5-4-2004

The effects of confidence and intention to learn on performance in reading comprehension tests

Anthony John Rosamilia
Rowan University

THE EFFECTS OF CONFIDENCE AND INTENTION TO LEARN ON PERFORMANCE IN READING COMPREHENSION TESTS

By
Anthony John Rosamilia

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts Degree
of
The Graduate School
at
Rowan University
May 4, 2004

Approved by _____
Professor

Date Approved 5/4/04

ABSTRACT

Anthony John Rosamilia
THE EFFECTS OF CONFIDENCE AND INTENTION TO LEARN ON PERFORMANCE IN READING COMPREHENSION TESTS
2003/2004
Dr. John Klanderman & Dr. Roberta Dihoff
Master of Arts in School Psychology

The present study was designed to better our understanding of human memory acquisition and recall by investigating what role, if any, confidence plays in tasks of academic performance and attempting to provide construct validity to the concept of intent to learn and its related principles of deep processing, attention to meaning, and elaborative rehearsal. 147 participants, whose confidence was manipulated prior to testing, were placed in one of four groups: High Confidence, Low Confidence, Control, and Spelling (no intent to learn). All participants were asked to read a short story adapted from the WIAT (the Spelling group asked only to check for spelling errors), and, contrary to their belief's were all given the same set of 10 multiple-choice questions. Confidence levels were assessed with a post-test questionnaire. One-way ANOVAs and Pearson's Correlations suggest not only that confidence can be manipulated through verbal persuasion, but that a significant role exists for confidence on performance, especially with respect to low confidence, and there is a vital role for the intention to learn on acquisition and recall.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER I

NEED:

For Centuries mankind has been interested in the study and applications of human memory. Indeed, certain mnemonic systems, those intended to aid in the retention of information, have dated back as far as ancient Greece (Reisberg, 1997). In more recent history, with the introduction of psychology as a formal science, researchers have made giant strides in the understanding of human memory. In the disciplines of cognitive and behavioral psychology, researchers have been able to, among other things, develop models of human memory acquisition, establish techniques for learning, retention, and recall, and even identify a number of categorical memory errors. However, there are, of course, numerous gaps in our current understanding.

Psychology, like all other progressive sciences, depends upon continuous research in order to achieve a better understanding of all its principles and applications. Hence, there is need to expand upon our current knowledge of cognitive and behavioral psychology with respect to human memory. More specifically, there is a need for continued research on what promotes better memory acquisition and recall, as its findings are no doubt beneficial in almost all areas of our daily life.

Concerning the acquisition and retention of information, continued research is necessary to further develop our understanding of its processes and applications, mainly

because of the unlimited number of its potential benefits and uses. Today, there is great concern over the current and future progress of school children in America. Through research in the cognitive and behavioral sciences, techniques can be developed to improve situations such as these by finding ways to promote better study habits and test taking skills.

The present study is designed to better our understanding of human memory acquisition by attempting to provide construct validity to the concept of intent to learn, and its related principles of deep-processing, attention to meaning, and elaborative rehearsal. Theoretically, those who engage material with an intention to learn and display attention to meaning (Elias & Perfetti, 1973), elaborative reasoning (Craik & Watkins, 1973), and/or deep-processing (Craik & Tulving, 1975), will both acquire and retain the information better than those who do not. While this will obviously be beneficial in a school setting where good study habits can separate a good student from a bad one, findings here can generalize to many other areas of life as well, such as in the work place, recalling life's memories, and ease of everyday tasks.

Concerning the recall of information, a variety of techniques have been developed over the years, from the mnemonic devices of young and old, to a relatively new technique know as hypermnesia, where "unforgetting" depends upon calling from a variety of cues over a period of time and circumstances (Reisberg, 1997). However, our current understanding of recall process is, like other areas of human memory and cognition, limited. Further research is obviously necessary to facilitate our current understanding, again because of a seemingly unlimited number of applications and uses.

Presently and specifically, the role of confidence prior to the recall of information is investigated, and its properties discussed.

The study of confidence and its role with respect to memory recall is necessary for many reasons. Most prevalent, perhaps, is its importance in the school setting and subsequent effects on test taking skills. However, knowledge in this area is far from limited to the educational environment. Indeed, much of the research that exists focuses on the effects of confidence on performance on other areas, most notably sports (Pickens, Rotella, & Gansneder, 1996; Garza & Feltz, 1998; Psychountaki, Athens, & Zervas, 2000; Taylor, 1987) It is partially by this rationale that confidence is expected to have some, albeit maybe small, effect on the recall of information, i.e. test taking.

Not only has confidence been shown to increase an individual's performance in a number of areas, it also exhibits properties which warrant a better understanding and a more thorough examination. For example, low levels of confidence have been associated with higher levels of stress and anxiety (Zuckerman, 1989), and the development of new confidence raising techniques can help to reduce stress levels (in addition to boosting performance in a particular area) and consequently promote better mental health. Programs to increase an individual's level of confidence continue to develop (Flowers, 1991; Garza & Feltz, 1998; Marston, 1968)

Further need for a stronger understanding of confidence and its role in performance stems from conflicting research in the area. For example, while it may be widely believed that levels of confidence are greater in males than in females, certain studies suggest that this may not be true, or at least dependant upon the subject or category in which confidence is being measured (McCarty, 1986; Ziegler & Hellen,

2000; Lundberg, Fox, Brown, & Elbedour, 2000; Lenney, Gold, & Browning, 1983; Clark, 1993). Conflicting research can also be found in the areas of beneficial confidence raising techniques (Flowers, 1991; Moller & Russel, 1994; & Savoy & Beitel, 1997) and, in fact, regarding the very role of confidence in performance and memory recall (Reddy, 1983; Marttoli & Richardson, 1998; Vancouver et al, 2002; & Ryska, 2002).

In addition to obtaining further construct validity for the concept of intent to learn, the primary focus of the present study is to examine the role of confidence *prior* to memory recall. In here lies a final need for research in this area, as much of the current knowledge (with respect to memory recall, not on performance in other areas) is based upon assessing confidence levels *after* memory recall (Jacoby & Witherspoon, 1982). In these studies, confidence of accuracy, post-test, is measured; interestingly, confidence is not a reliable indicator of memory accuracy.

PURPOSE:

The purpose of the present study is to aid in the understanding of human memory, or more specifically, to satisfy the need for further research in the area with respect to acquisition and recall. The benefits of such research will not only help develop better study skills and test-taking techniques, but are naturally relevant to other areas of life as well. Improving both the ways in which we intake information and subsequently recall the information, can improve productivity in the work place, help individuals to better remember life's important moments, and simplify the tasks of everyday life.

In order to improve upon techniques for both learning and recall, the present study will first examine the role of confidence prior to test taking. As is clear in other aspects of life, high confidence can greatly improve an individual's performance; a positive correlation here would broaden the range of such a construct to include tasks of cognitive and academic aptitude, as much of the previous research is restricted to tasks of athletics. Second, this study will attempt to provide further validity to the claim that constructs such as deep-processing, attention to meaning, and elaborative rehearsal, in fact, contribute to a stronger acquisition of information. Such findings would be congruent with much of the research that is out there, and is useful in establishing good study habits for students of all ages.

Thus, the purposes of the present study concerning human memory are two-fold. We will attempt to provide further validity to the construct of intent to learn (acquisition) and explore the role of confidence prior to test-taking (recall). Each, in turn, can then be used to develop techniques that can be most useful, but not limited to, the school setting.

HYPOTHESES:

In the overall design of the present study, a learning and recall test, in the form of a reading comprehension exam, was given to four separate groups. All groups were given the same information in which to learn and subsequently tested on recall with the same set of questions. Both the reading and test questions are designed to simulate those that would be regularly administered in an actual school environment. To control for prior

knowledge and familiarity effects, information contained in the reading is novel to all groups.

In order to examine the role of confidence prior to memory recall, and provide construct validity to the concept of intent to learn, and related principles of, deep-processing, attention to meaning, and elaborative rehearsal, the groups are divided and identified as follows:

High Confidence (HC): is led to believe that the test they are about to take is below their level; the questions are designed to be simple and easy and they are expected to do well, thus manipulated to show high levels of confidence.

Low Confidence (LC): is led to believe that the test they are about to take is above their level; the questions are designed to be difficult and tricky and they are expected to do poorly, thus manipulated to show low levels of confidence.

Control (C): no confidence manipulation

Spelling (SPL): is asked to read through the text searching for spelling errors, and not informed of a subsequent memory test, thus not engaging the material with intent to learn.

Thus, the following hypotheses are proposed, and their rationale explored in detail in chapter II:

A: Subjects in the High Confidence Group will score higher than Control, which in turn will score higher than subjects in the Low Confidence Group.

B: Groups with intent to learn (High Confidence, Control, Low Confidence) will score higher than the group not expecting the test (Spelling)

C: (Correlation) There will be a positive relationship between scores on the test and a subject's perceived level of confidence.

THEORY:

The following will provide information necessary for the understanding of human memory processes with respect to learning and recall. It will explore memory models, various types of memory, and possibilities for memory errors, as well as the constructs of confidence and intent to learn, and their roles in acquisition and recall of information. Overall, memory is based in three basic processes (Feldman, 1999). These processes include *encoding*, the initial acquisition of information, *storage*, saving information for later use, and *retrieval*, recalling the stored information.

Memory Models

Starting at around the 1950's, breakthroughs in cognitive and behavioral psychology have led scientists to develop models to help explain complex mental tasks such as learning, remembering, and problem solving (Reisberg, 1997). These models are based around a concept known as information processing, where these complex tasks are broken down into a large number of individual steps or components. While each step carries a unique set of characteristics, all components rely on an interaction with each other, usually resembling the form of input – output.

In a basic model of human memory, incoming information, after preliminary analysis by the brain, is passed immediately into short-term, or primary memory. Here,

the information is either being used by the individual, or maintained usually by a process known as rehearsal. If the information is deemed important enough to be stored, and not lost due to lack of rehearsal, it is then passed into long-term, or secondary memory. At this point the information can be stored, without rehearsal, until the retrieval process places it back into short-term memory for use. However, as will be discussed later, much can go wrong regarding information processing between the components of short- and long-term memory.

The basic model of human memory has been expanded upon by Shiffrin and Atkinson (1969) to form a more comprehensive model of the human memory system. New to this model are the components of a sensory register, a response generator, and various control processes which interact with the model's components. The sensory register is responsible for the preliminary processing of incoming information and stimuli before its transfer into the short-term memory store. This register holds memories, usually in the form of sight (iconic) or sound (echoic) memories, which often decay within one second of acquisition (Feldman, 1999). While most often passing into the short-term memory store, information can move directly from the sensory register into the response generator, that component responsible for output within the model.
A striking and noticeable thing is versatility and higher levels of interaction seen in this more complex memory model. Indeed, information can move from any component, including the sensory register, into the response generator for response output, and all components interact with one another by copying, rather than passing, information from one to the next. In addition, various control processes, called into action at the discretion of the individual, administer different procedures in all components of the system

depending on the task at hand. These processes include, but are not limited to, rehearsal activation; information modification, transfer, and coding; decision making; and response generator initiation.

Overall, these memory model systems provide a good understanding of how human memory works with respect to the three basic processes discussed earlier. Information is *encoded* using the sensory register, *stored* in the short- and long-term memory banks, and subsequently *retrieved*, via control processes, for output through the response generator. The specificities of these systems will be examined more closely by breaking them down further into various *types* of memory.

Types of Memory

In discussing memory model systems, two major memory types have already been identified: short- and long-term memory. One of the most important, short-term memory plays a role in virtually all active mental tasks, and being the gateway between stored information and the outside world, is a vital component of both acquisition and retrieval. It stores the contents of an individual's current thoughts and ideas, and thus has been termed more modernly *working memory* in that it holds the information actively being worked on (Reisberg, 1997). Information passes through working memory into long-term memory during acquisition, and is called back, or retrieved, into working memory and processed for use.

Subsequent research has enhanced our current understanding of working memory. Regarding capacity, it can hold roughly seven items at any given time (Miller, 1956), although techniques such as chunking – categorizing items into groups or "chunks" – can

increase this number (Bower, Clark, Lesgold, & Winzenz, 1969). Items stored in working memory, sustained by rehearsal, typically last only fifteen to twenty-five seconds before either being stored or lost (Feldman, 1999). Regarding retrieval, pulling information from storage into working memory for active use can prove difficult, effortful, and even slow (Reisberg, 1997). It is little surprise, then, that many things can go wrong with acquisition and recall, and many of them begin with working memory.

Another important type of memory, also established within memory model systems, is long-term memory. Barring factors such as amnesia, traumatic brain damage, lesions, and deterioration, long-term memory storage is considered to be permanent (Shiffrin and Atkinson, 1969), and "memory loss" is more often due to retrieval error than anything else (Reisberg, 1997). Due to the complex nature of such a vast storage system, researchers have been able to organize long-term memory into a number of individual subsets, each with its own set of unique characteristics. Subsets of memory type include: declarative; procedural; semantic; episodic; implicit; and explicit memory.

