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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

THE DIMENSIONS OF SELF-REGULATED LEARNING AND ACADEMIC ACHIEVEMENT IN COLLEGE STUDENTS

A Dissertation Submitted in Partial Fulfillment
of the Requirements of the Degree of
Doctor of Philosophy

Nasar Said

College of Education and Behavioral Sciences
School of Psychological Sciences
Educational Psychology

August 2013

This Dissertation by: Nasar Said

Entitled: *The Dimensions of Self-Regulated Learning and Academic Achievement in College Students*

has been approved as meeting the requirement for the Degree of Doctor of Philosophy in College of Education and Behavioral Sciences in School of Psychological Sciences, Program of Educational Psychology

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ABSTRACT

Said, Nasar. *The Dimensions of Self-Regulated Learning and Academic Achievement in College Students*. Published Doctor of Philosophy dissertation, University of Northern Colorado, 2013.

The purpose of this study was to first investigate the factor structure of a data set, which included the measures of: (a) executive functions, (b) metacognitive strategies, (c) time management, and (d) academic self-efficacy in a sample of undergraduate students (N = 45) . A second purpose was to explore whether there were differences between low-achieving (n = 21) and high-achieving college students (n = 24) in terms of the scores on the underlying factors identified in the factor structure that presumably will align with the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy or some type of combined variables. The results from Exploratory Factor Analysis showed that 3 factors were retained from 11 measures that represent executive functions, metacognitive strategies, time management, and academic self-efficacy. Six self-report-measures, which basically represent executive functions, time management strategies, and self-efficacy loaded on Factor 1, and this factor was labeled as Perceived Self-Regulation (PSR). Three measures, which basically represent metacognitive strategies, loaded for Factor 2, and this factor was labeled as Metacognitive Knowledge Strategies (MKS). Also, two direct measures, which represent executive functions, loaded on Factor 3, and this factor were labeled as Executive Control Processes (ECP). Results from the independent sample t-tests showed that there were

mean differences in the scores for the three factors, which identified in factor analysis (i.e., PSR, MKS, and ECP), between the high-achieving group and the low-achieving group in favor of the high-achieving group. Finally, Research Question 3 addressed the degree to which an individual's membership (i.e., high- and low-achieving groups) could be correctly classified by the scores of the three factors scores by determining the contribution of each factor to predict individual's membership while controlling for the other factors, and this was assessed through Hierarchical Binary Logistic Regression. Logistic Regression analysis showed that ECP appears to have a direct, and strong, effect on (or contribution to) the discrimination between the high- and low-achieving groups. Second, the contribution of MKS to the identification of high- and low-achieving group membership appears to be entirely mediated by the PSR factor; however, the PSR has a direct, moderate relationship to group membership.

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CHAPTER I

INTRODUCTION

Background of the Study

Of the total number of students enrolled at the University of Northern Colorado (UNC), 7% are identified as low-achieving students who are eligible to receive additional academic support, and are required to participate in academic probation program in order to develop a variety of learning strategies. There are many variables that contribute to various patterns of performance in school. Accordingly, within the field of educational psychology, there is a relatively recent interest in self-regulation models designed to explain the dilemma of academic problems, and how such academic problems may lead to academic failure and, eventually, attrition from higher education. Such academic difficulties are experienced by many low-achieving students (Borkoweski & Thorpe, 1994; Ries & McCoach, 2000).

Individual and group differences in self-regulated learning are related to achievement levels in college students (Pintrich & Schunk, 2002). Zimmerman and Labuhn (2012) suggested that highly self-regulated students are able to: (a) generate advantageous metacognitive strategies, (b) develop positive self-efficacy motives, and (c) modify ineffective actions to attain their learning goals. Wolters, Pintrich, and Karabenick (2003) proposed that, in all of the models of self-regulated learning, it is assumed that learners can potentially monitor, control, and regulate certain aspects of

their own cognition, motivation, and behavior as well as some features of their environment.

The focus of one line of research in self-regulated learning and academic performance has highlighted cognitive processes, such as students' metacognitive skills (Biggs, 1985; Entwistle & Entwistle, 2003; Pintrich, 2000) and executive functions (Espy, McDiarmid, Cwik, Stalets, & Senn., 2004; Taylor, Schatschneider, Barry, & Owens, 1996) as predictors of academic performance. A second line of research has been focused on those self-regulatory processes that are motivational in nature; the most common of which is self-efficacy (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Multon, Brown, & Lent, 1991). A third line of self-regulation research has examined students' use of study strategies**,** such as time management (Wells, 1993; Zulauf & Gortner, 1999). In turn, an understanding of the mechanisms and factors that underlie academic performance can be used to enrich the tutoring approaches for low-achieving students and, moreover, could lead to the emergence of several educational implications in regard to classroom practices.

In the current study, it is assumed that students' executive function, metacognitive strategies, time management, and academic self-efficacy are key components of self-regulated learning processes that contribute to the understanding of the differences between low-achieving and high-achieving students. Additionally, potential overlap among these components may exist. The metacognitive strategies that students adopt represent their cognitive engagement while they are involved in academic activities. The importance of being able to adapt one's cognitive strategies to academic task demands has been the focus of several researchers (Abd-El-Fattah, 2011; Biggs, 1985; Pintrich,

2000; Vrugt & Oort 2008), who proposed that, for effective learning, students must be aware of task requirements and be able to exert control over the cognitive processes used to meet these requirements. Moreover, there is now substantial evidence that executive function, which is defined as "the ability to maintain an appropriate problem-solving set for attainment of a future goal" (Welsh & Pennington, 1988, p. 202), plays a vital role in the learning process. For example, inhibition and working memory have been associated with performance in the areas of reading and mathematics (Blair & Razza, 2007; Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Espy et al., 2004; Latzman, Elkovitch, Young, & Clark, 2010; McClelland et al., 2007; St. Clair-Thompson & Gathercole, 2006). In addition to metacognition and executive functions, perceived academic self-efficacy is a motivational variable that could be important for academic performance.

Self-efficacy beliefs, which refer to "beliefs in one's capabilities to organize and execute the courses of action required for producing given attainments" (Bandura, 1997, p. 3), have been found to be related to the academic achievement of both men and women. In a meta-analysis of self-efficacy research studies, which were published between 1977 and 1988, a positive relationship was found between efficacy beliefs (Multon et al., 1991) and academic achievement (Graham & Weiner, 1996). Thus, the presence of self-efficacy helps students to predict their learning, and it enhances motivation. In addition to the importance of students' efficacy beliefs for the accomplishment of academic tasks, students should be better able to accurately regulate their study time and monitor their time usage.

The management of study time is one of the behavioral study strategies that improves performance in the task at hand, and it can be generalized beyond the learning

context (Zimmerman & Schunk, 2011). Based on previous research in our laboratory, the focus of this study was on time management, another component that is included in self-regulated learning processes and associated with academic performance (Zulauf et al., 1999). Zimmerman, Greenberg, and Weinstein (1994) found that the use of time planning and management helped students to better self-regulate their use of study time.

Based on the content of the measures used in the current study, metacognitive strategies are viewed as those strategies adopted by students in study situations, such as: (a) monitoring, (b) knowing what they know in regard to the academic tasks, (c) procedural knowledge, and (d) declarative knowledge. Also, the neuropsychological construct of executive functions involves cognitive processes similar to metacognition, such as planning and self-monitoring, but are applied to everyday situations that go beyond learning in the classroom. At this point, there is a relative consistency within the psychological literature that addresses a conceptual overlap among the factors of metacognition, executive functions, and time management. Hanten, Bartha, and Levin (2000) discussed executive functions and metacognition as virtually the same thing. Another point of overlap between metacognition and executive function is their connection to the self-regulatory process. This is evident in Borkowski's (1996) model of metacognition, in which he suggested that metacognition is one of the key components of self-regulation. Borkowski maintained that the key to self-regulation is executive functions and proposed that metacognitive skills are driven by executive functions. Barkley (1996) proposed that executive function and metacognition are used interchangeably in cognitive and developmental psychology. Torgensen (1994) suggested

that both terms may suffer from ambiguity of definition for which they could be substituted.

Time management, moreover, is comprised of several processes such as: (a) goal management, (b) planning, and (c) scheduling (Britton & Glynn, 1989). Therefore, it is likely that the variable of time management could overlap with both executive functions and metacognition.

Thus, in the current study, executive functions, metacognitive strategies, time management, and self-efficacy are each assumed to explain the differences between low-achieving students and high-achieving students, in terms of separate variables that represent separate underlying mechanisms. Also, it is possible that metacognitive strategies, executive functions, time management, and self-efficacy could be elements of one structure or factor. Therefore, a major aim of this study was to examine empirically the separability of these constructs in the data set including both low- and high-achieving college students. In addition, the degree to which these variables or the overarching factors distinguished between two groups of undergraduate students, differing in academic achievement level, was explored.

Purpose and Research Questions

The primary purpose of this study was to investigate the factor structure of a data set, which includes the measures of: (a) executive functions, (b) metacognitive strategies, (c) time management, and (d) academic self-efficacy. A second purpose was to explore whether there are differences between low- and high-achieving college students in terms of the underlying factors identified in the factor structure (e.g., executive functions,

metacognitive strategies, academic self-efficacy, and time management, or some type of combined variables). This purpose was addressed in the following research questions:

Q1 What is the underlying factor structure identified among the scores on the measures of executive functions, metacognitive strategies, time management, and self-efficacy?

- Do the factors align with the constructs of executive functions, metacognitive strategies, time management and academic self-efficacy, or do the factor structure represent combinations of the constructs of interest (e.g., executive functions and metacognition, or metacognition and time management)?

Q2 Are there mean differences between the two achievement groups in scores on the factors identified in the factor analysis that represent executive functions, metacognitive strategies, self-efficacy, and time management?

Q3 Do the factor scores identified in Q1 predict the individual's membership in relevant group (high- and low- achieving groups)?

a. What is the linear combination of scores that best predict the Individual's membership?

b. Which variables are the best predictors of the individuals' membership?

Hypotheses

From the theoretical associations between the constructs and academic achievement discussed, two hypotheses were derived regarding Research Question 2 and Research Question 3.

H1 It is hypothesized that the high-achieving group would outperform the low-achieving group in all or some of the factors identified in the factor analysis.

H2 It is hypothesized that some linear combination of the factors, identified in the factor analysis, would effectively classify each individual in her or his relevant group.

There has not been a priori hypothesis regarding the Research Question 1 given that there was not sufficient empirical evidence to determine the nature of the factor structure underlying the data set.

Definitions

This study consisted of one major variable of interest, which is academic achievement. Academic Achievement is defined as *a students' overall level of academic achievement as indicated by students' grade point average* (GPA), a numerical score, which can range from a low of 0.00 to a high of 4.00. This variable is embodied in the characteristics of the two groups of students; those groups are already identified as high- and low-achieving students. Low-achieving students are either underprepared students or students who do not perform academically to the expected standards (Nelson, 1998). In this study, low-achieving students are those students, who have not met the expected standard as reflected by a cumulative grade point average (GPA) falls below 2.0 out of 4.0, and for which they are placed on academic probation on the UNC campus. In order to return to good standing and avoid academic suspension, these students must raise their cumulative GPA to 2.0 or higher in their next 24 credits hours. High-achieving students are students, who show academic success and earn a cumulative GPA of 3.5 out of 4.00, and some of them have been selected as candidates for Honors Program at UNC.
The predictor variables in this study are:

Academic self-efficacy. The most quoted definition of self-efficacy is reported by Bandura (1997), and it refers to "beliefs in one's capabilities to organize and execute the courses of action required producing given attainments" (p. 3). Academic self-efficacy was assessed in this study by the short form of Bandura's (1989)

Multidimensional Scales of Perceived Self-Efficacy (self-report; MSPSE), specifically the scale that focuses on academic self-efficacy.

Executive functions. Cooper-Kahn and Diezal (2009) defined executive functions as "a set of processes that all have to do with managing oneself and one's resources in order to achieve a goal. It is an umbrella term for the neurologically-based skills involving mental control and self-regulation" (p. 1). Two direct measures of executive function were used: the Tower of London Test (Schnirman, Welsh, & Retzlaff, 1998) assessed the students' use of executive functions skills of planning, organization, and goal setting, and the Letter-Number Sequencing Test (Wechsler, 1997) examined the executive function of verbal working memory. In addition, the Behavior Rating Inventory of Executive Function (BRIEF)-Adult Version (self-report; Roth, Isquith, & Gioia, 2005) was used to measure various components of executive functions in the context of everyday behaviors based on self-report**.**

Metacognitive strategies. Metacognitive strategies represent students' cognitive engagement while they are involved in academic activities, and indicate their accurate monitoring of knowledge. An observational technique was devised for this study based on Tobias and Everson's (2002) direct measure of Knowledge Monitoring Ability. Also, the Metacognitive Awareness Inventory (self-report; Schraw & Dennison, 1994) was used to assess the metacognitive knowledge skills of procedural knowledge and declarative knowledge based on self-report.

Time management. Time management refers to students' competency to manage their study time with the use of long and short range planning, as well their attitude toward their use of time (Britton & Tesser, 1991). The Time Management Questionnaire

(Britton & Tesser, 1991) was used to assess students' assessment of their own strategies of study time management.

Need for Study

This study was an attempt to offer a comprehensive model of students' self-regulated learning in terms of executive functions, metacognitive strategies, time management, and academic self-efficacy, as observed in high- and low-achieving college students. Researchers (e.g., Borkoweski & Thorpe, 1994; Ries et al., 2000) in this area have found that highly self-regulated students academically surpass those with deficient self-regulation skills. An examination of the contribution of all these variables to academic performance of college students in one study represents a unique approach because, in the existing research, only the association between academic performance and each of these variables in isolation has been studied.

Additionally, there are few studies in which the authors (Chang, 2008; Harder, 2006; Mercer, 2005**)** reported the association between executive functions and academic achievement in adolescents and college students, as compared to children. Moreover, the focus of these existing studies was to examine the executive functions and academic achievement of clinically diagnosed college students with attention deficit hyperactivity disorder (ADHD) (e.g., Van der Sluis, Jong, & Van, 2007; Waber, Gerber, Turcios, Wagner, & Forben, 2006) , not typical college students. Thus, the findings that emerged from the current study filled this gap in the literature.

Other novel approaches reflected in this study are associated with measurement of the variables, as well as academic achievement. An observational technique was devised to assess students' metacognitive knowledge, based on the work of Tobias and Everson

(2002). In turn, this was an attempt to assess metacognitive knowledge directly in an actual learning situation, in contrast to the usual assessment of this construct by means of self-report. With regard to the operational definition of academic achievement, the participants in this study were drawn from two groups of students, who were identified by the university as low- and high-achieving students in order to avoid reliance on students' self-reports of their GPA as indicators of academic performance.

The direction in the current study was built upon previous findings from our UNC laboratory (Said, 2012; Said & Welsh, 2011), demonstrating that some of these variables explained a unique proportion of variability in academic performance for a sample of first year female college students. Another novel approach in the current study was to empirically test the extent to which the variables of metacognitive strategies, executive functions, time management, and academic self-efficacy are distinct constructs by use of factor analysis. This question emerged from the theoretical arguments of Borkowski (1989) and Hanten et al. (2000), who addressed the overlap among these constructs.

CHAPTER II

LITERATURE REVIEW

Introduction

The variables of interest in this current study can be viewed as the elements of a self-regulated learning model. According to Zimmerman (1989), "students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process" (p. 329). Such students initiate and direct their own effort to acquire knowledge and skills rather than rely on: (a) teachers, (b) parents, or (c) other agents of instructions (Zimmerman). Therefore, the level of students' use of executive functions, metacognitive strategies, self-efficacy, and time management may be an indicator of their initiation and activities in the academic context. Several authors (Borkowski, 1996; Pintrich, 2000; Winne, 1996; Zimmerman, 2000) of theoretical frameworks and research have discussed various models of self-regulated learning. In the current study, Bandura's (1986) social cognitive theory model of self-regulated learning is addressed as the theoretical frame that connects the variables of interest.

Social Cognitive Model of Self-Regulation

Bandura's (1986) concept of triadic reciprocity was central to the social cognitive theory. Zimmerman (1989) discussed self-regulated learning in context of the triadic reciprocity notion and proposed that a causal relationship exists between the: (a)

personal, (b) behavioral, and (c) environmental factors of self-regulated learning. Zimmerman proposed that self-regulated learning is not determined merely by personal processes, instead, these processes are assumed to be impacted by environmental and behavioral processes in a reciprocal pattern. With regard to these processes, three classes of self-regulated learning are discussed: (a) self-observation, (b) self-judgment, and (c) self-reaction.

