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I am submitting herewith a dissertation written by Peggy F. Hopper entitled "The Effect of Reading Instruction on Calibration Abilities Of At-Risk College Reading Students." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

Dr. J. Estill Alexander
Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of The Graduate School

THE EFFECT OF READING INSTRUCTION ON CALIBRATION ABILITIES OF AT-RISK COLLEGE READING STUDENTS

A Dissertation

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Degree

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By

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Abstract

Most research into metacognition has used populations of children. Therefore, the purpose of this research was to extend general knowledge about metacognition based on child data to adult populations. Previous research into adult metacognitive abilities has focused on academically stable college populations. For this reason, an adult population of academically at-risk college students was chosen to examine the effects of reading instruction on one aspect of metacognition, calibration. Calibration is a self-monitoring aspect of metacognition and is defined as the ability to predict performance on an academic task. A better understanding of metacognition in an adult at-risk population is important since metacognition plays a significant role in reading comprehension and successful learning in general. Subjects included all academically at-risk students in two ability levels of college reading classes. Reading ability of each subject was determined using the Nelson-Denny Reading Test (NDRT) as a pre- and post-test. Subjects were asked to predict performance on both vocabulary subtests of the NDRT as a measure of calibration skills. Change in reading ability and calibration ability as a result of one semester of reading instruction was calculated. Other variables investigated within the two class levels were age, gender, and confidence

judgements. Correlation matrixes representing a sampling over time were run for all variables. Results indicate that reading instruction, or more specifically, exposure to print, does not increase calibration skills significantly without direct instructional intervention. Further research into calibration ability in adult at-risk populations is warranted, especially research designed to determine what type of instruction increases calibration ability.

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CHAPTER 1

INTRODUCTION

Metacognition is a construct with theoretical foundations based in cognitive and developmental psychology (Osman & Hannafin, 1990). Metacognition is the ability to reflect on one's own knowledge and cognitions (Flavell, 1979). Metacognitive ability is considered integral to success in all areas of learning. As related to reading, metacognition is "concerned with the reader's ability to evaluate ongoing comprehension processes while reading through a text, and take some sort of remedial action when those processes bog down" (Anderson, 1982). Although research has long emphasized a relation between metacognitive ability and successful learning, few instructional designs incorporate instruction on metacognition or self-monitoring of cognition (Osman & Hannafin, 1990).

Metacognitive abilities have been shown to be amenable to instruction and transfer to other academic situations (Blakely & Spence, 1990; Osman & Hannafin, 1990; Steinberg, Bohning, & Chowning, 1991). Furthermore, metacognition, or more specifically the degree of metalinguistic awareness, has been linked with a developmental increase in reading ability (McAllister, 1989; Bowey, Tunmer, & Pratt, 1984; Warren-Leubecker & Carter; 1988). Calibration, a metacognitive ability, has been associated with more efficient study habits

and greater satisfaction with course results (Horgan, 1990; Hopper, 1993). These areas of metacognition appear to be important when teaching at-risk adult students of reading. In fact, adult students may be the most receptive to instruction about metacognitive strategies due to a greater capacity for mental activities than children (Burley, 1985).

Metalinguistic awareness, a component of metacognition, is the ability to reflect on language, both spoken and written (Yaden, 1984). Research into metalinguistic awareness has been based on child data, with an emphasis on developmental properties (Huffman, 1980; McAllister, 1989). Since metalinguistic awareness is assumed to increase with age, few studies have focused on adult populations (Barton & Hamilton, 1980; Burley, 1985; Hamilton & Barton, 1980). The implied assumption is that adults have developed a full capability for metalinguistic awareness. Or stated another way, children develop metalinguistic awareness as they are exposed to language, and thus have developed a complete psychological capacity for metalinguistic awareness by adulthood.

Calibration, or "students' ability to predict their own performance on a task" (Horgan, 1990, p. 2), is a related metacognitive phenomenon. Calibration, self-assessment, and metacogniton, though closely related constructs, have rarely been researched together. Self-assessment and calibration differ with regard to accuracy of prediction of performance. Calibration has been researched through probability estimates;

self-assessment has been researched through a comparison of self-assessment with other assessors (Horgan, 1990). A students' ability to calibrate performance correctly has been linked to increased motivation and effective time management (Horgan, 1990). Adults have been shown to be poor calibrators of reading comprehension except when expertise of background knowledge of the subject is evident (Glenberg & Epstein, 1987).

Academically underprepared college students have been a part of American higher education institutions since open door policies were instituted (El-Hindi, 1993; Wyatt, 1992). This population includes non-traditional students who frequently have difficulties returning to an educational setting due to disuse of cognitive skills such as encoding and retrieval (Caron, 1994). Non-traditional students are defined differently among institutions of higher learning, however most definitions of non-traditional students include characteristics similar to the following: "has reached the age of over 25, and has been out of school for 5 years, or more" (Caron, 1994, p. 4).

The majority of academically underprepared or at-risk students are also disadvantaged readers (Reed, 1989; Reinertson, 1989). Since reading research has shown a link between metacognitive knowledge and skilled reading, this population of disadvantaged readers can be influenced significantly by direct metacognitive instruction (El-Hindi,

1993; Hare & Pulliam, 1979). Unfortunately, the majority of research into metacognitive abilities have focused on children and as a result, methodologies for metacognitive reading remediation on the adult level are based on child data (Boraks, 1978; Gambrell & Heathington, 1981).

It is perhaps for this reason that at-risk college reading students should be researched through calibration abilities. Developmental/remedial students consider themselves "non-readers", i.e. they have the ability to read and a somewhat lesser ability to write, but generally choose not to participate in either skill outside of the academic arena. There is also a pronounced propensity to rely on oral informational media such as radio and television for factual information. Metacognitive skills may not be fully developed and this possibly contributes to reading difficulties as a result of media-dependence and a lack of exposure to print (Ong, 1982; Stanovich & Cunningham, 1993). There is also evidence that at-risk college reading students lack a realistic idea of their reading abilities. Reed (1989) found that students in this population who had the least accurate perception of reading ability had the lowest grade point averages on college level work.

Purpose of the Study

The purpose of this research is to extend general knowledge about metacognition based on studies on children to

adult populations. Knowledge about calibration levels on a metalinguistic task will provide a greater understanding of adult concepts of language, or metalinguistic awareness. A better understanding of metacognition in an adult at-risk population is important since metacognition plays a significant role in reading comprehension and successful learning in general. The following questions were investigated:

1. How well are at-risk college reading students able to calibrate on the vocabulary subtests of the Nelson-Denny Reading Test, Forms G and H?

2. Is there a relationship between accuracy of calibration, age, gender, and reading ability as measured by the Total Reading Score of the Nelson-Denny Reading Test, Forms G and H?

3. Do at-risk college reading students evidence an increased ability to calibrate after a semester of intensive exposure to print and reading instruction, which includes writing and vocabulary study?

