiences, not only provide key knowledge and drive certain cognitive motivational aspects, but they also impact motivation through the emotions they evoke (Efklides, 2011; Efklides & Petkaki, 2005); and thus the dynamic relationship between these constructs thus requires further research. It seems that, while the MAI provides a sound measure of the knowledge and regulation of cognition aspects of metacognition, perhaps it is not adequately tapping into the experiential domain of this construct, which is invariably infused with affects linked to one's cognition.

The findings in this research that showed no significant relationship between the MAI overall scale and performance across the different assessment tasks is concerning; especially in light of research that shows metacognition to be a predictor of learning (Schraw & Dennison, 1994; Schraw & Moshman, 1995; Wang et al., 1990). Winnie (1996) alerted to the importance of ongoing research into the different aspects and overall conceptualisation of metacognition as a construct. Clearly, what is also required is a close, psychometric investigation of metacognitive measures, to determine their overall efficacy, and whether they align with the theoretical definition of metacognition and its constructs. These needs to be a clearer understanding of what each metacognitive instrument purports to measure, and how it aligns with broader theoretical constructs. Further research into the psychometric efficacy and appropriateness of metacognitive measures for use in the South African context is also warranted.

Just as regulation of cognition is examined with regards to metacognitive awareness, so too should the regulation of motivation be examined with regards to how learners actively control their affects and motivation before, during, and after task performance (Pintrich, 2000; Wolters, 2003). Ongoing research is required to further investigate the dynamic interplay of such variables especially given that strategies for regulation of one's motivation and cognition are thought to be inter-related (Wolters, 2003).

The majority of participants in this research were in their first year of university study; they were thus at the initial stage of adjustment and domain expertise (Vrugt & Oort, 2008). Future research endeavours may wish to follow such students as they progress through the year, thus determining whether there is a change in the relationships between variables over the course of the first year and into later years. Longitudinal research investigating the relationships between motivational variables, self-regulation strategies, and performance variables is thus also likely to be beneficial (Lynch, 2010). Research comparing aspects of motivation and metacognition amongst first-year students, and those students who has been at the university level for several years could prove interesting; comparisons between undergraduate and postgraduate students could also add further insights.

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APPENDICES

APPENDIX A – Participant Information Sheet

SCHOOL OF HUMAN AND COMMUNITY DEVELOPMENT

PARTICIPANT INFORMATION SHEET

My name is Candice Cronk and I am conducting research for the purposes of obtaining my Master's Degree in Educational Psychology at the University of the Witwatersrand. My area of focus is metacognition, motivation and performance at the tertiary education level. The purpose of the study is to understand the relationship between metacognition, motivation and performance, and more specifically to investigate whether metacognition and motivation play a role in predicting academic performance in different assessment tasks in first-year university Psychology students. I would like to invite you to participate in this study.

Your participation in this research is strictly voluntary and you will not be disadvantaged in any way by choosing to not participate. You are also free to withdraw from the study at any time up until the point when questionnaires are completed and handed in. Your withdrawal from the study will result in no foreseeable negative consequences. As you have been informed, this year first-year Psychology students are able to obtain course credit by participating in research. You can obtain credit towards your Psychology I mark for participating in this research however you do not have to participate in this specific study to obtain this credit.

Participation in this study will require you to complete the questionnaire pack at home and then return the completed questionnaire pack to me at the first year psychology office (2nd floor Umthombo Building) on designated dates and times to be placed on the first-year noticeboard and blog. The total completion time for the questionnaire should be about 30 to 45 minutes. Please reflect on your experiences with your first-year Psychology course when responding to the items on the questionnaires. Filling out and returning the questionnaire pack will be taken as consent to participate in this study. In order to obtain a proof of participation slip enabling you to get credit for participating, you will need to return the questionnaire at the designated time and place. Once you have returned the questionnaire and obtained proof of participation, you will be asked to place it in a sealed box thus ensuring your responses remain anonymous. If you do not wish to obtain a proof of participation slip, you may fill in the questionnaire and return it directly to the sealed box in the first-year Psychology office (U203, 2nd floor Umthombo building) or main Psychology office (U211, 2nd floor, Umthombo building).

The questionnaire packs have each been assigned a random participant number to identify them. The first sheet of the demographic questionnaire also has the participant number and asks for your student number. Provision of your student number will grant permission for an independent third person to access your Psychology marks overall and on the different assessments you have done: namely, essay, test and exam, by linking your student number to your respective marks. The independent third party will then link your marks to the specific participant number and will then destroy the student number sheets as a means to protect your anonymity. At no point will the researcher have access to your student number as well as your participant number and marks. Providing your student number is completely optional and you may choose to participate in the study without providing your student number.

Once the study has been completed, a one-page summary of the main findings will be displayed on the Psychology first-year noticeboard and blog. If you would like to receive a more in-depth version of the results, you are welcome to email

me at EdMastersResearch@gmail.com with the subject “Research feedback”. Feedback will then be emailed to you. No individual feedback will be available, however, as responses are anonymous.

If you would please consider participating in this research it would be greatly appreciated as this research will provide information that may be useful in understanding academic performance at tertiary level which could guide future instruction.

Kind Regards

Candice Cronk

Contact Details:

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APPENDIX B – Demographic Questionnaire

DEMOGRAPHIC QUESTIONNAIRE: STUDENT NUMBER SHEET

Participant Number: _____

Student Number:

Please Note*:* By choosing to disclose your student number, you are giving the researcher permission to have a third party access your first-year Psychology marks under the conditions explained in the Participant Information Sheet. This is voluntary and you may choose to continue with the rest of the questionnaire without filling in your student number.

DEMOGRAPHIC QUESTIONNAIRE

Participant Number …….

Please fill in or tick (√) next to the appropriate response.

Age: □

Gender: Male □ Female □

Race*: Asian □ Black □ Coloured □ Indian □ White □

(*For statistical/analytic purposes only)

Other (Please explain): …….

Home Language:…….

Degree being studies (EG BA, BSc, BComm, etc): ……..

Type of School Attended: Public □ GDE □

Private □ IEB □

Please fill in where appropriate

Occupational of Mother:…….....

Highest Level of Education of Mother: ……

Occupation of Father: ……

Highest Level of Education of Father: …….

Occupational of Caregiver: ……..

Highest Level of Education of Caregiver:

Please answer the following questions.

1. What is your motivation to complete first-year Psychology?
   a. Psychology is my major □
   b. For credit purposes □
   c. Other (please explain) □
   …….

2. Is this the first year you have studied at university i.e. are you a first-year student?
   Yes □ No □

3. Is this the first time you are doing Psychology One?
   Yes □ No □

4. How well do you feel that you are coping with the academic requirements of university?
   Well □ Good □ Fair □ Poor □

5. Please indicate your average academic performance based on the range of marks you most often obtain for academic/school work.

Above 80% ……

75-80% ……

70-75% ……

65-70% ……

60-65% ……

50-59% ……

40-49% ……

30-39% ……

Below 30% ……

6. Please list the subjects you studied for Grade 12/Matric and the marks you obtained for each. If you do not remember the exact mark, Please give the symbol you obtained.

Subject	**Mark/symbol obtained**

APPENDIX C – Metacognitive Awareness Inventory (MAI)

SCHRAW AND DENNISON METACOGNITIVE AWARENESS INVENTORY

This inventory gives you an opportunity to describe how you learn and work in a classroom or learning environment. Please reflect on your experiences in Psychology One when answering the questions. There are no right or wrong answers. Please read the items carefully and answer each statement placing a cross over or circling your choice. Answers range from:

Always true of me ***Very often true of me*** ***Sometimes true of me*** ***Seldom true of me*** ***Never true of me***

1	I ask myself periodically if I am meeting my goals.	Always	Often	Sometimes	Seldom	Never
2	I consider several alternatives to a problem before I answer.	Always	Often	Sometimes	Seldom	Never
3	I try to use strategies that have worked in the past.	Always	Often	Sometimes	Seldom	Never
4	I pace myself while learning in order to have enough time.	Always	Often	Sometimes	Seldom	Never
5	I understand my intellectual strengths and weaknesses.	Always	Often	Sometimes	Seldom	Never
6	I think about what I really need to learn before I begin a task.	Always	Often	Sometimes	Seldom	Never
7	I know how well I did once I finish a test.	Always	Often	Sometimes	Seldom	Never
8	I set specific goals before I begin a task.	Always	Often	Sometimes	Seldom	Never
9	I slow down when I encounter important information.	Always	Often	Sometimes	Seldom	Never
10	I know what kind of information is most important to learn.	Always	Often	Sometimes	Seldom	Never
11	I ask myself if I have considered all options when solving a problem.	Always	Often	Sometimes	Seldom	Never
12	I am good at organising information.	Always	Often	Sometimes	Seldom	Never
13	I consciously focus my attention on important information.	Always	Often	Sometimes	Seldom	Never
14	I have a specific purpose for each strategy I use.	Always	Often	Sometimes	Seldom	Never
15	I learn best when I know something about the topic.	Always	Often	Sometimes	Seldom	Never
16	I know what the teacher expects me to learn.	Always	Often	Sometimes	Seldom	Never
17	I am good at remembering information.	Always	Often	Sometimes	Seldom	Never
18	I use different learning strategies depending on the situation.	Always	Often	Sometimes	Seldom	Never
19	I ask myself if there was an easier way to do things after I finish a task.	Always	Often	Sometimes	Seldom	Never
20	I have control over how well I learn.	Always	Often	Sometimes	Seldom	Never
21	I periodically review to help me understand important relationships.	Always	Often	Sometimes	Seldom	Never
22	I ask myself questions about the material before I begin.	Always	Often	Sometimes	Seldom	Never
23	I think of several ways to solve a problem and choose the best one.	Always	Often	Sometimes	Seldom	Never
24	I summarise what I've learned after I finish.	Always	Often	Sometimes	Seldom	Never
25	I ask others for help when I don't understand something.	Always	Often	Sometimes	Seldom	Never
26	I can motivate myself to learn when I need to.	Always	Often	Sometimes	Seldom	Never

27	I am aware of what strategies I use when I study.	Always	Often	Sometimes	Seldom	Never
28	I find myself analysing the usefulness of strategies while I study.	Always	Often	Sometimes	Seldom	Never
29	I use my intellectual strengths to compensate for my weaknesses.	Always	Often	Sometimes	Seldom	Never
30	I focus on the meaning and significance of new information.	Always	Often	Sometimes	Seldom	Never
31	I create my own examples to make information more meaningful.	Always	Often	Sometimes	Seldom	Never
32	I am a good judge of how well I understand something.	Always	Often	Sometimes	Seldom	Never
33	I find myself using helpful learning strategies automatically.	Always	Often	Sometimes	Seldom	Never
34	I find myself pausing regularly to check my comprehension.	Always	Often	Sometimes	Seldom	Never
35	I know when each strategy I use will be most effective.	Always	Often	Sometimes	Seldom	Never
36	I ask myself how well I accomplish my goals once I'm finished.	Always	Often	Sometimes	Seldom	Never
37	I draw pictures or diagrams to help me understand while learning.	Always	Often	Sometimes	Seldom	Never
38	I ask myself if I have considered all options after I solve a problem.	Always	Often	Sometimes	Seldom	Never
39	I try to translate new information into my own words.	Always	Often	Sometimes	Seldom	Never
40	I change strategies when I fail to understand.	Always	Often	Sometimes	Seldom	Never
41	I use the organisational structure of the text to help me learn.	Always	Often	Sometimes	Seldom	Never
42	I read instructions carefully before I begin a task.	Always	Often	Sometimes	Seldom	Never
43	I ask myself if what I'm reading is related to what I already know.	Always	Often	Sometimes	Seldom	Never
44	I re-evaluate my assumptions when I get confused.	Always	Often	Sometimes	Seldom	Never
45	I organise my time to best accomplish my goals.	Always	Often	Sometimes	Seldom	Never
46	I learn more when I am interested in a topic.	Always	Often	Sometimes	Seldom	Never
47	I try to break studying down into smaller steps.	Always	Often	Sometimes	Seldom	Never
48	I focus on overall meaning rather than specifics.	Always	Often	Sometimes	Seldom	Never
49	I ask myself questions about how well I am doing while I am learning something new.	Always	Often	Sometimes	Seldom	Never
50	I ask myself if I learned as much as I could have once I finish a task.	Always	Often	Sometimes	Seldom	Never
51	I stop and go back over new information that is not clear.	Always	Often	Sometimes	Seldom	Never
52	I stop and re-read when I get confused.	Always	Often	Sometimes	Seldom	Never

APPENDIX D – Motivated Strategies for Learning Questionnaire (MSLQ)

Please reflect on your experiences with Psychology One when answering the following questions. Remember there are no right or wrong answers, so you should just try to answer as honestly as possible.