Long-term memory can be first divided into *declarative* and *procedural* memory systems. Procedural memories can be defined as those which hold instruction on "how-to", and often involve an individual's skills or habits (Reisberg, 1997; Feldman, 1999). Examples include throwing a baseball, writing your name, and riding a bicycle. Declarative memories, on the other hand, are those concerned with factual information, such as what is learned in school, at home, or on the job, and can be further divided into *semantic* and *episodic* memory (Reisberg, 1997). Although closely related, semantic memory involves generic knowledge about the world, including historical facts, general

information, and logic, whereas episodic memories are reserved for information specific to one's life and personal experiences.

Finally, memories can be classified as either implicit or explicit. Implicit memories are those in which an individual is not often aware or conscious of, and are usually revealed by indirect memory tests (Riesberg, 1997 & Feldman, 1999). Despite the lack of awareness, these memories of previous experience guide and affect subsequent performance, thoughts, and behaviors. In contrast, explicit memories do involve a conscious recollection of information (Feldman, 1999). Often revealed by direct memory testing, explicit memories also affect behavior, but an individual is typically aware of those influential prior episodes. All in all, implicit and explicit memories tell us that our futures are affected by our pasts, whether we are consciously aware of it or not.

Of Acquisition and Recall

Since the present study deals directly with the acquisition and subsequent recall of learned information, it is important to understand just how this process unfolds in the human mind. As mentioned earlier, a stimulus or piece of information presented to an individual is first absorbed and processed by the sensory register before passing into the short-term memory store. Here, maintenance rehearsal (that which is item specific and relies almost soley on repitition) holds the information in the working memory system for use, or elaborative rehearsal (that which involves active thinking and attention to relationships) moves the information to the long-term memory system for "permanent" storage (Reisberg, 1997). This next, more complicated step, can best be understood and explained using the network model of long-term memory store, and pertinent to this

study, accurate and successful retrieval often depends on the way in which this step in the acquisition chain takes place.

The network model of memory storage states that as new information and knowledge is encoded and stored, it is represented in a vast network of connections and associations. Each fragment of information or individual idea, often referred to as a *node*, is connected to another piece of information (another node), via associations. In this way, the model is often likened to a fisherman's net, or an interconnection of roads and highways that connect city to city (Reisberg, 1997). Thus, when new stimuli are encountered and information stored, it is important to form strong associations within long-term memory to promote subsequent retrieval, usually brought about by the concept of intent to learn and related constructs.

Theoretically, retrieval occurs when the node of interest becomes *activated*, which is often dependent upon a strong enough signal input. This activation then triggers further activation of connected nodes, a process referred to as spreading activation. Each node has an activation level, dependent upon the amount and recency of the activation, and once a node has reached its response threshold, an outward spread along the network of nodes is set into motion (Reisberg, 1997). Once the sought out information is found within the system, it is then transferred into working memory for processing and use. Naturally, the pathways within the system are vital to memory recall, and effects such as frequency of use, strength of association, and number of connections influence the effectiveness and accuracy of memory recall.

Of Confidence: Self-Efficacy Theory

In the present study, hypotheses were presented that suggest a role for confidence in test taking performance. In order to better understand confidence as a construct, one can examine a theory of self-efficacy proposed by psychologist Albert Bandura (Schultz & Schultz, 1998). In his model, he defines self-efficacy as "feelings of adequacy, efficiency, and competence in coping with life" (Schultz & Schultz, 1998, p. 397). Confidence can be raised by meeting one's personally defined standards and performance goals; consequently, if these standards are not met and maintained, levels of self-efficacy are reduced.

When an individual displays high levels of self-efficacy, they approach situations, events, and tasks with a positive attitude. They often view life's difficulties as challenges and have greater confidence in their personal abilities. High self-efficacy is associated with improved problem solving and analytical skills, greater aspirations, and a reduced fear of failure. They anticipate success and persevere at the task at hand with high confidence, which often results in high performance levels.

On the other hand, people low in self-efficacy often feel helpless, assume a lack of control over life's obstacles, and exhibit lower levels of effort. Low self-efficacy is associated with low confidence, and can reduce an individual's aspirations, decrease motivation, and even interfere with thinking and cognition. Individuals in this category tend to show lower amounts of effort at any given task, and display a good deal of self-doubt, which ultimately results in performance impedance.

Bandura identifies four major influential sources which can sway an individual's judgment of self-efficacy level. These include: performance attainment; vicarious experiences, physiological & emotional arousal; and verbal persuasion.

Performance attainment is judged by Bandura to be the most influential sources of self-efficacy perception, and its effects are based on an individual's prior experiences. Typically, previous success provides insight on personal competency; achievements in meeting and maintaining one's goals and aspirations are demonstrative of capabilities, providing subsequent confidence and raising levels of self-efficacy. However, past failures, especially repetitive failures during childhood years, have inverse, negative effects on personal confidence, thereby lowering self-efficacy. These trends have the potential to be very progressive, in that experiences, of either success or failure, build upon one another as time passes.

Vicarious experiences influence perceived self-efficacy indirectly, in that they depend on another person's success or failure at any given task. Simply stated, watching another individual succeed can raise confidence and self-efficacy; observing failures can lower them. These effects tend to increase when observing another individual of similar abilities. Physiological & emotional arousal involves levels of stress and anxiety when approaching a particular task. Individuals are more confidence in success when not experiencing feelings of stress, tension, and fear; less confident when they do.

Verbal persuasion, one final form of source influence, is very significant to the present study. This concept states that telling a person that they possess the skills and abilities to succeed can accordingly raise their levels of self-efficacy. This is one of the most common forms of influential sources, and comes from teachers, coaches,

teammates, family members, friends, and others. It should be noted, however, that in order to effectively enhance self-efficacy and raise personal confidence, persuasion must remain realistic.

Concerning Intent to Learn

Intent to learn will be defined as actively engaging material or information with the intention to learn, retain, and subsequently recall, and will involve any combination of the following principles: *deep-processing, attention to meaning, and elaborative rehearsal.* Indeed, these principles have been shown to promote more accurate and complete retrieval of information, and this is due mainly from the role they play during the acquisition process. The following will define these principles and explain them in better detail.

A first of three proposed component of intent to learn involves the concept of depth of processing, which, in essence, reflects the amount, or level, of cognitive activity associated with a given task. Ranging from "shallow" to "deep", the former involves a more superficial approach, which can include the way stimuli look in relation to each other, whereas the latter requires a more thoughtful approach, like the meaning or relationships involved within the stimuli (Craik & Tulving, 1975). Although independent from intent to learn (Reisberg, 1997), the proposed hypotheses suggests a link between these concepts; subjects in the Spelling group (searching for spelling errors) are more likely to display shallow processing, whereas groups with the intention to learn are more likely to engage in *deep processing*, attending to information cognitively and with intent to recall.

Attention to meaning is, quite simply, cognitively attending to the meaning of an item, stimulus, or piece of information. It is the driving force behind the principles of elaborative rehearsal and deep-processing, and therefore plays a vital role in one's intent to learn. Although it is not *always* a component of elaborative rehearsal or deep-processing, it is usually attention to meaning that moves information from working- to long-term memory in a way more beneficial to retrieval later on.

Maintenance rehearsal, as described earlier with respect to memory models, involves holding information in working memory, without any real active cognitive awareness, usually by means of mental repetition. *Elaborative rehearsal*, on the other hand, requires actually thinking about the meaning or relativity of the item or stimulus present (Reisberg, 1997). It is elaborative rehearsal that is responsible for moving information from working- to long-term memory (Feldman, 1999). Regarding the proposed hypotheses, subjects in the Spelling group are less likely to engage in this type of rehearsal; proper acquisition and storage of information is less likely to take place, thus hindering the retrieval process.

Memory Errors

Thus far we have developed a very complex model of human memory with respect to acquisition and recall. It is little wonder, then, that much can, and does, go wrong with these delicate processes. The following will describe a number of possible memory errors including familiarity, suggestibility, intrusion, distortion, and blocking.

One form of memory error is based upon the concept of familiarity (Begg, Anas & Farinacci, 1992), and suggests that if a stimulus, item, or piece of information is

familiar, it will be judged more credible whether accurate or not. These errors usually involve implicit memories (which often do not "feel like memories") and can occur when information is attributed to the wrong stimulus or the wrong source (Reisberg, 1997, p. 192). Source confusion, or misattribution, is a very common form of memory error, and has its implications not only in the classroom, but in many legal settings as well (Schacter, 2001).

Similar types of memory errors can occur due to misleading questions (Loftus, 1975) and suggestibility (Schacter, 2001). The wording of particular questions asked after information has been acquired and stored can influence the nature and magnitude of a memory, and even make individuals believe they have seen or heard something they have not. Suggestibility errors result in memories skewed by comments and suggestions during an individual's retrieval of information. Again, errors such as these, which can occur regardless of how information was acquired in the first place, are important to understand especially when constructing tests that may be used in school settings; misleading questions and answer choice options (suggesting false information) can lead to errors during testing.

Another group of memory errors include those due to intrusion. These usually fall within the realm of transience errors, where memories weaken and are subject to interference over time. One type of intrusion error, distortion, is, as the name implies, memories which are in some way distorted or skewed. These usually occur rather systematically; shady and incomplete memories are "cleaned up" and the gaps filled in by an individual to make a memory more coherent (Reisberg, 1997). Intrusion errors, more generally, are those in which one recalls an element that was not a part of that originally

acquired (Reisberg, 1997). In this way, individuals tend to remember things that they never saw, episodes that never took place, or items that were never present (Brewer & Treyens, 1981).

A final, and unique, form of memory error is known as blocking. Blocking occurs when one simply cannot retrieve the information they are searching for (Schacter, 2001), and in this respect it is often referred to as retrieval failure. This type, which is extremely common, usually entails the blocking of difficult information, although can include such simple things as a friend's name, a place just visited, or what one had for dinner last night. Unlike some of the other forms of memory error, these can occur when information is not acquired well and weak associations are made between new and pre-existing knowledge

Many of these error types are important to understand because of their potential relevancy to the confidence portion of the present study. A lack of confidence may lead to second guessing and other intrusive tactics that may open doors to the various memory errors explained above. For example, second guessing an incorrect multiple choice option, after familiarity, intrusion, and recency effects, may be influential enough for an individual to deem it correct.

DEFINITIONS:

Attention to Meaning: Attending to the meaning of material or information being learned.

Confidence: The degree to which an individual expects to succeed or fail at any given task.

Deep Processing: Refers to the depth of processing (shallow, medium, deep) that involves the highest levels of cognitive activity.

Elaborative Rehearsal: A rehearsal process, which requires proactive thinking, that moves information from working- to long-term memory. Elaborative rehearsal includes a focus on meaning and attention to how newly acquired pieces of information relate to each other, to environment, or to previously existing knowledge.

Intent to Learn: Actively engaging material or information with the intention to learn, retain, and subsequently recall, and involves any combination of the following principles: attention to meaning, elaborative rehearsal, and deep-processing.

Long-term Memory: A relatively permanent storage system encompassing numerous forms of memory.

Maintenance Rehearsal: A rehearsal process that uses repetition to hold information in working memory for use.

Self-Efficacy Model: A model of self-efficacy, proposed by Albert Bandura, where self-efficacy is defined as "feelings of adequacy, efficiency, and competence in coping with life," and is raised or lowered based on an individual's performance.

Short-term Memory: Also known as *working memory*, short-term memory is where information is either processed for use, transferred into long-term memory, or lost.

ASSUMPTIONS:

There are a number of assumptions that must be understood in the present study. For example, it is assumed that confidence levels will, in fact, be manipulated by the test and the test administrator. However, this could be expected given Bandura's model of self-efficacy and the concept of verbal persuasion, which states that telling a person that they possess the skills and abilities to succeed can accordingly raise their levels of self-efficacy. Similarly, there is an assumption that participating individuals will perceive their true levels of confidence accurately after the testing. While there is no reason why a subject may lie, there judgments may be influenced by their perceived performance while taking the test.

Other assumptions include that participants will be competent enough to understand the test and test material; a simple assumption since test material will be modeled after reading comprehension tests, a format that college undergrads are familiar with, and judged to be below the college level. We can also safely assume that subjects will not be familiar or have prior knowledge of any test material, since it is original, non factual information. Finally, it can be assumed that subjects will try to get all answers correct despite the lack of rewards or grades.

LIMITATIONS:

Many of the limitations involved in the present study can be attributed to the sample and sampling process. For example, participants were all volunteers from

psychology classes, making it difficult to produce a representative sample inclusive of gender, age, race, and socio-economic status. Also, the sample involve is limited to college undergraduates. This limitation is of greatest concern, given the interest in said constructs and their role in the school system; it would therefore be interesting to replicate the current study at the elementary, middle, and high school levels.

The sample involved is also limited to the north eastern region of the United States; more specifically, mid-west New Jersey, and again is not overtly representative. Finally, limitations on the accuracy of the study exists based on the assumption that subjects will perceive confidence levels accurately. Should they not, all correlation and other statistical analysis will be skewed and misleading.

SUMMARY:

The following chapter will provide a comprehensive literature review of psychological studies pertaining to the constructs at hand, and will provide further reasoning for the hypotheses proposed. It will explore the current knowledge of confidence and self-efficacy in relations to test taking performance as well as performance in other areas. In congruency with Bandura's model of self-efficacy, the literature review will begin to examine the role of confidence in recall and retrieval processes.

The comprehensive literature review in the following chapter will also include studies pertaining to the concept of intent to learn. Within the review, related constructs of deep-processing, attention to meaning, and elaborative reasoning will be examined.