Self-observation can be defined as employing attention to aspects of one's behavior (Schunk, 1994). Observation of one's own behavior could provide useful knowledge about how well one is progressing toward one's goals. Self-observation is affected by such personal processes as self-efficacy, goal setting, and metacognitive planning, as well as by behavioral influences (Zimmerman, 1989). Further, Schunk described self-observation as a behavioral assessment tool and a motivational pattern for students. He suggested that, through the process of self-recording, students could assess their behavior on various dimensions of performance (e.g., quantity, quality, rate, and originality), as well as be able to monitor goal progress.

The second class of self-regulated learning is self-judgment. Self-judgment is students' evaluation of their performance in comparison with a goal and standard (Zimmerman, 1989). In this definition, self-evaluation is reliant on such personal processes as self-efficacy, goal setting, and knowledge of standard, as well as self-observed responses. Knowledge of a standard or goal might be generated from social norms or earlier performance levels (Bandura, 1986). Two common ways in which students can self-evaluate their performance are: (a) to behaviorally check the procedures,

such as reexamination of their answers on a certain exam and (b) to compare their answer in relation to those of another student or an answer sheet (Zimmerman).

Self-reaction is the final class of self-regulated learning that involves students' self-regulation on the basis of social cognitive theory. Self-reaction is students' reaction to their progress toward goals (Schunk, 1994). As was the case with self-observation and self-evaluation, learners' self-reactions involve such personal processes as: (a) self-efficacy perception, (b) goal setting, (c) metacognitive planning, as well as (d) behavioral outcomes. The relations between these processes are reciprocal. For example, initial levels of self-efficacy will influence a learner to adopt certain study strategies (Zimmerman, 1989). Based upon social cognitive theory, there are three self-regulation classes of self-reaction strategies affet: (a) behavioral self-reaction by which students seek to optimize their specific learning responses, (b) personal self-reaction by which they enhance their personal processes during learning, and (c) environmental self-reaction by which they improve learning environment (Zimmerman & Martinez-Pons, 1986).

In addition to the above perspective of self-regulated learning classes, Pintrich (2004) suggested that there are four dimensions of self-regulated learning processes. The first dimension is cognition, which concerns the various mental processes a student uses to encode process when engaged in academic tasks. These processes include students' use of cognitive and metacognitive learning strategies. For example, students can monitor and control their use of: (a) rehearsal, (b) organizational techniques, and (c) elaboration strategies.

Motivation and affect represent a second dimension of learning that students can self-regulate (Pintrich, 2004). That is, students' level of motivation represents an important target for the management of their own learning. Wolters (2003) identified many strategies that students use to sustain or improve their own motivation, which include: (a) self-provided rewards, (b) self-talk about the importance or usefulness of material, and (c) make learning activities into a game so they are more enjoyable.

A third dimension that students can self-regulate is their behavior or their actual participation, conduct, or other physical actions enacted as part of the learning process (Wolters, 2003). For instance, students use time management strategies in order to organize and control where and when they study; these strategies fit into this area.

Finally, the fourth dimension of learning that Pintrich (2004) identified as a potential target of students' regulation is the context or environment. This area includes facets of the: (a) immediate task, (b) classroom, or (c) even cultural environment. For instance, students might monitor and control the: (a) lighting, (b) temperature, and (c) noise in their environment. In addition, they can use help-seeking strategies in order to manage their learning by effectively utilizing teachers, parents, peers, or others within the social environment.

In summation, the dimensions that involve self-observation, self-judgment, and self-reaction are closely aligned with executive functions, metacognitive strategies, self-efficacy, and time management, in that, all of these dimensions embody various patterns of self-monitoring, planning, as well students' motivational beliefs. For example, the presence of motivational and cognitive patterns facilitate students' engagement in the academic task which, in turn, leads to better academic performance. Accordingly, several

authors (Garner, 2009; Zimmerman, 1998; Zimmerman, 2000) in the field of educational psychology have addressed the constructs of executive functions, metacognitive strategies, self-efficacy, and time management in the discussion of self-regulated learning processes; these are discussed in the following section.

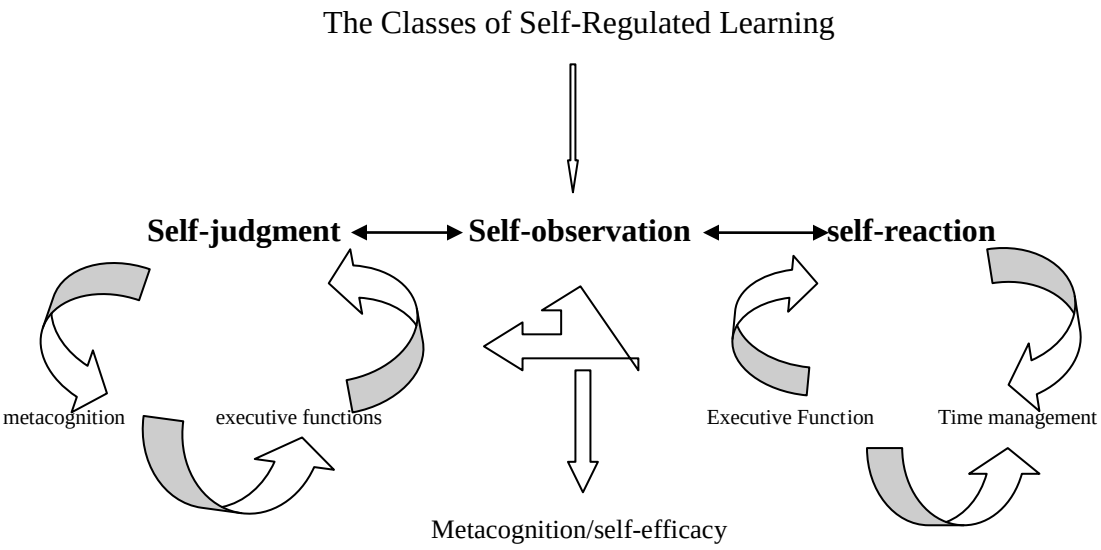

Figure 1 The Classes of Self-regulated Learning in Association with the Variables of Interest.

Executive Functions Model of Self-regulation

The study of self-regulated learning, as a part of general social cognitive theory, consists of integrated multiple processes, which include: (a) goal setting, (b) social modeling, (c) attributional feedback, (d) strategy instruction, (e) self-verbalization, and (f) self-evaluation (Harris, Graham, Urdan, McCormick, Sinatra, & Sweller, 2012). Zimmerman (1989) offered a relevant description of self-regulated learning: "students are self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their learning process" (p. 329). Based on

Zimmerman's perspective, executive functions, metacogniton, self-efficacy, and time management share a common connection to the self-regulated learning process.

Recently, researchers (Garner, 2009; Hofmann, Schmeichel, & Baddeley, 2012) have addressed executive functions in their discussion of self-regulated learning. This led to the emergence of different perspectives on how executive functions should be operationalized with regard to self-regulated learning (Garner, 2009). For example, Hofmann et al. (2012) proposed that executive functions (EF) are important mechanisms of self-regulation, and they provided four assumptions:

> First, the three broad facets of EF (updating, inhibiting, and shifting) support important mechanisms in an individual's self-regulatory goal pursuits. Second, EFs such as working memory, traditionally viewed as a "cool" cognitive concept, may be implicated in the regulation of "hot" processes such as unwanted emotional experiences, desires, and cravings. Third, we propose that temporary reductions in EFs may be a common mechanism at the heart of several situational risk factors contributing to self-regulation failure. Fourth, because EFs are trainable, at least to some extent, such improvements may translate to better behavioral self-regulation. (p.175)

Accordingly, self-regulated learning could be an applied domain of executive functions. In the context of the relations between executive functions and self-regulation, Garner (2009) suggested that self-regulated learning and executive functions may be viewed as overlapping but separable groups of constructs, in which self-regulated learning constructs could be expected to correlate with EF components. If this is the case, executive function is viewed as theoretical framework, and it is relevant to clinicians and researchers who study neuropsychological bases of learning; whereas, self-regulated learning highlights the executive function processes that are certainly involved in applied learning settings (Harris et al., 2012). Thus, while the application of executive functions to the applied context of self-regulated learning is somewhat new, metacognition

traditionally has been understood as a cognitive process that is included in the broader construct of self-regulation (Efklides, 2006).

Metacognition Model of Self-regulation

The presence of metacognitive knowledge aids in the planning phase of self-regulated learning (Garner, 2009). Similarly, Zimmerman (1998) proposed three phases to self-regulation, which involve metacognition. The first phase includes goal setting, strategic planning, and self-efficacy, in which students identify their goals, make plans to achieve them, and consider how likely it is they will achieve their goals. The second phase is performance or volitional control, which includes attention: (a) focusing, (b) self-instruction, and (c) self-monitoring. In this phase, students attempt the learning tasks and monitor what they are learning. Finally, the self-reflection phase is focused on the comparison of self-monitored information with a standard or goal and reactions to the results. During the reflection stage, students: (a) assess their success or failure, (b) modify their self-efficacy, (c) make causal attribution, and (d) adapt for future learning.

In sum, metacognitive strategies in the educational environment represent an aspect of self-regulated learning processes. It is suggested here that the components of metacognition are included within the broader construct of self-regulated learning. In addition to metacognition, another construct of self-regulated learning that is important for academic success is students' motivational beliefs, which is represented by their academic self-efficacy.

Self-efficacy Model of Self-regulation

Perceived self-efficacy is one of the determinants that govern academic achievement (Bandura et al., 2003; Multon et al., 1991), presumably because it represents

another component of the self-regulation of learning. Schunk (1989) utilized perceived self-efficacy as a self-regulative strategy, which is discussed in the context of the processes of: (a) self-observation, (b) self-judgment, and (c) self-reaction. Additionally, Zimmerman (2000) proposed that self-efficacy plays a role during the forethought, planning, and performance monitoring phases of self-regulated learning. Also, researchers (Pajares, 2008; Zimmerman & Martinez-Pons, 1990) have found that self-efficacy and the use of self-regulation strategies have reciprocal positive impacts on one another; higher self-efficacy beliefs increase the use of self-regulation strategies, and the use of self-regulation strategies can lead to increases in self-efficacy beliefs and academic achievement. Thus, this research demonstrates that the presence of self-efficacy does increase the level of self-regulation. Also, the casual effect of self-efficacy and self-regulation could be bi-directional.

Time Management Model of Self-regulation

Time management strategies are considered a behavioral construct that has been addressed in the discussion of self-regulated learning (Eilam & Aharon, 2003; Griffiths, 2003; Wolters, 2003; Zimmerman, 1990). Time management strategies have emerged as important cognitive aspects of self-regulated learning, which lead to higher academic achievements (Eilam & Aharon). According to Wolters, students can self-regulate their behavior or their actual participation, conduct, or other physical actions enacted as part of the learning process, for instance, time management strategies that students use to organize and control where and when they study fits into this area. Similarly, Griffiths defined time management as “an application of self-regulation processes in the temporal

domain" (2003, p. 5). Also, Eilam and Aharon viewed time management as "self-regulation strategies aimed at discussing plans and their efficiency" (p. 306).

Social cognitive theorists rely on Bandura's (1986) notion of triadic reciprocity in their discussion of time management. They conceive of time management as involving a combination of: (a) behavioral, (b) environmental and (c) personal influences. Behavioral influences include the operation of self-regulated learning subprocesses (i.e., self-observation, self-judgment, and self-reaction) to academic performance outcomes (Zimmerman et al., 1994). Environmental influences include the use of planning aides such as calendars, computers, and palm pilots, which can be used to help manage time optimally. Personal influences include learning strategies such as: (a) goal setting, (b) attributions, and (c) perceptions of self-efficacy (Schunk, 1989).

In conclusion, the variables of interest in this study (i.e. executive functions, metacognitive strategies, academic self-efficacy, and time management)**,** as they relate to learning situations**,** have theoretical foundations that emerge from social cognitive theory. Bandura's (1986) notion of triadic reciprocity notion has been extended to provide a foundation for a self-regulated learning model (Zimmerman, 1989). The processes of self-observation, self-judgment, and self-reaction embody various patterns within the self-regulated learning model including, but not limited to, planning, self-control, self-efficacy, and metacognition (Bandura, 1986; Schunk, 1994; Zimmerman, 1989). Moreover, these processes reflect reciprocal relationships between: (a) behavioral, (b) personal, and (c) environmental factors. If this is the case, processes such as planning, self-control, monitoring, and self-efficacy are clearly related to the constructs of executive functions, metacognitive strategies, self-efficacy, and time management, with

the possibility of reciprocal relationships being present between these constructs. Thus, identification of the dimensions, which underlie the components of the four constructs and their potential overlap, was a vital target in the current study.

As dimensions of self-regulated learning, students' executive functions, metacognitive strategies, academic self-efficacy, and time management could contribute to academic performance in such a way that they distinguish between low- and high-achieving students. Researchers **(**Al-Alwan, 2008; Ruban & Sally, 2006; VanZile-Tamsen & Livingston, 1999**)** have turned to the self-regulated learning model in attempts to better understand the individual differences in academic performance, with particular emphasis on high- and low-achieving college students as is the focus in this current study. Pintrich and De Groot (1990) found that high achievers reported more use of self-regulated learning strategies than lower achieving students. Given that, low- and high-achieving college students were examined in this study, a selective review of research that addressed self-regulated learning components in high- and low-achieving college students is presented.

Research on High- and Low-achieving College Students

In regard to research on college students, Al-Alwan (2008) investigated the differences in self-regulated learning components between high- and low-achieving students enrolled at Al-Hussein Bin Talal University (AHU) in Jordan. The sample for the study consisted of 90 students that were divided into two groups based on their first semester GPA: 50 high achievers (GPA higher than 0.86 out of 1) and 40 low achievers (GPA less than 0 .60). A self-report measure of self-regulated learning was administered. The results from the study indicated that there were significant differences between the

groups high- and low-achieving students in regard to self-regulated learning components such as: (a) intrinsic goal orientation, (b) extrinsic goal orientation, (c) task value, (d) control of learning beliefs, (e) self-efficacy, (f) test anxiety, (g) metacognition, and (h) time and study environment management. Also, the results showed that there were no significant differences in the components of: (a) effort-regulation, (b) peer learning, and (c) help-seeking. Finally, it was found that the subscales for self-regulated learning were related to each other.

In an earlier study, VanZile-Tamsen and Livingston (1999) examined the differences between high achievers and low achievers, as indicated by self-reported GPA, in regard to positive motivational orientation, as measured by responses to a self-report motivation scale, and use of self-regulated learning strategies, as measured by 50 learning strategy items. These items represented: (a) metacognitive strategies (i.e., Metacognitive Self-Regulation); (b) cognitive strategies (i.e., Elaboration, Organization, and Critical Thinking); and (c) resource management strategies (i.e., Time and Study Environment, Effort Regulation, Peer Learning, and Help Seeking) that these students used in a self--regulated fashion to impact their own academic success. The authors conducted the study with a sample of 320 college students; 94 students were chosen to represent low-achieving students, and 49 were chosen to represent high-achieving students. High achievers reported a significantly greater degree of engagement in strategy use and positive motivational orientation than did the low-achieving students. Also, positive motivational orientation was found to be highly related to engagement in self-regulated strategy use. In addition, this positive motivational orientation was more important for

self-regulated strategy use in low-achieving students in comparison to high-achieving students.

According to VanZile-Tamsen and Livingston (1999), enhancement of a positive motivational orientation will relate to enhancement of self-regulated strategy use. Noticeably, Al-Alwan (2008) and VanZile-Tamsen and Livingston used similar approaches to this current study; that is both were focused on the motivational and self-regulatory learning processes. However, assessment of these constructs in both studies was based on self-report measures. In contrast, in the current study, metacognitive monitoring ability and two executive control processes were measured by the use of direct assessment techniques.

Unlike most quantitative studies on self-regulated learning in college students, Ruban and Sally (2006) used a mixed method (i.e., quantitative/qualitative) to examine patterns of self-regulated learning strategy use among: (a) 49 low achievers, who were at-risk academically; and (b) 131 high achievers, who participated in a university honors program. Self-reported learning strategies and study skills survey, which were developed in the study, were used to assess students' self-regulated learning patterns. The survey included both closed-ended (e.g., items on a 5-point scale) and open-ended (e.g., qualitative data) items.