Assumptions

Assumptions this research is based on include:

1. The Nelson/Denny Reading Test provides an accurate reflection of reading ability through the Total Reading Score.

2. Calibration ability can be effectively determined through use of the vocabulary subtests of the Nelson/Denny Reading

Test.

3. Subjects received reading instruction in both levels of classes which emphasized vocabulary study and writing, and represents intensive exposure to print.

Limitations/Delimitations

Subjects for this research are all students at Walters State Community College. All subjects have been identified as at-risk requiring remedial/developmental courses according to the guidelines established by the Tennessee Board of Regents (TBR). The researcher had no control over assignment to course level or number of subjects available. Students were assigned to course level through entrance tests and past academic performance, and then randomly placed in a class. By using the total population of students enrolled in each level of reading course, an accurate picture of the variables targeted in this research was possible despite lack of randomization.

All subjects in the research population are classified as adults, although the age range is wide, as was expected. Because Walters State Community College is not a residential college, subjects were residents of East Tennessee and largely monolingual. Generalizations made as a result of this research are limited to like populations.

Definition of terms

Metacognition is defined as the ability to reflect on one's own knowledge or cognitions (Blakey & Spence, 1990; Flavell, 1979; Nelson & Narens, 1994). Metcalfe and Shimamura (1994) define metacognition as "our knowledge about how we perceive, remember, think, act--what we know about what we know" (p. 16). Flavell (1979) defines metacognition as "knowledge and cognition about cognitive phenomena" (p. 906). Osman and Hannafin (1990) define metacognition as the "awareness of one's own knowledge and the ability to understand, control, and manipulate individual cognitive processes" (p. 83). The range of definitions share a common factor of reflection upon mental activities.

Two components of metacognition are metalinguistic awareness and calibration. Metalinguistic awareness is defined as "the ability to reflect upon and analyze the structure of both spoken and written language" (Yaden, 1984, p. 5). Calibration is defined "as the accuracy with which students can predict their own performance" (Horgan, 1990, p. 1). Calibration is considered a metacognitive phenomenon related to the self-monitoring function of metacognition. Calibration of performance is defined as "judging correctness of already answered questions" (Glenberg & Epstein, 1987, p. 86). Calibration of comprehension as related to reading is "the correlation between subjective assessments of knowledge gained from reading and performance on an objective test"

(Glenberg, Sanocki, et al., 1986, p. 1). Self-assessment differs from calibration in that it is a component of metacognition "which involves learners' awareness of their own knowledge levels, how those levels are achieved, or how they eventually may be altered" (O'Leary, 1980, p. 89). Self-assessment is "the act of judging one's performance on a task" (Miller & Turner, 1987, p. 3), not specifically how accurate these judgments are as is the case with calibration.

Organization of the Study

The rest of the study is organized in the following way: Chapter II is an extended review of the literature. Chapter III reports the methods and procedures of the research involved. Chapter IV presents the results. Finally, Chapter V includes the discussion and implications.

CHAPTER II

REVIEW OF THE LITERATURE

Metacognition

The corpus of existing research about metacognition in general is extensive. Early research grounded in Flavell's (1979) cognitive monitoring model defined metacognitive experiences as "any conscious cognitive or affective experiences that accompany and pertain to any intellectual enterprise" (p. 4). Metacognitive experiences differ in content and function from other cognitions. Flavell used the term "tasks" to refer to the objectives of metacognitive experiences, and "strategies" to refer to cognitions or behaviors employed to achieve these tasks. Strategies included evaluation, revision, or selection. By Flavell's terminology, self-monitoring is a metacognitive strategy used to achieve a metacognitive objective.

Early research into metacognition relied almost totally on introspective research; a method which simply asked individuals to report the contents of various perceptions, beliefs, and thoughts (Metcalfe & Shimamura, 1994). Eventually this method of analysis was found to be empirically intractable as people's reports were found to be imperfect, as in the case of eyewitness research (Weingardt, Leonesio, & Loftus, 1994). Introspective research, although found to contain distortions, was found to have value in understanding

the control process of self-monitoring. Current research in metacogniton emphasizes learning in naturalistic situations and attempts to understand what facilitates metacognitive self-monitoring (Nelson & Narens, 1994).

Three areas of metacognitive abilities which are essential to learning are task knowledge, self-knowledge, and self-monitoring (McNeil, 1984). As related to reading, task knowledge is the ability to employ the proper strategy to successfully complete a reading task. Self-knowledge enables the reader to recognize his/her ability to comprehend text. Self-monitoring, is the ability to monitor comprehension effectively and the success or failure of a particular reading strategy (Burley, 1985). Self-monitoring affects calibration and the ability to check comprehension during reading tasks.

Although metacognition increases with age, adult poor readers have been shown to lack proficiency in some areas of metacognition related to reading (Burley, 1985; Gambrell & Heathington, 1981; Hare & Pulliam, 1979). Brown and Smiley (1983) found that adult remedial students were unable to summarize, a skill involving self-monitoring of comprehension. In a study of adult poor and good readers, poor readers were found to be less aware of self-monitoring strategies and how to use them (Gambrell & Heathington, 1981). In a related area, Hare and Pulliam (1979), found that awareness of adults' reading behaviors may influence reading performance. A distinct difference was noted when good and poor readers were

compared with respect to awareness of reading and comprehension strategies. By using an introspective methodology, consciousness of more reading behaviors was expressed by the better readers, suggesting a causal link between effective metacognition and proficient reading (Gambrell & Heathington, 1981; Hare & Pulliam, 1979).

Metalinguistic Awareness

Considerable research has been conducted on childrens' metacognitive abilities. Childrens' awareness of language, or metalinguistic awareness, has been the focus of numerous studies. Huffman (1982) found through in-depth interviews that childrens' awareness of language developed in a stage-like sequence. Children in Stage I portrayed reading as a physical behavior and frequently mentioned visible aspects of language, i.e. letters or words. Comprehension at this stage was equated with being able to successfully read through a passage. Stage II children recognized the role of the reader in comprehension. Between ages 16 and 18, Stage III, awareness of the expanded role of the reader is evident. Readers at this stage were beginning to understand the thinking and decision-making aspect of reading (Huffman, 1982).

Developmental aspects of childrens' metalinguistic awareness have been noted by other researchers as well. Metalinguistic ability has been hypothesized to be a distinct

type of linguistic ability that develops separately from speaking or listening abilities (Caron, 1994). Metalinguistic awareness is thought to reflect a general change in information processing brought on by greater cognitive development which occurs in conjunction with learning (Caron, 1994). For example, middle childhood has consistently been shown to be the time period for developing a variety of metalinguistic skills (Blatchford, 1992; Tunmer, Herriman, & Nesdale, 1988).