Please circle the answer that most applies to you. Answers range from 1 to 5:

1	2	3	4	5
Not at all true of me				***Very true of me***

		1 = not at all true of me 5 = very true of me
1	In a class like this, I prefer course material that really challenges me so I can learn new things.	1 2 3 4 5
2	If I study in appropriate ways, then I will be able to learn the material in this course.	1 2 3 4 5
3	When I take a test I think about how poorly I am doing compared with other students.	1 2 3 4 5
4	I think I will be able to use what I learn in this course in others courses.	1 2 3 4 5
5	I believe I will receive an excellent grade in this class.	1 2 3 4 5
6	I'm certain I can understand the most difficult material presented in the readings for this course.	1 2 3 4 5
7	Getting a good grade in this class is the most satisfying thing for me right now.	1 2 3 4 5
8	When I take a test I think about items on other parts of the test I can't answer.	1 2 3 4 5
9	It is my own fault if I don't learn the material in this course.	1 2 3 4 5
10	It is important for me to learn the course material in this class.	1 2 3 4 5
11	The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.	1 2 3 4 5
12	I'm confident I can learn the basic concepts taught in this course.	1 2 3 4 5
13	If I can, I want to get better grades in this class than most of the other students.	1 2 3 4 5
14	When I take tests I think of the consequences of failing.	1 2 3 4 5
15	I'm confident I can understand the most complex material presented by the instructor (lecturer) in this course.	1 2 3 4 5
16	In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.	1 2 3 4 5
17	I am very interested in the content area of this course.	1 2 3 4 5
18	If I try hard enough, then I will understand the course material.	1 2 3 4 5
19	I have an uneasy, upset feeling when I take an exam.	1 2 3 4 5
20	I'm confident I can do an excellent job on the assignments and tests in this course.	1 2 3 4 5
21	I expect to do well in this class.	1 2 3 4 5
22	The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	1 2 3 4 5
23	I think the course material in this class is useful for me to learn.	1 2 3 4 5
24	When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1 2 3 4 5
25	If I don't understand the course material, it is because I didn't try hard enough.	1 2 3 4 5

26	I like the subject matter of this course.	1 2 3 4 5
27	Understanding the subject matter of this course is very important to me.	1 2 3 4 5
28	I feel my heart beating fast when I take an exam.	1 2 3 4 5
29	I'm certain I can master the skills being taught in this class.	1 2 3 4 5
30	I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.	1 2 3 4 5
31	Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	1 2 3 4 5
32	When I study the readings for this course, I outline the material to help me organise my thoughts.	1 2 3 4 5
33	During class time I often miss important points because I'm thinking of other things.	1 2 3 4 5
34	When studying for this course, I often try to explain the material to a classmate or friend.	1 2 3 4 5
35	I usually study in a place where I can concentrate on my course work.	1 2 3 4 5
36	When reading for this course, I make up questions to help focus my reading.	1 2 3 4 5
37	I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.	1 2 3 4 5
38	I often find myself questioning things I hear or read in this course to decide if I find them convincing.	1 2 3 4 5
39	When I study for this class, I practice saying the material to myself over and over.	1 2 3 4 5
40	Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.	1 2 3 4 5
41	When I become confused about something I'm reading for this class, I go back and try to figure it out.	1 2 3 4 5
42	When I study for this course, I go through the readings and my class notes and try to find the most important ideas.	1 2 3 4 5
43	I make good use of my study time for this course.	1 2 3 4 5
44	If course readings are difficult to understand, I change the way I read the material.	1 2 3 4 5
45	I try to work with other students from this class to complete the course assignments.	1 2 3 4 5
46	When studying for this course, I read my class notes and the course readings over and over again.	1 2 3 4 5
47	When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	1 2 3 4 5
48	I work hard to do well in this class even if I don't like what we are doing.	1 2 3 4 5
49	I make simple charts, diagrams, or tables to help me organise course material.	1 2 3 4 5
50	When studying for this course, I often set aside time to discuss course material with a group of students from the class.	1 2 3 4 5
51	I treat the course material as a starting point and try to develop my own ideas about it.	1 2 3 4 5
52	I find it hard to stick to a study schedule.	1 2 3 4 5
53	When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.	1 2 3 4 5
54	Before I study new course material thoroughly, I often skim it to see how it is organised.	1 2 3 4 5
55	I ask myself questions to make sure I understand the material I have been studying in this class.	1 2 3 4 5
56	I try to change the way I study in order to fit the course requirements and the instructor's (lecturer's) teaching style.	1 2 3 4 5

57	I often find that I have been reading for this class but don't know what it was all about.	1	2	3	4	5
58	I ask the instructor (lecturer) to clarify concepts I don't understand well.	1	2	3	4	5
59	I memorise key words to remind me of important concepts in this class.	1	2	3	4	5
60	When course work is difficult, I either give up or only study the easy parts.	1	2	3	4	5
61	I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.	1	2	3	4	5
62	I try to relate ideas in this subject to those in other courses whenever possible.	1	2	3	4	5
63	When I study for this course, I go over my class notes and make an outline of important concepts.	1	2	3	4	5
64	When reading for this class, I try to relate the material to what I already know.	1	2	3	4	5
65	I have a regular place set aside for studying.	1	2	3	4	5
66	I try to play around with ideas of my own related to what I am learning in this course.	1	2	3	4	5
67	When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.	1	2	3	4	5
68	When I can't understand the material in this course, I ask another student in this class for help.	1	2	3	4	5
69	I try to understand the material in this class by making connections between the readings and the concepts from the lectures.	1	2	3	4	5
70	I make sure that I keep up with the weekly readings and assignments for this course.	1	2	3	4	5
71	Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.	1	2	3	4	5
72	I make lists of important items for this course and memorise the lists.	1	2	3	4	5
73	I attend this class regularly.	1	2	3	4	5
74	Even when the course materials are dull and uninteresting, I manage to keep working until I finish.	1	2	3	4	5
75	I try to identify students in this class whom I can ask for help if necessary.	1	2	3	4	5
76	When studying for this course, I try to determine which concepts I don't understand well.	1	2	3	4	5
77	I often find that I don't spend very much time on this course because of other activities.	1	2	3	4	5
78	When I study for this class, I set goals for myself in order to direct my activities in each study period.	1	2	3	4	5
79	If I get confused taking notes in class, I make sure I sort it out afterwards.	1	2	3	4	5
80	I rarely find time to review my notes or readings before an exam.	1	2	3	4	5
81	I try to apply ideas from course readings in other class activities such as lectures and discussions.	1	2	3	4	5

APPENDIX E – List of Abbreviations

Metacognitive Awareness Inventory (MAI)

Variable	Abbreviation
Knowledge of Cognition Subscale	KNOWCOGT
Declarative Knowledge	DKNOW
Procedural Knowledge	PKNOW
Conditional Knowledge	CKNOW
Regulation of Cognition Subscale	REGCOGT
Planning	PLAN
Information Management	IMANG
Comprehension Monitoring	CMON
Debugging	DEBUG
Evaluating	EVAL
MAI Overall Total	MAIOVT

Motivated Strategies for Learning Questionnaire (MSLQ)

Variable	Abbreviation
Motivation Subscale	MOTIVT
Value Components	VCOMT
Intrinsic Goal Orientation	INGOR
Extrinsic Goal orientation	EXGOR
Task Value	TVAL
Expectancy Components	ECOMT
Control of Learning Beliefs	CLBEL
Self-Efficacy for Learning Performance	SELP
Affective Components	ACOMT
Test Anxiety	TANX
Learning Strategies Subscale	LSTOT
Cognitive and Metacognitive Strategies	COGMCST
Rehearsal	REH

Elaboration	ELAB
Organisation	ORG
Critical Thinking	CRIT
Metacognitive Self-Regulation	MCSREG
Resource Management Strategies	RESMGST
Time and Study Environment Management	TSENVIRO
Effort regulation	EREG
Peer Learning	PEER
Help Seeking	HELP
MSLQ Overall Total	MSLQOVT

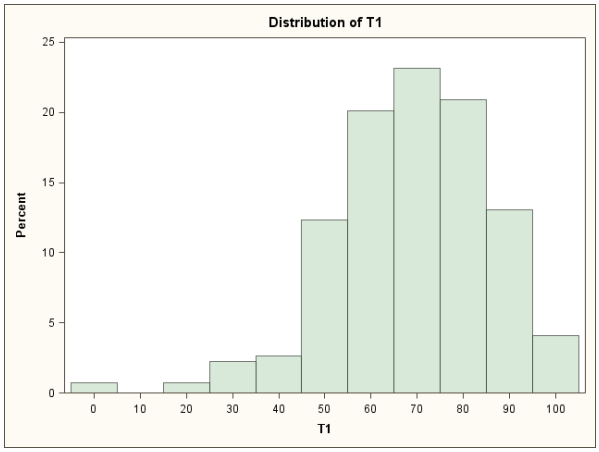
Performance Variables

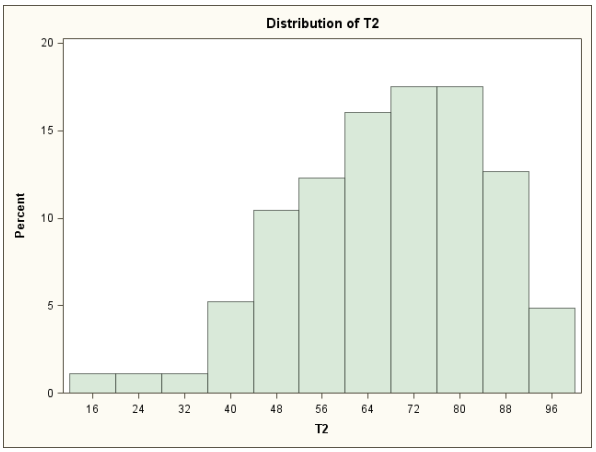
Test 1	T1
Test 2	T2
Essay 1	E1
Essay 2	E2
Exam	Ex
Overall Weighted Average	W.Ave