Overall, Ruban and Sally (2006) found interesting differences in the self-reported use of self-regulated learning strategies between low-achieving and high-achieving students, such as the use of: (a) self-evaluation, (b) time management, (c) organization of materials, (d) structure of environment, (e) memorization and rehearsal of materials, (f) clustering of materials, (g) utilization of support networks, and (h) non-strategic

behaviors. Ruban and Sally found that high achievers reported the use of a larger number of these strategies in comparison to low achievers. For the quantitative responses, high achievers reported strategies related to condensing and reorganization of notes and the use of various mnemonic devices and visual cues. Ruban and Sally interpreted their data by suggesting that many high achievers are deep processors of material. In contrast, low achievers generally reviewed notes, created flashcards, and engaged in routine memorization of the material, which provided support for the idea that low achievers tend to engage in the use of low-level strategies.

Despite the similarity between the Ruban and Sally's (2006) study and the current study, particularly in regard to the nature of the sample (e.g., students in an honors program and those with university academic probation), the relationships among self-regulated learning patterns or the structures underlying these strategies were not addressed in Ruban's and Sally study. Noticeably, the mixed method used in their study seemed to be vague in regard to the data analysis. That is, the authors interpreted the responses for both closed-end and open-ended items, based on the number of strategies used by both high and low achievers; instead it would have been preferable to have analyzed the closed-end responses with multivariate analysis.

Hacker, Bol, Horgan, and Rakow (2000) investigated the relation between students' self-assessment and performance, and they assessed students' ability to predict and evaluate their performance on a test in a sample of 99 undergraduate students. High-performing students were accurate in assessment of their performance, and that accuracy improved over multiple examinations. In comparison, low performing students showed moderate prediction accuracy but good accuracy for postexamination results. The lowest

performing students showed overconfidence in their judgment of results for both pre and postexamination. Judgments of performance were influenced by prior judgments and not prior performance. Performance and judgments of performance had little influence on subsequent test preparation behavior.

Based on an experimental design, Hacker, Bol, and Bahbahani (2008) examined whether calibration judgments were improved by an intervention that utilized extrinsic incentives. Also, these authors investigated the relationships among attributional style, performance, and students' calibration judgments on a test performance for a sample of 137 college students. The higher performing students were very accurate in their calibration and did not show significant improvements across a semester long course. Nor did attributional style significantly contribute to their calibration judgments. However, the lower performing students were less accurate in their calibration. The students in the incentive conditions showed significant increase in their calibration; in addition, attributional style constructs were significant predictors of calibration judgments for these students.

Therefore, students' abilities to predict their performance in Hacker's et al (2000) study and students' calibration judgment in Hacker's et al (2008) study both represent students' metacognitive monitoring skills that differentiated between low and high-achieving students. Notably, Hacker et al. (2000) and Hacker et al. (2008) focused on one dimension of self-regulated learning (i.e., knowledge monitoring accuracy), which is similar to the focus in this current study on knowledge monitoring ability. However, the indicator for academic performance in both studies was one test session upon which

students were divided into high and low achievers, in contrast to the current study, in which the students in both groups are already identified as high and low achievers.

In the Hacker et al. (2000) and Hacker et al. (2008) studies, the authors found new insights about the differences between high- and low-achieving college students that address the importance of knowledge monitoring accuracy for academic performance. Comparative approaches were used in these studies; the same method used in this current study. Additionally, different self-regulated dominions were examined in terms of high and low achievement in college.

The studies discussed in this section addressed the importance of self-regulated learning in differentiating between high- and low-achieving college students, and the results suggest that different components of self-regulated leaning distinguish between these two types of students. In line with expectations, proactive students (typically high achieving) show more engagement in academic tasks than passive students (typically low achieving). Self-regulated learning components share in common one theme and that is active learning. Therefore, in order to understand the potential contribution of other self-regulated learning dimensions (e.g., executive functions, metacognition, self-efficacy, and time management) to academic performance, theoretical perspectives and research for each component process are discussed in the following section.

Executive Functions and Academic Achievement

Garner (2009) stated that executive functions are "goal-directed neurocognitive process[es] that allow for the control and coordination of cognition and behavior" (p. 406). The use of these functions facilitate goal-setting, in that, inappropriate responses are inhibited so that, in general, the individual can engage in well planned, flexible, future

oriented behavior (Alvarez & Emory, 2006). Several skills have been identified in definitions of executive functions, but there is consensus (Barkley, 2001; Perner & Lang, 2000) about the key attributes of: (a) planning, (b) organization, (c) inhibition, (d) monitoring, and (e) shifting.

Planning refers to the ability to internally represent the relation between current behavior and future outcomes, as well as the capacity to plan, which allows individuals to set and maintain goals (Barkley, 2001). The use of short and long term planning may facilitate academic success to enhance prioritization of learning tasks (i.e., short term planning) and pursue course of study, which leads to graduation (i.e., long term planning; Garner, 2009)

Cognitive organization is a second key component of executive functions. The presence of organizational skills allows individuals to: (a) control attention and the contents of working memory; and (b) determine priorities, manage time effectively, and keep track of tasks. According to Mayer (1991), the use of such processes promotes success in the classroom.

Inhibition is a third key component of executive functions that allows the individual to control and inhibit the inappropriate response (Garner, 2009). If impulses are not inhibited, it is difficult for an individual to control his or her emotions, especially when frustrated, which can lead to: (a) poor decision making, (b) unfinished tasks, and (c) impaired social relationships. Also, poor inhibition has been found to be associated with poor academic performance (Zentall, 2005), and this may manifest as inappropriate responses to questions or poor decision making in regard to academic practices.

Finally, the use of shifting allows the individual to adopt flexible thinking and behavior (Latzman et al., 2010). Shifting, according to Monsell (1996), is the ability to change between multiple tasks, mental sets, or operations; also, it is referred to as *attention switching*. This ability has been examined in the context of the performance of brain damaged patients on specifically-designed laboratory paradigms, in which participants are unable to shift between tasks (Monsell, 1996). The ability to shift is required for many academic tasks, so that the individual can successfully update information and change procedures.

Blair (2002) examined the relationship between aspects of executive functions and academic performance in different age groups. Skills, which are correlated with the ability to perform well academically, are highly dependent upon abilities that fall under the umbrella of executive functions. In the following section, a review of research on the relationship between executive functions and academic achievement is presented.

With a sample of 63 typical college students enrolled in introductory psychology, Mercer (2005) examined the potential relations among: (a) isolated writing skills, (b) executive functions, (c) working memory, and (d) connected text production, which defined as producing *dependent and independent clauses successfully*. Isolated writing skills, executive functions, and working memory measures predicted scores on a measure of unsupported production of connected text and accounted for 15% of the variance in scores on the connected text production measure. Also, executive functions did not contribute to written expression performance. In addition, the manipulation, which was designed to examine the role of executive function in written expression by reduction of the organizational demands of the writing task, did not have its predicted effect. The

author suggested that flaws in the study design may have accounted for the failure to find support for the contribution of executive function to writing performance.

The focus of Mercer's (2005) study was on non-diagnosed/typical college students to investigate the contribution of executive functions to an aspect of academic performance (e.g., writing expression). The components of executive functions in Mercer's study are similar to the nature of executive functions used in the current study. However, the focus in Mercer's study was only on one academic domain: written expression. Notably, different academic domains have been found to relate to different executive functions, as demonstrated in the Latzman et al. (2010) study. These authors examined the role of certain aspects of executive functions (i.e., shifting, monitoring, and inhibition), as measured by the Delis–Kaplan Executive Functions System (as cited in Mercer, 2005) in the prediction of adolescents' (i.e., aged 11-16 years) performance in a wide range of academic subjects: reading, science, mathematics, and social studies as measured by The Iowa Tests of Basic Skills (as cited in Mercer, 2005). The results showed that the use of shifting uniquely explained performance in both reading and science; whereas, the use of monitoring uniquely predicted performance on measures of social studies and reading. Finally, the presence of inhibition uniquely predicted measures of mathematics and science. The findings from the Latzman et al. study suggested that various academic domains require different cognitive (i.e., executive function) abilities.

For typically developing adolescent students, research on the association between executive functions and academic performance is still limited. Notably, the focus of most studies in this area is either on school age samples or diagnostic college students with

ADHD. For example, Chang (2008) investigated the relationship among three constructs: (a) underlying executive processes of self-regulation, (b) self-regulation behavior, and (c) academic achievement. The Chang sample consisted of 32 college students (i.e., 16 of each gender) with ADHD and 36 (i.e., 18 of each gender) without ADHD. For the control students, without ADHD, the executive processes of self-regulation components accounted for: (a) 36.6% of the variance in letter-word identification score, (b) 37.4% of the variance in the spelling score, (c) 63.9% of the variance of calculation score, and (d) 59.6% of the variance in the score of overall academic skills. For students with ADHD, the executive processes of self-regulation components explained 38.3% of the variance in spelling score and 31% of the variance in the general academic skills score. In contrast, self-regulation behavior was a non-significant predictor of academic domains for the students in both groups. Also, in a study of academic skills in an ADHD sample, Harder (2006) examined the relation between executive function and written expression with two groups of undergraduate students. Group 1 consisted of 31 students diagnosed with ADHD, and Group 2 consisted of 27 control students. Harder found that the measure of inhibition made a unique contribution to the prediction of Writing Mechanics for both groups.

Similarly, with a diagnostic sample of youth aged 9-15 years with reading disabilities (n = 26) and without reading disability (n =34), Sesma, Mahone, Levine, Eason, and Cutting (2009) examined the unique contribution of executive functions such as working memory and planning skills to reading comprehension. After they controlled for individual differences in the skills necessary for reading, including attention, basic decoding skills, reading fluency, and vocabulary, the measures of working memory and

planning accounted for 63% of the variance in reading comprehension, a large effect size. However, executive function skills (e.g., planning and working memory) were not significant contributors to single word reading (i.e., decoding).

Thus, several researchers (Chang, 2008; Harder, 2006; Mercer, 2005) have conducted studies with samples of college students. However, the focus of the Chang and the Harder studies was on clinically diagnosed ADHD college students, not typical college students as the focus in the current study. Although executive functions did not significantly contribute to writing expression in Mercer's study, inhibition found to be significant contributor to writing mechanic in Harder's study. Also, executive functions uniquely predicted various patterns of academic performance in Chang's study.

In addition to executive function aspects, metacognition is another component that is thought to be contributing to college students' competency in academic achievement. That is, in the theoretical arguments, which address the overlap between executive function and metacognition, as well as theoretical models in which both processes have been described, metacognition may operate as a regulatory process that monitors and controls more basic cognitive processes (Hanten et al., 2000; Nelson & Narens, 1990). Additionally, evidence from neuroimaging studies suggests that both processes share common neural elements in the frontal lobes (Chiou, 2009). Due to these theoretical and physiological similarities, it has been hypothesized that the two processes may be related, and this will be examined in the current study.

Metacognition and Academic Achievement

The metacognitive strategies students adopt represent their cognitive engagement while they are involved in academic activities. Flavell (1979) defined metacognition as

"knowledge and cognition about cognitive phenomena" (p. 906). Based on the literature in this area, there are two distinct aspects of metacognition: (a) knowledge about cognition and (b) the regulation of cognition. Both are viewed as important for effective learning (Tobias & Everson, 2002). Dunslosky and Thiede (1998) viewed metacognition as the higher order mental processes involved in learning that include making plans for learning. The importance of adapting one's cognitive strategies to task demands has been the focus of several self-regulation models.

Biggs (1985) proposed that, for effective learning, students must be aware of task requirements and be able to exert control over the cognitive processes used to meet these requirements. Meta-learning, according to Biggs, occurs when the student utilizes his or her cognitive strategies to accomplish the task requirements. Likewise, in Winne and Hadwin's (1998, as cited in Abd-El-Fattah, 2011) study of self-regulated learning, metacognition included four basic stages: (a) task definition, (b) goal setting and planning, (c) enactment, and (d) adaptation. Winne and Hadwin suggested that the learner: (a) develops a perception of what the task is and the available resources, (b) constructs a plan to address the task, (c) adapts study strategies, and (d) makes changes to his or her cognitive structure depending on perception of performance.

Accordingly, Pintrich (2000) suggested that students: (a) develop perceptions of the task demands, (b) engage in metacognitive monitoring, (c) select and implement cognitive strategies that are appropriate for the task demands, and (d) evaluate task performance while they reflect on the effectiveness of the cognitive strategies. Pintrich proposed that these somewhat diverse strategies of self-regulated learning represent an interaction between personal factors and learning situations such as: (a) task demands, (b)

the coordination of goal setting and metacognition, (c) the use of cognitive learning strategies, and (d) self-reflection.

Subsequent metacognition researchers have offered a slightly different framework for the categorization of cognitive knowledge. For example, several researchers (Cross & Paris, 1988; Kuhn, 2000; Schraw, Crippen, & Hartley, 2006; Schraw & Moshman, 1995) have used the concepts of declarative and procedural knowledge to distinguish cognitive knowledge types. Kuhn and Dean (2004) characterized declarative cognitive knowledge broadly as epistemological understanding, or the students' understanding of thinking and knowing in general. Schraw et al. portrayed declarative cognitive knowledge as knowledge about oneself as a learner and what factors might influence one's performance. Paris and Winograd (1990) discussed the process of self-appraisal as reflection about personal knowledge states in order to answer the question, "Do I know this?" Additionally, Cross and Paris defined declarative cognitive knowledge as specifically within the context of reading as awareness of the factors that might affect reading ability.

On the other hand, procedural knowledge involves awareness and management of cognition, including knowledge about strategies (Cross & Paris, 1988; Kuhn & Dean, 2004; Schraw et al., 2006). Also, Schraw et al. defined conditional cognitive knowledge, which is knowledge of why and when to use a given strategy.

In addition, knowledge of monitoring accuracy is an ability that is involved in the metacognitive aspect of cognition regulation (Schraw & Dennison, 1994). It could be related to learning in complex environments and reflected in indices of such academic performance. Clearly, students, who can accurately distinguish between what they

already know and what is yet to be learned, have an advantage in dealing with academic demands, especially, those that require frequent update and are built on previous knowledge (Tobias & Everson, 2002).

In the context of the relationship between metacognition and academic performance, Vrugt and Oort (2008) worked with a sample of college students to investigate the extent to which metacognitive strategy contributes to academic performance. In a sample of 952 first year college students, Vrugt and Oort used path analysis to investigate the interrelationships among: (a) achievement goals; (b) study strategies; (c) metacognition (e.g., metacognitive knowledge, regulation, and experience); and (d) academic achievement. The authors found that students' use of metacognitive and resource management strategies had a positive effect on their academic achievement as measured by exam scores. In contrast, the use of surface cognitive strategies had a negative effect on their academic achievement.

In regard to their investigation of the effect of knowledge monitoring accuracy to academic performance, Tobias and Everson (2000, 2002) examined learners' ability to differentiate between what they knew and did not know in a sample of college students. Their findings indicated that knowledge monitoring ability is important factor for learners of all levels of ability and developmental stages. In a narrative review of dozens of studies with students of all ages and abilities, Tobias and Everson found that students, who were able to differentiate between what they knew and what they did not know, were more likely to excel than students who were not able to distinguish their level of comprehension.

Knowledge monitoring ability has been found to be related to academic performance across different age groups (Tobias & Everson, 2002). However, there is still a need to address this relationship for college students, with emphasis on individual differences between high and low achievers. In addition to the contribution of executive functions and metacogntive strategy to academic performance, students' self-efficacy, as a positive motivational expectation, has been found to be associated with academic performance in college students.

Self-Efficacy and Academic Achievement

Interestingly, self-efficacy beliefs generally can explain approximately 25% of the variance in the prediction of academic performances (Pajares, 2006). According to Bandura's (1986) social cognitive theory, there is an interaction between behavioral, personal factors, and environmental conditions, which contribute to academic performance. Individuals develop self-efficacy beliefs that enable them to exert control over their thoughts, feelings, and actions. These beliefs influence cognitive, motivational, affective, and decisional processes and determine whether individuals will view themselves as capable or incapable. Additionally, self-efficacy beliefs are related to a particular academic domain (Klassen, 2002) and formed by previous experiences: (a) especially the mastery experience, (b) verbal messages, and (c) social persuasions (Mattern & Shaw, 2010).

Bandura (1993) proposed that self-efficacy beliefs affect college outcomes because their presence increases students' motivation and persistence to master challenging academic tasks and fosters the efficient use of acquired knowledge and skills. Self-efficacy has been shown to be associated with choice of task, motivational level, as

well as effort and perseverance with the task (Compeau & Higgins, 1995). There has been a strong interest in discovering the extent to which students' self-efficacy predicts their academic achievement. For example, in a meta-analysis of self-efficacy research studies, which were published between 1977 and 1988, Multon et al. (1991) found a positive relationship between efficacy beliefs and academic achievement.