Most research in metalinguistic awareness concerns children as related to beginning reading. Readiness to read and the cognitive development that accompanies it seems to be undergirded by an emerging internal awareness of language and its properties. McAllister (1989), correlated cognitive development with metalinguistic awareness using Piaget's developmental stages. Phonological awareness begins during the sensorimotor stage from zero to two years of age. Syntactic awareness occurs between the ages of two to seven years during the pre-operational stage. The emergence of linguistic competence develops during this stage as children apply rules and begin to manipulate language. The final level, semantic awareness, begins at approximately age seven to eleven, and parallels the concrete operational cognitive stage. Early metalinguistic abilities appear to be dependent on cognitive growth which is in turn related to metalinguistic awareness. McAllister (1989) suggests that literacy is the

"essence of metalinguistic awareness" (p. 12).

Not only have childrens' metacognitive skills been tested, but several researchers have also investigated the interaction between lower socioeconomic status (SES) and metalinguistic awareness. Swanson (1983) found that low SES in minority students had an effect on concepts about reading due to a bias towards middle class preschool experiences. Another look at SES status and metacognition by Warren-Leubecker and Carter (1988) led the authors to suggest that lower SES children might require some form of training in metacognition because average (middle class) students appeared to develop these same skills more spontaneously. The researchers cited formal literacy training for increases in language awareness in lower SES children. Metalinguistic awareness was found to be more deficient than basic skills.

Moreover, gaps in the ability to self-assess comprehension have been reported by several researchers (Markman, 1977; Miller & Turner, 1987). Children handicapped in reading have been shown to tolerate ambiguity and confusion while reading rather than seek clarification. Evidence from these studies indicate that metacognitive self-monitoring is not done automatically by poor readers during the reading process. Also, research into teaching behaviors show evidence of differential treatment between high and low achievers such as demanding less work from low achieving students (Marshall & Weinstein, 1984). Dependence on an outside authority such

as a teacher is one possible reason for the inability to successfully self-monitor comprehension (Blakey & Spence, 1990; Coley & Kapinus, 1988; Osman & Hannafin, 1990).

Adult readers are generally more aware of comprehension success or failure than younger readers (Markman, 1977). Steinberg, Bohning, and Chowning (1991) investigated nonproficient readers on the college level and found that although these students used comprehension-monitoring strategies, they frequently used strategies inaccurately or inappropriately. Based on these findings, the authors suggested teaching comprehension-monitoring strategies beginning on the word level. One such word-recognition strategy which involved formulating hypotheses about unknown word meanings was found to be used by only 35% of the readers in the study. Other research has indicated that adult poor readers often skip over unknown words without realizing the cost to comprehension (Miller & Turner, 1987). Farr, Webb and Collins (1992) hypothesized that adult poor readers lacked reasoning abilities necessary to acquire word meanings from context.

A common finding in research of metacognition and reading has been that effective use of self-monitoring strategies distinguishes between good and poor readers (Baker, 1979; Kaufman & Randlett, 1983; Gambrell & Heathington, 1981; Hare & Pulliam, 1979; Secondary Perspectives, 1990; Ward & Clark, 1989). According to Kaufman (1983), the most significant

differences in strategy usage were found in unobservable mental operations reported by good readers. Kaufman suggested that these differences may result from years of instruction stressing associative learning rather than higher level thinking. Higher IQ in high ability readers versus lower IQs in poor readers has been suggested as a reason why poor readers do not use or articulate the use of active comprehension self-monitoring strategies. Kaufman also suggested that instruction with a focus on creating awareness of mental operations (cognitions) during the reading process may be the best method of improving comprehension in adult poor readers.

Metalinguistic awareness developed during Piaget's cognitive growth stages has been shown to facilitate the development of linguistic tasks such as successfully learning how to write or ability to reflect on the meaning of word (Templeton & Thomas, 1984; Warren-Leubecker & Carter, 1988). Phonological awareness, another example of a metalinguistic task, appears to be causally related to reading achievement (Warren-Leubecker & Carter, 1988). Also, syntactic awareness has been found to predict early reading achievement (Warren-Leubecker & Carter, 1988).

The relationship between reading and metalinguistic awareness is probably of a reciprocal nature, and it is generally accepted that reading skill increases as metalinguistic awareness increases (Vygotsky, 1965; Pressley,

Ghatala, Woloshyn, & Pirie, 1990; Johns, 1979; Warren-Leubecker & Carter, 1988). Researchers appear divided in establishing which attribute affects the other the most and the earliest. Environment appears to play an important role in this reciprocal relationship. Hakes (1982) for example, found that children growing up in literate environments are more likely to develop competence in metalinguistic awareness and emerging literacy. Homes without reading materials and characterized by the lack of certain oral traditions such as bedtime stories create environments which inhibit metalinguistic competence (Heath, 1982; Warren-Leubecker & Carter, 1988).

However, studies of the timing of metalinguistic development minimally support the idea that metalinguistic skills differ from language-acquisition skills in general (McAllister, 1989). Moreover, metalinguistic skills appear to be acquired later than other language skills, are not as automatic, and are not found to be universal (Vygotsky, 1965; Warren-Leubecker & Carter, 1988).

Specific metacognitive tasks involving various populations has been the focus for most of the research into metalinguistic awareness. Most research of this nature has found positive correlations between the tasks involved, pointing to a general or unitary metalinguistic construct (Ricciardelli, 1993). This single construct has been hypothesized to have two components; a control component which

is responsible for selection and integration of new information, and a component for linguistic knowledge which structures and analyzes language information. Metalinguistic tasks used in task related research includes word-order repetition, word renaming, symbol substitution, and grammar judgments (Ricciardelli, 1993).

Evidence from research into children's self-assessment about achievement in school tasks has suggested a developmental trend, although it remains unclear at what age this change begins. Blatchford (1992) found in a study involving seven to eleven-year-olds, that younger subjects used individual standards when assessing their own performance, while older children used normative or social standards. Academic self-assessment with regard to reading scores were not commiserate with measured attainments.

Illusion of Knowing

The concept of illusion of knowing has been described as the "belief that comprehension has been attained when, in fact, comprehension has failed" (Ward & Clark, 1989, p. 5). Feedback or external monitoring of comprehension was found by Ward & Clark (1989) to have no effect as a short term intervention on subjects' ability to correctly assess comprehension. Glenberg, Wilkinson, and Epstein (1992) found that illusion of knowing had a high incidence in college-level readers. Failure to detect contradictions created in texts

for research purposes were frequently not detected. The authors speculated that a default assumption was the reason for the lack of comprehension; that is, readers assumed by default that comprehension was occurring until some overt failure was noticed by the reader.