Finally, to further rationalize the stated hypotheses, these principles will be related to the learning processes of acquisition and encoding.

CHAPTER II

Chapter two contains a comprehensive literature review of psychological studies relevant to the hypotheses proposed. The first major section examines the literature with respect to self-efficacy (SE) and performance. It begins by discussing research relevant to SE and performance in athletic and motor-skill related tasks, and then moves into studies more specific and related to the hypotheses at hand by examining the role of self-efficacy in cognitive/academic performance. The next major section of the review begins with redefining key terms, such as *intent to learn*, as well as its proposed sub-components, and then provides research in an effort to provide rationale to hypotheses. It will start with an explanation of the overall concept of intent to learn, which is then broken down into depth of processing, attention to meaning, and elaborative rehearsal, respectively.

CONFIDENCE

The present study examines the role of confidence on performance with respect to a reading comprehension exam, with rationale for an effect stemming from the Self-Efficacy Model proposed by Bandura. Recall that high self-efficacy is associated with improved problem solving and analytical skills, greater aspirations, and a reduced fear of failure; individuals with high SE anticipate success and persevere at the task at hand with high confidence, which often results in high performance levels. In contrast, low SE is associated with low confidence, and can reduce an individual's aspirations, decrease

motivation, and even interfere with thinking, effort, and cognition. In addition, Bandura proposed four major influential sources which can sway an individual's judgment of self-efficacy level: performance attainment; vicarious experiences, physiological & emotional arousal; and verbal persuasion. The following examines the research relative to this area and current hypotheses, beginning broadly (studying the effects of SE on athletic and motor performance) and concluding more specifically (studying the effects of SE on academic and cognitive performance.)

Confidence and Motor Performance

Many studies have shown confidence to be predictive of performance with respect to athletic skills, adding credibility to Bandura's model of self-efficacy, especially in regards to the four major influential sources that sway an individual's judgment of self-efficacy. For example, Martin and Gill in 1991 have shown this association to exist between confidence and performance in long distance running. Using the Trait Sport-Confidence Inventory (TSCI), the State Sport-Confidence Inventory (SSCI), and a self-efficacy questionnaire they were able to assess a subject's general and pre-competitive confidence levels prior to a midseason track meet (The TSCI was administered two to seven days before the meet, and both the SSCI and self-efficacy questionnaire 25-35 minutes before the meet). Scores on these tests were then compared in relation to performance at the meet, which was measured by both the finishing time and the finishing place of the individual.

Correlational analyses suggest a positive relationship between confidence and performance with respect to long distance running. Subjects with high levels of

confidence in this sport and high expectations to succeed ran the races faster than those subjects who were less confidence and felt less likely to succeed. In fact, the outcome portion of the self-efficacy questionnaire (that which was concerned with a subjects confidence in a successful outcome) accounted for 52% of the variance for finishing place and 62% of the variance for finishing time, thus an influential factor in both performance measures in the study.

In another interesting study in the same area, subjects were given the Physical Self-efficacy Scale, to measure general confidence in their physical skills, and the Task-specific Self-Efficacy Scale, to assess their levels of confidence specific to tasks involved in long distance running (LaGuardia & Labbe, 1993). When correlated to race times, they obtained similar results, suggesting a link between confidence and performance. Taking this concept a step further, they found task-specific self-efficacy to be a much greater predictor of performance than general self-efficacy, and, also congruent to Bandura's model, there was a strong relationship between a runner's predicted and actual performance in the race, suggesting that confidence may have been influenced by self-knowledge, experience, and prior accomplishments. But perhaps the most compelling evidence for rationale of the current hypothesis stems from an endurance study (leg lifting task) in which self-efficacy was manipulated (Weinberg, 1986). Subjects either thought they were competing against someone who exhibited high performance in this task (creating low confidence in a subject's success) or someone with a knee injury who performed poorly on the same task (creating high confidence in success); the test was rigged so that the subject lost in either case, so that performance (on the endurance task) could run its full course. Finally, subjects were either told to employ a strategy of

dissociation or positive self-talk. Results suggest a role for confidence; individuals high in self-efficacy exerted more effort and lasted significantly longer than individuals low in self-efficacy, and this was true regardless of the strategy employed.

Similar results have been obtained for many other sports as well. Barling and Abel (1983) have found self-efficacy to be predictive of tennis performance by significant positive relationships between the self-efficacy scores of 40 tennis players and independent judge's ratings of their performance. In another study, whose design is more closely related to that of the present study, the confidence of 54 golfers was assessed both before and during the first putt of each hole in an 18-hole golf competition (Pickens, Rotella, & Gansneder, 1996). In this case, not only was confidence predictive of a successful putt, but confidence *during* the putt was a stronger predictor of performance than confidence *before* the putt, indicating a true and significant influential role for confidence in task performance. Still other studies have found this relationship to exist in wrestling (Treasure, Monson, & Lox, 1996), swimming (Pscyhountaki, Athens, & Zervas, 2000), and in a very comprehensive study (Taylor, 1987), in six difference intercollegiate sports. In the latter study, the levels of confidence of 84 college varsity athletes of cross country running, alpine skiing, nordic skiing, tennis, basketball, and track and field, as measured by a questionnaire adapted from the Sport Competition Anxiety Test, were significant predictors of performance in their respective areas, when measured both subjectively and objectively.

However, it should be known that not all research in the area points to a direct link between confidence and performance in physical abilities, and others are internally inconsistent. For example, two studies involving gymnastics (Winfrey & Weeks, 1993;

Weiss, Wiese, & Klint, 1989) found no significant influence of confidence on performance. And still others provide evidence that is not overtly compelling; when measuring confidence and performance by multiple means, only some of the many possible relationships in the studies turned out to be significant. Another major limitation of many, but not all, of the studies discussed simply compare a person's self efficacy and sport confidence with their performance. Confidence is almost never manipulated, like in the leg endurance study (Weinberg, 1986). Confidence and self efficacy levels are most likely reflective of past performance, as well as other factors as proposed by Bandurra, and so do not provide compelling rationale to the hypotheses proposed in the present study. Although, as confidence does seem to be a predictor of performance in many respects, it is proposed here that high confidence in success of a mental task with little influential prior experience and no knowledge of information contained within will be sufficient to effect an individual's score. In other words, it is hypothesized that confidence in one's ability to do well on a test, as determined immediately before test taking, will effect test performance.

Confidence and Academic Performance

So far it has been established that self-confidence and motor performance have a significant and intriguing relationship in accordance with Bandura's model of self-efficacy. Indeed, confidence can be predictive of performance in a given area, even when manipulated by experimenters. However, more closely related to the current study is the research suggesting the same relationship between confidence and academic or cognitive performance, especially when a match exists between a specific aspect of a task at hand

and confidence in that aspect. Several studies have, in fact, added validity to this claim, and thus provided further rationale for the current hypotheses.

One very interesting study demonstrates the positive effect of self-efficacy on writing performance using a group of 181 ninth grade public high school student from the southwest united states (Pajares & Johnson, 1996). In one session, students completed the Writing Self-Efficacy Scale, and in the second, they were asked to write a 30 minute essay entitled, "My Idea of a Perfect Day." Essays were then scored, using a standardized scoring method, by the researchers, each of which had significant experience teaching high school level English composition. Interrater reliability was .87.

Researchers then used path analysis techniques to examine the data directly and indirectly, "thus enabling causal inferences to be made, if modestly and cautiously" (Pajares & Johnson, p. 167). They were able to analyze the effects of writing self-efficacy on essay writing performance (and writing apprehension), in a way that controlled for previously assessed writing aptitude, making thus study very relevant to our present interests. Results indicated that self-efficacy was a strong and independent predictor of writing performance and that low self-efficacy led to higher levels of writing apprehension, results consistent with other research as well as Bandura's model of self-efficacy. Zero-order correlations were very high, in fact: between self-efficacy and performance - .60, $p<.0001$; and between self-efficacy and apprehension - -.41, $p<.0001$. The authors go on to suggest that teachers should pay as much attention to a student's confidence in a given skill as their actual performance in the skill, since it is these beliefs that may predict motivation and future performance in academics more accurately.

Other studies suggest a similar relationship between self-efficacy and overall academic performance (Multon, Brown, & Lent, 1991; Wood & Locke, 1987; Lent, Brown, & Larkin, 1986). One study, using a complicated method of meta-analysis, reviewed the research of a total of 41 samples of subjects across 39 studies (Multon, Brown, & Lent, 1991). Results, although not as strong as in the previously discussed study, suggest a relationship between self-efficacy and overall academic performance (.38), suggesting self-efficacy was responsible for approximately 14 percent of variance. Another study yielded similar results when using a very large sample of 581 undergraduate level students (Wood & Locke, 1987). Results here indicated a strong and significant relationship between student self-efficacy to both academic performance in college and a student's own academic grade goals. One final study, using a sample of 105 undergraduates in technical and science fields, found not only a relation between self-efficacy and college performance, but also indicated that self-efficacy is a significant contributor to academic persistence and a perceived range of career options (Lent, Brown, & Larkin, 1986).

More evidence for a relationship between self-efficacy and performance comes from studies investigating confidence and performance in mathematics. One study in particular involved a large sample (391 college undergraduates) providing three forms of math related self-efficacy judgments: confidence to solve math problems, confidence to succeed in math related courses, and confidence to perform well in math related tasks (Pajares & Miller, 1995). Correlational analysis yielded significant relationships between SE and performance; however, these results suggests that effects are very task specific. For example, confidence to solve math problems was a much better predictor of

successfully solving math problems than either doing well at a math related task or earning a good grade in a math related course. Similarly, confidence in math related tasks and earning a good grade in math related courses were both stronger predictors of performance in their respective categories, suggesting a very task specific component to the given hypotheses.

However, some discrepancies in the research literature suggest caution when concluding self-efficacy to be a valid predictor of academic or cognitive-related performance. For example, one study, examining the self-efficacy of 262 college undergraduate's confidence to solve math related problems, did not yield results similar to those described above (Hackett & Betz, 1989). While previous studies have suggested that self-efficacy is a predictor of performance, especially when measures of SE and performance are task consistent, findings in this study suggested that confidence to solve math related problems was a stronger predictor of math-related educational and career choices than both math performance and past math achievement; results in contrast with the task specific confidence results found elsewhere. Another study goes beyond task specificity and provides evidence directly against the relation between SE and performance, again using mathematic achievement as criterion (Norwich, 1987). Regression analysis suggested that little or, in fact, no relation existed between these two factors when other entities, such as self-concept of math ability, prior task achievement, and prior self-efficacy were considered.

Another experiment examined the effects of confidence on performance, using a dual study design, and were concerned with their effects over time, rather than across subjects (Vancouver et al, 2002). In their basic design, the self-efficacy of 43 to 87

undergraduates to perform well on an analytic game was manipulated, and subjects played the game two or more times. Interestingly, and as expected by the researchers, a negative relationship was found when analysis was conducted over time; self-efficacy in this case led to overconfidence and thus increased the likelihood of participants committing logical errors while playing the games. This study presents a new caution when studying confidence, and therefore promoting confidence in academic and athletic venues, which is to be careful of influencing an individual to the point of overconfidence, which can be detrimental to performance.

Intent to Learn

This next major section examines research relevant to the hypothesis that groups with the intent to learn (HC, C, and LC) would score better on a subsequent reading comprehension test than the group without the intent to learn (SPL, the group whose task was to read through the text scanning for spelling errors and unaware of a test). Intent to learn was defined as actively engaging material with the intent to learn and subsequently recall information, and includes one of more of the following sub-processes: deep-processing, attention to meaning, and elaborative rehearsal. The following examines the research with respect to these processes:

Depth of Processing

Depth of processing is a concept, under the umbrella of intent to learn, which reflects the amount of cognitive activity associated with a given task. Shallow levels of processing involve attending to the physical or sensory characteristics of a stimuli, such

as lines and angles, brightness, and loudness, whereas deeper levels involve more complex reasoning, such as pattern recognition, relativity, and the extraction of meaning (Craik & Lockhart, 1972). Conceptually, deeper levels of processing are associated with stronger, more elaborate, and longer lasting encoding and storage of information. Processing stimuli at deeper levels allows an individual to make concrete associations between the material attended to and previously learned rules and prior knowledge (Craik & Lockhart, 1972); information is thus more efficiently moved into the long-term memory store, handled better, and made more accessible for retrieval when needed.

A number of studies have demonstrated the effects of depth of processing on memory acquisition and recall. Of particular interest was an experiment that involved five unique orienting tasks (ways in which a subject was introduced to words) where subjects were assigned to either one of the groups or control (Hyde & Jenkins, 1973). These tasks, which may be rated from shallow to deep levels of processing, involved a subject determining: whether a word fit into one of two sentences (Sentence Frame); whether a word contained the letters "E", "G", or both (E-G Checking); whether the word was a noun, adjective, verb, or other (Parts of Speech); how often a word is used in the English language (Frequency of Use); and the pleasantness or unpleasantness of a word presented (Pleasant-Unpleasant Rating).