With a sample of 173 undergraduate students, who were enrolled in an introductory psychology class, Coutinho (2008) examined the relationship between self-efficacy and academic performance as assessed by GPA. First year students were not included in the study to ensure that GPA would be based on more than two semesters; thereby, the measure of academic achievement would be more representative of performance. Coutinho found that self-efficacy was positively related to GPA. Similarly, Chemers, Hu, and Garcia (2001) examined the relationship between self-efficacy, self-confidence, academic expectations, and academic performances with a sample of 373 students at the University of California. The results demonstrated evidence for the role of self-efficacy in academic success. Also, academic expectations and performance were associated with academic self-efficacy. That is, individuals who entered college with confidence, performed better academically than those with lower self-confidence. Similarly, individuals, who reported higher expectations for success, demonstrated higher academic performance.

Lane (2004) investigated the relationships between self-efficacy, self-esteem, previous performance accomplishments, and current academic performance among a sample of 205 undergraduate students. Each student's average grade from the modules studied was used as an indicator of academic achievement. The results from multiple

regression analysis indicated that self-efficacy mediated the relationship between previous performance accomplishments and academic performance. These findings lend support to the predictive effectiveness of self-efficacy measures in academic settings.

Barber (2009) examined the contributions of academic self-efficacy and socio-demographic factors to academic achievement, as determined by first semester GPA, with a sample of 250 first generation and non-first generation community college students. The findings supported the point of view that academic self-efficacy appears to be a significant factor contributing to academic achievement; higher levels of academic self-efficacy lead to higher first-semester GPA for both first generation and non-first generation community college students.

In an extensive recent study, Mattern and Shaw (2010) examined the relationship between academic self-efficacy as measured by the Self-Estimate of Math Ability and Self-Estimate of Writing Ability to academic outcomes as reported in College Board databases that included SAT scores and self-reported high school GPA from the SAT questionnaire. The sample in the study comprised 107,453 students' from 110 colleges and universities across the United States. They found that students with higher academic self-beliefs also had higher: (a) SAT scores, (b) grades, and (c) second year retention rates. With regard to participants' demographic characteristics for the self-beliefs group, the authors found that students in the highest 10% in mathematics ability were less likely to be female, African American, or Hispanic, in comparison to the total group. For the highest 10% in writing ability, there were smaller percentages of African American, Asian, and Hispanic students, as well as students whose first language was not English in comparison to the total group.

Despite the association between self-efficacy and particular academic domains in Mattern and Shaw's (2010), students' level of general confidence in their academic performance across different academic tasks could be important for academic success or failure in college. Additionally, students' with a high level of self-efficacy are more likely to employ the important study strategies to accomplish academic tasks, and one of these strategies is time management. Finally, it is difficult to know the direction of cause and effect between self-efficacy and academic achievement, the direction could go either way. As successful academic performance may lead to high self-efficacy, high self-efficacy could also lead to high academic performance.

Time Management and Academic Achievement

The management of study time is another important source of students' skills in self-regulation of their academic performance. To successfully meet their class requirements in regard to explicit and implicit deadlines, students must: (a) plan their study time, (b) feel efficacious about management of their time, and (c) monitor their progress (Juvonen & Wentzel, 1996). However, notably, there is no agreement among authors in regard to the definition of the term, time management. In the proposed study, the Britton and Tesser (1991) definition of time management behavior is preferred, in which they identify time management as students' ability to set short and long range time planning.

The focus, therefore, is on three components of time management: (a) long range planning, in which students know how to set accurate plans for the entire course of study; (b) short range planning, in which students arrange their time for a week of homework and exams; and (c) time attitude, which refers to "how students feel about their efficiency

of time use, their control of time use, and their skills in time self-monitoring" (Juvonen & Wentzel, 1996, p. 173). Given this, time management behaviors and time management beliefs are important components in learning processes. Accordingly, researchers have investigated the importance of time management in academic performance for college students.

In the context of the contribution of time management to academic achievement in college, Balduf (2009) used a qualitative research design to examine the causes of underachievement for a sample of seven college freshmen, who had earned academic warnings or had been placed on academic probation. Balduf found that poor time management skills, inadequate study skills, and internal versus external motivation contributed to college underachievement. In another study, Macan, Shahani, Dipboye, and Phillips (1990) examined four factors of time management within a sample of 123 undergraduate students: (a) Factor 1, setting goals and priorities; (b) Factor 2, mechanics, planning, and scheduling; (c) Factor 3, perceived control of time; and (d) Factor 4, preference for disorganization measured by Time Management Behaviors Scale. Macan et al. explored the association between these four factors and academic performance as measured by students' self-reported GPA and self-reported performance ratings compared to other students. The results showed that all factors of time management were correlated with academic performance; however, perceived control of time was the strongest predictor of academic performance.

Time management was found to be related to poor academic performance in Balduf's (2009) study. Not only did poor time management likely cause academic failure for those students, a lack of motivational and cognitive processes may have been

involved. Therefore, in the current study, a comprehensive model of time management components, as well motivational and cognitive variables were examined.

Interestingly, not only do good time management practices contribute to better academic performance, students' attitudes toward their management of time has a positive impact on their academic performance as found by Britton and Tesser (1991), Tanrıögen and Işcan (2009), and Wells (1994). Britton and Tesser tested the effects of time management practices on academic achievement. In 1983, 90 college students completed a time management questionnaire, and their high school Scholastic Aptitude Test (SAT) scores were obtained from college records. Principal-components analysis of the 35 item time management instrument identified three components: (a) long range planning, (b) short range planning, and (c) time attitude. In 1987, 4 years later, each student's cumulative GPA was obtained from college records. The results indicated that time attitude and short range planning predicted these students' GPA; whereas, long range planning did not. Likewise, Wells examined the association between time management behaviors and attitudes as measured by the self-report Time Management Questionnaire and academic achievement as assessed by students' GPA. In a sample of 88 college students, time management behaviors, feelings, and beliefs showed unique contributions to students' GPA.

Similarly Tanrıögen and Işcan (2009) investigated the effects of time management skills on academic achievement with a sample of 375 college students, who attended 5 different colleges. The results showed that students' time planning skills explained 47% of variability in academic achievement, and their time management attitudes and skills explained 38% of total variance in academic achievement. Moreover, the authors found

that the positive attitudes of students toward time management affected their academic achievements. Having positive attitudes about time management can help students to develop their skills in time management.

Summary

In summation, various self-regulated learning processes have been found to be important determinants for academic performance. However, the research discussed and reviewed has, to some extent, focused on different self-regulated learning processes than the constructs used in this study. For example, executive functions have been studied in the context of clinical diagnoses; whereas in the current study, executive functions were studied in the academic setting in typical college students. Also, many of the studies reviewed were focused on a variety of age groups, and different measurements procedures were utilized. A causal comparative approach was used in the current study to examine executive functions, metacognitive strategies, academic self-efficacy, and time management in high- and low-achieving college students. The author has not found a published research study, in which the same design exploring all of these constructs in college students has been used. In addition, in order to study this comprehensive model, the potential overlap among these constructs was taken into account in this current study.

In the previous section, theoretical foundations and research was reviewed to support the objectives of the current study. Social cognitive theory was employed as the theoretical base of self-regulated learning, and, the connections and overlap among executive functions, metacognition, self-efficacy, and time management to self-regulated learning have been discussed. Finally, the research addressing the importance of self-regulated learning on college achievement was reviewed. The conclusions drawn from

this review of the relevant literature support the need to examine these constructs in terms of possible differences between low- and high-achieving college students. In Chapter III, the target population, participants, instruments, and research procedures are presented.

CHAPTER III

METHODOLOGY

This quantitative study is a causal comparative study (i.e., quasi-experimental). In the causal comparative study, the researcher makes a comparison between two or more groups of participants in order to explain existing differences between them in regard to some variables of interest. The only difference between quasi-experimental and experimental research is that in a quasi-experimental study the groups have already been formed without manipulation (Fraenkel & Wallen, 1996). One drawback is that it is difficult to identify cause and effect in this design. That is, even if there are achievement group differences in metacognition, for example, the differences could be due to some other variable that is naturally confounded with achievement (e.g., academic major). This research design was chosen to investigate the association between the grouping variable of interest (i.e., level of academic achievement) and the outcome variables (i.e., factors identified in factor analysis aligned with the constructs of executive functions, metacognitive strategies, academic self-efficacy, and time management).

Participants

The population of this study consisted of two subpopulations: the first subpopulation includes University of Northern Colorado (UNC) undergraduate students, who were identified as high-achieving students with cumulative GPA of 3.5 (i.e., on a 4.0 scale) or higher. A hundred and twenty seven of these students have been admitted to the Honors Program established by UNC. The second subpopulation consists of 663 UNC

undergraduate students, who were identified as low-achieving students with cumulative GPAs of falls below 2.0. These students have been placed on academic probation in the Academic Support and Advising Center at UNC. Thus, the current researcher received 127 emails for Honors Program Students and 663 emails for Academic Probation students. To broaden the population of high academic achieving students, the researcher requested the emails list for undergraduate students who have GPA of 3.5 and higher. The request was submitted to Information Management and Technology Center at UNC attached with an approval letter from Institutional Review Board.

The sample included two groups of undergraduate students (N = 45), who were enrolled at UNC during Spring semester 2013: low-achieving students and high-achieving students. The low-achieving group (n = 21) were comprised of students who were placed on academic probation with GPAs falls below 2.0. The high-achieving group (n = 24) were comprised of students who are engaged in the University Honors Program with GPAs of 3.5 or higher, as well as other undergraduate students who had GPAs over 3.5. After the study had been approved, the Honors Program directors, the administrators of the Academic Support and Advising Center, and Information Management and Technology at UNC released the emails list for the target populations. Then, the researcher contacted the students for volunteers. A total of 1,000 emails were sent to high-achieving students and 663 emails were sent to low-achieving students. Freshmen were not allowed to participate in this research, in that the first year GPA does not represent a reliable estimate of the overall academic achievement of the student. Therefore, this sample represented a convenience sample of volunteers and, ultimately, may have not represented the full populations of high- and low-achieving UNC students.

Protection of Human Subjects

Since the study was conducted on students, application was made to the Institutional Review Board of UNC, and the study was approved by Institutional Review Board. Hence, the study posed no risk of injury to the participants. Confidentiality was maintained by numerical coding of the participants, storage of the data a secured location, and reporting of aggregate data rather than individual data.

Instruments

Several instruments and techniques were used to measure the variables of interest in this study in order to answer the research questions. The study included several types of instruments: (a) executive functions measures, (b) metacognitive strategies measures, (c) academic self-efficacy measure, and (d) time management measures (Table 2).

Table 1

Demographic and Academic Characteristics of the Sample

		High Achievers	Low Achievers
Gender			
	Male	4	8
	Female	20	13
Age		20.13	20.57
Ethnicity			
	Caucasian	21	16
	Hispanic	1	4
	Asian	1	0
	African American	1	1
Academic Level			
	Sophomore	13	11
	Junior	9	4
	Senior	2	6
	Total	24	21

Note. The number for age variable represents mean

Table 2

Measures Used in the Study in Corresponding to Variables

Variables	Measures
Executive Functions	1. Tower of London (observation
	2. Letter Number sequencing (observation)
	3. Behavior Index of the BRIEF (self-report)
	4. Metacognitive Index of the BRIEF (self-report)
Metacognitive Strategies	5. Knowledge Mentoring Ability (observation)
	6. Procedural Knowledge (self-report)
	7. Declarative Knowledge (self-report)
Time Management	8. Long Range Planning (self-report)
	9. Short Range Planning (self-report)
	10. Time Management Attitudes (self-report)
Self-efficacy	11. Academic Self-efficacy (self-report

Executive Functions Measures

Tower of London Test (TOL). This test, developed by Schnirman et al. (1998), was used to measure students' executive functions, particularly the planning component. The point of the task is to move the balls, one at a time, to build the goal pattern that is presented to the student on a large card. According to Schnirman et al., the balls are set up in a *starting pattern*, and the participant is told how many moves (i.e., 4, 5, or 6) it will take to move the balls into the goal pattern. The participant must follow a few simple rules while the ball is moved: (a) only 1 ball can be moved at a time; (b) the balls must be placed on a peg at all times; and (c) only 1 ball can be placed on the smallest peg, 2 on the medium sized peg, and 3 on the largest peg.. The student will be asked to come up with a way to move the balls into the goal position in the requested number of moves. There are 30 problems: (a) 10 four move, (b) 10 five moves, and (c) 10 six move. The

internal consistency reliability for the TOL is .79, based on a sample of 50 college students.

Letter-Number Sequencing Test (LNS). This test is a subscale of the Wechsler Adult Intelligence Scales (Wechsler, 1997), and was used in this study to assess students' verbal working memory as a component of executive functions. The task in this test is that participant is read a combination of numbers and letters and is asked to recall the numbers first in ascending order and then the letters in alphabetical order. Each item consists of three trials of a particular length, and each trial is a different combination of numbers and letters. There are seven items, which range from 2 letter/number sequences (e.g., B-7) to 8-letter/ number sequences (e.g., S-2-L-8-B-1-G-7). Five practice trials are given. For both practice and item trials, the tester says each combination at a rate of one number or letter per second and allows the participant sufficient time to respond. Testing is discontinued after scores of 0 on all three trials of an item. For each trial of an item, the participant is given a score of 1 for a correct response and a score of 0 for an incorrect response. A response is incorrect if a number or letter is omitted or not given in the specified sequence within the block (i.e., letter block or number block). However, the participant may give the letter block first and the number block second (i.e., opposite the stated rules), as long as the letters and numbers are given in the correct sequence. The maximum possible score is 21 points. The internal consistency reliability of the LNS has been reported to be .88 for a sample of 18-19 year old participants and .77 for a sample of 20-24 year olds; the test-retest stability for 16-29 year olds was .70 (i.e., corrected). This task appeared to be a valid test of verbal or auditory working memory on the basis of

factor analytic studies (Wechsler, 1997), in which the LNS loaded on the Working Memory factor along with the other tasks, such as Digit Span and Arithmetic.

Behavior Rating Inventory of Executive Function (BRIEF). This scale developed by Roth et al. (2005). It is a self-report questionnaire comprised of 75 items, which address difficulties with the following executive functions: (a) inhibit, (b) shift, (c) emotional control, (d) self-monitor, (e) initiate, (f) working memory, (g) plan/organize, (h) task monitor, and (i) organization of materials. In addition to the subscales, the measure yields data for the: (a) Behavioral Regulation Index, (b) Metacognition Index, and (c) Global Executive Composite. The internal consistency for the scale is moderate to high; the alpha coefficients range from .73-.90. The BRIEF was used in this study to measure students' executive functions in daily life as self-reported by the participants.

Metacognition Measures

Knowledge Monitoring Ability (KMA). An observational technique devised for this study based on Tobias and Everson's (2002) Knowledge Monitoring Ability. This instrument was used to measure students' knowledge monitoring ability. The basic strategy is to evaluate the differences between students' estimates of their knowledge in a particular domain (e.g., both procedural and declarative) and their actual knowledge as determined by performance on a test. In the prototypical KMA, students were asked to estimate their knowledge (e.g., in the verbal domain, they identify words they know or do not know from a word list), and these estimates were contrasted with their performance on a standardized test, which contained many of the same words. Differences between students' estimates and their test performance provided an index of knowledge monitoring ability.

The KMA (Tobias & Everson, 2002) generates four scores, including estimates that the word was: (a) known and correctly identified on a subsequent vocabulary test [++]; (b) known, yet incorrectly identified on the test [+ -]; (c) unknown, yet correctly identified on the test [-+]; and (d) unknown and incorrectly identified on the test [- -]. Within this framework the [++] and the [- -] scores represent accurate metacognitive estimates of vocabulary word knowledge, while the two other measures [i.e., + - and -+] represent inaccurate knowledge monitoring estimates.

Metacognitive Awareness Inventory (MAI). This scale was developed by Schraw and Dennison (1994). A short form of 13 items from the MAI was used to assess two metacognitive skills: procedural knowledge and declarative knowledge. Based on previous research in the UNC laboratory, the focus of this study is on procedural knowledge and declarative knowledge as correlates of academic achievement. The MAI's items are classified into eight subcomponents: (a) monitoring, (b) planning, (c) procedural knowledge, (d) declarative knowledge, (e) evaluation, (f) debugging strategies, (g) information management strategies, and (h) conditional knowledge. These subcomponents are subsumed under two broader categories: knowledge of cognition and regulation of cognition. The internal consistency for the scales of procedural knowledge and declarative knowledge is .70, computed with a sample of 197 undergraduates.