Conceptualizations of "Word"

One way of testing metalinguistic awareness has been to look into how children conceptualize word. In perhaps the most widely recognized investigation of children's concepts of language, Papandropoulou and Sinclair (1974) discovered that conceptualizations become more sophisticated with age, or as the researchers stated "this concept undergoes a long and slow elaboration during the ages studied" (p. 249). At ages four to five-years-old, children were found to exhibit no distinct metalinguistic awareness. By ages seven to eight-years-old, meanings of words connect words and things. Children of eleven years consider the relationship between words and the larger linguistic body, i.e. language. Researchers link this sequence of development with cognitive development of abstraction abilities (Papandropoulou & Sinclair, 1974; Roberts, 1992). The ability to metacognitively reflect on language seems to allow a child to create distance between signifiers (words) and significates (things) (Papandropoulou & Sinclair, 1974).

These results were strengthened by a study by Downing and

Oliver (1974). Findings indicate that children do not have adequate concepts of word. These concepts were found to improve with age. Implications were that reading instruction should not be based on the assumption that children understand word when beginning school. Downing (1976) has called the metalinguistic term word part of the "reading instruction register". Bowey, et al. (1984) claimed a higher incidence in the comprehension of word than was found in the Downing and Oliver study. The authors found that content words were recognized more frequently as words than function words. The implication of this research is that instruction should begin with content words until children exhibit concept development of the metalinguistic term "word".

Although there exists a relatively large body of research on children's conceptualization of word, there is a paucity of research into adult concepts. One wide study of metalinguistic skills by Hamilton and Barton (1980) examined metalinguistic awareness of the concept word on adults of different literacy levels. Three dimensions or characteristics included in definition responses were the mention of units, functions, or meaning. Definitions having reference to functional aspects of word were the most common. It was significant that more high level readers were able to give an approximately ideal form of word definition. The authors concluded that "cognitive confusion" was not yet resolved in adult populations relating to language awareness

(Barton, 1981; Hamilton & Barton, 1980; Downing & Oliver, 1974).

As part of this same study, Barton (1981) investigated the metalinguistic skills of adult illiterates with respect to segmental awareness. Segmental awareness was defined as the ability to identify individual words and to segment words into syllables (Ferguson, 1981). Barton cited the lack of research on adults learning to read, and as a result, the majority of reading-acquisition theories are based on child data. Since specific types of metalinguistic awareness are viewed as prerequisites for successfully learning to read, it stands to reason that adult learners need these same skills. According to Barton, it should not be assumed that adults have naturally acquired these skills over time. Results of this research indicated that some segmental skills were related to literacy levels. Ability to identify a specific word in a sentence (the third word, for example) was more difficult for non-literate adults. In general, tasks involving identification of units within units (syllables within words, for example) proved significantly more difficult for adult non-literates. Other tasks associated with more general skills, such as memory and attention show no group differences.

Research into word concepts in children and adults has been shown to be important for many reasons. Previous investigations have established a link between cognitive development and awareness of linguistic units (Roberts, 1992).

Also, research has established a relationship between the acquisition of the ability to understand the concept of word and beginning reading ability (Bowey et al., 1984; Roberts, 1992). Awareness evolves gradually as children are exposed to written language. A complete understanding of word concept development has important practical implications in the matter of facilitating the successful development of reading ability in both children and adults (Templeton & Thomas, 1984). Some researchers suggest that a child's main task in learning to read is to gain an awareness of the correspondence between speech and print, which "can be explained only if we regard reading as a deliberately acquired, language-based skill, dependent upon the speaker-hearer's awareness of certain aspects of primary linguistic activity" (Mattingly, 1972, p. 145).

Calibration

In the relatively small body of research done for the purpose of examining adults' abilities to calibrate, or accurately predict their performance on an academic task, few studies have examined calibration related to straightforward linguistic tasks, and academic at-risk populations have been virtually ignored for the preferred population of academically stable college students. Horgan (1990), for example, examined college students' abilities to predict test scores. Horgan found that the ability to calibrate, although poor to begin

with, was improved during a semester as the result of feedback received from previous tests. Horgan linked effective calibration to enhanced motivation and more efficient time management due to the ability to determine when to stop studying, or stated differently, when test information was considered to be learned.

Glenberg and Epstein (1987) examined the reasons why previous research found that adult readers were generally poor calibrators of comprehension. Glenberg and Epstein found that expertise in the domain of the text positively affected calibration, and suggested that adults' background knowledge used for self-monitoring of reading comprehension was important. Morris (1990) later called the use of domain knowledge for predictions the "domain familiarity strategy" which states that subjects believe they do better in exercises on text related to their domain of expertise. Morris found much like Glenberg and Epstein that subjects did calibrate better, but not greatly so. Moreover, Glenberg and Epstein found that calibration did not improve with practice using calibration exercises without interventions of feedback or instruction. Horgan (1990) points out that Glenberg and Epstein used an artificial situation in order to determine these calibration results and suggests that only naturally-occurring academic situations reveal true calibration measures.

In an attempt to determine what effects the degree of

accuracy of calibration, Lichtenstein and Fischhoff (1977) manipulated expertise in text domain and intelligence of the subjects. The researchers found that neither manipulation produced a change in calibration performance. This is in contrast to Glenberg and Epstein (1987) who found that expertise in text domain increased calibration performance. However, Lichtenstein and Fischhoff did determine that calibration ability improves as knowledge is gained, but knowledge does not increase indefinitely. The best calibration measures were found when subjects scored approximately 80% correct on the exercise calibrated. The researchers also found that overconfidence which is consistently found in the literature dealing with calibration changes to underconfidence when test items move from difficult to easy (Lichtenstein & Fischhoff, 1977).

Glenberg, Sanocki, et al. (1986) found that poor calibration of comprehension appears to be the rule rather than the exception. These researchers found that poor calibration resulted when a comprehension test was given directly after reading a passage or if a time delay was involved between the reading task and the test. Three different types of comprehension tests were used to gauge calibration; inference tests, verbatim-recall tests, and idea-recognition tests. Since poor calibration was evidenced with different test types, the authors concluded that subjects may be assessing general knowledge of a text domain rather

than knowledge gained from the immediate reading of the text. Moreover, according to the researchers, testing procedures cannot be blamed for poor performance since poor calibration was evidenced on all test types. Also, Glenberg, Sanocki, et al. found that calibration could be enhanced through use of pre-tests constructed specifically to provide self-generated feedback. This method was successful only if the pre-test tapped the same general knowledge and processes used on the post- or criterion test.

In an extension of the Glenberg, Sanocki, et al. (1986, 1987) studies, Walczuk and Hall (1989) used examples and embedded questions in text to produce self-generated feedback in an effort to increase deep-processing. Examples were used to illustrate abstract principles concretely and embedded questions to encourage self-testing and, as a result, comprehension monitoring. Results from the study were consistent with Glenberg, Sanocki, et al.. Intervention in the form of examples and embedded questions used jointly were found to increase calibration abilities. The investigators conclude that deeper processing of text tends to increase self-monitoring with better calibration as a result.