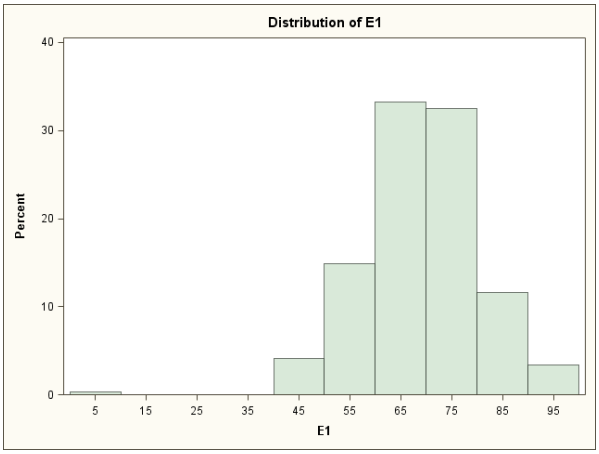
Independent Variables used in the Regressions

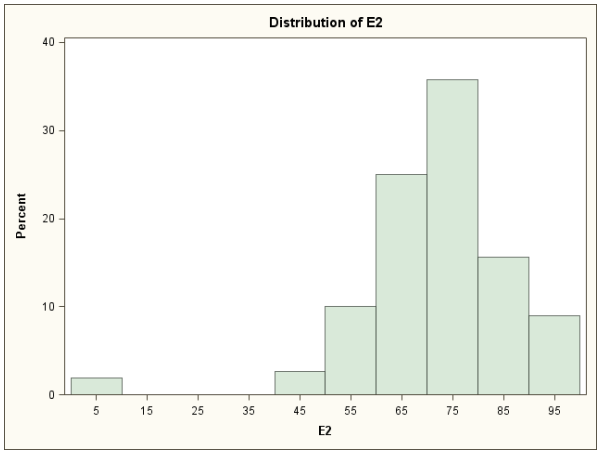
Nominal Socio-Economic Status	NSES
Nominal Home Language	NHLANG
Type of Schooling	TYPE SCHOOL