Following the word presentation and orienting tasks, subjects were given five minutes in which to recall as many words as they could, and results were consistent with depth of processing theory. Semantic tasks, which require deeper levels of processing and higher cognitive activity were found to be associated with higher levels of recall. Consequently, tasks involving attending to the graphic or acoustic properties of the

stimuli only, resulted in poor recall. Indeed, subjects judging the pleasantness-unpleasantness of a word, a task of deep semantic processing, were able to recall roughly double the amount of words than subjects focusing on whether a word fit in a sentence (Sentence Frame group) or the spelling of a word (E-G Checking group), tasks with nonsemantic properties and relatively shallow levels of processing (Hyde & Jenkins, 1973).

Another interesting study in the area of depth of processing was conducted by Jacoby (1978), who likens the concept to a math problem: working through and obtaining an answer on one's own would render it easier to remember and recall than simply being given the answer. To illustrate this point, he had subjects either read a pair of words, or read one word and construct on their own the word's pair (this response word was presented with two letter's, never the first or the last, omitted and replaced with blank spaces). The probability of cued recall more than doubled when subjects constructed the word's pair on their own, a task of deep semantic processing, when compared to merely being read the word pairs, a task with very little cognitive properties. Interesting, this same effect is demonstrated when subjects are asked to generate their own meaningful sentences, as opposed to simply being read them (Bobrow & Bower, 1969). These studies are of particular importance in the school setting with respect to teaching and learning techniques, as well as study habits and test taking skills. Namely, simply being given an answer, or perhaps reading a definition, may not be as beneficial to a student as working though information with deep levels of processing and high cognitive intent.

Many other studies have examined the role of depth of processing in learning, memory, and recall, giving further evidence to the benefits of deep levels of processing.

For example, Tresselt and Mayzner (1960), in an experiment very similar to that of Hyde and Jenkins (1973), tested word recall following three unique orienting tasks. The tasks involved were the crossing out of vowels (shallow processing), the copying of words (medium processing), and judging a words relation to the concept of economy (deep processing). The latter condition yielded recall results twice that of the second condition and four times that of the first. Another study had orienting tasks divided into two conditions, where subjects reviewed a list of words looking for words with the letter "A"(structural task) or words representing living things (semantic task) (Schulman, 1971). Naturally, recall performance in the semantically oriented tasks were significantly greater than that of the structurally oriented tasks.

Attention to Meaning

Attention to meaning is, as simple as it sounds, attending to the meaning of a piece of information or stimulus present, and plays a very important role in successful acquisition and storage. Much of the evidence for its value is derived from studies examining the role of depth of processing, such as those described above. This is because, while deep processing includes methods such as analyzing relationships, drawing upon previously existing knowledge, and forming associations within existing schema, its most prominent and definitive characteristic is its reliance on the meaning of the stimulus at hand. In other words, attention to meaning it the agent allowing deeper forms of processing to take place; without it, processing can be considered mediocre at best.

Several studies have demonstrated the positive effects of attention to meaning on learning and recall. One study in particular, utilizing a multi-experimental design, provides very compelling evidence, and again is closely related to the depth of process studies examined earlier (Craik & Tulving, 1975). Generally, subjects, tested individually, were exposed to words presented tachistoscopically for 200 milliseconds each. However, prior to exposure, subjects were asked a question about the word in order to orient them into a particular level of processing or analysis. These questions, ranging from shallow to deep levels of processing respectively, either focused on the structural (physical appearance of the word), phonemic (acoustical qualities of the word), or semantic (meaning of the word, expressed by fitting into a sentence or category) properties of the word. All questions, either presented verbally or written on a card, required a "yes" or "no" response from the participants.

Results show that questions concerning the meaning of a word led to higher memory recall than did questions of either phonemic or structural properties. These results not only indicate an effect for attention to meaning, but also again for depth of processing, in that recall performance was ranked from lowest to highest as follows: structural (shallow), phonemic (medium), and semantic (deep). In addition, "yes" responses generated significantly greater recall than did "no" responses, at least with respect to phonemic and semantic conditions. Apparently, a subject was able to extract more meaning from a stimulus word when it fit into the category or question asked prior to exposure. Overall, the study gives strong evidence that attending to the meaning of a stimulus is an important factor in the promotion of acquisition and recall; for words indicative of a "no" response, recognition ranged from 19 percent (structural) to 49

percent (meaning), and for "yes" responses, that difference rose from 15 to 81 percent. Attending to the meaning of a word influence subsequent recall by up to five times.

Other studies in the area have yielded similar results. For example Elias and Perfetti (1973) exposed subjects, divided into three groups, to eighty target words for ten seconds each. The groups each represented an instructional, or orientational, condition: the *acoustic* group asked to provide as many rhyming or "sound alike" words as they can; the *synonym* group asked to give synonyms or words close in meaning; and the *associative* group instructed to provide single-word free associations. The groups differed in the levels of processing engaged in, and ultimately in the amount of meaning focus on, the latter groups exhibiting deeper processing and stronger attention to meaning. All subjects were then subjected to a test of recognition, which consisted of both words on the list, new words of either similar associations, other synonyms, or other rhymes (distracters), and words of control.

Results were highly significant and again provide evidence for the roles of both attention to meaning and deep processing. Subjects in the conditions encouraging semantic, or meaningful, encoding demonstrated higher levels of recognition and were less susceptible to distracters than subjects in the acoustic (nonsemantic) conditioning group. Indeed, recognition increased as the levels of processing and attention to the meaning of the stimulus word increased; the free association group showing better scores than did the group generating synonyms.

Still other studies exhibit evidence for attention to meaning (and deep processing), and are worth examining. For example, Nelson, Walling, and McEvoy (1979) found that attending to the meaning of a target word resulted in higher levels of recall than focusing

on the acoustical nature of the word (rhyming) even when the target word contained multiple meanings. They also suggest that rhyming (a task representing a moderate amount of processing in most studies) seems to produce greater recall than structural focus because of some, although small, amount of semantic inference. Till and Jenkins (1973) performed a very similar experiment to the ones described above, only they presented words auditorily as opposed to visually. They oriented subjects to the words in one of three ways: "E" checking, estimation of the number of letters, and rating of pleasant- unpleasantness, the latter representing the group where meaning was attended to. Again, the nature of the orienting task was a vital component when it came to recall testing, with the semantic task influencing recall significantly greater than nonsemantic tasks.

Elaborative Rehearsal

Another component of approaching a stimulus or a piece of information with the intent to learn involves the way in which one rehearses the to-be-learned items. Cognitive psychological theory has identified two unique rehearsal processes, each with its own distinct characteristics: maintenance and elaborative rehearsal. Maintenance rehearsal is rather simple, involving a straightforward and uncomplicated repetition of the items being learned. Elaborative rehearsal, on the other hand, is not such a mechanical process; rather it involves a cognitive focus on the meaning of the items at hand, how they fit into the current environment, and their relation to other items or previously existing knowledge. By theory, maintenance rehearsal is a process in which information is held in working memory for use, whereas elaborative rehearsal is a proactive thinking process

which transfers information into the long-term memory store and there kept available until called upon at a later time.

An interesting study, performed by Craik and Watkins (1973), demonstrates just how maintenance rehearsal is not a sufficient technique for learning and recall. Subjects in their experiments, like many similar experiments, were asked to listen to lists of words. However, their task involved simply reporting the last word in the list that began with a *critical letter* (the critical letter changed from list to list, and was shown to the subjects by flipping a card prior to hearing the list). For example, a subject may flip the card, see the letter "k," and then listen to a list of words reporting the last word in that list that began with "k," the critical letter. After working through all the lists, subjects engaged in a simple arithmetic task for one minute before being surprised with a free recall test of *any* of the words presented.

In this experiment, subjects were more likely to engage in maintenance, rather than elaborative, rehearsal, simply keeping the latest critical word in working memory (without cognitively attending to the meaning of the word or its relation to other words) until the next critical word was presented in the list. The rationale for this is pretty straight-forward; given the nature of the task and the lack of anticipation of a memory test, subjects will do what is easiest for them, and not take steps to actively engage the material with any *intent to learn* and remember words for later recall. And the results show just that. Subjects did very poorly in the recall tests, demonstrating that maintenance rehearsal does not lead to better recall.

As an added twist, the space between presentations of critical words in this study was manipulated by the experimenters. In other words, after presentation of a critical

word, the next word with the same letter was presented anywhere from immediately to with twelve items between them. This was to manipulate the amount of maintenance rehearsal that took place; the more items presented between critical words, the more the word will be rehearsed in working memory. Interesting, the amount of rehearsal in no way effected the percentage of words recalled, with subjects scoring poorly on words rehearsed few or many times. Clearly, it is not the amount, but rather the type of rehearsal which dictates the effectiveness of learning and recall- elaborative rehearsal promoting better recall than maintenance rehearsal.

The properties of maintenance rehearsal, namely, the fact that the amount of rehearsal is unimportant when compared to the type of rehearsal, has implications is everyday-life. Everyday exposure to an object may not be enough to form a lasting memory of that object provided that the exposure lacks in creating meaningful bonds. A rather interesting study of this principle is demonstrated by Nickerson and Adams (1979). Their everyday object – the penny. Although exposed to this object literally tens of thousands of times, subjects are unable to accurately identify what else, besides Lincoln's head, is on the front side of the penny, or for that matter, which way his head is facing. It is only after a meaningful (elaborative) rehearsal of the properties of this object, or any other object, that renders its properties available for subsequent storage and retrieval in one's long term memory store.

A Note on Incidental Learning

Many of the experiments discussed proposed that simply knowing a recognition test was to come is not enough to promote better learning or recall (Till & Jenkins, 1973;

Elias & Perfetti, 1973; Hyde & Jenkins, 1973; and others). In other words, incidental and intentional learning usually yield identical results. What makes a difference, rather, is the processes behind the learning, which were manipulated by the experimenters in their studies. To put it another way, the intention to learn is insignificant if it does not include some combination of the subcomponents described above: deep-processing, attention to meaning, and/or elaborative rehearsal. Unlike some of the studies described, however, we expect subjects in this study *with* the intent to learn to score better than subjects *without* the intent to learn, because of the task performed by the latter group. Namely, the task of merely reading through text scanning for spelling errors is one of shallow, nonsemantic processing, where meaning is not attended to and elaborative rehearsal is not expected to take place. On the other hand, those with the intent to learn are free to choose the learning strategy they best see fit, a property fundamentally different than many other studies (both incidental and intentional learning groups were oriented to words in the same way), and we assume that some, although not all, will use strategies of high cognitive activity, thus on the whole scoring better than the group checking for spelling errors. It is important to understand that intentional versus incidental learning is not being challenged here, but rather the important subcomponents of learning, (i.e. depth of processing, attention to meaning, and elaborative rehearsal) are being further explored.

SUMMARY:

While the literature discussed above does contain some discrepancies, overall it provides generally strong and consistent rationale for the hypotheses proposed.

Remember that intent to learn was defined as actively engaging material with the intent to learn and subsequently recall, and includes one of more of the following sub-processes: deep-processing, attention to meaning, and elaborative rehearsal. The current hypothesis predicts that groups with the intent to learn (High Confidence, Low Confidence, and Control groups) should score better on a test of reading comprehension than the group without the intent to learn (the Spelling group). The studies described above provide rationale for this hypothesis, especially with respect to the sub-components of the concept of intent to learn.

Again, however, intent to learn was defined slightly different in past studies, and therefore showed no effect on memory performance. The current study, though, uses a reading comprehension task instead of a word list memory recall task. These tasks are fundamentally different; whereas one could not assume which learning strategies and techniques a participant would engage in, if any, when learning a list of words, we can assume that in most cases, subcomponent processes of intent to learn as described here will be used (subjects will at least attend to the meaning of the sentences contained within the reading comprehension text when knowledgeable about the presence and type of test they are about to take). On the other hand, participants reading through the text for spelling errors, not aware of a subsequent reading comprehension test are not expected to attend to the meaning of the sentences as they read them, nor approach the material with deep levels of processing (visual aspects of a word are considered relatively low in the processing hierarchy) or elaborative rehearsal.

Finally, assuming that confidence can be successfully manipulated, it is hypothesized that confidence levels prior to taking the reading comprehension exam will

effect a participant's performance (i.e. how many questions they answer correctly). Again, most of the studies described above showed positive relationships between confidence and performance in both athletic and cognitive skills, even when manipulating confidence and statistically controlling for factors such as prior performance and prior knowledge. Also, significant and positive results in this study would be consistent with Bandura's model of self efficacy, which not only has strong face validity and makes sense logically, has strong empirical data to support its ideals.

CHAPTER III

SAMPLE:

A total of 147 subjects were included in the study, 60 (40.8%) of which were male, 77 (59.2%) of which were female. All subjects were college undergraduates from a north-eastern university; their ages ranged from 18 to 46, with the mean age being 20.3265 (SD = 3.4545). All participants were recruited from undergraduate psychology courses, and offered extra credit, or the partial fulfillment of a course requirement, in return for their voluntary participation.

The 147 subjects were divided into the four experimental groups as follows: The High Confidence (HC) group consisted of 33 subjects, 9 of which were male, and 24 of which were female; the Low Confidence (LC) group included 53 subjects, with 17 males and 36 females; the Control (C) group consisted of 10 males and 16 females for a total of 26 subjects; and the Spelling (SPL) group included a total of 35 participants, 24 of which were male and 11 of which were female. There were no significant difference between the groups with respect to age.