Research by Pressley et al. (1990) also indicated that adults cannot accurately predict performance on comprehension-based tests. Indications were that adults either do not monitor comprehension, or do so inaccurately. As in the Walczuk and Hall (1989) study, monitoring of understanding

while reading was found to be facilitated by adjunct questions created for this purpose. Pressley et al. found that thematic miscomprehension was the most common source of error.

Increased processing of text was also researched by Maki, Foley, Kajer, Thompson and Willert (1990). Subjects in the study were asked to read paragraphs with deleted letters found in certain words, therefore increasing the need to deeper process the text while reading. The researchers suggested that this manipulated need for deep-processing on the word level would increase comprehension and evidence an increased calibration ability in the subjects. This hypothesis was confirmed by the research results. Maki et al. (1990) concluded that causing subjects to think more about each individual incomplete word might have allowed the reader to gain greater access to personal background knowledge concerning text material through self-feedback.

In a similar study, Schommer and Surber (1986) examined the influence of reading instruction designed to produce surface- vs. deep-processing and passage difficulty on self-monitoring of comprehension in skilled adult readers. The study was designed to overcome problems using contradiction paradigms to determine comprehension failure as was done in many previous studies (Glenberg, Sanocki, et al., 1987). Results indicated that metacomprehension failure was more prominent with shallow-processing instruction using difficult passages, than even shallow-processing instruction using easy

passages. The interaction between processing-level instruction and passage difficulty was significant when determining success of self-monitoring of comprehension.

Many theories abound to explain the predominance of poor calibration of comprehension. Some errors resulting in poor calibration such as overconfidence in calibration judgements have been thought to occur because subjects base general understanding on the last few sentences of text read instead of the whole text. Also, studies have shown that use of short-term memory content may focus on the last sentences of text instead of the entire text, resulting in poor calibration of comprehension (Magliano, Little, & Graesser, 1993). Overconfidence of calibration judgements are the most common calibration bias; that is, predicting a higher percentage of items correct on an academic task than actually are correct (Lichtenstein & Fischhoff, 1977; Maki & Berry, 1984; Walczyk & Hall, 1989).

Poor calibration may also be due to assessment of text-domain expertise instead of assessment of reading comprehension as Glenberg and Epstein (1987) determined. In other words, readers self-assess general knowledge of the domain of a text instead of knowledge gained from current reading in that domain. It is also possible that subjects are capable of understanding facts in the text, but are incapable of assimilating relationships within the text, thus contributing to poor calibration (Magliano et al., 1993). It

is perhaps this last explanation that points to the need for research into calibration on word-recognition tasks. The inability to grasp relationships within the text may be in part due to an inability to fully understand individual word meanings. Begg, Duft, Lalonde, Melnick and Sanvito (1989) found that ease of processing of words plays a part in self-assessment of comprehension. Concrete words are assessed more accurately than abstract words, and common words more easily than rarer words. In the Begg et al. (1989) study subjects were found to base predictions on ease of processing which has been invalidated as a predictor of memory affecting later academic exercises.

In a study by Schraw, Potenza, and Nebelsick-Gullet (1993) calibration of performance was found to improve with feedback from previous comprehension tests and the use of incentives. The incentive used in the study was extra course credit. According to the researchers, incentives facilitate the use of self-generated cognitive feedback which was used to monitor performance. This in turn, resulted in better calibration. The researchers viewed self-monitoring of comprehension as a flexible, controllable attribute of the subject. Improved calibration was therefore considered to be under the control of the student. It was noted in the study that learners were more accurate on easy tasks than on difficult tasks (Schraw et al., 1993).

Research by Glover (1989) provides insight into

calibration abilities of good readers contrasted with poor readers. Although evidence supports increased accuracy of self-assessment correlated with increased academic abilities, few studies have been done to explore calibration ability as influenced by reading level. Results of Glover's (1989) study confirm observations that good readers are more accurate in their calibration of comprehension abilities, while poor readers are less accurate and frequently overestimate performance. Glover concludes by suggesting that poor readers receive instruction in metacognitive strategies which could lead to increased academic abilities and better calibration.

Maki and Berry (1984) came to essentially the same conclusion as Glover (1989). In an investigation of how well academically poor students in comparison to academically good students assess levels of comprehension, Maki and Berry (1984) found that academically poor students were poorer self-assessors of comprehension than academically good students. The researchers found that prior knowledge of the student and how well this expertise fits with the text and domain familiarity were factors in how well college students could self-assess. In general, students were not good assessors. Maki and Berry also listed interest in the text as a possible factor relating to ability to self-assess comprehension, one of the few studies in which there was an affective reason given about calibration ability.

Exposure to Print

Although the exact effects of reading instruction per se cannot be determined in the literature, the effects of literacy or exposure to print on cognitive functioning have been investigated thoroughly (Cipielewski & Stanovich, 1992; Cunningham & Stanovich, 1990, 1991; McBride-Chang, Manis, Seidenberg, Custodio & Doi, 1993; Ong, 1982; Stanovich & Cunningham, 1992; Stanovich & West, 1989; West, Stanovich & Mitchell, 1993). Exposure to print, an aspect of ongoing literacy development has been investigated from many different directions. As in most metacognitive areas, the body of research dealing with exposure to print predominantly uses populations of children. For the purposes of this review, however, only key research on calibration with children populations are mentioned in order to focus on research on the same topic with adult populations.

Studies show that cognitive factors and exposure to print have been found to be almost uniformly correlated in the literature. One mechanism of cognitive change as a result of reading or exposure to print involves the differentiation of language used in speech vs. print (West et al., 1093). Words which are more rarely used and considered part of a high vocabulary level are found much more frequently in print and less frequently in speech (West et al., 1993). Everyday speech also exhibits less complex syntactical patterns than is uniformly found in print (Stanovich & Cunningham, 1992).

Print exposure has also been found to be a unique source of cultural and world knowledge which media and oral sources lack (Ong, 1982; Stanovich & Cunningham, 1992). Increased verbal intelligence has also been claimed as a cognitive correlate of literacy activities and exposure to print. Although controversial in the literature, some researchers claim decontextualized thinking skills are also increased as literacy activities and exposure to print increases (Ong, 1982).

Gauging an absolute amount of exposure to print or reading-related activities has been a constraining factor in the research. Early research gathered data through the use of open-ended questionnaires and interviews (McBride-Chang et al., 1993). Although these methods evidenced limited success, gathering information on the level of an individual reader was still problematic. Activity diaries were considered a partial solution to this problem. Children were asked to record out-of-school activities, especially reading time. Researchers discovered that the commitment to keep an accurate record was a drawback, but furthermore, estimating time spent in retrospect turned out to be too difficult a cognitive task for children (Cipielewski & Stanovich, 1992). This methodology was also subject to social desirability confounds. Current research into exposure of print correlates use checklists-with-foils. Foils prevent social desirability effects because guessing is precluded as an advantageous strategy to use on

the checklist. The advantages of this method are empirically demonstrated in most of the following research studies.