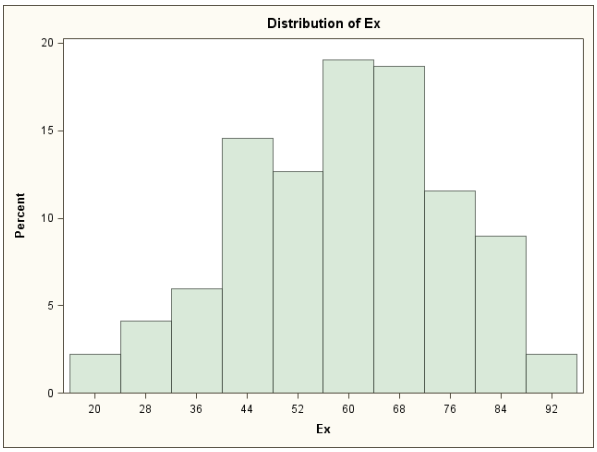
APPENDIX F - Histograms

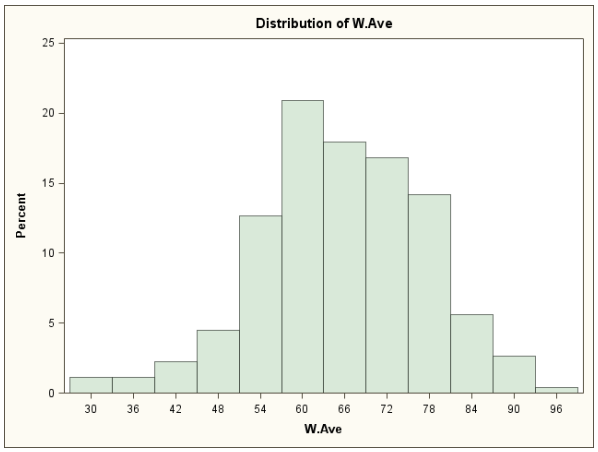


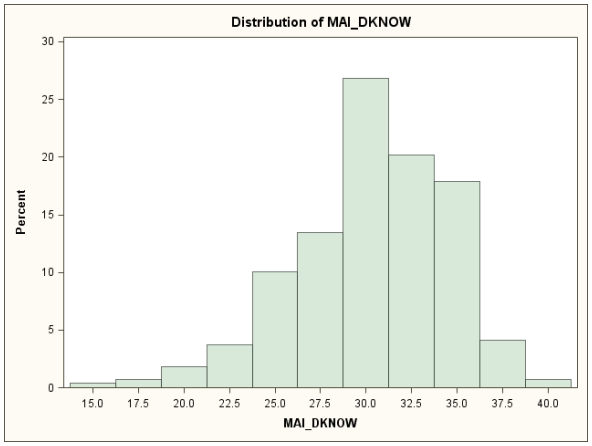








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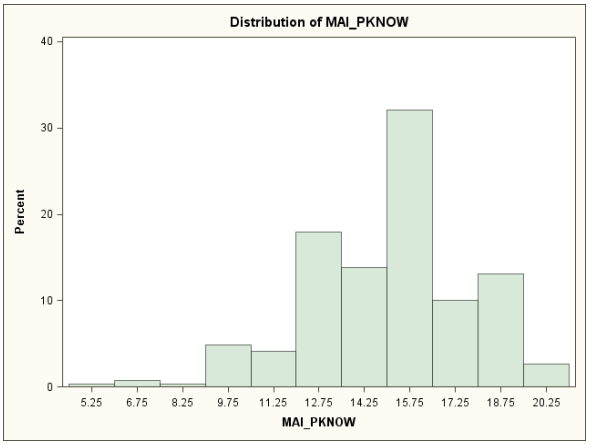
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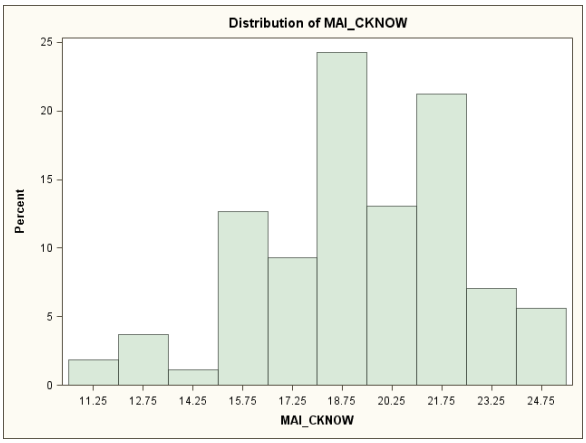
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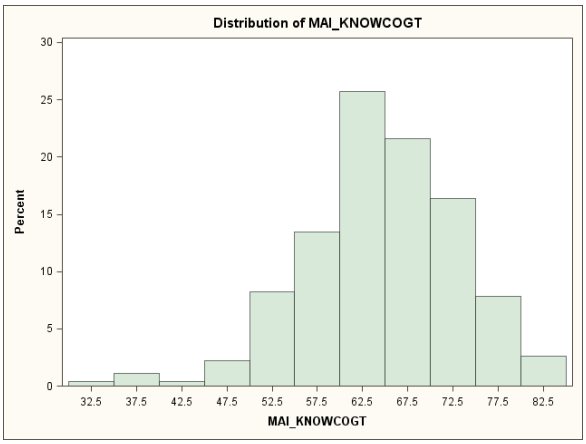
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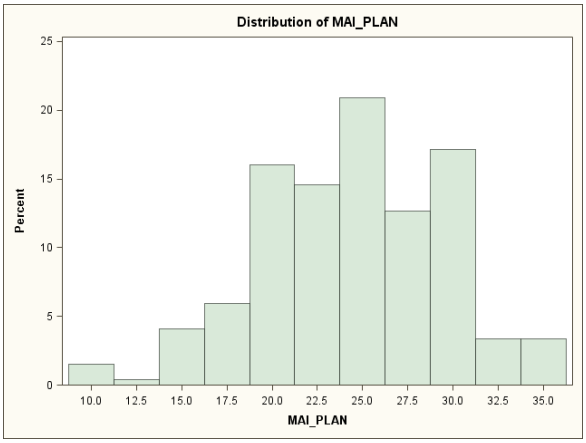
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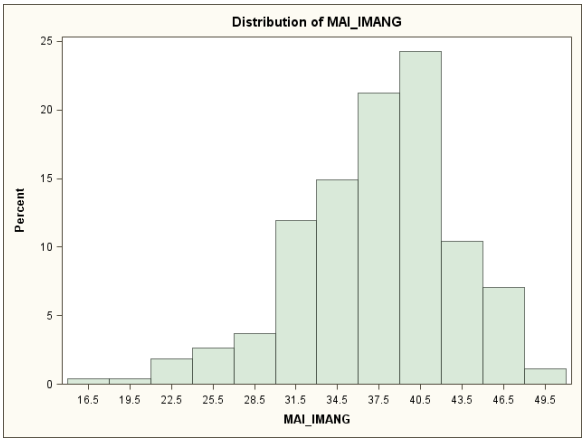
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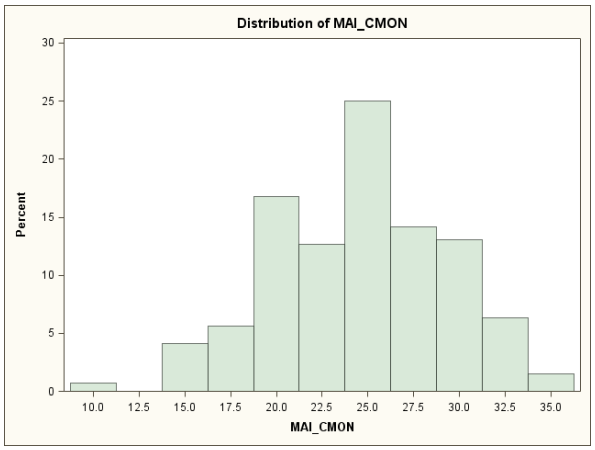
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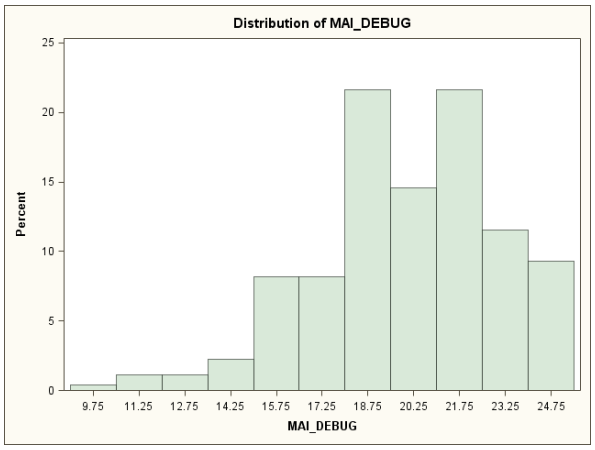
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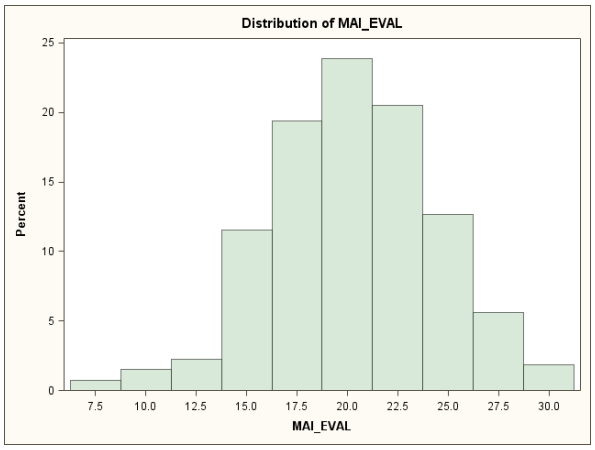
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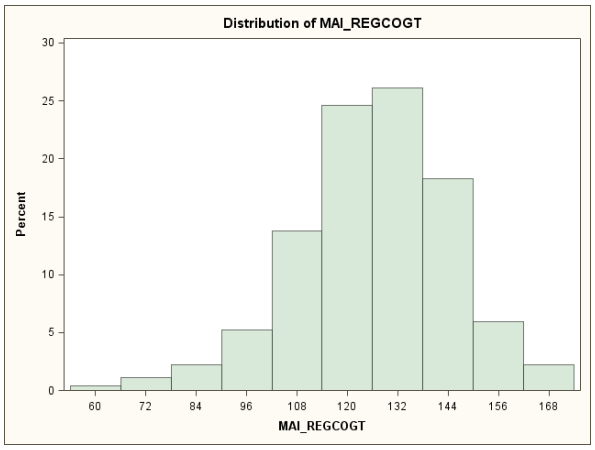
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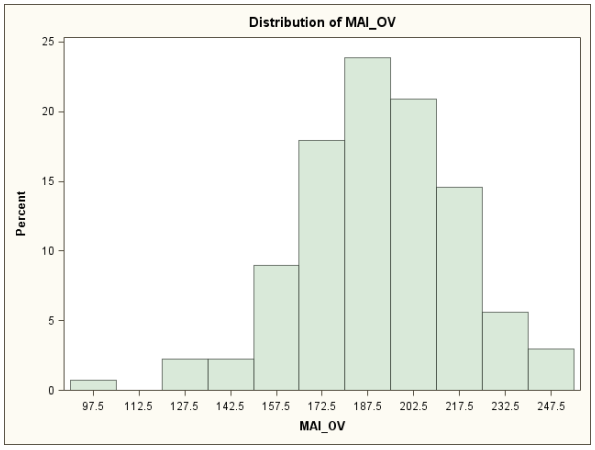
MAI_REGCOGT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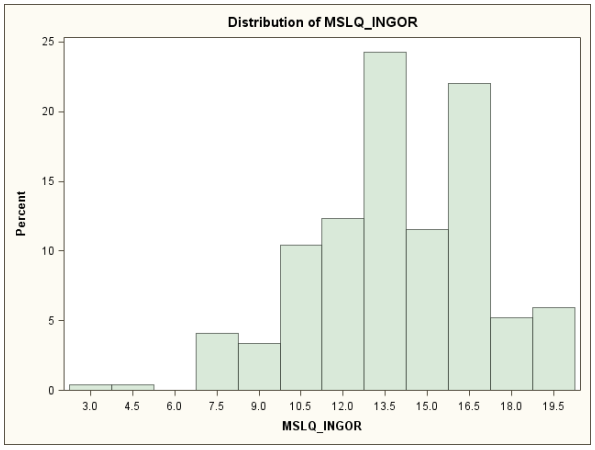
MAI_OV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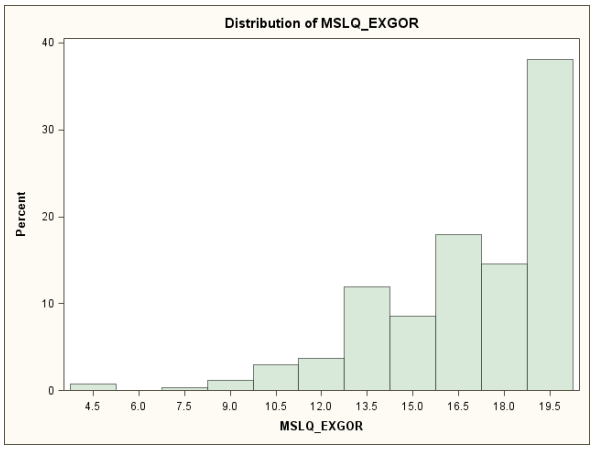
MSLQ_INGOR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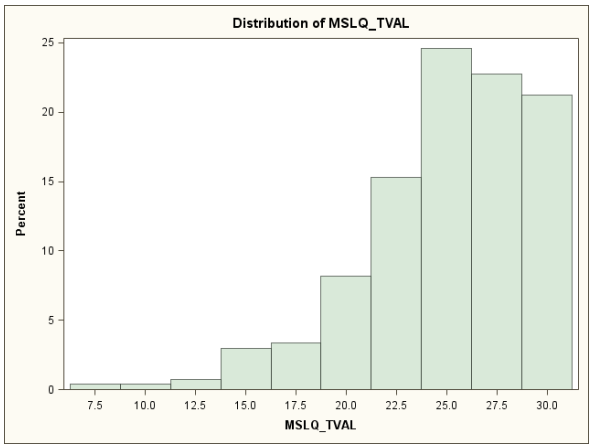
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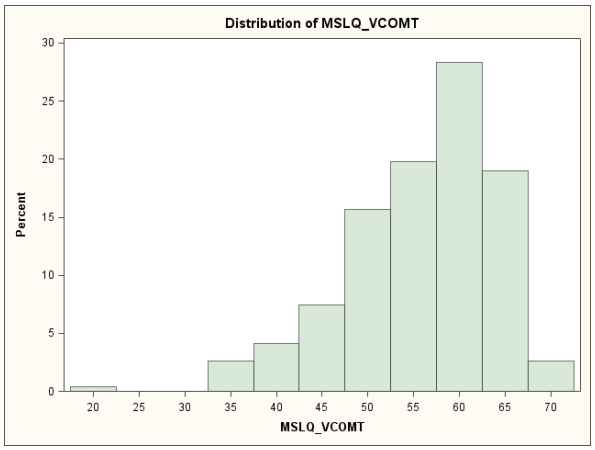
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Percent