MATERIALS:

The materials used in the study consisted of a reading comprehension exam short story, a corresponding set of 10 multiple-choice questions, and a brief post-test questionnaire. The reading comprehension short story was taken from the Wechsler Individual Achievement Test (WIAT), and considered far below the reading level of college students. The experimenter felt is should be generally easy for a college level student, given that the story itself would not be available for reference during the question segment of the experiment (so memory and recall can be assessed). The copy contained the title of the story, "The Rock," as well as three paragraphs of narrative content deemed novel to all readers. Two sentences were added, neither of which affected the main idea of the story, so that additional questions can be formulated.

The corresponding set of 10 multiple-choice questions referenced the material contained within the story, and was written by the experimenter. The multiple-choice questions were intended to be directly related to the story and worded clearly. Each question contained 4 choices, labeled "a" through "d", and involved the main idea of the passage as well as details. The question sheet contained also a set of directions, different depending on the group (as confidence was manipulated both vocally and through the directions) asking subjects to circle the answer they think is correct. Finally, the post-test questionnaire, also written by the experimenter, consisted of demographic related questions (age, gender, and year in college), questions about general and reading-comprehension test confidence, 3 questions of confidence (before, during, and after the

test), and finally an item asking participants to report how many of the 10 questions they believed to have answered correctly.

PROCEDURE:

The procedure, while overall uniform, differed slightly depending upon the group being tested. All groups were first asked to read and sign the informed consent sheet, and instructed that their participation was voluntary and could be stopped at any time. For the HC, LC, and C groups, the short story was passed out to all participants, and each was given ample time to read. Before reading, however, participants were given verbal instruction, which differed by group. While all groups were led to think that the study involved the examination of multiple-choice questions, and what makes them easy or difficult: the High Confidence group was led to believe that the questions they were given were simple and easy, and that they may expect to do well; the Low Confidence group was led to believe that the questions they were getting were difficult and tricky, and that they may expect to do poorly; and the Control group was not told anything about the nature of the questions. The Spelling group, on the other hand, was given a different copy of the story, which contained 10 spelling errors, and asked to read through the story and circle words they believed to be misspelled. Subsequently, they were surprised with multiple-choice test.

After reading through the story, all groups were instructed to put away the story, so they could not refer back to it, and then asked to answer the multiple-choice questions

to the best of their ability. When finished, they were then given the post-test questionnaire to fill out, which concluded the session.

HYPOTHESES:

There were three basic hypotheses proposed in this study: subjects in the High Confidence group will score better than the Control group, which in turn will score better than the Low Confidence group; there will be positive relationship between performance and perceived confidence; and subjects with the intent to learn (groups HC, LC, and C) will perform better than those without (SPL group). These proposed hypotheses can be summed up in the follow null and alternate hypotheses:

H_0: There will be no differences in the performances (scores on a reading comprehension test) of the four experimental groups (*HC, LC, C, and SPL*).

H_1: There will be differences in the performances (scores on a reading comprehension test) of the four experimental groups (*HC, LC, C, and SPL*).

H_0: There will be no relationship between a subject's perceived levels of confidence and their scores on a reading comprehensive test.

H_1: There will be a between a subject's perceived levels of confidence and their scores on a reading comprehensive test.

DESIGN:

Concerning the first set of null and alternate hypotheses proposed, there were four group (independent) variables based in a between-subjects design and one dependent variable. The group variables depended on confidence manipulation and the knowledge of a subsequent test and were *high confidence*, *low confidence*, *control*, and *spelling*; the dependent variable was the score on a reading comprehensive test. One-way analysis of variance (ANOVA) was conducted in order to assess the possible differences in the performances of the four independent groups.

The second set of null and alternative hypotheses involved the variables of perceived confidence and test performance. Perceived confidence was further broken down into the levels of confidence *before*, *during*, and *after* testing, *general* and *reading comprehension* test taking skills, as well as how many, of 10 questions, subjects expected to have answered correctly. Pearson correlations were conducted to examine the relationships between these factors and performance on a reading comprehension test.

SUMMARY:

The overall design of the present study involved four independent groups: *high confidence, low confidence, control, and spelling*. These groups were manipulated to investigate the following hypotheses: subjects in the High Confidence group will score better than the Control group, which in turn will score better than the Low Confidence

group; there will be positive relationship between performance and perceived confidence; and subjects with the intent to learn (groups HC, LC, and C) will perform better than those without (SPL group). The next chapter will present the results, including tables and figures, of the statistical analyses (one-way ANOVA and Pearson's correlation) used to explore the hypotheses proposed.

CHAPTER IV

Chapter IV presents data and the results of statistical analyses pertaining to the hypotheses proposed as well as other analyses, both statistical and anecdotal, relative to the study at hand. First explored are hypotheses A and B collectively, which are concerned with how well individuals performed on a test of reading comprehension with respect to confidence manipulation and the intent to learn respectively. Next, data from the post-test questionnaire are presented, with particular focus on the differences in reported levels of confidence between the four groups. Finally, all correlational data related (and unrelated) to hypothesis C are presented, which is concerned with the relationship between confidence and performance.

DATA CONCERNING HYPOTHESES A & B:

Recall hypothesis A, which generally asserts that subjects high in confidence will score better on a test of reading comprehension than subjects low in confidence. In the present study, confidence was manipulated to create three (of four) groups: High Confidence (HC), Low Confidence (LC), and Control (C). Thus, hypothesis A can be otherwise stated that the group high in confidence will score better than the control group, which in turn will score better than the group low in confidence – or HC > C > LC. Hypothesis B, while closely related to hypothesis A, concerned a fourth group,

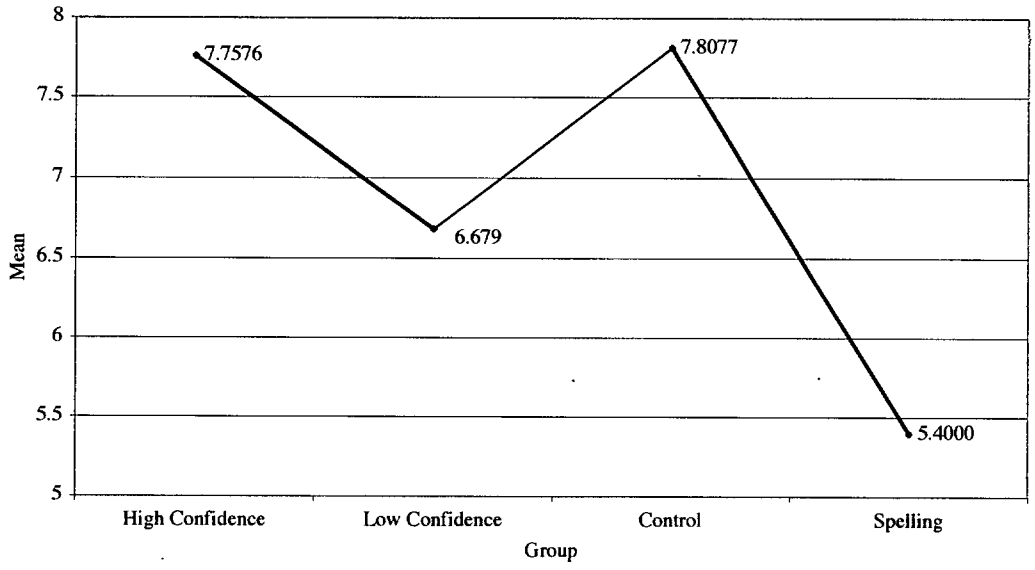
fundamentally different in that its subjects approached the reading comprehension test with no "intent to learn" the material in the text. Instead, those subjects fell under the pretence that they were to read the short story checking for spelling mistakes and then subsequently surprised with the same multiple-choice given to all other groups. Thus a fourth "spelling" group was created (SPL), and hypothesis B speculates that this group, who is not attending to the meaning of the story, nor engaged in elaborative rehearsal or deep-processing, will score lower than all other groups on the test of reading comprehension.

Table 4.1 shows the mean scores (number of questions answered correctly out of 10) and other descriptive data for each of the four groups. On average, the High Confidence group scored a 7.7576 (SD = 1.5417), the control group scored a 7.8077 (SD = 1.5237), the Low confidence group scored a 6.6792 (SD = 1.53266) and the Spelling group scored a 5.4000 (SD = 1.9281). For ease of comparison, these means are presented visually in figure 4.1, and from this table, the potential for significant differences between some of the groups becomes readily apparent.

TABLE 4.1: Descriptive Data – *Number of Correct Answers by Group*

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
HC	33	7.7576	1.54172	.26838	7.2109	8.3042	5.00	10.00
LC	53	6.6792	1.87876	.25807	6.1614	7.1971	2.00	10.00
C	26	7.8077	1.52366	.29881	7.1923	8.4231	5.00	10.00
SPL	35	5.4000	1.92812	.32591	4.7377	6.0623	2.00	9.00
Total	147	6.8163	1.97595	.16297	6.4942	7.1384	2.00	10.00

Figure 4.1: Means Plot - *Number of Correct Answers on Reading Comprehension Test*



To assess if significant differences of mean test scores occurred between groups, a one-way analysis of variance (ANOVA) and Tukey Honestly Significant Differences (HSD) post hoc tests were performed and are presented in tables 4.2 and 4.3 respectively. Results of the ANOVA suggest that certain differences do, in fact, exist between one or more of the experimental groups, $F(3, 143) = 13.525$, $p<.001$. Tukey HSD tests reveal that significant differences were found between: HC and LC groups (mean difference = 1.0783, $p<.05$); HC and SPL groups (mean difference = 2.3576, $p<.001$); C and LC groups (mean difference = 1.1284, $p<.05$); C and SPL groups (mean difference = 2.4077, $p<.001$); and LC and SPL groups (mean difference = 1.2792, $p<.01$). In fact, each of the groups performed significantly different from one another on the reading comprehension test, with the exception of the High Confidence and Control Groups, which scored almost identical.

According to ANOVA and Tukey HSD post hoc analysis, hypothesis A is partially supported, and hypothesis B is completely supported. Concerning hypothesis A,

the Low Confidence group scored significantly lower than both High Confidence and Control groups. However, no significant differences were found between High Confidence and Control group – in other words, the High Confidence group was not found to score higher than Control, but did score higher than the Low Confidence group. Again, figure 4.1 presents, rather nicely, the main findings concerning hypotheses A and B, and the significant differences between the groups, as well as where they lie, can clearly be seen.

TABLE 4.2: ANOVA – *Number of Correct Answers by Group*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	125.995	3	41.998	13.525	.000
Within Groups	444.046	143	3.105		
Total	570.041	146			

TABLE 4.3: Tukey HSD Post Hoc Test - *Number of Correct Answers by Group*

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
HC	LC	1.0783*	.39075	.033	.0626	2.0941
	C	-.0501	.46209	1.000	-1.2513	1.1511
	SPL	2.3576***	.42757	.000	1.2461	3.4690
LC	HC	-1.0783*	.39075	.033	-2.0941	-.0626
	C	-1.1284*	.42192	.041	-2.2252	-.0317
	SPL	1.2792**	.38381	.006	.2815	2.2770
C	HC	.0501	.46209	1.000	-1.1511	1.2513
	LC	1.1284*	.42192	.041	.0317	2.2252
	SPL	2.4077***	.45624	.000	1.2217	3.5937
SPL	HC	-2.3576***	.42757	.000	-3.4690	-1.2461
	LC	-1.2792**	.38381	.006	-2.2770	-.2815
	C	-2.4077***	.45624	.000	-3.5937	-1.2217

* The mean difference is significant at the .05 level.
** The mean difference is significant at the .01 level.
*** The mean difference is significant at the .001 level.

CONFIDENCE MANIPULATION:

The core, and essentially the crux, of the entire research study was dependent upon confidence. Hence, a number of statistical analyses were conducted to investigate the characteristics of confidence pertaining to this study independent of any hypotheses proposed. Mainly, in order to investigate the nature and influence of confidence on academic performance, two essential questions must be examined: was confidence successfully manipulated in the present study (did differences exist in the reported levels of a subject's confidence between groups); and is it possible, as suggested by Albert Bandura's Self-Efficacy Theory, to significantly effect the confidence of an individual simply by "verbal persuasion."

For such questions to be examined, all subjects were asked to rate their levels of confidence *before*, *during*, and *after* taking the reading comprehension test, in a post-test questionnaire. All questions were scored on a 5-point rating scale as follows: 1 = very low confidence, 2 = fairly low confidence, 3 = average confidence, 4 = fairly high confidence, and 5 = very high confidence. Mean scores, as well as other descriptive data, for each group are presented in table 4.4.

Figures 4.2, 4.3, and 4.4 present, in visual form, the mean scores of subject's reported levels of confidence before, during, and after taking the reading comprehension test respectively. When compared, the graphs clearly demonstrate a consistent trend in mean confidence levels between the groups at all three time periods – namely, an overall similarity between High Confidence and Control groups, and lower scores for both Low Confidence and Spelling Groups. These trends also share an overall similarity to the trend

found for the data of Hypothesis A (as shown in figure 4.1), with very similar results for each of the four groups.