Bandura's Multidimensional Scales of Perceived Self-Efficacy (MSPSE)

Bandura's (1989) short form of the MSPSE consists of 11 items that were used to measure academic self-efficacy. The MSPSE scales were developed in response to the theoretical and applied importance of the self-efficacy construct. In Bandura's (1986) social cognitive theory of perceived self-efficacy, he specified the origins and structure of

efficacy beliefs. Items on the scales were tailored to academic domains of functioning, such as “How well can you take class notes of class instruction,” and “How well can you use the library to get information for class assignment?” The internal consistency reliability of the academic self-efficacy subscale has been reported as $r = .74$ for a college aged sample (Choi, Fequa, & Griffin, 2001).

Time Management Questionnaire (TMQ)

The time management questionnaire was developed by Britton and Tesser (1991), and was used in the current study to measure students’ time management of study time. The questionnaire consists of 18 items, each answered on a 5-point scale consisting of the responses (i.e., always, frequently, sometimes, infrequently, and never). In scoring, 5 points were assigned to the response at the end of the scale that defined a priori as the *good* practice, and 1 point was assigned to the response at the other end of the scale, with intermediate values given for the other responses. Higher values on the scale correspond to better time management practices. The questionnaire includes three subscales of time management: (a) short range planning, (b) long range planning, and (c) time management attitude.

Procedures

All testing conducted during Spring semester of 2013 within two sessions. For the first 40 minute session, a group of participants, which ranged between 2 and 5 participants for each time slot, responded to the research surveys of: (a) executive function (BRIEF), (b) Time Management Questionnaire, (c) Academic Self-Efficacy, and (d) Metacognitive Awareness Inventory (i.e., procedural knowledge and declarative knowledge) and the measure of Knowledge Monitoring Ability. Upon completion the

first session, the researcher and the participants scheduled the second session for each participant individually. In the second 40 minute session, each individual took 40 minutes to respond to the direct measures of executive functions: (a) Tower of London and (b) the Letter Number Sequencing of verbal working memory. There were variations in the time was taken to complete these, and students were allowed to leave each session when they finished. The duration between the two sessions was approximately between two to four days for each participant.

Upon entering the room for the first session, each participant was signed for a number to indicate her or his participant number. This number was used as form of identification for the study. The participants were told that they should record their participant number on each instrument. All participants were given the consent form to read and sign, and any questions raised by the participants were addressed in that time. Upon completion of the first session, the researcher and participants arranged the appointment for administering the second study session. The participants were debriefed as to the objectives of the study at the conclusion of the second test session.

Data Analysis

To analyze the data collected from the instruments, several statistical procedures were used. Addressing Research Question 1, exploratory Factor analysis was performed to identify whether there are underlying structures or dimensions that align with (or combine) the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy, The extraction method of Principle Axis Factor with orthogonal rotation (i.e., varimax) was conducted for the 11 measures that represent these four constructs.

Composite factor scores were created for the factors identified in factor analysis by standardizing the variables that loaded in each factor and summing them up. The purpose of creating a composite score for each variable was to use those factor's score in the comparison between high-achieving students and low-achieving students. The use of factor scores is helpful in this study particularly if the factors did not align with the tests. That is, the use of factor scores could also be helpful as a composite score, of sorts, for a variable that has more than one measure (e.g., executive functions made up of TOL, LNS, and BRIEF).

The assumptions for factor analysis are: (a) factor analysis is designed for interval data, although it can be used for ordinal data (e.g., scores assigned to Likert scales) as well; (b) the variables used in factor analysis should be linearly related to each other and checked by examination of scatterplots of pairs of variables; and (c) also, the variables must be at least moderately correlated to each other. If the variables are not moderately correlated, the number of factors will be almost the same as the number of original variables (Gorsuch, 1983), which means that the conduct of factor analysis would be pointless.

For Research Question 2, the purpose was to determine the differences between high- and low-achieving students in the factor's scores identified in factor analysis. Independent-Sample *t*-tests were performed by which a *t*-value was obtained for each comparison.

After examination of the factors in which high- and low-achieving students differed (i.e., Research Question 2), a logistic binary regression analysis was performed to identify the relative contribution of the different factor's scores in classification the

individual in her or his group (i.e., high or low-achieving group). The group membership as indicator to achievement level became a dependent variable in logistic regression. Based on logistic regression's results, it was possible to obtain a more accurate understanding of the importance of the factors (i.e., indentified in factor analysis from the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy) in predicting individual's membership in his relevant group.

In Chapter IV, the data are analyzed and presented. Several statistical procedures were utilized: (a) descriptive statistics, (b) factor analysis, and (c) independent-sample t-tests, and d) logistic binary regression.

CHAPTER IV

RESULTS

The primary purpose of this study was first to discover the underlying of structure among the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy. The second purpose was to find whether there are mean differences between high- and low-achieving students in the factors identified among the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy, as well as the relative contribution of these factors to differentiating between the two groups. A total of 45 undergraduate students, who responded to the invitation email, attended both study sessions: 24 participants represented the high-achieving group and 21 participants represented the low-achieving group.

In this chapter, the results are presented in regard to the research questions. First, the reliability of measures used in the current study is presented. Second, a summary of descriptive statistics of means and standard deviations for the variables is presented. Third, the factor analysis, which was conducted to answer Research Question 1, is presented in order to address the nature of the underlying factor structure identified among the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy. Next, Independent Sample t-test results are presented to investigate the second Research Question regarding the differences between the low- and high-achieving groups of students in the factors scores identified in the factor analysis.

Additionally, results of logistic linear regression address Research Question 3 as to whether the factor scores, providing composite scores of the associated variables of executive functions, metacognitive strategies, time management, and academic self-efficacy, predict the individual's membership in the relevant group (i.e., high-achieving group and low-achieving group).

Reliability of Measures

To assess the reliability of the measures used in the study, a Cronbach's alpha was performed. The internal consistency reliability was computed for the 75-item Behavior Rating Inventory of Executive Functions-BRIEF (Roth et al., 2005) and the consistency was found to be high (r = .91). Also, the internal consistency reliability was computed for the 11 items that represent short form of Bandura's (1989) Multidimensional Scale of Self-Efficacy (r = .84). In addition, the internal consistency reliability was computed for the 13 items of the Metacognitieve Awareness Inventory (Schraw & Dennison, 1994) and found to be of adequate strength (r = .77). The eighteen-item of Time Management Questionnaire had adequate internal consistency reliability (r = .74). However, the 20 items of Knowledge Monitoring Ability Measure were found to have relatively low internal consistency reliability (r =.55).

Descriptive Statistics

Displayed in Table 3 are the descriptive statistics of means and standard deviations for 11 measures of four constructs (i.e., executive functions, metacognition, time management, and self-efficacy). These 11 measures are assumed to be overlapping in the current study. Therefore, the purpose of Research Question 1 was to discover the underlying of structure factors that align with these measures. Also provided in Table 3

are the abbreviations for each score in the parentheses next to each variable. Kurtosis test of normality was significant for all variables (N = 45, ps < .05), which indicated that these variables were not normally distributed.

Table 3

Descriptive Statistics for Study Variables

Variables	Measures	*M*	*SD*	MIN	MAX
Executive functions	Tower of London (TOL)	23.87	4.310	11.00	30.00
	Letter Number Sequencing (LINS)	13.20	2.546	8.00	18.00
	Behavior Index of the BRIEF (BHIX)	2.3881	.27054	1.60	2.87
	Metacognitive Index (MCIX)	2.3567	.28616	1.60	2.80
Metacognition	Declarative Knowledge (DK)	2.6167	.26703	2.00	3.00
	Procedural Knowledge (PK)	2.5156	.37292	1.80	3.00
	Knowledge Monitoring Ability (KMA)	15.0667	2.34908	7.00	18.00
Time Management	Long Range Planning (LRP)	2.7200	.59605	1.20	3.80
	Short Range Planning (SRP)	3.3841	.89930	1.57	4.86
	Time Management Attitude (TMA)	3.230	.40900	2.50	4.17
Self-efficacy	Academic Self-efficacy (ASE)	3.0505	.53276	1.64	3.82

Note. Range of scores for each variables: TOL(19); LNS(10); BHIX(1.27); MCIX(1.20); DK(1); PK(1.20); KMA(11); LRP(2.60);SRP(3.29); TMA(1.67); and ASE(2.18

N = 45

Factor Analysis of Underlying Structure: Research Question 1

Exploratory Factor Analysis (EFA) was conducted to answer Research Question 1 in regard to the underlying structures of the measures, which represent executive functions, metacognitive strategies, time management, and academic self-efficacy. The EFA was the more appropriate analysis for Research Question 1 than Confirmatory Factor Analysis (CFA). In CFA, the researcher has an a priori hypothesis about the number of factors and which variables would load on these based on theoretical framework or previous research. In contrast, the EFA is used to explore the underlying

patterns for variables and does not require previous knowledge about these variables or expected patterns of factors.

Pearson's correlation analysis was performed to determine the bivariate relationships among the scores of the various measures used in this study. As shown in Table 4, there are many significant correlations among these measures. For instance, students' scores on the measure of academic self-efficacy were positively correlated with their scores on: (a) the metacognitive index of the BRIEF survey of executive functions, and Tower of London test; (b) metacognitive strategies of procedural knowledge and declarative knowledge; and (c) time management strategies of long range planning, short range planning, and time management attitude.

The BRIEF metacognitive index of executive functions was significantly associated with: (a) the BRIEF behavior index; (b) time management strategies of long range planning, short range planning, and time management attitude; and (c) metacognitive strategies of procedural knowledge and declarative knowledge. In addition, students' scores on the Letter Number Sequencing test were significantly correlated with the participants' scores on: (a) Tower of London test; (b) time management strategy of long range planning; and (c) metacognitive skill of knowledge monitoring ability.

Table 4

Correlations Matrix for 11Measures

Variables	1	2	3	4	5	6	7	8	9	10	11
1-TOL											
2-LNS	.43**	-									
3-BHIX	.01	.01	-								
4-MCIX	.18	-.17	.43*	-							
5-DK	.00	.13	.32*	.27*	-						
6-PK	.00	.11	.17	.31*	.58**	-					
7-LRP	.31*	.27*	.22	.41**	.16	.48**	-				
8-SRP	.33*	.02	.28*	.58**	.10	.19	.43**	-			
9-TMA	.01	.02	.17	.278	.27*	.48**	.22	.26	-		
10-ASE	.25*	-.14	.18	.65**	.47**	.60**	.43**	.43**	.43**	-	
11-KMA	.17	.36*	-.03	.00	.57**	.34**	.22	.18	.21	.21	-

Note. TOL = Tower of London; LNS = Letter Number Sequencing; BHIX = Behavioral Index of BRIEF; MCIX = Metacognitive Index of BRIEF; DK = Declarative Knowledge; PK = Procedural Knowledge; KMA = Knowledge Monitoring Ability; LRP = Long Range Planning; SRP = Short Range Planning; TMA = Time Management Attitude; and ASE = Academic Self-efficacy

N = 45

The many significant correlations among the measures displayed in Table 4 indicate the possibility of underlying common patterns among these measures. With respect to the assumptions of factor analysis, Bartlett's test was performed as another indicator to the strength of the relationship among variables. Bartlett's test was used to examine the null hypothesis, that is, the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore inappropriate for structure detection. Bartlett's was significant ($p < .05$). Also, the Kaiser-Meyer Olkin is used to measure the sampling adequacy, and this should be greater than 0.5 for a factor analysis to be conducted. An examination of Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO = .661).

The initial factors solution was performed with use of the Principal Component method to determine the number of factors based on Eigenvalue (1.00; see Figure 2). Three factors had eigenvalues = > 1: first factor (EV = 3.7), second factor (EV = 1.7), and the third factor (EV = 1.5). The three factors had eigenvalues, which exceeded 1, and this indicated that each factor explained unique proportion of variability in the loaded variables.

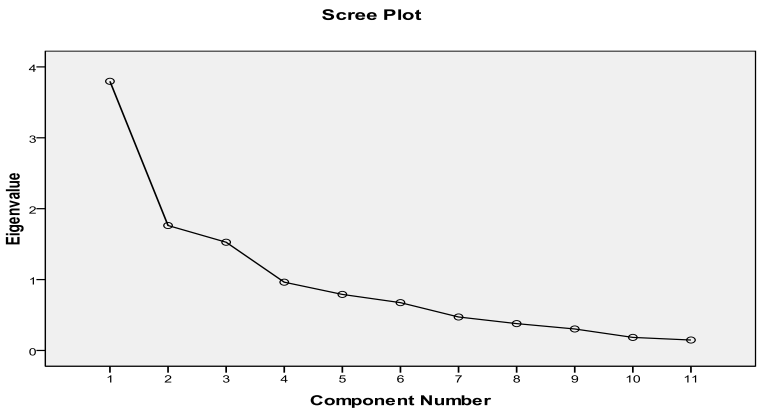

Figure 2. Plot for Initial Factor Solution Using Principle Component Analysis

After determining the number of factors retained with use of the principle component method, the extraction method of Principal Axis Factor (PAF) with a Varimax (orthogonal) rotation of 11 measures was conducted by fixing three factors on data gathered from 45 participants. The PAF is preferable for the purpose of Research Question 1 to the other common methods used in social sciences (i.e., Principle Component [PC] and Maximum Likelihood [ML]). The PC is not the preferred method for identifying latent dimensions or constructs represented in the original variables (Joseph, Rolph, Ronald, & William, 1995), which is the purpose in the current study. The ML method requires the assumption of normality, and it was not preferable in the current study since the 11 variables are not normally distributed. In addition, PAF is the preferred factor analysis method in case of small sample size.

Orthogonal Model rotation (varimax), as opposed to the Oblique Model rotation, was used in the final factor analysis. Orthogonal Model rotation (varimax) is appropriate; the assumption for orthogonal model has been met for the data, as the common factors were uncorrelated with each other. When an oblique rotation was initially performed (i.e.,

direct oblimin), the highest correlation between the three loaded factors was very slight (r = 0.28). In regard to this, Tabachnick and Fiddell (2007) argue that:

> Perhaps the best way to decide between orthogonal and oblique rotation is to request oblique rotation with the desired number of factors and look at the correlations among factors…if factor correlations are not driven by the data, the solution remains nearly orthogonal. Look at the factor correlation matrix for correlations around .32 and above. If correlations exceed .32, then there is 10% (or more) overlap in variance among factors, enough variance to warrant oblique rotation. (p. 646)

After the Orthogonal Model rotation (i.e., varimax) was performed, the rotation transformed the correlations matrix between the common factors. Thus, and as shown in Table 5, the final decision was to use Principal Axis Factoring method with an orthogonal rotation model (i.e., varimax) of 11 measures, which represented the four constructs (i.e., executive functions, metacognitive, time management, and academic self-efficacy).

The results from an orthogonal rotation of the solution are shown in Table 5. When loadings less than 0.30 were excluded, the analysis yielded a three-factor solution with a simple structure (factor loadings = > .30). Six measures loaded onto Factor 1: the metacognitive index and behavior index of the BRIEF executive functions survey, academic self-efficacy, and the three subscales of the time management questionnaire: short range planning, long range planning, and time management attitude. It is clear that all six of these variables align with students' skills to self-regulate their learning activities. This factor was labeled, Perceived Self-Regulation (PSR).

Table 5

Summary of Factor Analysis Results

Variables	Factor Loadings			Communalities
	1	2	3	
Metacognition Index of BRIEF	**.822**	-	-	.689
Academic Self-efficacy	**.762**	.415	-	.752
Short Range Planning	**.748**	-	-	.612
Long Range Planning	**.482**	-	.374	.428
Behavior Index of the BRIEF	**.362**	0	0	.151
Time Management Attitude	**.338**	.375	-	.255
Declarative Knowledge	-	**.795**	0	.662
Procedural Knowledge	.356	**.716**	-	.641
Knowledge Monitoring Ability	-	**.612**	.327	.486
Tower of London			**.789**	.465
Letter number Sequencing			**.626**	.698
% of variance	23.27	17.85	11.95	
Eigenvalue	3.79	1.76	1.52	

Note. EFA; Principal Axis Factor with Orthogonal Rotation (Varimax)

Noticeably, time management attitude had very close loadings on the two factors, 0.338 in Factor 1 and 0.375 in Factor 2. In this case, the current author relied on the theoretical bases of this measure by including this variable in the first factor with the other measures of time management (i.e., Long Range Planning and Short Range Planning). Three variables loaded onto Factor 2: declarative knowledge, procedural knowledge, knowledge monitoring ability. These three variables are related to students' ability to use metacognitive knowledge strategies. Therefore, Factor 2 was labeled Metacognitive Knowledge (MKS). Additionally, the two direct measures of executive functions, Tower of London Test (TOL) and Letter and Number Sequencing Test (LNS), loaded onto Factor 3. The TOL is used to measure the executive control process of planning, the LNS assesses the executive process of verbal working memory, and both measures are direct measures of these processes, rather than self-report. Thus, the third factor was labeled as Executive Control Processes (ECP).