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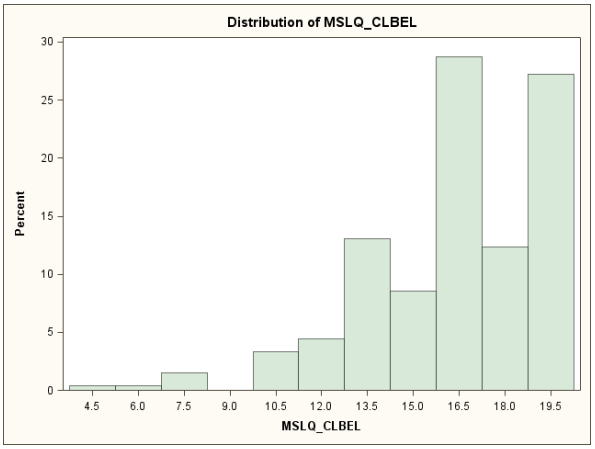
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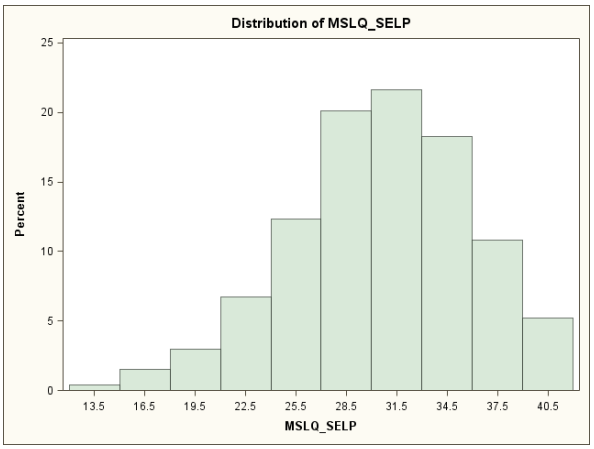
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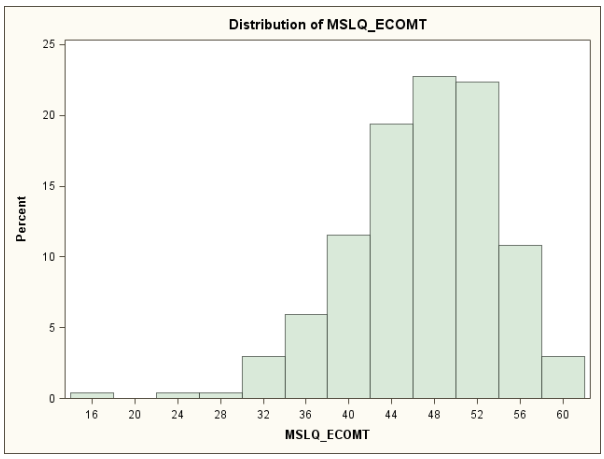
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Percent
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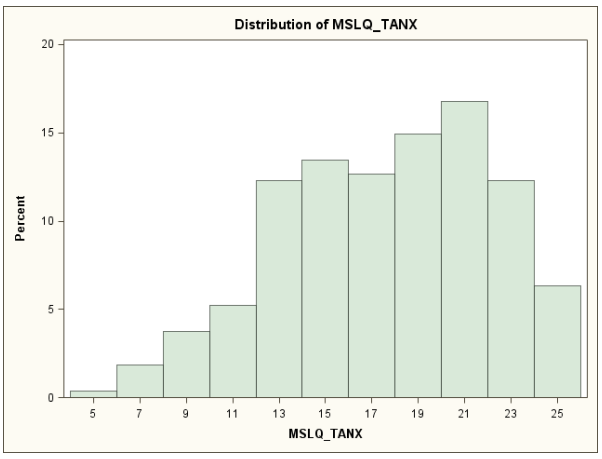
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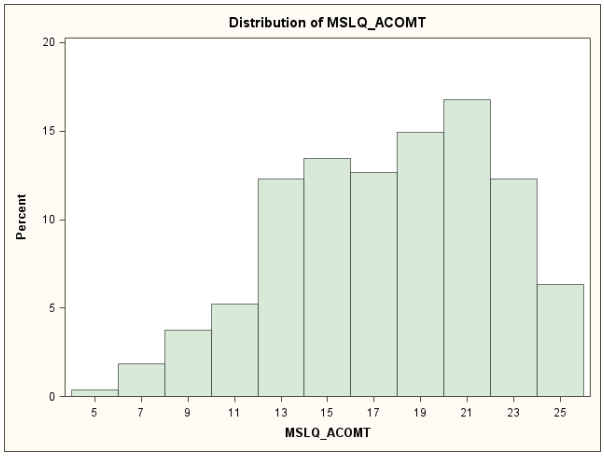
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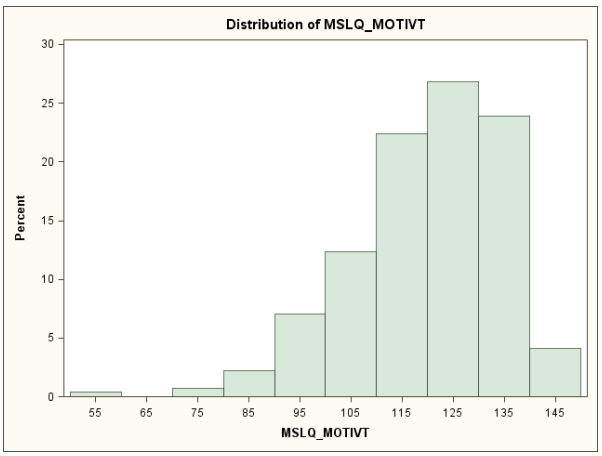
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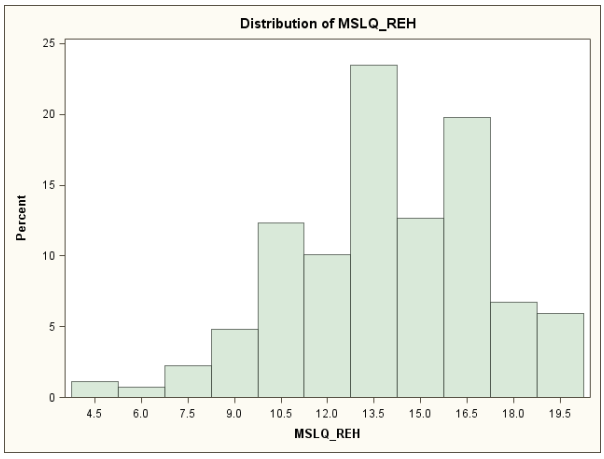
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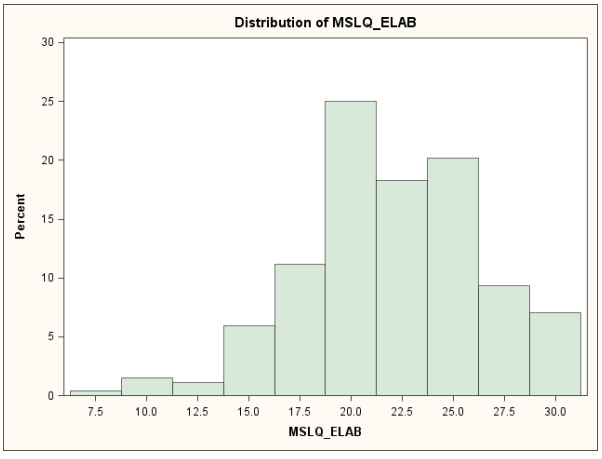
MSLQ_REH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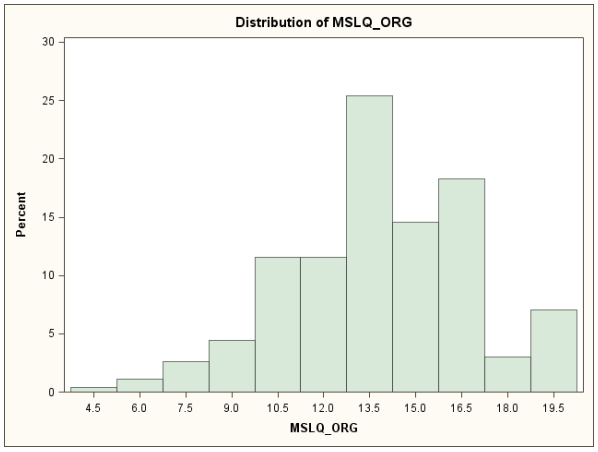
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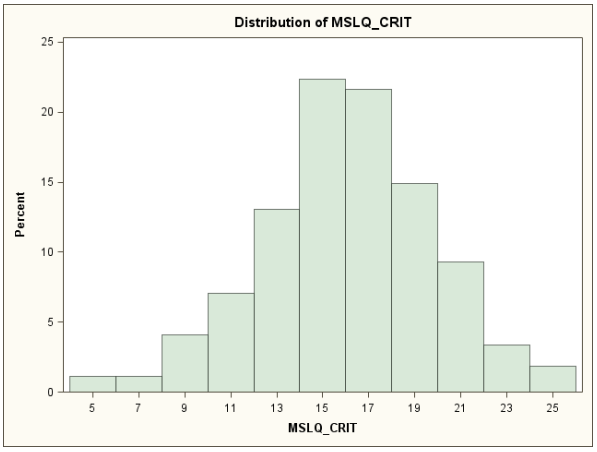
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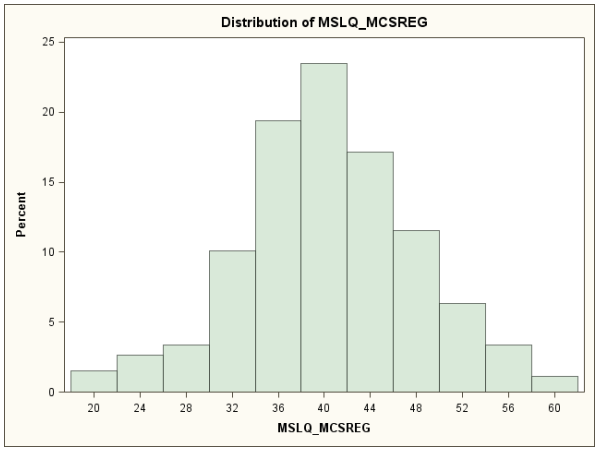
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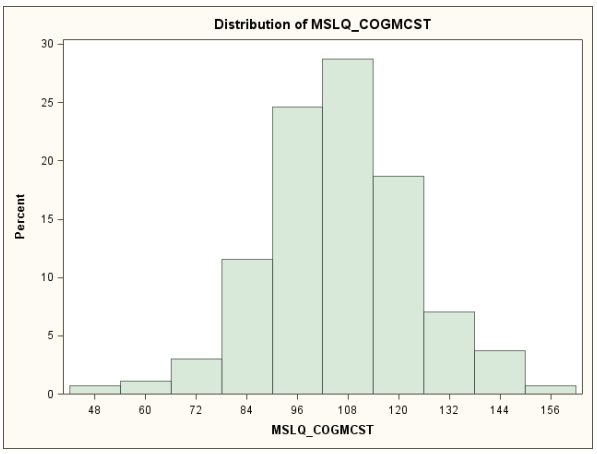
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Percent
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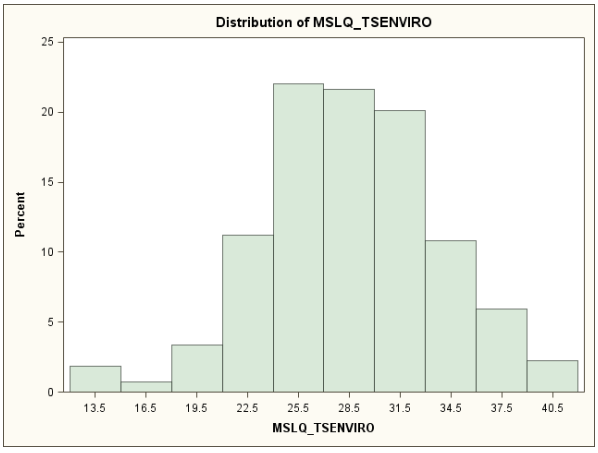
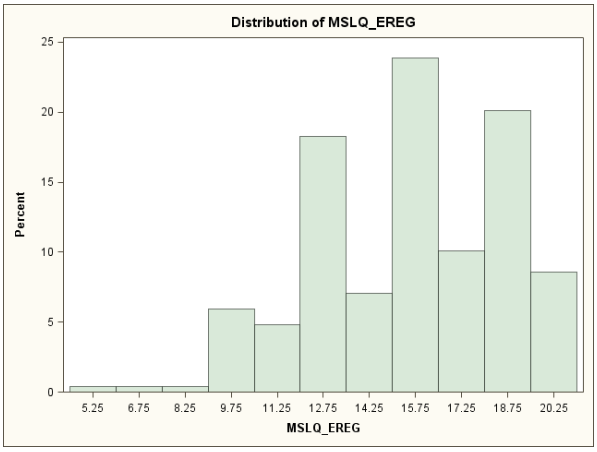
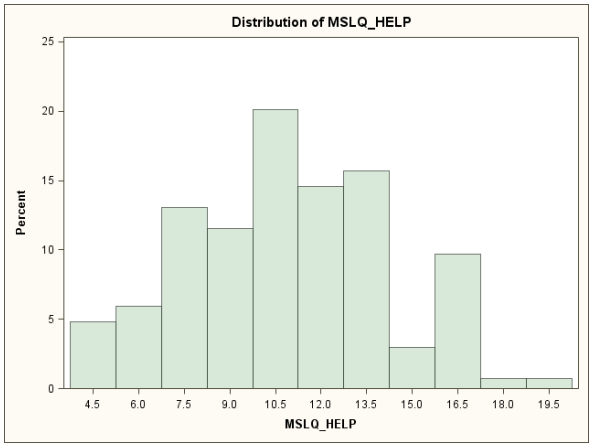
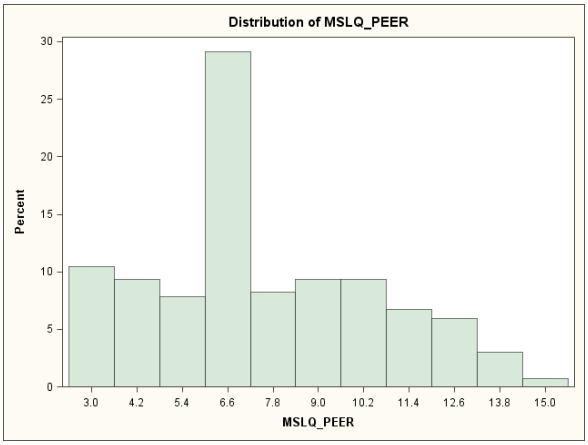
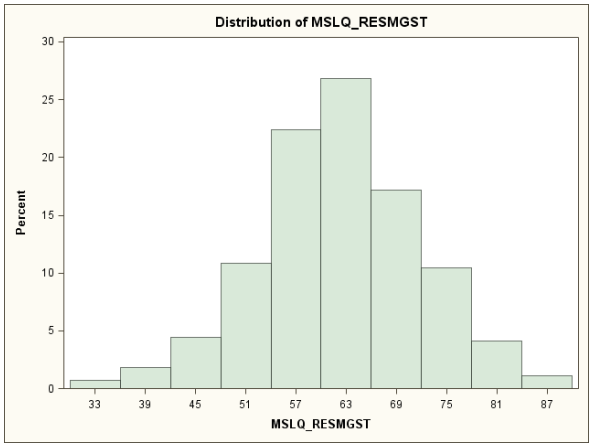
144
156
MSLQ_COGMCST