TABLE 4.4: Descriptive Data – *Confidence About Reading Comprehension Test by Group*

Variable	Group	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Confidence *Before* Test	HC	33	3.7879	.81997	.14274	3.4971	4.0786	2.00	5.00
	LC	53	3.1887	.85612	.11760	2.9527	3.4247	1.00	5.00
	C	26	3.5769	.98684	.19353	3.1783	3.9755	1.00	5.00
	SPL	35	2.5714	.94824	.16028	2.2457	2.8972	1.00	5.00
	Total	147	3.2449	.99031	.08168	3.0835	3.4063	1.00	5.00
Confidence *During* Test	HC	33	3.7273	.83937	.14612	3.4296	4.0249	2.00	5.00
	LC	53	3.2075	.68944	.09470	3.0175	3.3976	1.00	4.00
	C	26	3.8462	.92487	.18138	3.4726	4.2197	2.00	5.00
	SPL	35	2.7714	.80753	.13650	2.4940	3.0488	1.00	4.00
	Total	147	3.3333	.88622	.07309	3.1889	3.4778	1.00	5.00
Confidence *After* Test	HC	33	3.8485	.87039	.15152	3.5399	4.1571	2.00	5.00
	LC	53	3.1321	.85570	.11754	2.8962	3.3679	1.00	5.00
	C	26	3.7308	.82741	.16227	3.3966	4.0650	2.00	5.00
	SPL	35	2.4000	.91394	.15448	2.0860	2.7140	1.00	5.00
	Total	147	3.2245	1.01897	.08404	3.0584	3.3906	1.00	5.00

Figure 4.2: Means Plot - *Confidence Before Taking Reading Comprehension Test*

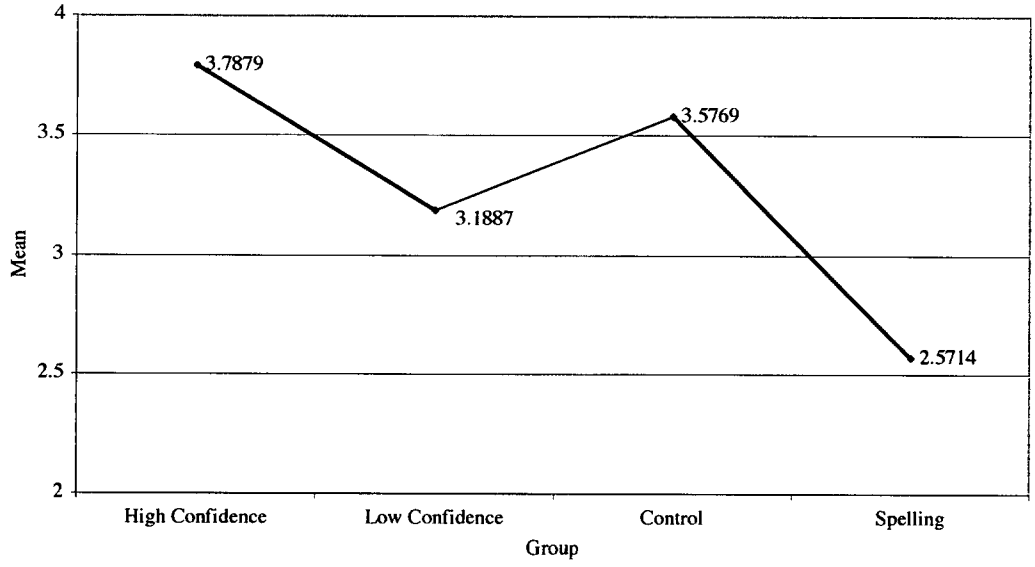


Figure 4.3: Means Plot - *Confidence During Reading Comprehension Test*

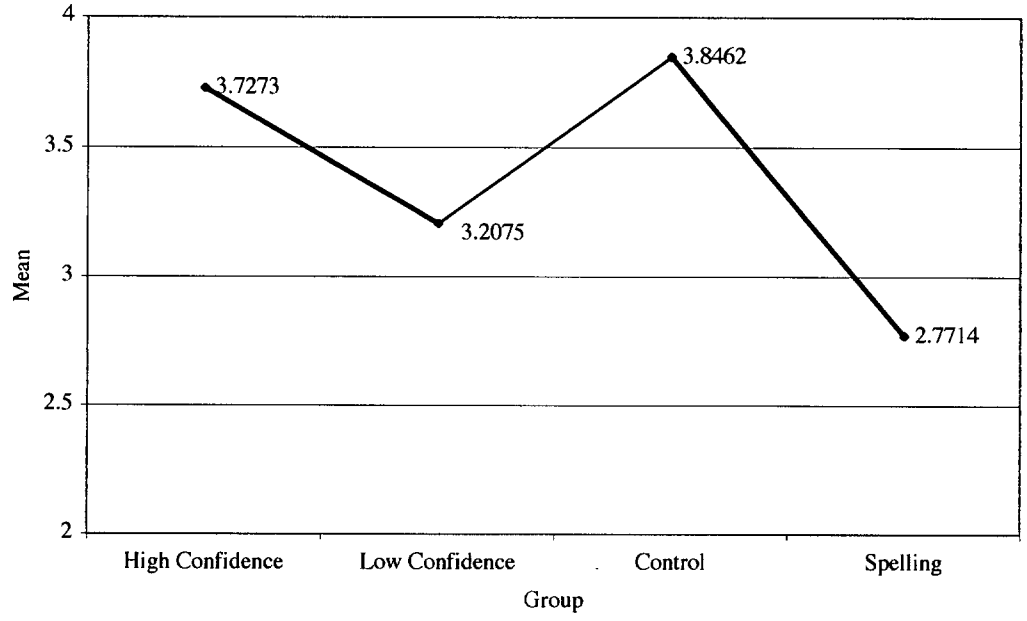
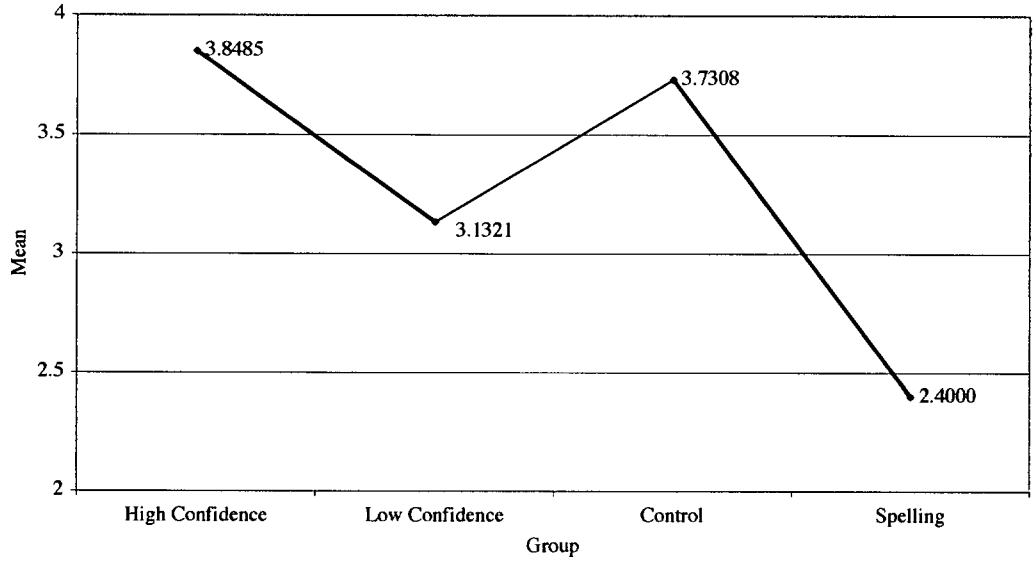


Figure 4.4: Means Plot - *Confidence After Taking Reading Comprehension Test*



To assess if confidence was significantly manipulated in the present study, and that one's level of confidence, even in academics, can be effected by "verbal persuasion," one-way ANOVAs and Tukey HSD post hoc tests were performed. Table 4.5 presents the results of the ANOVA, and as the table shows, significant differences exist, between at

least some of the groups, for all measures of confidence: for confidence before taking the test, $F(3, 143) = 11.917$, $p<.001$; for confidence during the test, $F(3,143) = 12.517$, $p<.001$; and for confidence after taking the test, $F(3, 143) = 19.343$, $p<.001$.

TABLE 4.5: ANOVA – *Confidence About Reading Comprehension Test by Group*

Variable		Sum of Squares	df	Mean Square	F	Sig.
Confidence *Before* Taking Test	Between Groups	28.638	3	9.546	11.917	.000
	Within Groups	114.546	143	.801		
	Total	143.184	146			
Confidence *During* Test	Between Groups	23.848	3	7.949	12.517	.000
	Within Groups	90.818	143	.635		
	Total	114.667	146			
Confidence *After* Taking Test	Between Groups	43.759	3	14.586	19.343	.000
	Within Groups	107.833	143	.754		
	Total	151.592	146			

Tukey HSD post hoc tests, presented in table 4.6, reveal significant differences between most of the groups for all the measures of confidence (before, during, and after taking the test), demonstrating the successful manipulation of confidence, and again yielding results similar in trend to those of hypotheses A and B. In fact, the High Confidence and Control groups are the only two groups which consistently show no significant differences in reported confidence at all three times. Otherwise, there were only two other situations where differences between groups were not found significant: before taking the test, the Low Confidence group was not found to report lower levels of confidence than the Control group, although it did compared to the High Confidence group; and during the test, the Low Confidence group actually reported low levels of confidence comparable to that of the Spelling group, which neither intended to learn the material nor aware of a subsequent reading comprehension test.

TABLE 4.6: Tukey HSD Post Hoc Test – *Confidence About Reading Comprehension Test*

Variable	(I) Group	(J) Group	Mean Diff (I-J)	SE	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Confidence *Before* Taking Test	HC	LC	.5992*	.19846	.016	.0833	1.1151
		C	.2110	.23470	.805	-.3991	.8210
		SPL	1.2165***	.21716	.000	.6519	1.7810
	LC	HC	-.5992*	.19846	.016	-1.1151	-.0833
		C	-.3882	.21429	.272	-.9453	.1688
		SPL	.6173*	.19494	.010	.1105	1.1240
	C	HC	-.2110	.23470	.805	-.8210	.3991
		LC	.3882	.21429	.272	-.1688	.9453
		SPL	1.0055***	.23172	.000	.4031	1.6079
	SPL	HC	-1.2165***	.21716	.000	-1.7810	-.6519
		LC	-.6173*	.19494	.010	-1.1240	-.1105
		C	-1.0055***	.23172	.000	-1.6079	-.4031
Confidence *During* Test	HC	LC	.5197*	.17672	.020	.0604	.9791
		C	-.1189	.20898	.941	-.6621	.4244
		SPL	.9558***	.19337	.000	.4532	1.4585
	LC	HC	-.5197*	.17672	.020	-.9791	-.0604
		C	-.6386**	.19081	.006	-1.1346	-.1426
		SPL	.4361	.17358	.062	-.0151	.8873
	C	HC	.1189	.20898	.941	-.4244	.6621
		LC	.6386**	.19081	.006	.1426	1.1346
		SPL	1.0747***	.20633	.000	.5384	1.6111
	SPL	HC	-.9558***	.19337	.000	-1.4585	-.4532
		LC	-.4361	.17358	.062	-.8873	.0151
		C	-1.0747***	.20633	.000	-1.6111	-.5384
Confidence *After* Taking Test	HC	LC	.7164**	.19256	.002	.2159	1.2170
		C	.1177	.22771	.955	-.4742	.7097
		SPL	1.4485***	.21070	.000	.9008	1.9962
	LC	HC	-.7164**	.19256	.002	-1.2170	-.2159
		C	-.5987*	.20792	.024	-1.1392	-.0582
		SPL	.7321**	.18914	.001	.2404	1.2237
	C	HC	-.1177	.22771	.955	-.7097	.4742
		LC	.5987*	.20792	.024	.0582	1.1392
		SPL	1.3308***	.22483	.000	.7463	1.9152
	SPL	HC	-1.4485***	.21070	.000	-1.9962	-.9008
		LC	-.7321**	.18914	.001	-1.2237	-.2404
		C	-1.3308***	.22483	.000	-1.9152	-.7463

* The mean difference is significant at the .05 level.
** The mean difference is significant at the .01 level.
*** The mean difference is significant at the .001 level.

Participants in all groups were also asked to estimate the number of questions (out of 10) they believed to have answered correctly. While this, too, is not directly related to

any of the hypotheses proposed, and is better suited for the correlational analyses to be discussed later, ANOVAs and Tukey HSD post hoc tests were conducted to analyze any potential differences in this respect between the four groups.

Table 4.7 presents the mean estimated score, and other descriptive data, for each of the four groups, and displayed visually in figure 4.5, juxtaposed with the actual number of correct responses. The High Confidence group, on average, estimated to have answered 8.1212 (SD = 1.2185) correct, the Control group estimated 7.6923 (SD = 1.3790) correct, the Low Confidence group estimated 6.2453 (SD = 1.5678), and the Spelling group estimated 4.7429 (SD = 1.8684).