The results from factor analysis, which are displayed in Table 5, also present the communalities. Communality is the sum of the squared factor loadings for all factors for a given variable, that is, the variance accounted for by all the factors. Displayed in Table 5 are the eigenvalues for each factor. The eigenvalue for a given factor reflects the variance in all the variables, which is accounted for by that factor. The ratio of eigenvalues is the ratio of explanatory importance of the factors with respect to the variables. If a factor has a low eigenvalue (i.e., less than 1), then it contributes little to the explanation of variances in the variables. For this analysis, the eigenvalues for the three factors exceeded 1, indicating that a unique proportion of the variances in the variables were explained by the relevant factor. The percentage of variance for each factor in Table 5 represents the squared factor loading, and this is the percentage of variance in the variables, explained by a factor.

The scores for the factors were created by use of the non-refined method (i.e., Sum Scores of the Standardized Variables). This method is recommended in case the standard deviations of the variables, which loaded on the same factor, vary widely (DiStefano, Zhu, & Mîndrilă, 2009). As shown in Table 1, there was a wide range in the standard deviations among the variables that loaded on the same factor. Therefore, standardized scores were created for each variable, and a composite score was computed for each factor by summing the standardized variables that loaded into one factor. The factor score for perceived self-regulation (PSR) was created by summing the standardized variables of: (a) behavior index and (b) metacognitive index ofthe BRIEF, (c) academic self-efficacy, (d) long range planning, (e) short range planning, and (f) time management attitude. The factor score for metacognitive knowledge strategies (MKS) was created by

summing the standardized variables of: (a) declarative knowledge, (b) procedural knowledge, and (c) knowledge monitoring ability. Finally, the factor score for executive control processes (ECP) was created by summing the standardized scores on the tests of TOL and LNS.

Independent *t*-Test of Group Differences: Research Question 2

Independent Sample *t*-tests were performed in order to answer the Research Question 2 as to whether there were mean differences in the factor scores identified in the factor analysis (i.e., PSR, MKS, and ECP) between the high- and low-achieving groups. The assumptions of *t*-test were tested, and no violations were found. The scores for the three factors were normally distributed, since the Sapiro-Wilk test of normality was non-significant for the scores of the three factors within each group. Additionally, the equality of variances assumption was tested using Levene's test. For PSR and ECP, Levene's test was non-significant ($p > .05$*);* whereas, for MKS, Levene's test was significant, albeit at trend level ($p = .05$), so the *t*-statistic, which is associated with the row of *the equality of variances not assumed*, was used to interpret the differences between low and high achieving in MKS.

The results from independent sample *t*-tests supported Hypothesis One that the high-achieving group would outperform the low-achieving group in all or some of the factors identified in the factor analysis. Independent sample *t*-tests in Table 6 showed that there were mean differences in the scores of the three factors between the high-achieving group and low-achieving group. The high-achieving group significantly differed from the low-achieving group in the mean of PSR, $t(43) = 5.532$, $p < .000$, with a high effect size, $d = 1.639$ in favor of the high-achieving group. The means of MKS were significantly

different between high- and low -achieving group, $t(43) = 3.990$, $p < .000$, with a large effect size, $d = 1.171$ in favor of the high-achieving group. Also, there were significant differences between the low and high-achieving group in the mean of ECP, $t(43) = 3.373$, $p < .002$ with a large affect size, $d = 1.003$ in favor of high-achieving group (see Table 6). The means of MKS were significantly different between high and low-achieving group, $t(43) = 3.990$, $p < .000$, with a large effect size, $d = 1.171$ in favor of high-achieving group. Also, there was significant differences between low and high-achieving group in the mean of ECP, $t(43) = 3.373$, $p < .002$ with a large affect size, $d = 1.003$ in favor of high-achieving group (Table 6).

Table 6

Mean Differences between High-achieving Group and Low-achieving Group

Variables	High Achievers (n = 24)		Low Achievers (n = 21)				
	M	*SD*	*M*	*SD*	*t*	*p*	Effect Size
Perceived Self-regulation	2.47	2.89	-2.82	3.53	5.532	.000**	1.639
Metacognitive Knowledge Strategies	1.17	1.71	-1.34	2.50	3.894	.000**	1.171
Executive Control Processes	0.718	1.51	-0.81	1.58	3.373	.002**	1.002

Note. Equality of variances assumed for PFE and ECP, but not for MKS.

Logistic Regression for Prediction of Group Membership: Research Question 3

Based upon the results from the independent sample t-tests for Research Question 2, high- and low- achieving groups differed in the three factor scores: Perceived Self-Regulation (PSR), Executive Control Processes (ECP), and Metacognitive Knowledge Strategies (MKS); however; the effects on each factor were examined independently. Therefore, Research Question 3 addressed the degree to which an individual's membership (i.e., high- and low-achieving groups) could be correctly classified by the scores of the three factors scores by determining the contribution of each factor to predict individual's membership while controlling for the other factors, and this was assessed through Hierarchical Binary Logistic Regression. The results from logistic regression supported Hypothesis Two that some linear combination of the factors, identified in the factor analysis, would effectively classify each individual in her or his relevant group.

In this study, logistic regression is preferable to discriminant analysis, which provides the same information, because logistic regression has more flexible assumptions regarding the independent variables, in that, they need not be: (a) interval, (b) normally distributed, (c) linearly related, or (d) of equal variances of covariant within each group (Menard, 1995). The multicollinearity assumption of logistic regression was tested, and

the VIP values of the multicollinearity tests did not exceed 3 for the independent variables (i.e., PSR (1.25), MKS (1.26), and ECP (1.04)). This was an indication that there was no multicollinearity issue among the independent variables.

The Hosmer and Lemeshow test (HL) of *goodness-of-fit* was performed first to examine the best fitting of model for the three predictors in one step. If the H-L *goodness-of-fit* test statistic is greater than .05, as is desirable for good-fitting models, it represents a failure to reject the null hypothesis, that is, there is no difference between observed and model-predicted values. This indicates that the model and the observed data are essentially the same, and the model estimates fit the data at an acceptable level (Menard, 1995). In the current analysis, H-L was not significant ($p = 0.741$), which meant that the model was quite a good fit. In turn, this indicates that, as a set, the predictors reliably distinguished between the high-achieving group and low-achieving group. In addition, Nagelkerke's R^2 indicated a moderately strong relationship between prediction and grouping ($R^2 = 0.780$). Thus, 78% of the variation in the outcome variable (i.e., group membership) is explained by the logistic model. Also, the classification table presents how many of the cases were correctly predicted by use of the three factor scores (see Table 7).

The columns in the classification table represent the two predicted values of group memberships, while the rows are the two observed (i.e., actual) group assignments. Thus, the model prediction succeeded overall was 91% (i.e., 91% for high-achieving group and 90% for low-achieving group; see Table7).

Table 7

Classification Table of High- and Low-achieving Groups

Observed	Predicted		
	High Achieving	Low Achieving	Percentage Correct
High Achieving	22	2	91.7
Low Achieving	2	19	90.5
Overall Percentage			91.1

The classification plot or histogram of predicted probabilities provides a visual demonstration of the correct and incorrect predictions (Figure 3). Also called the "classplot" or the "plot of observed groups and predicted probabilitie,." it was another very useful piece of information from the SPSS output. The resulting plot was very useful for showing possible outliers; therefore, the U-shaped in Figure 3 was desirable and indicated the predictions were well-differentiated with cases clustered at each end. A normal distribution indicated too many predictions close to the cut point. Few errors appeared in Figure 3; the "1s" to the left were false positives (i.e., students from high achievers classified in low-achieving group). The "0s" to the right were false negatives (i.e., students from low achievers classified in high-achieving group).

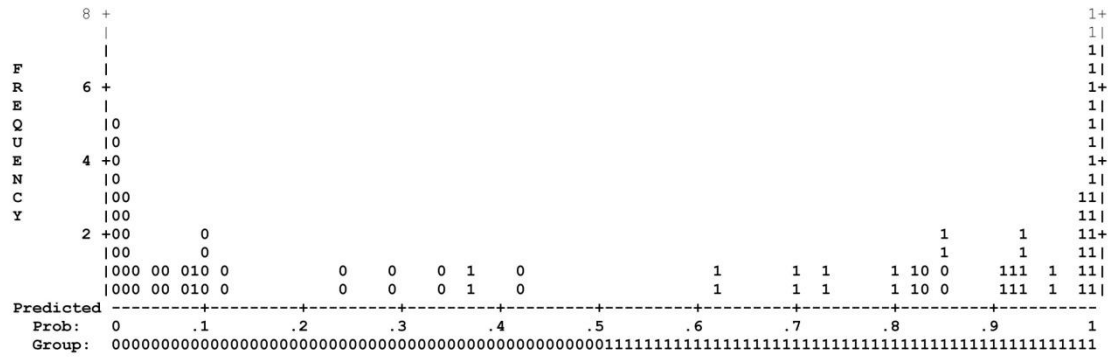

Figure 3. Observed Groups and Predicted Probabilities Plot

To determine the strength of the contribution of each factor, as well as the degree to which there existed potential mediational relationships among the predictors, a series of hierarchical logistic regressions were performed. At Step One, the ECP variable was entered and this was done for two reasons: (a) because it constituted direct measures of Executive Function processes, it may be reflect a "core" or primary set of skills and (b) ECP was not significantly correlated with the other two factor scores (Table 8), so there was no possibility that the prediction of group membership was mediated by either of the other two factors.

Table 8

Correlations Between Three Factor Scores

Variables		1	2	3
1.	Perceived Self-regulation	-		
2.	Metacognitive Knowledge Strategies	.44**	-	
3.	Executive Control Processes	.16	.19	-

The contribution of each factor to predict individual membership is answered by the variables in the equation table (see Table 9), which represents results from hierarchical logistic regression in three steps. Table 9 includes important elements: a) the Wald statistic and associated probabilities provide an index of the significance of each predictor in the equation. The simplest way to assess Wald is to examine the significance value; if less than .05, one rejects the null hypothesis because the variable makes a significant contribution (Chao-Ying & Tak-Shing, 2002); b) the *Exp (B)* column is the most important indicator in Table 9. The *Exp (B)* value presents the effect of the independent variable on the odds ratio; this is the extent to which raising in the predictors by one unit influences the probability of the odds ratio in the predicted variable. *EXP (B)* could be interpreted in terms of the change in odds. If the value exceeds 1, then the odds of an outcome occurring increase; if the value is less than 1, any increase in the predictor leads to drop in odds ratio of the outcome variable (Menard, 1995).

Displayed in Table 9, ECP was a significant predictor of group membership at Step One with an odds ratio of 1.96 (a higher score on ECP gives one a 1.96 greater chance of being classified in the high-achieving group). At Step 2, MKS was entered and it, too, was a significant predictor with an odds ratio of 1.89. Interestingly, in this two-factor model the ECP became a stronger predictor with an odds ratio of 2.15. At Step 3, PSR was entered and it represented a significant predictor with an odds ratio of 2.05. In this three-factor model, the odds ratio of ECP increased to 3.6 and the odds ratio for MKS decreased to 1.43, and was no longer significant.

Table 9

First Set of Hierarchical Logistic Regression

	Predicators	B	Wald	*Df*	Sig.	Exp(B)
Step 1	ECP	.675	7.694	1	.006	1.964
Step 2	ECP	.767	6.553	1	.010	2.153
	MKS	.639	8.068	1	.005	1.895
Step 3	ECP	1.279	6.926	1	.008	3.591
	MKS	.363	1.680	1	.195	1.437
	PSR	.720	6.624	1	.010	2.053

Another set of hierarchical regressions was conducted in which ECP, PSR, and MKS were entered at Steps 1, 2, and 3, respectively. In this analysis, the ECP and PSR factors were significant predictors, and the MKS factor was not (Table 10). Results from Table 10 showed that the contribution of MKS to the identification of high and low-achieving group membership appears to be entirely mediated by the PSR factor; whereas the ECP and PSR have direct relationships to group membership.

Table 10

Second Set of Hierarchical Logistic Regression

	Predicators	B	Wald	*Df*	Sig.	Exp(B)
Step 1	ECP	.675	7.694	1	.006	1.964
Step 2	ECP	1.289	7.088	1	.008	3.631
	MKS	.875	9.346	1	.002	2.399
Step 3	ECP	1.279	6.926	1	.008	3.591
	MKS	.720	6.624	1	.010	2.053
	PSR	.363	1.680	1	.195	1.437

In Chapter V, the research findings are discussed in connection to the existing research findings, limitations in this current study regarding the sample and study design, and the educational implications of these findings with regard to the academic preparation of college students.

CHAPTER V

DISCUSSION

The emphasis of self-regulated learning approaches in regard to academic achievement is on: (a) how students organize and create advanced learning environments for themselves, and (b) how they plan and control their own instructions. During their academic involvement, learners are likely to be responsible; however, those students, who exert initiative, motivation, and personal responsibility, attain particular academic success (Zimmerman & Martinez-Pons, 1988). At this point, self-regulated students are distinguished by their competence in the use of metcognitive, motivational, and behavioral strategies. In this study, it was assumed that the factors of executive functions, metacognitive strategies, time management strategies, and academic self-efficacy represent dimensions of self-regulated learning that contribute to the understanding of the differences between low-achieving and high-achieving students. Additionally, potential overlap among these hypothetical constructs may exist. Thus, as a contribution to the existing research in self-regulated learning, the purpose of this study was to first investigate the factor structure of a data set, which includes the measures of: (a) executive functions, (b) metacognitive strategies, (c) time management, and (d) academic self-efficacy in a sample of undergraduate students ($N = 45$) . A second purpose was to explore whether there were differences between low-achieving ($n = 21$) and high-achieving collage students ($n = 24$) in terms of the underlying factors identified in the factor structure that presumably will align with the measures of executive functions,

metacognitive strategies, time management, and academic self-efficacy, and to examine the degree to which these factors accurately distinguish the two groups.

Factor Structure Underlying the Variables

The results from Exploratory Factor Analysis showed that three factors were retained from 11 measures that represented executive functions, metacognitive strategies, time management, and academic self-efficacy. Six self-report-measures, which represent executive functions, time management strategies, and self-efficacy, loaded on Factor 1 (i.e., the executive functions of metacognitive index and behavior index; the time management strategies of long range planning, short range planning, and time management attitude; and academic self-efficacy). Three measures, which represent metacognitive strategies, loaded on Factor 2 (i.e., procedural knowledge, declarative knowledge, and knowledge monitoring ability). Also, two direct measures of executive function skills loaded on Factor 3 (i.e., Tower of London test and Letter Number Sequencing test of verbal working memory).

For the Factor 1, one can conclude that the measures of executive functions, time management, and academic self-efficacy are highly correlated to the extent they referred to one underlying structure. It was clear that students with high perceived self-efficacy were likely to use effective time management strategies and exert the executive functions of behavioral regulation skills and metacognitive skills. These measures loaded into the Factor 1 were all self-reported measures and, therefore, labeled as perceived self-regulation (PSR). These findings supported the Zimmerman et al. (1994) findings that learners with high self-efficacy were more likely to manage their time, and they were consistent with the Hemanson et al.(2008) findings that self-efficacy is positively

associated with the maintenance of cognitive functions. Further, and in the neuropsychological context, both executive functions and cognitive time management appear to be controlled by the prefrontal cortex region of the brain (Fuster, 1989). According to Barkley (2012), time management strategies are "essential to every act of reasoning that precedes and directs actions toward goals" (p. 198); that is executive functions processes. Essentially, Barkley's model of executive functions is consistent with the common loading of the BRIEF self-reports of executive function skills and the self-report of time management planning abilities and attitudes. Also, the loading of academic self-efficacy into Factor 1 with executive functions and time management is reasonable given that all the three variables have a common dimension represented in students' self-regulation. Many of the items on this academic self-efficacy measure assess students' confidence in their self-regulation (e.g., how well can you finish homework assignments by deadlines, how well can you organize your schoolwork). Therefore, the factor of perceived self-regulation in this study is a combination of subsets of measures that have been discussed in the literature as correlated variables. However, there is no published empirical evidence to the authors' knowledge that demonstrates a common factor for executive functions, efficacy, and time management in a college student sample and, therefore, this finding represents a potentially important contribution to the literature.