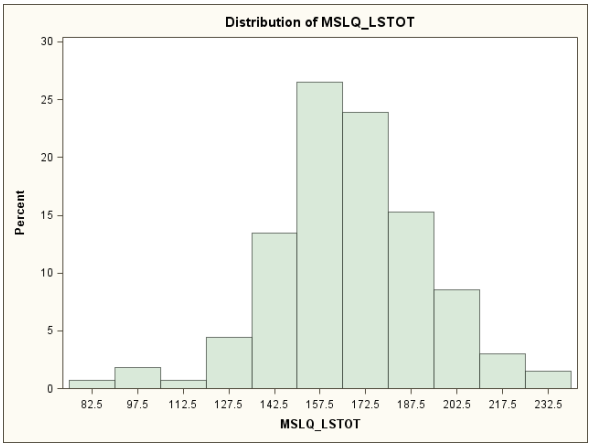

Distribution of MSLQ_TSENVIRO
Percent
25
20
15
10
5
0
13.5
16.5
19.5
22.5
25.5
28.5
31.5
34.5
37.5
40.5
MSLQ_TSENVIRO

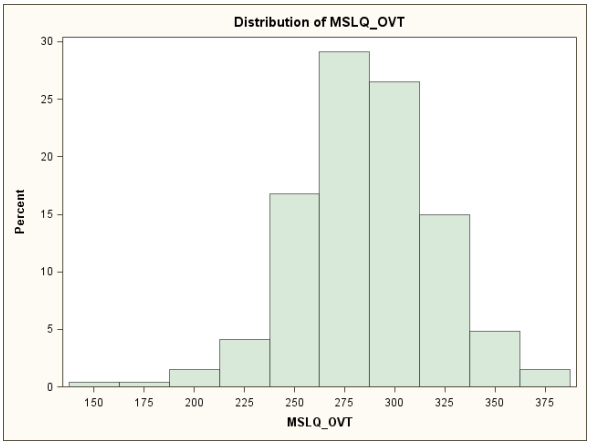

Distribution of MSLQ_EREG
Percent
25
20
15
10
5
0
5.25
6.75
8.25
9.75
11.25
12.75
14.25
15.75
17.25
18.75
20.25
MSLQ_EREG


Distribution of MSLQ_HELP
Percent
0
5
10
15
20
25
4.5
6.0
7.5
9.0
10.5
12.0
13.5
15.0
16.5
18.0
19.5
MSLQ_HELP


Distribution of MSLQ_PEER
Percent
0
5
10
15
20
25
30
3.0
4.2
5.4
6.6
7.8
9.0
10.2
11.4
12.6
13.8
15.0
MSLQ_PEER


Distribution of MSLQ_RESMGST
Percent
0
5
10
15
20
25
30
33
39
45
51
57
63
69
75
81
87
MSLQ_RESMGST


Distribution of MSLQ_LSTOT
Percent
0
5
10
15
20
25
30
82.5
97.5
112.5
127.5
142.5
157.5
172.5
187.5
202.5
217.5
232.5
MSLQ_LSTOT


Distribution of MSLQ_OVT
Percent
0
5
10
15
20
25
30
150
175
200
225
250
275
300
325
350
375
MSLQ_OVT

APPENDIX G – Metacognitive Awareness Inventory (MAI) Correlation Matrix

Pearson Correlation Coefficients
N = 268

	DKNOW	PKNOW	CKNOW	KNOWCOGT	PLAN	IMANG	CMON	DEBUG	EVAL	REGCOGT
DKNOW	1.0000									
PKNOW	0.6386	1.0000								
	<.0001									
CKNOW	0.5827	0.6609	1.0000							
	<.0001	<.0001								
KNOWCOGT	0.8940	0.8547	0.8427	1.0000						
	<.0001	<.0001	<.0001							
PLAN	0.5487	0.6585	0.6120	0.6883	1.0000					
	<.0001	<.0001	<.0001	<.0001						
IMANG	0.6081	0.6192	0.5794	0.6940	0.6291	1.0000				
	<.0001	<.0001	<.0001	<.0001	<.0001					
CMON	0.5475	0.5598	0.5872	0.6487	0.6834	0.6332	1.0000			
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001				
DEBUG	0.4580	0.5147	0.4959	0.5586	0.4918	0.5857	0.4974	1.0000		
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001			
EVAL	0.4787	0.5150	0.4998	0.5702	0.6449	0.6138	0.6911	0.4972	1.0000	
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		
REGCOGT	0.6477	0.7004	0.6765	0.7727	0.8509	0.8597	0.8587	0.7026	0.8321	1.0000
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

APPENDIX H – MSLQ Learning Strategies Subscale Correlation Matrix

Pearson Correlation Coefficients, N = 268													
	REH	ELAB	ORG	CRIT	MCSREG	COGMCST	TSENVIRO	EREG	HELP	PEER	RESMGST	LSTOT	MSLQOVT
REH	1.0000												
ELAB	0.5596	1.0000											
	<.0001												
ORG	0.5180	0.6189	1.0000										
	<.0001	<.0001											
CRIT	0.4858	0.6041	0.4556	1.0000									
	<.0001	<.0001	<.0001										
MCSREG	0.5730	0.6787	0.6113	0.6159	1.0000								
	<.0001	<.0001	<.0001	<.0001									
COGMCST	0.7352	0.8510	0.7553	0.7721	0.9108	1.0000							
	<.0001	<.0001	<.0001	<.0001	<.0001								
TSENVIRO	0.4366	0.4792	0.5118	0.3339	0.5550	0.5777	1.0000						
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001							
EREG	0.2723	0.3964	0.3871	0.2545	0.4489	0.4478	0.5171	1.0000					
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001						
HELP	0.1982	0.2057	0.3195	0.1551	0.2552	0.2759	0.2364	0.1823	1.0000				
	0.0011	0.0007	<.0001	0.0110	<.0001	<.0001	<.0001	0.0027					
PEER	0.2099	0.1845	0.2438	0.2706	0.1959	0.2597	0.0918	0.0192	0.4612	1.0000			
	0.0005	0.0024	<.0001	<.0001	0.0013	<.0001	0.1335	0.7537	<.0001				
RESMGST	0.4458	0.5016	0.5722	0.3896	0.5781	0.6161	0.7972	0.6506	0.6579	0.5118	1.0000		
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001			
LSTOT	0.6967	0.8008	0.7604	0.7010	0.8732	0.9514	0.7221	0.5725	0.4532	0.3846	0.8286	1.0000	
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		
MSLQOVT	0.6442	0.7766	0.7044	0.6952	0.8247	0.9057	0.6506	0.5792	0.3219	0.2830	0.7179	0.9242	1.00000
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

APPENDIX I – MSLQ Motivation Subscale Correlation Matrix

Pearson Correlation Coefficients
N = 268

	INGOR	EXGOR	TVAL	VCOMT	CLBEL	SELP	ECOMT	TANX	ACOMT	MOTIVT	MSLQOVT
INGOR	1.0000										
EXGOR	0.3175	1.0000									
	<.0001										
TVAL	0.5318	0.4369	1.0000								
	<.0001	<.0001									
VCOMT	0.7631	0.7190	0.8721	1.0000							
	<.0001	<.0001	<.0001								
CLBEL	0.3556	0.3589	0.4920	0.5186	1.0000						
	<.0001	<.0001	<.0001	<.0001							
SELP	0.4263	0.4657	0.5894	0.6349	0.2727	1.0000					
	<.0001	<.0001	<.0001	<.0001	<.0001						
ECOMT	0.4910	0.5237	0.6790	0.7265	0.6455	0.9108	1.0000				
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001					
TANX	0.0503	0.2631	-0.0022	0.1172	0.1382	-0.1705	-0.0761	1.0000			
	0.4113	<.0001	0.9704	0.0553	0.0236	0.0051	0.2143				
ACOMT	0.0503	0.2631	-0.0022	0.1172	0.1382	-0.1705	-0.0761	1.0000	1.0000		
	0.4113	<.0001	0.9704	0.0553	0.0236	0.0051	0.2143	<.0001			
MOTIVT	0.6622	0.7186	0.7934	0.9222	0.6273	0.7199	0.8406	0.3357	0.3357	1.0000	
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		
MSLQOVT	0.6204	0.5043	0.6456	0.7503	0.3313	0.6403	0.6504	0.1195	0.1195	0.7508	1.0000
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0506	0.0506	<.0001	

APPENDIX J – Motivated Strategies for Learning Questionnaire (MSLQ) Correlation Matrix

Pearson Correlation Coefficients, N = 268										
	MSLQ_INGOR	MSLQ_EXGOR	MSLQ_TVAL	MSLQ_VCOMT	MSLQ_CLBEL	MSLQ_SELP	MSLQ_ECOMT	MSLQ_TANX	MSLQ_ACOMT	MSLQ_MOTIVT
MSLQ_REH	0.2538	0.2332	0.2246	0.2970	0.0634	0.2836	0.2523	0.0920	0.0920	0.3085
	<.0001	0.0001	0.0002	<.0001	0.3004	<.0001	<.0001	0.1328	0.1328	<.0001
MSLQ_ELAB	0.4084	0.2670	0.4166	0.4651	0.1582	0.4102	0.3935	0.0041	0.0041	0.4394
	<.0001	<.0001	<.0001	<.0001	0.0095	<.0001	<.0001	0.9466	0.9466	<.0001
MSLQ_ORG	0.3242	0.2154	0.2832	0.3463	0.0469	0.3167	0.2715	0.0760	0.0760	0.3396
	<.0001	0.0004	<.0001	<.0001	0.4444	<.0001	<.0001	0.2148	0.2148	<.0001
MSLQ_CRIT	0.5199	0.2177	0.3906	0.4748	0.1339	0.3502	0.3355	0.0150	0.0150	0.4210
	<.0001	0.0003	<.0001	<.0001	0.0283	<.0001	<.0001	0.8066	0.8066	<.0001
MSLQ_MCSREG	0.4821	0.2515	0.3780	0.4670	0.0888	0.4155	0.3679	-0.0005	-0.0005	0.4271
	<.0001	<.0001	<.0001	<.0001	0.1470	<.0001	<.0001	0.9928	0.9928	<.0001
MSLQ_COGMCST	0.5065	0.2912	0.4261	0.5156	0.1221	0.4475	0.4076	0.0324	0.0324	0.4823
	<.0001	<.0001	<.0001	<.0001	0.0457	<.0001	<.0001	0.5972	0.5972	<.0001
MSLQ_TSENVIRO	0.2329	0.1661	0.3474	0.3263	0.0492	0.4205	0.3550	-0.2105	-0.2105	0.2795
	0.0001	0.0064	<.0001	<.0001	0.4220	<.0001	<.0001	0.0005	0.0005	<.0001
MSLQ_EREG	0.2305	0.2648	0.4433	0.4116	0.2045	0.3837	0.3923	-0.1226	-0.1226	0.3706
	0.0001	<.0001	<.0001	<.0001	0.0008	<.0001	<.0001	0.0448	0.0448	<.0001
MSLQ_HELP	0.1042	-0.0572	-0.0236	0.0051	-0.1238	-0.0043	-0.0566	-0.0128	-0.0128	-0.0275
	0.0886	0.3507	0.6996	0.9337	0.0427	0.9431	0.3558	0.8347	0.8347	0.6537
MSLQ_PEER	0.0858	0.0317	-0.0589	0.0140	-0.1527	0.0227	-0.0474	0.0457	0.0457	-0.0003
	0.1609	0.6050	0.3366	0.8192	0.0123	0.7104	0.4394	0.4558	0.4558	0.9950
MSLQ_RESMGST	0.2557	0.1602	0.2955	0.3062	0.0015	0.3469	0.2761	-0.1400	-0.1400	0.2534
	<.0001	0.0086	<.0001	<.0001	0.9800	<.0001	<.0001	0.0218	0.0218	<.0001
MSLQ_LSTOT	0.4599	0.2695	0.4183	0.4861	0.0874	0.4536	0.3976	-0.0316	-0.0316	0.4418
	<.0001	<.0001	<.0001	<.0001	0.1535	<.0001	<.0001	0.6056	0.6056	<.0001