Cunningham and Stanovich (1991) introduced the Title Recognition Test (TRT), developed for the purpose of measuring children's exposure to print. The TRT lists titles of children's books along with other title foils. According to the researchers, the TRT accurately assesses individual differences in exposure to print while using low cognitive demands and without placing a high demand on memory. Use of the TRT has shown that print exposure is a predictor of spelling ability, general world knowledge, and vocabulary and word knowledge in children. Print exposure is considered a Matthew effect of reading: i.e. a child's exposure to print contributes greatly to verbal intelligence and further develops reading ability (Cunningham & Stanovich, 1991; Stanovich, 1986).

Stanovich and Cunningham (1992) examined the extent to which reading is causally prior to specific cognitive outcomes. Based on the assumption that within a literate society there are still significant variations in individual's exposure to print, Stanovich and Cunningham (1992) investigated the following four specific variables in an adult population: vocabulary, cultural knowledge, spelling and verbal fluency. A variety of checklists-with-foils were used to assess exposure to print including the Author Recognition Test (ART), the Magazine Recognition Test (MRT), the favorite-

author questionnaire, the activity-preference scale, a general reading questionnaire, and the Nelson-Denny Reading Test. Results pointed overwhelmingly to a positive correlation between increase in the variables studied and print exposure.

The relationship between reading, vocabulary levels and exposure to print was examined in research conducted by Stanovich and Cunningham (1993). The researchers found that individual differences in general or declarative knowledge in a student population of adults were positively correlated with exposure to print. Exposure to oral media, television in particular, was found to have a negative relationship with general knowledge. The term "cognitive anatomy of misinformation" was used to explain this phenomena, i.e. subjects had too little exposure to print, an over reliance on television, and as a result had low declarative knowledge. Ong (1982) calls this reliance on oral information "secondary orality", which differs from written literacy through the degree of abstraction and introspection necessary to interact with language on a metacognitive level. Reading for information has been found to provide a deeper knowledge than oral information from the media provides. Declarative or domain knowledge strongly determines reading comprehension through the increased ability to efficiently process vocabulary and content information during the reading process (Stanovich & Cunningham, 1993).

West, Stanovich, and Mitchell (1993) examined exposure to

print in a unique adult population. Using observers at a major airport, adults were observed in literacy acts and classified as readers or nonreaders. Readers were asked to fill out several checklists-with foils which differentiated between media exposure and print exposure. Even when controls were used for age and education, print exposure (not media exposure) was significantly linked to cultural knowledge and vocabulary. These findings are commiserate with the majority of research into cognitive correlates of print exposure.

Pedagogical implications of the study of calibration abilities are clear. Instructions on reading comprehension have been shown to have a positive impact on the learner's ability to accurately calibrate reading performance. Instructions on deep-level processing were found to be particularly effective (Magliano et al., 1993). Instructional time may need to be devoted to helping students monitor their comprehension while reading through the use of classroom-based incentives (Schraw et al., 1993). It has also been found that the well-calibrated student will not yield to the fundamental attribution error of attributing success or failure to factors external to the student (Horgan, 1990).

Summary

Calibration, one component of metacognition, is the ability to predict performance on an academic task. Increased ability to calibrate has been linked with many positive

cognitive behaviors including increased metalinguistic awareness and greater academic motivation. With respect to reading, poor calibration of comprehension is common among academically at-risk students who evidence reading difficulties. Unfortunately, the majority of research into metacognition has been done on populations of children. This research has been done in part to extend understanding on metacognition to adult populations.

CHAPTER III

METHODS AND PROCEDURES

Population of the Study

The population for this study was all remedial and developmental students enrolled in reading courses at Walters State Community College in Morristown, Tennessee during the Fall Semester, 1995. The remedial and development distinction at Walters State Community College refers to two distinct levels of classes related to skill differences and grade cut-off scores as part of a multilevel reading curriculum. All students placed in remedial or developmental courses evidence skill levels below those required for general college admission. Remedial students have the greatest skill deficiencies and are placed in the basic level (0710) class. Developmental students have either taken the basic level (0710) reading course during a previous semester, or have scores high enough to skip the basic level and enroll in upper level (0820) reading courses.

Remedial/Developmental Education

A student's placement in a remedial/developmental reading course depends in part on achievement in high school, recent ACT, SAT or GED test scores, and the College Level Examination Program (CLEP). Walters State Community College as a member of the Tennessee Board of Regents (TBR) is directed to assess

readiness for college-level courses through The Academic Assessment and Placement Program (AAPP). As described in the Walters State 1995-1996 Catalog & Student Handbook, "The AAPP is a battery of standardized tests used by all TBR institutions as the primary measure of proficiency in the Basic Academic Competencies." The Basic Academic Competencies are defined by the College Board's Project EQuality and are published in Academic Preparation for College. All TBR institutions address these competencies in developmental/remedial course work provided to incoming students who are academically underprepared. A percentile score of 31 on the AAPP results in placement in a developmental reading course (0820), and a percentile score of 26 results in placement in a remedial reading course (0710).

The purpose of Remedial/Developmental Education at Walters State Community College as described in the Walters State 1995-1996 Catalog & Student Handbook "is to assist students in the improvement of those academic skills necessary to better performance in the classroom", i.e. the basic skills. Courses are offered in Reading, Math, English and Study Skills. The percentage of first-time freshmen who enroll in remedial or developmental courses has remained at approximately eighty percent from 1992 to 1994 (Bowers, 1995). Of these freshmen, approximately twenty-one percent are required to take only one remedial/developmental course, while the majority are required to enroll in two or more.

Approximately thirteen percent of these landed in remedial reading courses, and twenty-one percent in developmental reading. Thirty-two percent tested out of reading in particular, leaving a slight majority required to take these classes (Bowers, 1995).

Assignment to a particular instructor's class is done randomly or by student choice during registration procedures. Students in each class were read an informed consent statement, leaving their participation in this research on a strictly voluntary basis. Student participation or nonparticipation had no effect on grades or course outcomes. The same informed consent statements were reviewed before data collection at the end of the semester. Also, approval for the use of human subjects in research was authorized by the Committee on Research Participation at the office of Research Administration on the University of Tennessee campus.

The Nelson-Denny Reading Test

Students enrolled in reading courses are required to take the Nelson-Denny Reading Test (NDRT), Form G, at the beginning of each semester and Form H at the end of the semester. The NDRT has been the most widely used standardized reading test for community college populations in the past 50 years (Heerman & Seltzer, 1983). The NDRT is normed for students in the range of 9th grade in high school through college seniors or adults (Cummins, 1981; Murphy, Conoley & Impara, 1994).