TABLE 4.7: Descriptive Data – *Number of Questions Estimated to Have Answered Correct*

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
HC	33	8.1212	1.21854	.21212	7.6891	8.5533	5.00	10.00
LC	53	6.2453	1.56777	.21535	5.8132	6.6774	3.00	9.00
C	26	7.6923	1.37896	.27044	7.1353	8.2493	4.00	10.00
SPL	35	4.7429	1.86836	.31581	4.1011	5.3847	1.00	9.00
Total	147	6.5646	1.98649	.16384	6.2408	6.8884	1.00	10.00

Figure 4.5: Means Plot - *Actual Number Correct Versus Estimated Number Correct*

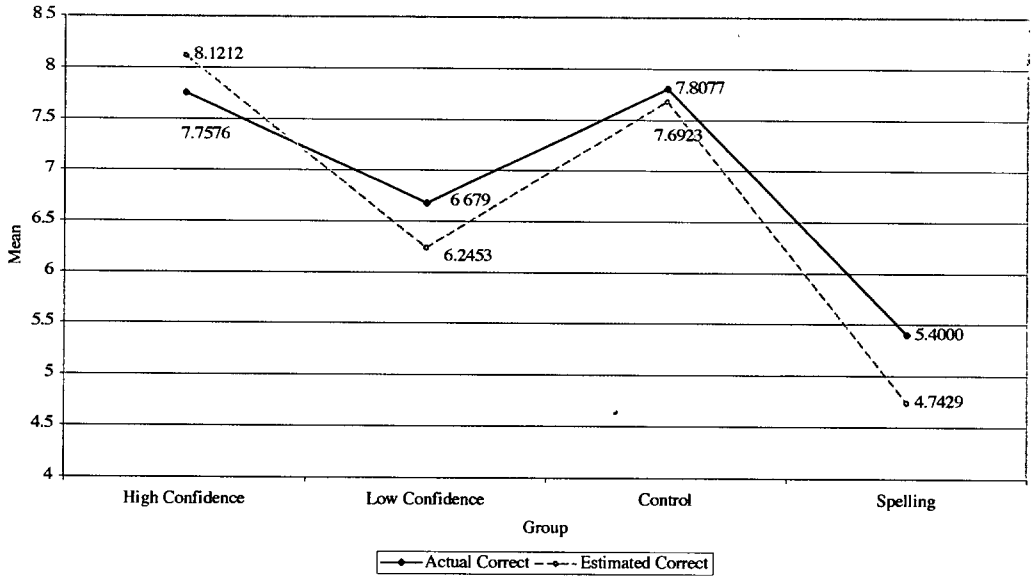


Table 4.8 and 4.9 display the results of the one-way ANOVA and Tukey post hoc analysis, respectively. Results indicated significant differences in the estimated number of correct responses by group ($F(3,143) = 32.739$, $p<.001$), with differences falling, again, in a pattern similar to that of the actual number of correct responses by group (Hypotheses A and B). As revealed by Tukey HSD post hoc tests, differences were found in the estimation of all groups except between the High Confidence and Control groups. Correlational analysis, discussed later in this chapter, also reveals that these means relate rather well with participant's actual scores on the test.

TABLE 4.8: ANOVA - *Number of Questions Estimated to Have Answered Correct by Group*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	234.585	3	78.195	32.739	.000
Within Groups	341.551	143	2.388		
Total	576.136	146			

TABLE 4.9: Tukey HSD Post Hoc Test - *Number of Questions Estimated to Have Answered Correct by Group*

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
HC	LC	1.8759***	.34270	.000	.9851	2.7668
	C	.4289	.40527	.715	-.6246	1.4824
	SPL	3.3784***	.37499	.000	2.4036	4.3531
LC	HC	-1.8759***	.34270	.000	-2.7668	-.9851
	C	-1.4470**	.37004	.001	-2.4089	-.4851
	SPL	1.5024***	.33661	.000	.6274	2.3774
C	HC	-.4289	.40527	.715	-1.4824	.6246
	LC	1.4470**	.37004	.001	.4851	2.4089
	SPL	2.9495***	.40013	.000	1.9093	3.9896
SPL	HC	-3.3784***	.37499	.000	-4.3531	-2.4036
	LC	-1.5024***	.33661	.000	-2.3774	-.6274
	C	-2.9495***	.40013	.000	-3.9896	-1.9093

** The mean difference is significant at the .01 level.
*** The mean difference is significant at the .001 level.

Finally, participants were also asked to rate their confidence in their *general* and *reading comprehension* test taking skills. No significant differences were found between any of the groups for either variable. Such findings suggest that, at least on a perceptual

level, that no group had any particular advantage over the next, i.e., all groups rated their general and reading comprehension test-taking skills comparably.

CORRELATIONAL DATA AND HYPOTHESIS C:

Recall hypothesis C, which contends that a positive relationship will exist between scores on the reading comprehension test and a subject's perceived level of confidence independent of the group they were in. Table 4.10 presents the results of a Pearson correlational analysis relative to hypothesis C, as well as correlations designed to examine other aspects of confidence and estimations of performance.

TABLE 4.10: Pearson's Correlations

				Reported Levels of Confidence				
		Actual Correct	Estimated Correct	In General Test Taking	In Reading-Comprehension	Before Taking Test	During Test	After Taking Test
Actual Correct	r	1	.506***	.184*	.112	.293***	.368***	.504***
	Sig	.	.000	.026	.178	.000	.000	.000
	N	147	147	147	147	147	147	147
Estimated Correct	R	.506***	1	.179*	.121	.424***	.635***	.769***
	Sig	.000	.	.030	.144	.000	.000	.000
	n	147	147	147	147	147	147	147

* Significant at the .05 level..
*** Significant at the .001 level.

With respect to hypothesis C, there were a number of significant positive correlations between the number of correct responses and the various measures of confidence. As can be seen on the first line of table 4.10, there was a positive relationship between the actual number of correct answers and confidence in general test taking skills ($r=.184$, $p<.05$), confidence before taking the test ($r=.293$, $p<.001$), confidence during the test ($r=.368$, $p<.001$), and confidence after taking the test ($r=.504$, $p<.001$). Surprisingly,

no relationship was found between one's confidence in their reading comprehension test taking skills and the number of correct answers (r=.112, n.s.).

Many other correlations, available for analysis, were not presented in table 4.10, as most involve the relationships between the various reported levels of confidence, and not surprisingly are mostly positive and strongly significant. However, one other correlation of particular interest, and thus presented, is the strong correlation between a subject's estimated number of correct answers and their actual number of correct answers (r=.506, p<.001). In this case, subjects were able to rather accurately estimate their performance regardless of experimental group.

CHAPTER V

The present study was designed to better our understanding of human memory acquisition and recall by investigating what role, if any, confidence plays in tasks of academic performance and attempting to provide construct validity to the concept of intent to learn and its related principles of deep processing, attention to meaning, and elaborative rehearsal. These purposes not only fill a need for continued research in the cognitive and behavioral psychological sciences, but can also find practical application in nearly all aspects of life, most notably in the school setting.

Confidence was defined in its simplest form as the degree to which an individual expects to succeed or fail at any given task. This concept was elaborated on using Albert Bandura's Model of Self-Efficacy (Schultz & Schultz, 1998): high self-efficacy is associated with positive attitudes, high confidence, improved problem solving and analytical skills, and greater performance levels; low self-efficacy, on the other hand, is associated with decreased motivation, lower confidence, lower effort, and impeded performance. In addition, Bandura proposed four major influential sources which can effect an individual' self-efficacy: performance attainment; vicarious experiences; physiological & emotional arousal; and, most important to the present study, verbal persuasion.

Intent to learn was defined as actively engaging material or information with the

intention to learn, retain, and subsequently recall the information, and involves any combination of the following principles: deep-processing, attention to meaning, and elaborative rehearsal. Deep-processing refers to the level of processing (shallow, medium, deep) that involves the highest levels of cognitive activity. Attention to meaning, as simple as it sounds, refers to actively attending to the meaning of the material or information being learned. Finally, elaborative rehearsal is a process, requiring proactive thinking, that moves information from working- to long-term memory by focusing on meaning and attending to how newly acquired pieces of information relate to each other, to their environment, or to previously existing knowledge.

To examine the roles these principles have on academic performance, a reading comprehension test, involving a one-page short story and 10 multiple-choice questions, was given to individuals divided into four groups. Before administering the test, the confidence of the groups were manipulated (both verbally and in the directions) to create a group high in confidence (expecting easy questions and anticipating to do well), a group low in confidence (expecting difficult questions and anticipating to do poorly), and a control group (no manipulation). In addition, a fourth group was asked to read the story checking for spelling errors and not aware of a subsequent multiple-choice test. Despite the belief that different groups were receiving questions of varying difficulty levels, all participants in the study received the exact same set of ten questions.

Thus experimental and correlational analyses were performed to test the following hypotheses:

A: Subjects in the High Confidence Group will score higher than Control, which in turn will score higher than subjects in the Low Confidence Group.

B: Groups with intent to learn (High Confidence, Control, Low Confidence) will score higher than the group not expecting the test (Spelling)

C: (Correlation) There will be a positive relationship between scores on the test and a subject's perceived level of confidence.

DISCUSSION:

Confidence

Examining the role of confidence (prior to task) on academic performance represents the main purpose of the study at hand. Results indicate a significant role for confidence in this respect, as hypothesis A was partially supported. While no effects were apparent for the High Confidence group, who scored no different than control, a substantial and significant effect was found for the Low Confidence group. On average, the Low Confidence group scored slightly over one point lower than both the High Confidence group (mean difference = 1.0783) and the Control group (mean difference = 1.1284). This significant difference in score suggests that approaching an academic task with low levels of confidence may be enough to impede performance on that task, at least to a degree. While one point may not seem like much, it does represent a whole letter grade in difference, and in this case, a difference between a "D" and a "C".

While most of the previous research on confidence focuses on athletics and effects from previous experience, the current experiment was very similar to that of a study by Weinberg (1986), who also attempted to manipulate confidence before a task, and results were similar. In that study, participants, engaged in a leg lifting endurance

task, thought they were in competition with either someone who exhibited high performance in the task (thus creating a low confidence group) or a person with a knee injury (thus, a high confidence group). Naturally, those with higher confidence exerted more effort and lasted significantly longer than those low in confidence. In other words, the high confidence group performed better than the low confidence group, and, since no control group was utilized, the results are very similar to the results presented here, where the high confidence group significantly outperformed the low confidence group on the reading comprehension test.

Hypothesis B represents a correlational approach to looking at confidence in this study, and again, results indicate a role for confidence in academic performance. In this case, confidence was found to be significantly related to the number of correct answers on the reading comprehension test. Specifically, the actual number of correct answers was found to be related to a subject's reported level of confidence before the test (r=.293), during the test (r=.368) and after the test (r=.504). Scores were also, however not strongly, related to a subject's reported confidence in their general test taking skills, but surprisingly in no way related to their reported confidence in their reading comprehension skills. This may be due to the fact that subject's were not permitted to look back on the story while answering the questions (so memory and recall can be measured), a procedure fundamentally different than most other reading comprehension tests.

The correlational findings in the present study closely resemble those in previous confidence studies in both athletics and academics. Indeed, most of the prior research centers around correlational analysis. For example, Martin and Gill (1991) and

LaGuardia & Labbe (1993) each found confidence to be strongly related to successful performance in long distance running. Similar relationships were found between confidence and performance in tennis (Barling & Abel, 1983), putting (Pickens, Rotella, & Gansneder, 1996), wrestling (Teasure, Monson, & Lox, 1996), swimming (Pscychountaki, Athens, & Zervas, 2000), and many other athletic activities (Taylor, 1987). Present findings emulate also those in certain academic studies, also correlational in nature. For example, Pajares and Johnson (1996) found confidence in one's writing ability to be highly related to writing performance, and Pajares and Miller (1995) found the same relationship to exist between confidence and mathematical problem solving skills.

To investigate possible explanations of why subjects lower in confidence scored lower on the reading comprehension test in the current study than subjects higher in confidence, it may be necessary to refer back to the *memory model* and *memory error* sections of chapter one. The first and simplest explanation is that human memory, acquisition, and recall, represent very complex tasks involving multiple systems and multiple processes, including encoding, storage, and retrieval. Indeed, much can and does go wrong, and that is without low levels of confidence impeding on the process. Another explanation is that low levels of confidence may open doors to a number of possible memory errors, especially during a task such as a multiple-choice test. For example, low confidence individuals may be prone to errors of familiarity (certain choices, although incorrect, may be mistakenly judged as accurate simply because they are familiar) or errors of suggestibility (where the wording of a question may have been more confusing to those low in confidence and already second-guessing themselves). Intrusion errors

represent yet another possibility; the choices they encounter in the questions can intrude, and distort, existing knowledge – if one is already unsure of themselves, they may more prone (more easily influenced) by incorrect choices.

Intent to Learn

The "intent to learn" portion of the study was represented by Hypothesis C, which contends that subjects in the Spelling group, who were reading for spelling errors and unaware of the multiple-choice test (therefore not engaged in deep-processing, attention to meaning, and elaborative rehearsal) would score the lowest out of all groups in the experiment. Results indicate just that, and full support for Hypothesis C. With an average of 5.4 correct responses, the Spelling group scored, on average, 1.2792 points lower than the Low Confidence group, 2.3576 points lower than the High Confidence group, and 2.4077 points lower than the Control group. These results indicate a very strong and significant role for the concept of intent to learn on memory and recall, and suggest importance for actively and meaningfully engaging material when later called upon to retrieve said material.