APPENDIX K: Pearson's Correlation Coefficients for MAI Knowledge of Cognition Subscale and MSLQ

Pearson Correlation Coefficients N = 268				
	MAI Declarative Knowledge	**MAI Procedural Knowledge**	**MAI Conditional Knowledge**	**MAI Knowledge of Cognition**
MSLQ Intrinsic Goal Orientation	0.2438	0.3024	0.2465	0.2999
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Extrinsic Goal Orientation	0.0107	0.0426	0.0857	0.0486
	0.8613	0.4866	0.1615	0.4276
MSLQ Task Value	0.2781	0.2382	0.2020	0.2813
	< 0.0001	< 0.0001	0.0009	< 0.0001
MSLQ Value Components	0.2363	0.2499	0.2270	0.2732
	< 0.0001	< 0.0001	0.0002	< 0.0001
MSLQ Control of Learning Beliefs	0.0512	-0.0215	0.0688	0.0429
	0.4037	0.7260	0.2614	0.4843
MSLQ Self-Efficacy for Learning Performance	0.3404	0.3890	0.3173	0.3990
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Expectancy Components	0.2922	0.2996	0.2814	0.3352
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Test Anxiety	-0.2567	-0.2195	-0.1258	-0.2382
	< 0.0001	0.0003	0.0395	< 0.0001
MSLQ Affective Components	-0.2567	-0.2195	-0.1258	-0.2382
	< 0.0001	0.0003	0.0395	< 0.0001
MSLQ Motivation	0.1868	0.2091	0.2169	0.2327
	0.0021	0.0006	0.0003	0.0001
MSLQ Rehearsal	0.1886	0.3558	0.3320	0.3193
	0.0019	< 0.0001	< 0.0001	< 0.0001
MSLQ Elaboration	0.2992	0.4280	0.3673	0.4084
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Organisation	0.3001	0.4381	0.3419	0.4029
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Critical Thinking	0.3109	0.4079	0.3405	0.3985
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Metacognitive Self-Regulation	0.4344	0.5385	0.5066	0.5580
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Cognitive Metacognitive Strategies	0.4011	0.5478	0.4857	0.5371
	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Pearson Correlation Coefficients N = 268				
	MAI Declarative Knowledge	**MAI Procedural Knowledge**	**MAI Conditional Knowledge**	**MAI Knowledge of Cognition**
MSLQ Time Study Environment Management	0.3783	0.4511	0.3681	0.4547
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Effort Regulation	0.3330	0.3375	0.2795	0.3662
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Help Seeking	0.1025	0.2425	0.2057	0.1975
	0.0938	< 0.0001	0.0007	0.0011
MSLQ Peer Learning	0.1079	0.2106	0.1461	0.1693
	0.0777	0.0005	0.0167	0.0054
MSLQ Resource Management Strategies	0.3706	0.4888	0.3950	0.4719
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Learning Strategies	0.4299	0.5803	0.4995	0.5661
	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Overall	0.3960	0.5163	0.4601	0.5158
	< 0.0001	< 0.0001	< 0.0001	< 0.0001

APPENDIX L: Pearson's Correlation Coefficients for MAI Regulation of Cognition Subscale and MSLQ

Pearson Correlation Coefficients N = 268						
	MAI Planning	**MAI Information Management**	**MAI Comprehension Monitoring**	**MAI Debugging**	**MAI Evaluating**	**MAI Regulation of Cognition**
MSLQ Intrinsic Goal Orientation	0.3232	0.3041	0.4070	0.2398	0.3736	0.4019
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Extrinsic Goal Orientation	0.1906	0.0768	0.1593	0.0954	0.1884	0.1711
	0.0017	0.2099	0.0090	0.1192	0.0019	0.0050
MSLQ Task Value	0.2344	0.2098	0.2347	0.2286	0.2163	0.2695
	0.0001	0.0005	0.0001	0.0002	0.0004	< 0.0001
MSLQ Value Components	0.3118	0.2491	0.3313	0.2417	0.3205	0.3515
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Control of Learning Beliefs	-0.0143	-0.0069	0.0326	0.0389	0.0289	0.0148
	0.8150	0.9101	0.5944	0.5257	0.6366	0.8088
MSLQ Self-Efficacy for Learning Performance	0.4191	0.3426	0.3630	0.2359	0.3013	0.4115
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Expectancy Components	0.3265	0.2690	0.3022	0.2040	0.2517	0.3330
	< 0.0001	< 0.0001	< 0.0001	0.0008	< 0.0001	< 0.0001
MSLQ Test Anxiety	-0.1696	-0.1148	-0.0660	-0.0190	-0.0280	-0.1061
	0.0054	0.0604	0.2816	0.7562	0.6470	0.0829
MSLQ Affective Components	-0.1696	-0.1148	-0.0660	-0.0190	-0.0280	-0.1061
	0.0054	0.0604	0.2816	0.7562	0.6470	0.0829
MSLQ Motivation	0.2709	0.2265	0.3020	0.2216	0.2842	0.3152
	< 0.0001	0.0002	< 0.0001	0.0003	< 0.0001	< 0.0001
MSLQ Rehearsal	0.3475	0.3747	0.3767	0.3311	0.4082	0.4441
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Elaboration	0.4435	0.5316	0.4344	0.4398	0.4850	0.5661
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Organisation	0.4614	0.5107	0.3918	0.4003	0.4071	0.5304
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Critical Thinking	0.4546	0.4319	0.5216	0.3371	0.5232	0.5531
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
MSLQ Metacognitive Self-Regulation	0.5739	0.5795	0.6405	0.5412	0.6000	0.7090
	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Pearson Correlation Coefficients N = 268						
	MAI Planning	**MAI Information Management**	**MAI Comprehension Monitoring**	**MAI Debugging**	**MAI Evaluating**	**MAI Regulation of Cognition**
MSLQ Cognitive Metacognitive Strategies	0.5785 < 0.0001	0.6103 < 0.0001	0.6117 < 0.0001	0.5264 < 0.0001	0.6154 < 0.0001	0.7133 < 0.0001
MSLQ Time Study Environment Management	0.4537 < 0.0001	0.4116 < 0.0001	0.3426 < 0.0001	0.3272 < 0.0001	0.3002 < 0.0001	0.4507 < 0.0001
MSLQ Effort Regulation	0.3545 < 0.0001	0.2388 < 0.0001	0.2458 < 0.0001	0.2765 < 0.0001	0.2261 0.0002	0.3229 < 0.0001
MSLQ Help Seeking	0.1693 0.0054	0.2518 < 0.0001	0.1101 0.0718	0.3703 < 0.0001	0.1825 0.0027	0.2483 < 0.0001
MSLQ Peer Learning	0.2186 0.0003	0.2457 < 0.0001	0.1528 0.0123	0.1959 0.0013	0.2349 0.0001	0.2543 < 0.0001
MSLQ Resource Management Strategies	0.4731 < 0.0001	0.4510 < 0.0001	0.3408 < 0.0001	0.4429 < 0.0001	0.3614 < 0.0001	0.4992 < 0.0001
MSLQ Learning Strategies	0.5960 < 0.0001	0.6099 < 0.0001	0.5679 < 0.0001	0.5472 < 0.0001	0.5786 < 0.0001	0.7020 < 0.0001
MSLQ Overall	0.5541 < 0.0001	0.5455 < 0.0001	0.5467 < 0.0001	0.4972 < 0.0001	0.5469 < 0.0001	0.6510 < 0.0001

APPENDIX M: Pearson's Correlation Coefficients for MSLQ Resource Management Strategies Subscale and Performance Variables

Pearson Correlation Coefficients N=268						
Variable	**Test 1**	**Test 2**	**Essay 1**	**Essay 2**	**Exam**	**Weighted Average**
Time & Study	0.1578	0.1963	0.1255	0.1177	0.1872	0.2155
Enviro Management	0.0097	0.0012	0.0399	0.0542	0.0021	0.0004
Effort Regulation	0.1726	0.1724	0.1237	0.1587	0.1823	0.2195
	0.0046	0.0046	0.043	0.0092	0.0027	0.0003
Help Seeking	0.0795	0.1343	0.0645	0.0932	0.0856	0.1215
	0.1941	0.0279	0.2926	0.1279	0.1620	0.0469
Peer Learning	0.1653	0.0691	-0.0312	0.0474	0.0268	0.0734
	0.0067	0.2590	0.6108	0.439	0.6622	0.2308
Resource Management	0.2137	0.2235	0.1171	0.1572	0.1926	0.2452
Strategies	0.0004	0.0002	0.0554	0.0099	0.0015	< 0.0001

APPENDIX N: Pearson's Correlation Coefficients for the MSLQ, MAI and Performance Variables

Pearson Correlation Coefficients N = 268						
	T1	**T2**	**E1**	**E2**	**Ex**	**W. Ave**
MSLQ_INGOR	-0.0541	0.0351	-0.0576	-0.0170	0.0030	-0.0155
	0.3774	0.5673	0.3470	0.7809	0.9606	0.7999
MSLQ_EXGOR	-0.1012	-0.0778	-0.0857	-0.0730	-0.1211	-0.1265
	0.0980	0.2041	0.1616	0.2336	0.0476	0.0384
MSLQ_TVAL	0.0324	0.0739	-0.0132	0.0089	0.0828	0.0629
	0.5974	0.2274	0.8292	0.8846	0.1761	0.3042
MSLQ_VCOMT	-0.0420	0.0212	-0.0606	-0.0294	-0.0025	-0.0216
	0.4934	0.7292	0.3225	0.6311	0.9667	0.7240
MSLQ_CLBEL	-0.0029	0.0169	-0.0117	-0.0767	0.0419	0.0049
	0.9616	0.7831	0.8481	0.2107	0.4945	0.9357
MSLQ_SELP	0.1120	0.1440	0.0505	0.0684	0.0730	0.1172
	0.0671	0.0183	0.4102	0.2639	0.2331	0.0552
MSLQ_ECOMT	0.0876	0.1216	0.0350	0.0214	0.0759	0.0952
	0.1524	0.0467	0.5677	0.7265	0.2150	0.1200
MSLQ_TANX	-0.1994	-0.0707	-0.1244	-0.1158	-0.1862	-0.1935
	0.0010	0.2486	0.0418	0.0583	0.0022	0.0015
MSLQ_ACOMT	-0.1994	-0.0707	-0.1244	-0.1158	-0.1862	-0.1935
	0.0010	0.2486	0.0418	0.0583	0.0022	0.0015
MSLQ_MOTIVT	-0.0433	0.0466	-0.0550	-0.0416	-0.0231	-0.0269
	0.4796	0.4473	0.3691	0.4968	0.7058	0.6610
MSLQ_REH	0.0049	0.0513	0.0013	-0.0629	-0.0561	-0.0253
	0.9352	0.4022	0.9826	0.3045	0.3602	0.6797
MSLQ_ELAB	-0.0170	0.0751	-0.0551	-0.0287	-0.0260	-0.0130
	0.7807	0.2200	0.3685	0.6389	0.6711	0.8318
MSLQ_ORG	0.0541	0.1422	-0.0107	0.0566	-0.0060	0.0543
	0.3770	0.0198	0.8611	0.3554	0.9209	0.3752
MSLQ_CRIT	-0.0444	-0.0006	-0.0981	-0.0361	-0.0801	-0.0703
	0.4685	0.9916	0.1091	0.5553	0.1908	0.2510
MSLQ_MCSREG	0.0262	0.1166	-0.0001	0.0181	0.0266	0.0504
	0.6686	0.0566	0.9987	0.7670	0.6639	0.4110
MSLQ_COGMCST	0.0073	0.0991	-0.0354	-0.0085	-0.0226	0.0077
	0.9049	0.1054	0.5631	0.8898	0.7115	0.8994