The NDRT is divided into two subtests; Vocabulary and Comprehension. The Vocabulary subtest is comprised of 80 items; 40 prefixed and 40 nonprefixed words. Each word is presented along with five answer choices in the form of synonyms and minimal context to aid cueing and disambiguate word choices. The Vocabulary subtest is timed at 15 minutes. The Comprehension subtest which is timed at 20 minutes was used along with the Vocabulary subtest scores to establish a total reading score for each student.

While it is widely agreed that there are some drawbacks in using the NDRT to determine reading ability, the NDRT meets an important need since there are few instruments designed specifically to measure reading achievement, progress and reading rate in college-aged students (Mitchell, 1994). Forms G and H are the latest revisions of the original NDRT which was first published in 1929 (Brown, Fishco, & Hanna, 1993). This most recent version was designed specifically to address criticisms that the previous test evidenced gender or racial bias. Test-retest reliabilities for this revision are not yet available, however, on Forms E and F the Vocabulary subtest yielded consistent results ranging from .89 to.95 on the Vocabulary subtest and .75 to .82 on the Comprehension subtest. Validity data consists of the evidence indicating that the comprehension subtest requires reading the passages or is, in effect, context dependent (Mitchell, 1994).

The NDRT answer form is in a self-scoring format.

Scoring is usually accomplished after the test has been administered as a class-wide activity. The raw scores established through self-scoring can then be converted into stanines, grade equivalents, and percentiles from tables provided in the "Manual for Scoring and Interpretation" (Brown et al., 1993; Cummins, 1981). Derived grade equivalent scores were used in this research. The Total Reading Score, a combination of both subtest scores, was also be used.

Measurement of Reading and Calibration Abilities

The instructor in each class was given a range of numbers and asked to assign these numbers randomly to the students in a particular class who consented to participate. Instructors kept a record of number assignments to be matched with subject numbers used for the final checklist. Immediately after students finished the timed vocabulary section of the NDRT, students were asked to complete a checklist comprised of the vocabulary words on the NDRT with instructions to check the words they believe they answered correctly on the test itself. Subjects were encouraged to refer to the test booklet and not rely on memory alone. A sample of these forms are found in Appendixes A and B.

After the NDRT was completely administered, teachers instructed students to transfer scores from the Nelson-Denny answer form to the data gathering form provided to each student. Since students are required to record their date of

birth on the NDRT scoring form, this data was transferred as well in order to determine the age factor in the study. The same is true for gender. Each instructor visually checked to make sure the information was correctly recorded by the student as the form and NDRT answer sheet were collected from each student. These records were destroyed after the final checklist was administered and data was compiled in order to protect confidentiality.

Gathering of these data took approximately 5-10 minutes per class, depending on many variables such as how frequently instructions need to be repeated, how large the class was, and how long individual students spent on the calibration task. Collection times were the same on Forms G and H. Subjects appeared to grasp the directions given easily and had no specific difficulties marking the checklist forms. To this researcher's knowledge, there were no subjects who declined to participate willingly when presented with the complete information about the research.

Number of Subjects

One hundred subjects in remedial (0710) classes participated in the data collection at the beginning of the semester. One hundred seventy-two subjects participated at the developmental (0820) level. These numbers represent by far a majority of the total population, since some subjects did not participate due to late registration, lack of

attendance on the day data were collected, or miscellaneous other situations. The number of subjects who participated at the end of the semester represented a small number since subjects were lost due to natural attrition reasons which included academic failure, personal problems leading to withdrawal, and various other personal reasons. Of the subjects still enrolled at the end of the semester, the majority participated in the final data gathering procedure. The final number of participants totaled sixty-four for the remedial (0710) population taken from eight separate classes, and for the developmental (0820) population, 131 subjects from nine separate classes.

Statistical Procedures

Early research into calibration proposed several different measures of calibration probabilities (Lichtenstein, Fischhoff, & Phillips, 1975). Although each of the formulae for determining calibration had merit for certain research methodologies, the formula proposed by Horgan (1990) was judged to be the most appropriate for the current study. Therefore, calibration performance was determined through the difference between predicted performance on the vocabulary section of the NDRT and actual performance as calculated in percentages. The actual formula was as follows: (actual score - expected score) squared divided by expected score. In this case, actual and expected scores were percentages of

correct answers.

Two separate sets of data were collected, one from Form G at the beginning of the semester, and the final set of data from Form H at the end of the semester. A positive sign was given a calibration score that showed an overconfidence factor; that is, a score which evidenced that the subject overestimated the number of items correct on the Vocabulary subtest. Conversely, a negative was assigned a score which evidenced an underconfidence factor; that is, a score that showed that the subject underestimated the number of items correctly. Since Horgan's (1990) formula uses absolute values through squaring, over vs. underconfidence did not cause statistical problems. However, numbers of overconfident and underconfident calibration judgements will be calculated and discussed.

The two separate populations of remedial and developmental students were statistically tested to determine differences related to calibration ability, age, gender, and literacy level as defined by the NDRT Total Reading Scores. The change in calibration ability and change in reading or literacy levels were also determined from the difference in the scores at the beginning of the semester and the end of the semester. Pearson correlation analysis was run on all variables. Stat-Star (MacDougall & Stevens, 1994), a particularly user-friendly statistical software, was used to run correlation matrixes and analyze the data. Procedures

were repeated for both sets of data and comparisons determined.

CHAPTER IV

RESULTS

The results are described first in terms of general descriptive data and then in overall correlations among variables. Statistical means were determined by class level for age, two measures of reading ability, and calibration ability. These measures were taken at the beginning and end of the semester. Changes in reading and calibration abilities as a result of one semester of reading instruction were also calculated. A correlation matrix including all variables was run for each class level. Correlation coefficients represent a sampling over time. Data were stratified in each class level by age category and gender.

In each of the following tables RA1 stands for the first measure of reading ability using Form G of the Nelson-Denny Reading Test (NDRT), RA2 the second measure of reading ability which used Form H of the NDRT, and RA^ the change in reading ability calculated by taking the difference between RA1 and RA2. Units of measurement for reading ability consists of grade equivalency scores derived from the total reading score of the NDRT and represent the median performance of a subject by grade and month within a grade. Although grade equivalency scores are problematic for adult students, this measure provides an appropriate approximation for comparing calibration scores.

Similar to the reading scores in the tables, CA1 stands for the first measure of calibration ability taken from the first calibration exercise done at the beginning of the semester which utilized the vocabulary subtest of Form G of the NDRT. The second measure of calibration ability is represented by CA2, and was taken from the second calibration exercise done at the end of the semester using the vocabulary subtest of Form H of the NDRT. CA^ stands for change in calibration ability and was calculated by taking the difference between CA1 and CA2. Calibration ability was determined by the following equation: (actual score - expected score) squared, divided by expected score. Measurement for calibration ability consists of probability percentages, with greater accuracy as the number gets closer to 0. In the age category, students were classified as traditional (ages 17 - 25) or non-traditional (ages 26 and above).