Unsurprisingly, the self-reported measures of declarative knowledge and procedural knowledge, and direct measure of knowledge monitoring ability, loaded on a common Factor 2. Declarative knowledge refers to students' ability to represent the prior knowledge and the learning events in term of their relationships with the other learning

tasks; whereas, procedural knowledge refers to students' effective use of the prior knowledge in other learning situation (Schraw & Dennison, 1994). Therefore, declarative knowledge refers to *an understanding* of the relations between the prior learning and later learning situation, and procedural knowledge refers to *how to apply* the prior learning in the other learning situation. Additionally, knowledge monitoring ability refers to fundamental or prerequisite metacognitive process by which students can accurately monitor their prior knowledge (Tobias & Everson, 2002). Given that these three aspects of metacognitive knowledge strategies (i.e., procedural knowledge, declarative knowledge, and knowledge monitoring ability) are related to students' ability to effectively use metacognitive strategies to employ their prior knowledge in the other learning situations. Therefore, Factor 2 was labeled as metacognitive knowledge strategies (MKS) that represent another dimension of self-regulated learning processes.

Interestingly, the metacognition index of the BRIEF executive functions loaded into Factor 1 instead of its loading into Factor 2 with the other measure of metacognition. This could be interpreted in light of the different aspects of metacognition measured by the BRIEF metacognitive index as compared to the other aspects of metacognition measured by procedural knowledge, declarative knowledge, and knowledge monitoring ability. While the metacognitive index of the BRIEF reflects the ability to initiate, plan, organize, self-monitor, and sustain working memory, the other measures of metacognition that loaded in Factor 2 reflect different aspect of metacognition, specifically knowledge monitoring strategies in the context of educational activities.

The third dimension of self-regulated learning, which resulted from EFA, was executive control processes (ECP). Two direct measures, which assess executive

functions in action rather than self-reports surveys of executive functions, loaded on Factor 3; TOL and LNS were moderately correlated (r = 0.43) and they loaded in one factor (i.e., executive control process). The TOL test measures students' ability to cognitively plan action or movement; whereas, the LNS test measures the verbal working memory. The association between these tests supports the findings of Spiegel, Koester, Weigelt, and Schack (2012) that action planning processes involve cognitive mechanisms that are also required for verbal working memory. This suggests that action planning and verbal working memory share common cognitive resources. Additionally, Phillips (1999) suggested that it is reasonable that the TOL requirements for setting up, maintenance, and execution of a multistage plan will make considerable demands on working memory resources. Thus, the loadings of TOL and LNS into one factor in the current study support existing literature.

Each of the three factors explained unique proportion of variances in the loaded variables. Factor 1 accounted for 23.27% of the variability in the measures of: (a) behavioral index, (b) metacognitive index, (c) academic self-efficacy, (d) long range planning, (e) short range planning, and (f) time management attitude. Factor 2 accounted for 17.85% of variability in the measures of: (a) procedural knowledge, (b) declarative knowledge, (c) knowledge monitoring ability, and (d) time management attitude. The first factor includes six self-reported measures; therefore, one can conclude that in addition to the overlap among these skills in term of self-regulated learning processes, these self-reported measures loaded in one factor due to the common method of responses (i.e., common method variance).

Interestingly, the measure of time management attitude had very similar loadings on two factors: 0.338 on Factor 1 and 0.375 on Factor 2. Although time management attitude basically represents a subscale of time management, it loaded also in Factor 2 with metacognitive knowledge measures. It could be due to the similarity of contents of this measure and the measures of metacognitive strategies, in that, time management attitude assesses one's knowledge with respect to time management *strategies*. Therefore, although it was ultimately decided to allow time management attitude to load with the other time management variables on Factor 1, it is reasonable to assume that one's attitudes towards time management also would be closely related to metacognitive awareness in leaning contexts.

Finally, Factor 3 accounted for 11.95% of variability in the measures of TOL and LNS, and these are direct measures of executive functions rather than the self-reported measures of executive functions which loaded in the first factor. Thus, the association between these two measures and loading in one factor is due to the common method of responses to executive control processes in action instead of perceived executive functions as represented in self-reported measures.

Differences between High and Low Academic Achievers

Regarding the second purpose of this study, the understanding of self-regulated dimensions (i.e., the factor scores of PSR, MKS, and ECP) was extended by examining how these factors differ in low and high-achieving groups. The results from the Independent-Sample *t*-Tests showed that high-achieving students were more likely to have higher PSR (i.e., time management strategies, executive functions, and academic self-efficacy), than the low-achieving students. These findings are consistent with the

existing research findings that high-achieving students performed better than low-achieving students on: (a) a measure of academic self-efficacy (Al-Alwan, 2008; VanZile & Livingston, 1999); (b) time management strategies and behavioral regulation skills (Al-Alwan, 2008; Ruban & Sally, 2006); and (c) metacognitive executive functions (VanZile-Tamsen & Livingston, 1999).

Since both groups of students were classified based on their GPA, students with high GPA are more likely to manage their time in an effective way to meet the academic demands (e.g., reading tasks, submission of assignments, preparation for exams). Also, students with high GPA are likely to use behavioral regulation strategies with respect to executive functions, in which they would be able to shift cognitive set and modulate emotion and behavior by an appropriate inhibitory control. Further, high-achieving students tend to be competent in their ability to exert metacognitive executive functions as they are likely to be able to initiate, plan, organize the academic activities, and have self-monitoring skills. Additionally, students with high GPA tend to have high confidence in their ability to accomplish various academic tasks. Thus, high GPA, driven by effective time management strategies and higher-order processes of executive functions, is more likely to lead to high academic self-efficacy beliefs for high-achieving students. Interestingly, the associations among these skills is consistent with the Phenotype Model of Executive Functions suggested by Barkley (2012), in which he referred to the executive function deficit to a lack in time management skills, self-organization, and self-motivation.

Results from Independent-Sample *t*-Test also showed that there are differences between high-achieving group and low-achieving group in the factor of MKS, in terms

of: (a) declarative knowledge, (b) procedural knowledge, and (c) knowledge monitoring ability. With respect to the differences between high-achieving students and low-achieving students in procedural knowledge and declarative knowledge, these findings support those of Meichenbaum's and Biemiller (1998) that high-achieving students have been found to possess more metacognitive knowledge than low-achieving students. Also, the differences between high-achieving students and low-achieving students in knowledge monitoring ability are supported by the existing research findings that students' metacognitive monitoring skills differed in high-achieving students (Hacker et al., 2000; Hacker et al., 2008). Likely, high-achieving students use their prior knowledge to employ more effective metacognitive knowledge strategies, such as procedural knowledge, declarative knowledge, and knowledge monitoring accuracy, than low-achieving students. Hence, the learning processes within each discipline are hierarchically built, and the use of effective metacognitive knowledge strategies to organize the relationships between prior and later learning tasks is critical to academic achievement. Thus, students are not only required to master prior learning, but also use metacognitive knowledge strategies to use the prior learning competently. Also, knowledge monitoring accuracy is an important strategy involved in successful learning. According to Tobias and Everson (2002), learners, who accurately distinguish between what has been learned and what they have yet to learn, are better able to focus attention and other cognitive resources on the academic materials to be learned.

In addition to the differences between high and low-achieving students in the factors of PSR and MKS, high-achieving students performed better on the measures of ECP; that is, the performance on the TOL and LNS. The ECP is represented in the

executive functions of movement planning as measured by TOL and verbal working memory as measured by LNS. This current author has not found published research in which the importance of performance on the TOL and LNS tasks for academic achievement have been investigated in typical college students. Therefore, investigation of the differences between high and low-achieving college students in their performance on TOL and LNS is a notable contribution to the existing research, which has generally examined the linkage between TOL performance and academic achievement in school-age sample (Altemeier, Jones, Abbott, & Berninger, 2006; Bull, Espy, & Wiebe, 2008), and the associations between verbal working memory and academic achievement either in diagnostic sample or school aged student (Swanson, Zheng, & Jerman, 2009; Taylor et al., 1996).

The differences between high-achieving and low-achieving students in the factor of executive control processes indicates that high-achieving students are more likely to exert planning strategies with regard their academic activities than low-achieving students. Also, the difference between the two groups in verbal working memory was an expected finding. In that the importance of working memory for academic achievement is supported by the findings reported by Swanson et al. (2009) that students with poor short-term memory often have difficulty recalling a sentence they just read, descriptions of characters in text, and previous learning that is related to academic task at hand.

Predicting Academic Achievement Group Membership

Finally, the prediction of individual's membership using the dimensions of self-regulated learning (i.e., PSR, MKS, and ECP) was examined. The importance of differences between the high-achieving group and low-achieving group in the dimensions

of self-regulated learning has been extended to investigate the extent to which each factor predict the classification of the student in the relevant group while controlling the others. It was of interest to determine the linear combination of the factors that most accurately determined group membership, and the relative contribution of the factors. Results from Logistic Binary Regression indicated that the model explained a relatively large amount of variability (78%) in the grouping of students in the relevant group, and the overall model, including all three factors in one step, was significant and correctly classified 91% of the high-achieving group and 90% of the low-achieving group. Also, in the examination of the individual contribution for each variable to predict individuals' group membership, as well as the degree to which there existed potential mediational relationships among the predictors. The results from Hierarchical Logistic Regression showed that the factor of ECP made the highest contribution to the prediction of individual membership in the relevant group. Respectively, the factor of PSR contributed significantly to predict individual membership in the relevant group; whereas, the contribution of MKS to predict individual's membership in the relevant group membership was mediated by PSR.

Together, these regression results can be interpreted as suggesting the following possibilities. First, ECP appears to have a direct, and strong, effect on (or contribution to) the discrimination between the high and low-achieving groups. Second, the contribution of MKS to the identification of high and low-achieving group membership appears to be entirely mediated by the PSR factor; however, the PSR has a direct, moderate relationship to group membership. Third, the finding that the ECP factor's predictive strength actually *increased* after entering the two other factors into the model suggests

that ECP may predict a very specific component of the individual differences in academic achievement, That is, it is not a strong predictor when entered into the model first as the only predictor variable; this is consistent with its lower effect size in the t-test analysis. However, when other variables were entered into the logistic regression that presumably explain variance in group membership that is not shared with ECP, then the ECP factor became a stronger predictor of this unique component of the variance. This explanation is consistent with the speculation that the ECP factor, made of direct measures of Executive Function processes rather than the self-reports that characterize the other two factors, is assessing a core capacity that may indeed be influenced by other cognitive capacities, such as speed of processing and fluid intelligence.

These results support the existing research findings that the Perceived Self-Regulation of time management strategies predict the level of academic achievement in college students (Balduf, 2009; Britton & Tesser, 1991; Macan et al., 1990; Tanrıögen & Işcan, 2009; Wells, 1994). The perceived self-regulation of self-efficacy predict the level of academic achievement in college (Chemers, Hu, & Garcia, 2001; Coutinho, 2008; Lane, 2004; Pajares, 2006). In addition, the perceived self-regulation of behavioral regulation processes of shifting and inhibition uniquely predict adolescents' academic achievement (Mercer, 2005).

The executive control processes uniquely contributed to predict an individual's membership in his or her relevant group. This indicated that a student with a high competency in planning and verbal working memory is more likely to be classified in a high-achieving group; whereas, a student with poor planning skills and verbal working memory is more likely to be classified in a low-achieving group. Existing research

findings support the associations of performances on TOL and LNS tests with academic achievement in various samples of younger students or those with clinical diagnoses. For example, in one study, Bull et al. (2008) found that TOL performance in preschool predicted improvements in both reading and mathematics from age 5-8. In another study, Swanson's (1994) found that verbal short-term memory contributed unique variance to reading comprehension and mathematics in adults and children with reading disabilities.

In comparison to the factors of PSR and ECP that had direct effect of prediction, the contribution of MKS to predict individual's membership was entirely mediated by PSR. This indicated that the strong metacognitive knowledge is not sufficient to be classified in a high-achieving group; the individual must also have a high level of perceived self-regulation. The nonsignificant contribution of metacognitive knowledge strategies in the model is seen in term of the odd ratio associated with the metacognitive knowledge strategies (*OR* = 1.437). In that, if the odds ratio ranges between 1-1.5, it is considered to be very weak, and this is consistent with the low effect size in the t-test analysis. Despite of the slight predictive ability of metacognitive knowledge in the current study, the importance of metacognitive knowledge strategies is supported by the existing literature, in that, metacognitive knowledge can assist or hinder new learning, and students with greater metacognitive knowledge strategies of a topic understand and remember more than those with more limited metacognitive knowledge (Schraw & Dennison, 1994; Tobias & Everson, 2002).

The current author has not found a study in the published literature that examine the degree to which these factors (i.e., PSR, MKS, and ECP) can accurately predict

membership in low and high-achieving groups in college. These findings in turn provide significant contribution to the existing literature.

Limitations

There are some inherent limitations in this study sample, measures, and design. The major limitation of the study was the lack of random selection from each population. The participation in this study was voluntary and included students who responded to the invitational email sent by this researcher. Thus, as this study provided valid findings on the academic experiences for high and low-achieving students, the results may not be generalizable to a wider population. Additionally, another limitation emerged in this study regarding the measure of Knowledge Monitoring Ability that demonstrated low internal consistency reliability as measured by a Cronbach's alpha ($\alpha = 0.55$).

Another limitation emerged in this study with respect to Research Question 1, in which the purpose was to discover if the underlying structures aligned with the measures of executive functions, metacognition, self-efficacy, and time management. A sample of 45 participants is a relatively small size to perform exploratory factor analysis; factor analysis typically requires a large sample for analysis (Joseph et al., 1995). Also, since the sample used in the factor analysis included two groups with different characteristics (i.e., high vs. low-achieving students), the factors structures could very well be different in each group. Unfortunately, the use of the exploratory factor analysis to examine whether different factor structures existed for each group was not possible due to insufficient sample size for this analysis. That is, the KMOs (i.e., the measure of sampling adequacy in factor analysis) were small (*KMO* = 0.457 for the high-achieving

group, *KMO* = 0.492 for the low-achieving group). And as a result, the number of variables in relative to number of participants in each group was not factorable.

With regard to the interpretation of the results for Research Question 2, the achievement group differences in the factors of perceived executive functions and efficacy, metacognitive knowledge strategies, and executive control processes, could be due to a variable or variables other than academic achievement status. Other variables that were potentially confounded with achievement, such as general intelligence, academic majors, grade level, ethnicity, or gender, were not controlled in this study. Indeed, there was higher proportion of males and non-White participants in the low-achieving group. Additionally, it is hard to determine cause and effect from this correlational study; therefore, further research with different designs (e.g., longitudinal, path analysis) is recommended, which might be able to better address the causal connections between these factors and academic achievement.

Implications

Researchers in the field of educational psychology have discussed the factors of cognitive executive functions, metcognitive strategies, time management, and self-efficacy in the context of self-regulated learning processes (Eilam & Aharon, 2003; Garner, 2009; Griffiths, 2003; Hofmann et a l., 2012; Zimmerman, 1998). Respectively, researchers (Al-Alwan, 2008; Ruban & Sally, 2006; VanZile-Tamsen & Livingston, 1999) have turned to the self-regulated learning model in attempts to better understand the individual differences in academic performance, with particular emphasis on high and low-achieving college students. However, there is still disagreement about the overlap among the constructs of executive functions, metacognitive strategies, time management,

and self-efficacy (Barkley, 1996; Barkley, 2012; Hanten et al., 2000; Nelson & Narens, 1990), because these could be better investigated as part of the overall construct of self-regulated learning. In a novel approach, the current study empirically investigated the overlap among measures of four constructs of self-regulated learning (i.e., executive functions, metacognitive strategies, time management, and academic self-efficacy) in order to examine the importance of these patterns of self-regulated learning in distinguishing between high and low-achieving college students.

Thus, research and educational implications emerge from the findings of this current research study. In terms of research implications, the findings from factor analysis open a path for researchers to investigate the potential overlap among several psychological constructs associated with self-regulated learning. Apparently, many psychological constructs in the field of educational psychology, rather than the constructs used in this study, represent to some extent patterns of self-regulated learning. For example, the psychological constructs of, but not limited to, intrinsic goal orientation, extrinsic goal orientation, task value, effort regulation, and control of learning beliefs could be referred to as the common underlying dimensions of self-regulated learning. Therefore, more research is needed in this area to specifically identify the common patterns, which underly these constructs. Specifically, it would be recommended that the initial finding of three factors in this study be replicated on a larger sample and the degree to which the factor structure holds up in different groups (e.g., high and low academic achievers) should be explored.