Pearson Correlation Coefficients N = 268						
	T1	**T2**	**E1**	**E2**	**Ex**	**W. Ave**
MSLQ_TSENVIRO	0.1578	0.1963	0.1255	0.1177	0.1872	0.2155
	0.0097	0.0012	0.0399	0.0542	0.0021	0.0004
MSLQ_EREG	0.1726	0.1724	0.1237	0.1587	0.1823	0.2195
	0.0046	0.0046	0.0430	0.0092	0.0027	0.0003
MSLQ_HELP	0.0795	0.1343	0.0645	0.0932	0.0856	0.1215
	0.1941	0.0279	0.2926	0.1279	0.1620	0.0469
MSLQ_PEER	0.1653	0.0691	-0.0312	0.0474	0.0268	0.0734
	0.0067	0.2590	0.6108	0.4390	0.6622	0.2308
MSLQ_RESMGST	0.2137	0.2235	0.1171	0.1572	0.1926	0.2452
	0.0004	0.0002	0.0554	0.0099	0.0015	<.0001
MSLQ_LSTOT	0.0887	0.1578	0.0205	0.0554	0.0591	0.1013
	0.1473	0.0097	0.7375	0.3663	0.3348	0.0978
MSLQ_OVT	0.0468	0.1360	-0.0083	0.0230	0.0336	0.0631
	0.4446	0.0259	0.8925	0.7072	0.5830	0.3029
MAI_DKNOW	0.1813	0.1515	0.1582	0.0981	0.1777	0.2060
	0.0029	0.0130	0.0094	0.1091	0.0035	0.0007
MAI_PKNOW	0.0967	0.1329	0.0520	0.0649	0.0757	0.1106
	0.1141	0.0296	0.3962	0.2891	0.2168	0.0705
MAI_CKNOW	0.0171	0.0490	0.0081	0.0022	0.0056	0.0198
	0.7805	0.4241	0.8938	0.9712	0.9264	0.7458
MAI_KNOWCOGT	0.1250	0.1327	0.0967	0.0690	0.1127	0.1424
	0.0409	0.0298	0.1140	0.2601	0.0654	0.0197
MAI_PLAN	-0.0013	0.0221	0.0270	0.0455	-0.0700	-0.0133
	0.9830	0.7182	0.6595	0.4574	0.2530	0.8279
MAI_IMANG	0.0404	0.1287	-0.0228	-0.0547	0.0379	0.0419
	0.5102	0.0351	0.7098	0.3717	0.5365	0.4943
MAI_CMON	-0.0238	0.0640	-0.0677	0.0202	-0.0277	-0.0105
	0.6980	0.2966	0.2695	0.7410	0.6513	0.8635
MAI_DEBUG	0.0618	0.0675	0.0596	-0.0298	0.1359	0.0963
	0.3130	0.2706	0.3306	0.6264	0.0260	0.1155
MAI_EVAL	-0.0735	0.0054	-0.1239	0.0004	-0.1122	-0.0872
	0.2301	0.9296	0.0425	0.9942	0.0667	0.1545
MAI_REGCOGT	-0.0004	0.0731	-0.0346	-0.0039	-0.0173	0.0025
	0.9937	0.2329	0.5721	0.9486	0.7770	0.9666
MAI_OV	0.0409	0.0966	0.0068	0.0199	0.0246	0.0488
	0.5050	0.1145	0.9108	0.7455	0.6882	0.4257

APPENDIX O: Pearson's Correlation Coefficients for the Performance Variables

Pearson Correlation Coefficients N = 268						
	Test 1	**Test 2**	**Essay 1**	**Essay 2**	**Exam**	**Weighted Average**
Test 1	1.0000					
Test 2	0.5058 < 0.0001	1.0000				
Essay 1	0.3200 < 0.0001	0.2752 < 0.0001	1.0000			
Essay 2	0.3774 < 0.0001	0.3377 < 0.0001	0.2915 < 0.0001	1.0000		
Exam	0.6395 < 0.0001	0.6019 < 0.0001	0.4695 < 0.0001	0.3518 < 0.0001	1.0000	
Weighted Average	0.7826 < 0.0001	0.7505 < 0.0001	0.5821 < 0.0001	0.5925 < 0.0001	0.9044 < 0.0001	1.0000

APPENDIX P: Regression Models for Examination Performance

Table 21: Knowledge of Cognition, Demographics, and Exam

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.99	< 0.0001	0
NHLANG	**1**	-7.56	< 0.0001	-0.43370
NESES	**1**	-0.58	0.5595	-0.03262
TYPE SCHOOL	**1**	2.80	0.0055	0.16452
MAI_KNOWCOGT	**1**	1.78	0.0763	0.09649

Table 22: Regulation of Cognition, Demographics, and Exam

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.85	< 0.0001	0
NHLANG	**1**	-7.44	< 0.0001	-0.43156
NESES	**1**	-0.45	0.6535	-0.02522
TYPE SCHOOL	**1**	2.84	0.0048	0.16781
MAI_REGCOGT	**1**	0.26	0.7988	0.01395

Table 23: Motivation, Demographics, and Exam

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.50	< 0.0001	0
NHLANG	**1**	-7.47	< 0.0001	-0.43097
NESES	**1**	-0.33	0.7418	-0.01864
TYPE SCHOOL	**1**	2.89	0.0041	0.17102
MSLQ_MOTIVT	**1**	0.68	0.4961	0.03762

Table 24: Cognitive and Metacognitive Strategies, Demographics, and Exam

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	10.47	< 0.0001	0
NHLANG	**1**	-7.45	< 0.0001	-0.43044
NESES	**1**	-0.43	0.6663	-0.02417
TYPE SCHOOL	**1**	2.84	0.0048	0.16798
MSLQ_COGMCST	**1**	0.14	0.8870	0.00773

Table 25: Resource Management Strategies, Demographics, and Exam

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.82	< 0.0001	0
NHLANG	**1**	-7.29	< 0.0001	-0.42042
NESES	**1**	-0.43	0.6684	-0.02387
TYPE SCHOOL	**1**	2.47	0.0141	0.14793
MSLQ_RESMGST	**1**	1.71	0.0878	0.09580

APPENDIX Q: Regression Models for Essay Performance

Table 26: Knowledge of Cognition, Demographics, and Essay1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.11	< 0.0001	0
TYPE SCHOOL	**1**	2.15	0.0325	0.14362
NHLANG	**1**	-1.61	0.1083	-0.10526
NESES	**1**	0.03	0.9757	0.00193
MAI_KNOWCOGT	**1**	1.46	0.1453	0.09011

Table 27: Knowledge of Cognition, Demographics, and Essay2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	6.71	< 0.0001	0
NHLANG	**1**	-1.43	0.1533	-0.09202
TYPE SCHOOL	**1**	3.53	0.0005	0.23178
NESES	**1**	-0.20	0.8393	-0.01269
MAI_KNOWCOGT	**1**	1.22	0.2232	0.07410

Table 28: Regulation of Cognition, Demographics, and Essay1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	11.42	< 0.0001	0
TYPE SCHOOL	**1**	2.21	0.0279	0.14820
NHLANG	**1**	-1.48	0.1388	-0.09781
NESES	**1**	0.20	0.8452	0.01245
MAI_REGCOGT	**1**	-0.57	0.5670	-0.03558

Table 29: Regulation of Cognition, Demographics, and Essay2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.06	< 0.0001	0
NHLANG	**1**	-1.40	0.1623	-0.09075
TYPE SCHOOL	**1**	3.56	0.0005	0.23420
NESES	**1**	-0.12	0.9079	-0.00725
MAI_REGCOGT	**1**	0.23	0.8174	0.01410

Table 30: Motivation, Demographics, and Essay1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	9.23	< 0.0001	0
TYPE SCHOOL	**1**	2.16	0.0319	0.14492
NHLANG	**1**	-1.54	0.1244	-0.10103
NESES	**1**	0.09	0.9320	0.00548
MSLQ_MOTIVT	**1**	-0.47	0.6403	-0.02934

Table 31: Motivation, Demographics, and Essay2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	6.52	< 0.0001	0
NHLANG	**1**	-1.39	0.1666	-0.08936
TYPE SCHOOL	**1**	3.56	0.0004	0.23516
NESES	**1**	-0.08	0.9350	-0.00516
MSLQ_MOTIVT	**1**	0.12	0.9080	0.00713

Table 32: Cognitive and Metacognitive Strategies, Demographics, and Essay 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	11.99	< 0.0001	0
TYPE SCHOOL	**1**	2.21	0.0278	0.14831
NHLANG	**1**	-1.52	0.1297	-0.09973
NESES	**1**	0.15	0.8786	0.00971
MSLQ_COGMCST	**1**	-0.59	0.5570	-0.03627

Table 33: Cognitive and Metacognitive Strategies, Demographics, and Essay 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	8.68	< 0.0001	0
NHLANG	**1**	-1.38	0.1682	-0.08913
TYPE SCHOOL	**1**	3.56	0.0004	0.23466
NESES	**1**	-0.10	0.9209	-0.00621
MSLQ_COGMCST	**1**	-0.01	0.9909	-0.00069265

Table 34: Resource Management Strategies, Demographics, and Essay 1

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	10.33	< 0.0001	0
TYPE SCHOOL	**1**	1.98	0.0491	0.13498
NHLANG	**1**	-1.46	0.1452	-0.09609
NESES	**1**	0.16	0.8749	0.01000
MSLQ_RESMGST	**1**	0.90	0.3712	0.05712

Table 35: Resource Management Strategies, Demographics, and Essay 2

Variable	DF	t-value	p-value	Standardized Estimate
Intercept	**1**	7.21	< 0.0001	0
NHLANG	**1**	-1.25	0.2139	-0.08031
TYPE SCHOOL	**1**	3.23	0.0014	0.21584
NESES	**1**	-0.10	0.9244	-0.00591
MSLQ_RESMGST	**1**	1.42	0.1572	0.08866