These findings are not at all surprising, as they only add construct validity to concepts long supported by studies in the area of cognitive psychology. For example, it has been long known that encoding with deeper levels of cognitive processing (such as judging the semantic qualities of words) leads to better recall than shallow levels of processing (such as checking if words contain certain letters); as demonstrated in a study by Hyde and Jenkins (1973), where deep-processing lead to roughly double the amount of recall than did shallow-processing. Consequently, previous studies, such as the one

conducted by Craik and Tulving (1975), demonstrate that attending to the meaning of a stimulus yield far greater amounts of recall than simply concentrating on the structural or phonemic qualities of the stimulus. Finally, it is by definition, at this point, that we accept elaborative rehearsal as the process that transfers information from working (or short-term) memory into long-term memory and maintenance rehearsal the keeps information active in working memory (Reisberg, 1997). This concept has been supported by many studies, including Craik and Watkins (1973), where maintenance rehearsal was proven a far inferior technique in the promotion of recall than was elaborative rehearsal.

As stated, the present findings that the Spelling group (that without the intent to learn the material presented) scored lower on the reading comprehension test than all other groups, is not at all surprising. The reasoning behind the results is inherent in the definition provided. Namely, scanning text in search of spelling mistakes is not a task that requires deep and meaningful processing, does not have individuals attending to the meaning of the story, and, if anything, involves maintenance, rather than elaborative rehearsal. Years of research in cognitive psychology have shown the importance of these principles in tasks involving the acquisition and recall of information, and the present study was certain no exception.

Other Findings

The most important statistical analysis in this study, independent from any of the hypotheses proposed, was that which examined the effects of the attempted confidence manipulation. Results indicate that confidence was indeed manipulated, but only for the Low Confidence group; High Confidence and Control groups reported similar levels of

confidence, and coincidentally scored similar on the reading comprehension test. It is not certain why, in fact, no effect was found for the High Confidence group, although it may have been due to the nature of the task (college undergraduates are already confidence in tests like these, and manipulation was not enough to produce differences between the High Confidence and Control groups) or perhaps the verbal persuasion was too short and non-intense to produce the effect sought. However, the fact that the Low Confidence group reported levels of confidence significantly below that of the other two groups suggests not only that confidence can be and was manipulated in this case, but that the differences in scores between the groups was most likely due to differences in confidence.

A final interesting and notable result involves the relationship between a subject's estimated number of correct answers and their actual number of correct answers. The high and significant correlation between the two suggests that subject's were able to very accurately judge their performance and guess how many questions they answered correctly. Also, analysis of variance for both variables yielded a similar pattern of results; namely, differences between all groups except the HC and C groups. Interestingly, it seems that, if anything, the High Confidence group may have overestimated their performance, whereas the Low Confidence group may have underestimated their performance, providing further evidence that confidence had a significant role in this experiment.

CONCLUSIONS:

There are three general conclusions that can made from the results of this study. The first is that the intention to learn material (through deep-processing, attention to meaning, and elaborative rehearsal) plays a vital role in the processes of learning, memory, and recall. Naturally, approaching stimuli and information with this in mind can greatly enhance productivity in all areas of life, most notably in the school setting. Many already have poor study habits; this and previous studies have shown that trying to memorize material, even repetitively, or attempting to learn material without fully understanding it, is a poor, inadequate, and insufficient way of learning.

A second conclusion is that confidence is dynamic, and seemingly delicate, in that is can be manipulated and changed, at times with relative ease. Recall that in Bandura's Model of Self-Efficacy (Schultz & Schultz, 1998), he cites four major influential sources which can influence confidence. Performance attainment states that prior experience can raise or lower one's confidence; watching someone else succeed or fail (vicarious experiences) can also sway confidence; and confidence is aversely effected when one is experiencing feelings of stress, tension, and fear (physiological and emotional arousal). The present study adds validity to the fourth source of influence, verbal persuasion, which contends that the levels of an individual's confidence is susceptible to verbal suggestibility.

A third, and perhaps most significant conclusion, involves the main purpose of this study, which was to examine the role of confidence (prior to task) on academic performance. The results suggest that confidence plays an important and significant role

in tasks of academics, and previous studies have made similar suggestions for other tasks, most notably athletics. It has been long known and accepted that performance (good or bad) affects confidence; but research, including that presented here, suggests that confidence affects performance, perhaps even in tasks of academic and cognitive abilities.

Implications for Future Research

There are a number of ways the research presented here can be expanded on in the future. For example, Bandura suggested that physiological & emotional arousal can impact confidence; a design similar to the current experiment can examine this claim, as well as its effects on performance, by adding items to measure levels of stress and tension during the procedure. Another expansion could be to see if any gender differences exist for any of the results explored here. But perhaps the most important expansions would be to administer the same procedure to different age groups and to use different academic tasks. The primary purpose of the study was to examine the role of confidence on academic tasks, mostly because of potential implications in the school setting. It would only seem appropriate, then, to examine that role with age groups representative of all grade levels, and use a variety of academic tasks typical to the school environment.

REFERENCES

Barling, J. & Abel, M. (1983). Self-efficacy beliefs and tennis performance. *Cognitive Therapy & Research, 7*(3), 265-272.

Begg, I., Anas, A., & Farinacci, S. (1992). Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth. *Journal of Experimental Psychology: General, 121*, 446-458.

Bobrow, S. A. & Bower, G. H. (1969). Comprehension and recall of sentences. *Journal of Experimental Psychology, 80*(3), 445-461.

Bower, G. H., Clark, M. C., Lesgold, A. M., & Winzenz, D. (1969). Hierarchal retrieval schemes in recall of categorized word lists. *Journal of Verbal Learning and Verbal Behavior, 8*, 323-343.

Clark, R. A. (1993). Men's and women's self confidence in persuasive, comforting, and justificatory communicative tasks. *Sex Roles, 28(9-10)*, 553-567.

Craik, F. I. M. & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11*, 671-684.

Craik F. I. M. & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology; General, 104*, 269-294.

Craik, F. I. M, & Watkins, M. J. (1973). The role of rehearsal in short-term memory. *Journal of Verbal Learning and Verbal Behavior, 12*, 599-607.

Elias, C. S., & Perfetti, C. A. (1973). Encoding task and recognition memory: The importance of semantic encoding. *Journal of Experimental Psychology, 99,* 151-156.

Feldman, R. S. (1999). *Understanding psychology, 5th ed.* New York: McGraw-Hill College.

Flowers, J. V. (1991). A behavioral method of increasing self-confidence in elementary school children: Treatment and modeling results. *British Journal of Educational Psychology, 61*(1), 13-18.

Garza, D. L. & Feltz, D. L. (1998). Effects of selected mental practice on performance, self-efficacy, and competition confidence of figure skaters. *Sport Psychologist, 12*(1), 1-15.

Hackett, G. & Betz, N. E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. *Journal for Research in Mathematics Education, 20*(3), 261-273.

Hyde, T. S. & Jenkins, J. J. (1973) Recall for words as a function of semantic, graphic, and syntactic orienting tasks. *Journal of Verbal Learning and Verbal Behavior, 12*, 471-480.

Jacoby, L. L. (1978). On interpreting the effects of repetition: Solving a problem versus remembering a solution. *Journal of Verbal Learning and Verbal Behavior, 22*, 485-508.

Jacoby, L. L., & Witherspoon, D (1982). Remembering without awareness. *Canadian Journal of Psychology, 36*, 300-324.

LaGuardia, R. & Labbe, E. E. (1993). Self-efficacy and anxiety and their relationship to training and race performance. *Perceptual and Motor Skills, 77*, 27-34.

Lenney, E., Gold, J., & Browning, C. (1983). Sex differences in self-confidence: The influence of comparison to others' ability level. *Sex Roles, 9*(9), 925-942.

Lent, R. W., Brown, S. D., & Larkin, K. C. (1986). Self-efficacy in the prediction of academic performance and perceived career options. *Journal of Counseling Psychology, 33*(3), 265-269.

Loftus, E. F. (1975). Leading questions and the eyewitness report. *Cognitive Psychology, 7*, 560-572.

Lundeberg, M. A., Fox, P. W., Brown, A. C., & Elbedour, S. (2000). Cultural influences on confidence: Country and gender. *Journal of Educational Psychology, 92*(1), 152-159.

Marston, A. R. (1968). Dealing with low self-confidence. *Educational Research, 10*(2), 134-138.

Martin, J. J., & Gill, D. L. (1991) The relationships among competitive orientation, sport-confidence, self-efficacy, anxiety, and performance. *Journal of Sport & Exercise Psychology, 13,* 149-159.

Marottoli, R. A. & Richardson, E. D. (1998). Confidence in, and self-rating of, driving ability among older drivers. *Accident Analysis & Prevention, 30*(3), 331-336.

McCarty, P. A. (1986). Effects of feedback on the self-confidence of men and women. *Academy of Management Journal, 29*(4), 840-847.

Miller, G. (1956). The magical number seven plus or minus two: Some limitations on our capacity for processing information. *Psychological Review, 63,* 81-97.

Moller, L. & Russell, J. D. (1994). An application of the ARCS model design process and confidence-building strategies. *Performance Improvement Quarterly, 7*(4), 54-69.

Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation. *Journal of Counseling Psychology, 38*(1), 30-38.

Nelson, D. L., Walling, J. R., & McEvoy, C. L. (1979). Doubts about depth. *Journal of Experimental Psychology: Human Leaning and Memory, 5*(1), 24-44.

Nickerson, R. A., & Adams, M. J. (1979). Long-term memory for a common object. *Cognitive Psychology, 11*, 287-307.

Norwich, B. (1987). Self-efficacy and mathematics achievement: A study of their relation. *Journal of Educational Psychology, 79*(4), 384-387.

Pajares, F. & Johnson, M. J. (1996). Self-efficacy beliefs and the writing performance of entering high school students. *Psychology in the Schools, 33*, 163-174.

Pajares, F. & Miller, M. D. (1995). Mathematics self-efficacy and mathematics performance: The need for specificity of assessment. *Journal of Counseling Psychology, 42*(2), 190-198.

Pickens, M. M., Rotella, R. J., & Gansneder, B. M. (1996). The effect of putting-confidence on putting-performance. *Journal of Sport Behavior, 19*(2), 148-162.

Psychountaki, M., Athens, G., & Zervas, Y. (2000). Competitive worries, sport confidence, and performance ratings for young swimmers. *Perceptual & Motor Skills 91*(1), 87-94.

Reddy, M. S. (1983). Study of self-confidence and achievement motivation in relation to academic achievement. *Journal of Psychological Researches, 27*(2), 87-91.

Reisberg, D. (1997) Cognition: *Exploring the science of the mind.* New York: W. W. Norton & Company.

Ryska, T. A. (2002). Effects of situational self-handicapping and state self-confidence on the physical performance of young participants. *Psychological Record, 52*(4), 461-478.

Savoy, C. & Beitel, P. (1997). The relative effect of a group and group/individualized program on state anxiety and state self-confidence. *Journal of Sport Behavior, 20*(3), 364-376.

Schulman, A. I. (1971). Recognition memory for targets from a scanned word list. *British Journal of Psychology, 62*, 335-346.

Shiffrin, R. M., & Atkinson, R. C. (1969). Storage and retrieval processes in long-term memory. Psychological Review, 76, 179-193.

Shultz, D. & Shultz, S. E. (1998). *Theories of personality, 6th ed.* New York: Brooks/Cole Publishing Company.

Taylor, J. (1987). Predicting athletic performance with self-confidence and somatic and cognitive anxiety as a function of motor and physiological requirements in six sports. *Journal of Personality, 55*(1), 139-153.

Till, R. E. & Jenkins, J. J. (1973). The effects of cued orienting tasks on the free recall of words. *Journal of Verbal Learning and Verbal Behavior, 12*, 489-498.

Treasure, D. C., Monson, J., & Lox, C. L. (1996). Relationship between self-efficacy, wrestling performance, and affect prior to competition. *Sport Psychologist, 10*(1), 73-83.

Tresselt, M. E., & Mayzner, M. S. (1960). A study of incidental learning. *Journal of Psychology, 21*, 339-347.

Vancouver, J. B., Thompson, C. M., Tischner, E. C., & Putka, D. J. (2002). Two studies examining the negative effect of self-efficacy on performance. *Journal of Applied Psychology, 87*(3), 506-516.

Weinberg, R. S. (1986). Relationship between self-efficacy and cognitive strategies in enhancing endurance performance. *International Journal of Sport Psychology, 17*(4), 280-292.

Weiss, M. R., Wiese, D. M., & Klint, K. A. (1989). Head over heels with success: The relationship between self-efficacy and performance in competitive youth gymnastics. *Journal of Sport & Exercise Psychology, 11*(4), 444-451.

Winfrey, M. L., & Weeks, D. L. (1993). Effects of self-modeling on self-efficacy and balance beam performance. *Perceptual & Motor Skills, 77*(3), 907-913.

Wood, R. E., & Locke, E. A. (1987). The relation of self-efficacy and grade goals to academic performance. *Educational & Psychological Measurement, 47*(7), 1013-1024.

Ziegler, A. & Heller, K. A. (2000). Conditions for self-confidence among boys and girls achieving highly in chemistry. *Journal of Secondary Gifted Education, 11*(3), 144-151.

Zuckerman, D. M. (1989). Stress, self-esteem, and mental health: How does gender make a difference? *Sex Roles, 20*(7-8), 429-444.