Within the existing research literature, cognitive executive functions have been examined either in diagnostic samples or in school age children. This current study

brought this construct to the educational field, rather than the clinical field of psychology, by connecting executive functions to academic achievement in college. Thus, the findings from this study, which highlighted the important of executive functions in order to differentiate between high and low-achieving college students, open new research paths with respect to the role of executive functions to performance in the demanding world of higher education. By studying executive functions in the educational contexts, this study was an extension of existing research findings as reported by Ardila, Pineda, and Rosselli (2000), who found that some executive function measures were correlated with the Wechsler Intelligence Scale for normal Children between 13-16 year olds. Also, these findings may stimulate interest among researchers to replicate the current study in different environments and with different populations, or to design intervention programs to strengthen self-regulation processes, particularly those related to executive functions, self-efficacy, and time management.

The findings from this study may lead to several educational implications for students and teachers as well as teaching practices in college. Self-regulated learning demonstrates important element in academic achievement in this study. The fact that low-achieving students reported less use of these strategies indicates that interventions or teaching approraches that can encourage these students to use these strategies may lead to improved academic achievement. Hence, instructional practices are recommended to encourage students to be self-regulated learners. The current findings regarding the importance of executive functions and efficacy, metacognitive knowledge strategies, and executive control to individual differences in academic achievement potentially have important educational implications for college teaching and remediation of low-achieving

students. For improving executive functions and efficacy, college students might be encouraged to develop executive function skills by designing constructive Institutional method to teach effective strategies for improving the executive functioning skills of time management and organization. Also, Gentile (1997) suggested basic strategies to enhance students' self-efficacy beliefs:

1- students can be provided with opportunities to be successful on academic tasks

2- Students need to be given constant reminders that they are in control of their academic fates

3- Teachers and counselors need to emphasize the relevance and value of academic tasks

4- Teachers need to emphasize learning rather than grades or performance.

The findings from this study also revealed that low-achieving students exert less metacognitive knowledge strategies than high-achieving students. Therefore, promoting metacognitive strategies during teaching practices represent important element in enhancing academic achievement. In that, Schraw (1998) proposed that firstly, teachers should discuss the importance of metacognitive knowledge with their students, including the unique role it plays in self-regulated learning. Secondly, teachers should model their own metacognition for their students; usually, teacher model their cognition (i.e., how to perform a task) without modeling metacognition (i.e., how they think about and monitor their performance).

The logistic regression suggests that students may be able to be identified early on as following a path towards high academic achievement or low academic achievement, and those particularly in the second group could be helped early on to avoid failure and

attrition. Therefore, a screening measure could be developed for first year students based on their scores on these three factors.

Conclusion

Executive functions, metacognitive strategies, time management, and academic self-efficacy represent key components of self-regulated learning processes. They also demonstrated an important pattern in differentiating between high- and low-achieving college students in terms of the scores of the three factors driven by these constructs. The first factor retained from the measures of executive functions, metacognitive strategies, time management, and academic self-efficacy is perceived executive functions and efficacy, which combines six self-reported surveys of different constructs. The second factor retained from three measures of metacognitive strategies was metacognitive knowledge strategies, which combined two self-reports measures and one direct measure of metacognitive strategies. Finally, the third factor retained from two direct measures of executive functions representing in TOL and LNS. This contributes evidence to an emerging literature on academic success and failure in college and has a range of practical implications.

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APPENDIX A

APPROVAL LETTER FROM INSTITUTIONAL REVIEW BOARD

UNIVERSITY of NORTHERN COLORADO

Institutional Review Board

DATE:	February 11, 2013
TO:	NASAR SAID
FROM:	University of Northern Colorado (UNCO) IRB
PROJECT TITLE:	[405754-3] Self-regulated learning dimensions and academic achievement
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVED
APPROVAL DATE:	February 11, 2013
EXPIRATION DATE:	February 11, 2017
REVIEW TYPE:	Expedited Review

Thank you for your submission of Amendment/Modification materials for this project. The University of Northern Colorado (UNCO) IRB has APPROVED your submission. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on applicable federal regulations.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of February 11, 2017.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Sherry May at 970-351-1910 or Sherry.May@unco.edu. Please include your project title and reference number in all correspondence with this committee.

Nasar -

Generated on IRBNet

APPENDIX B

PARTICIPANTS' ACCESS

From: Crow, Loree [Loree.Crow@unco.edu]

Sent: Monday, December 03, 2012 10:57 AM

To: Nasar Said

Nasar,

Yes, I will grant you access to current Honors Program students e-mail addresses for you to request participants for your study. As we discussed, I would not want you to expect more than 10% participation rate in your study. We currently have 189 students active in the Honors Program, and of those 62 are freshmen, leaving you with 127 students in your pool of possible participants. Therefore, I would not expect you to be able to obtain more than 12 or 13 participants for your study, and that is based on you offering some kind of incentive.

If you have any questions, please let me know.

Sincerely,

Loree Crow
Director, University Honors Program
Center for Honors Scholars & Leadership

Hi Nasar,

I have the list of students with their e-mails and current cumulative credit hours. Let me know if there is anything else you need. Thank you!

Loree Crow
Director, University Honors Program
Center for Honors Scholars & Leadership

Dear Nasar Said,

Per Charlie Couch in the Registrar's Office I am sending you a list of UG students email addresses with a 3.5 or higher GPA that are enrolled in Spring 2013. (file is enclosed)

Janene

---Nasar,

Thank you for sending your invitation letter. Attached are the e-mail addresses of currently enrolled students on academic probation.
Keep me posted on your progress. :)

Jennifer Griffin
Director of Advising Services • Academic Support and Advising
Mortar Board Advisor • National Senior Honor Society

APPENDEIX C

INVITATION EMAIL SENT TO THE PARTICIPANTS

Dear student:

My name is Nasar Said. I am Ph.D. student at University of Northern Colorado/School of Psychological Sciences. You are invited to participate in a research project entitled: the Dimensions of Self-regulated Learning and Academic Achievement in College Students. The purpose of this research is to investigate the association of students' metacognitive awareness, cognitive executive functions, self-efficacy, and time management. Examining the links between these variables is important since they are crucial to effective academic achievement for college students.

Participating in this research will include two sessions. For the first session, it takes approximately 40 minutes to administer the research surveys of executive function, time management, self-efficacy, and Knowledge Monitoring Ability technique; and for the second individual session, you will take approximately 40 minutes to complete the direct measures of executive functions: Tower of London and the Letter Number Sequencing working memory task. It is my hope that this information would contribute significantly to educational practices in college level. I highly appreciate your consideration, and as compensation of your time, you will receive $20 upon completion the second session.

If you agree to participate in this research project, please reply to this email keeping the same subject (Invitation to participate in research/March 1st), and please indicate your gender and the day/time (the times for the first session: from 11:00 to 11:40/ and from 1:00 to 1:40/ It is opened everyday from March 1st to April 30th). The location to meet is McKee 0014F & G (this is a double room) in School of Psychological Sciences (The lower level of McKee building).

Upon completion of the first session, we will set the meeting for the second session depending on your availability. The students who are willing to participate in this research should not be freshmen.

Regards

Nasar Said
School of Psychological Sciences
University of Northern Colorado
Said5047@bears.unco.edu

APPENDEIX D

CONSENT FORM

UNIVERSITY of
NORTHERN COLORADO

CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Project Title: The Dimensions of Self-regulated Learning and Academic Achievement in College Students

Researcher: Nasar Said
Phone: 720.862.6460
Email: said5047@bears.unco.edu

Advisor: Marilyn Welsh, School of Psychological Sciences
Phone: 970.351.2236
Email: Marilyn.welsh@unco.edu

Purpose and Description: The purpose of my study is to investigate the association of students' metacognitive awareness, cognitive executive functions, self-efficacy, and time management. Examining the links between these variables is important since they are crucial to effective academic achievement for college students.

You will be testing in two sessions. For the first session, it takes approximately 40 minutes to administer the research surveys of executive function, time management, self-efficacy, and Knowledge Monitoring Ability technique; and for the second individual session after a week, you will take approximately 40 minutes to complete the direct measures of executive functions: Tower of London and the Letter Number Sequencing working memory task. I expect there to be variations in the time it takes to complete these and I will allow you to leave each session when you finish.

The measures will be used in this study place no more than minimal risk to you. Most of the measures in this study deal with assessing common, everyday behaviors and decision-making (BRIEF and self-efficacy) particularly as it relates to your educational experiences (time management, metacognitive awareness, and executive functions).Such measures place no more than minimal risk to.

Upon completion the two sessions, you will be payed $20 as a compensation of your time and effort. Also, you have the right to know the important findings gain in this research. I will take every precaution in order to protect the confidentiality of your responses. I will assign a subject number to you. Only the lead investigator (Said) will know the name connected with a subject number and your name will never appear on any of the response

sheets. When I report data, your name will not be used. Data collected and analyzed for this study will be kept in a locked cabinet.Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact the Sponsored Programs and Academic Research Center, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-2161.

Subject's Signature	Date
Research's Signature	Date

APPENDIX E

DEMOGRAPHIC FORM

DEMOGRAPHIC FORM

Participant# _____

Please circle the statement that describes you

What is your gender?

Male Female

Age? _____

Would you describe yourself as?

American Indian / Native American

Asian

Black / African American

Hispanic / Latino

White / Caucasian

What is your academic major? _____

Are you:

Sophomore: (At least 32 semester hours, but less than 64 semester hours)

Junior: (At least 64 semester hours, but less than 96 Semester hours)

Senior: (At least 96 semester hours)

APPENDIX F

KNOWLEDGE MONITORING ABILITY (KMA)

KNOWLEDGE MONITORING ABILITY (KMA)

Participant# -------- Age---- Gender-------

Please read the following 20 words carefully and place (Y) in front of the word that you **know** its meaning and (N) in front of the **unknown** word.

#	WORD	Y/N		#	WORD	Y?N
1	Circumscribe			11	Magnify	
2	Excavate			12	Astronaut	
3	Apprise			13	Intervene	
4	Dissemble			14	Diffidence	
5	Platitude			15	Facetious	
6	Abeyance			16	Retrospect	
7	Incredulous			17	Apprehension	
8	Accretion			18	Precede	
9	Occult			19	Broach	
10	Consternation			20	Extraterrestrial	

Vocabulary Test for assessing Knowledge
Monitoring Ability

Participant# ----- Age ------- Gender-----

- **Each of the following words has four meanings, only one meaning is correct. Chose one correct meaning for each word.**

1) circumscribe:
   a) wheedle, led astray
   b) to bless, make happy, or ascribe a virtue to. Regard as saintly.
   c) to draw a line around; to encircle
   d) expression of blame or disapproval; a rebuke

2) excavate:
   a) causing delay, procrastinating
   b) loud, noisy, rough, lacking restraint
   c) reduce the strength of, lessen seriousness, partially excuse
   d) to dig out

3) apprise:
   a) give notice to, inform
   b) elegant, refined in manners
   c) protest against, express disapproval of
   d) accretion, depositing, building up layer by layer

4) dissemble:
   a) Berate, vituperate, to thunder out, to explode.
   b) Majestic, venerable.
   c) Seeming, appearing as such, professed
   d) present false appearance; deceive

5) platitude:
   a) lose courage, turn frightened
   b) to attribute to a cause or source, ascribe
   c) a trite or banal statement; unoriginality
   d) unquestionable, true.

6) abeyance:
   a) illogical, of questionable truth or merit
   b) argue earnestly to dissuade, correct, or protest
   c) changeable, inconstant, fickle, unstable, explosive
   d) suspended action

7) incredulous:
   a) causing tears, tearful
   b) skeptical, unwilling to believe
   c) like a seed; constituting a source, originative.
   d) a riddle, dilemma, enigma

8) accretion:
   a) growth, increase by successive addition, building up
   b) a scheme or plot, a group of plotters
   c) recant solemnly, repudiate, renounce
   d) clumsy, bungling

9) occult:
   a) poor, penniless
   b) hidden, concealed, beyond comprehension
   c) argumentative, pugnacious, combative, quarrelsome
   d) unsubstantial, flimsy, weak

10) consternation:
   a) Weaken, deprive of strength, attenuate.
   b) sophisticated, artful, trying to deceive, cunning
   c) Diligent, hard-working, sedulous.
   d) sudden confusion or amazement

11) magnify:
   a) Berate, vituperate, to thunder out, to explode.
   b) calm, sluggish temperament; unemotional
   c) to enlarge, to make bigger
   d) a scheme or plot, a group of plotters

12) astronaut:
   a) learned, scholarly
   b) loosely connected, not flowing logically
   c) one who travels in interplanetary space
   d) deliver, provide, represent

13) intervene:
   a) come between
   b) immoral person
   c) a carefree episode or experience; a short poem describing a picturesque episode
   d) to join together

14) diffidence:
   a) having sound judgment; perceptive, wise; like a sage
   b) appease, lessen, propitiate
   c) shyness
   d) disintegration, looseness in morals
   e) to distress, create stress or torment

15) facetious:
   a) humorous, funny, jocular
   b) equal distribution of weight; equilibrium
   c) diminishing or lessening of swelling
   d) a supporting bar

16) retrospect:
- a) firmness, persistency, adhesiveness, tending to hang on
- b) cheap, gaudy, showy, tacky
- c) melodious, harmonious
- d) a looking back on things

17) apprehension:
- a) misgiving, dread. Also a stopping or arrest. Also an understanding, prosaic
- b) to punish, hold up to public scorn
- c) lofty, noble
- d) weaken, deprive of strength, attenuate.

18) precede:
- a) to speech
- b) to go before
- c) to understand easily
- d) to be good helper

19) broach:
- a) one who abandons long-held religious or political convictions
- b) write in scholarly fashion
- c) to adorn, especially in a cheap, showy manner
- d) bring up, announce, begin to talk about

20) extraterrestrial:
- a) cheerful, casual, carefree
- b) sweetly flowing; usually used to describe use of words
- c) effete, no longer fertile, worn out
- d) beyond the earth

APPENDIX G

TIME-MANAGEMENT QUESTIONNAIRE

Time-Management Questionnaire (Britton & Tesser, 1991)

Participant# ------ Gender------- Age-------

Please read each question and place a check mark under the corresponding category that best describes how the question applied to you.

Question	Always	frequently	sometimes	Infrequently	Never
1. Do you make a list of the things you have to do each day?					
2. Do you plan your day before you start it?					
3. Do you make a schedule of the activities you have to do on work days?					
4. Do you write a set of goals for yourself for each day?					
5. Do you spend time each day planning?					
6. Do you have a clear idea of what you want to accomplish during the next week?					
7. Do you set and honor priorities?					
8. Do you often find yourself doing things which interfere with your schoolwork simply because you hate to say "No" to people?					
9. Do you feel you are in charge of your own time, by and large?					
10. On an average class day do you spend more time with personal grooming than doing schoolwork?					
11. Do you believe that there is room for improvement in the way you manage your time?					
12. Do you make constructive use of your time?					
13. Do you continue unprofitable routines or activities?					
14. Do you usually keep you desk clear of everything other than what you are currently working on?					
15. Do you have a set of goals for the entire quarter?					
16. The night before a major assignment is due, are you usually still working on it?					
17. When you have several things to do, do you think it is best to do a little bit of work on each one?					
18. Do you regularly review your class notes, even when a test is not imminent?					

APPENDIX H

BANDURA'S SCALE OF ACADEMIC SELF-EFFICACY

Bandura's Scale of Academic Self-Efficacy

Participant#.....

Please answer each of the questions below by marking **not at all, somewhat well, moderately well, or very well** as it is applied on you

1- How well can you finish homework assignments by deadlines?

1=not at all 2=somewhat well 3=moderately well 4=very well

2- How well can you study when there are other interesting things to do?

1=not at all 2=somewhat well 3=moderately well 4=very well

3- How well can you concentrate on school subjects?

1=not at all 2=somewhat well 3=moderately well 4=very well

4- How well can you take class notes of class instruction?

1=not at all 2=somewhat well 3=moderately well 4=very well

5- How well can you use the library to get information for class assignments?

1=not at all 2=somewhat well 3=moderately well 4=very well

6- How well can you plan your schoolwork?

1=not at all 2=somewhat well 3=moderately well 4=very well

7- How well can you organize your schoolwork?

1=not at all 2=somewhat well 3=moderately well 4=very well

8- How well can you remember information presented in class and textbooks?

1=not at all 2=somewhat well 3=moderately well 4=very well

9- How well can you arrange a place to study without distractions?

1=not at all 2=somewhat well 3=moderately well 4=very well

10- How well can you motivate yourself to do school work?

1=not at all 2=somewhat well 3=moderately well 4=very well

11- How well can you participate in class discussion?

1=not at all 2=somewhat well 3=moderately well 4=very well