Review of Research Purposes. The data collected for measurement of calibration ability addresses one purpose of this study, specifically, how well at-risk college reading students were able to calibrate on the vocabulary subtests of the NDRT. Examining the change in calibration ability (CA^) from the beginning of the semester to the end of the semester, using both descriptive and correlational data, address another purpose of this research. The change in calibration ability

indicates how (or if) calibration ability was affected by a semester of reading instruction, more to the point, a semester of intensive exposure to print and reading instruction. The final purpose of this research, to determine relationships among accuracy of calibration, age, gender, and reading ability, are addressed in the correlation data and tables.

Descriptive Data For All Students

Means for age, reading ability and calibration skills from both classes are presented in Table 1. The remedial (0710) class had a mean age of approximately one year greater than the developmental (0820) class. It should be noted, however, that the actual number of non-traditional students was greater (23) in the developmental (0820) class than in the remedial (0710) class (16). Consistent with class divisions, the upper (0820) level class had greater mean grade equivalent scores on the first and second measures of the Nelson-Denny Reading Test. The lower level remedial (0710) class increased in reading ability from the first of the semester to the final measure at the end of the semester slightly less (0.5) than the upper level developmental (0820) class (0.6).

Table 1

Descriptive data for two classes of remedial/developmental students with regard to age, reading ability, and calibration skills.

	Class Level	
	0710 (n=64)	0820 (n=131)
Students (n)	64	131
Age (yrs)	22.9	21.8
Reading ability		
RA1	9.9	10.4
RA2	10.1	11.0
RA^	0.5	0.6
Calibration		
CA1	4.8	4.9
CA2	4.6	4.1
CA^	0.2	3.0

Note. Numbers reflect the mean scores separated by class.

Mean calibration scores differed between class levels as well. The first measure of calibration (CA1) was slightly greater for the upper (0820) level class, indicating less perfect calibration than the lower (0710) class. The reverse is true for the second measure of calibration ability (CA2). In this second measure the upper (0820) level class evidenced greater calibration ability. The calibration change (CA^) number for the developmental (0820) level class probably resulted from the wide range of individual scores based on performance at the beginning of the semester and the end of the semester. Overall, the upper (0820) level class showed a greater positive change in calibration ability of 3.0 vs. the 0.2 for the lower (0710) level class.

Age Effects on Reading Ability and Calibration. The range in ages was wide within the two levels of classes. The actual year-range was from 17 years to 49 years in the lower (0710) level class, and 17 years to 54 years in the upper (0820) class. Because the range was so great, the traditional and non-traditional students were separated by age variable for separate statistical measures. The descriptive data presented in Table 2 show that non-traditional students in the developmental (0820) level class increased more in reading ability than either traditional or non-traditional students in the lower

Table 2

Effects of age on reading ability and calibration in two classes of remedial/developmental students.

	Traditional		Non-Traditional	
	0710 (n=48)	0820 (n=108)	0710 (n=16)	0820 (n=23)
Reading Ability				
RA1	10.2	10.4	8.9	10.3
RA2	10.6	11.1	8.6	11.1
RA^	0.5	0.5	0.0	0.7
Calibration				
CA1	4.9	5.3	4.8	3.1
CA2	5.0	4.1	3.4	3.8
CA^	0.1	3.8	0.5	-0.6

Note. Traditional students were ages 17 - 25 years, and non-traditional students were ages 26 years and above. Numbers reflect the mean scores and the sample size, n, varied by class population.

(0710) level class. Both class levels of traditional students evidenced approximately the same increase in reading ability with lower (0710) level students remaining at the same total reading ability level.

The greatest change in calibration ability within the traditional and non-traditional classification was in the upper (0820) level traditional students. These subjects evidenced a substantial change in calibration ability. Since a score of zero denotes perfect calibration, the calibration change of 3.8 in the 0820 class, although moving closer to zero, is still indicative of poorer calibration ability than in the other traditional or non-traditional groups in both classes whose scores were closer to zero in both ability measures. The subjects closest to zero and therefore evidencing the greatest calibration ability were the traditional remedial (0710) level students with a 0.1 value. Overall, the non-traditional students were better calibrated than the traditional students.

Gender Effects on Reading Ability and Calibration. Gender related effects on reading ability and calibration skills were great. Table 3 summarizes these findings. The change in reading abilities (1.2) for the males in the lower (0710) level class was much greater than for the females (0.1). In the upper (0820) level class, males and females evidenced the same small increase in ability (0.6).

Table 3

Effects of gender on the reading ability and calibration skills in two classes of remedial/developmental students.

	Male		Female	
	0710 (n=20)	0820 (n=42)	0710 (n=44)	0820 (n=89)
Reading Ability				
RA1	9.5	10.6	10.0	10.4
RA2	10.6	11.1	9.9	11.0
RA^	1.2	0.6	0.1	0.6
Calibration				
CA1	2.6	2.0	5.8	6.3
CA2	5.6	5.4	4.2	5.3
CA^	-2.9	-3.4	1.6	6.1

Note. Numbers reflect the mean scores and the sample size, n, varied by class population.

The change in calibration abilities for the males of both class levels showed a decrease in the ability to calibrate, -2.9 for the 0710 males, and -3.4 for the 0820 males. The negative number indicates that calibration units moved further away from zero rather than closer to zero or perfect calibration. The females of both class levels moved closer to zero by 1.6 for the 0710 class and 6.1 for the 0820 class. The upper (0820) level females evidenced the greatest increase in calibration ability.

Correlation Data For All Students

Pearson r values among age, reading ability and calibration ability indicates several significant relationships (Table 4). Age was shown to be negatively correlated with both measures of reading ability in the 0710 class with a greater significance factor for RA2. There were no significant correlation values for age in the 0820 class.

The first measure of reading ability (RA1) correlated positively with the second measure of reading ability (RA2) in both class levels. RA1 correlated negatively with reading change (RA^) for both class levels also. The second measure of reading ability (RA2) showed a substantial positive correlation with reading change in the upper level (0820) class only.

For calibration ability, the first measure of calibration skills was found to be positively correlated with calibration

Table 4

Correlation values (Pearson r) among age, reading ability, and calibration skills for two levels of classes.

	RA1	RA2	RA^	CA1	CA2	CA^
AGE	-.25*	-.35*	-.25	.02	-.13	.10
	-.02	-.02	.01	-.08	-.10	-.06
RA1		.68*	-.48*	-.01	-.16	.07
		.76	-.32*	-.10	-.02	.06
RA2			.23	-.14	-.24	.03
			.35*	-.18	.04	.04
RA^				-.13	-.14	.00
				-.02	.10	-.02
CA1					.28	.75*
					.05	.39*
CA2						-.38*
						-.15

Note. The top number of each variable indicates the r value for the 0710 class and the lower number for the 0820 class; * = p-value < .05 (2-tail).

change in both class levels. CA2, the second measure of calibration ability, was found to be inversely correlated to calibration change (CA^) in the lower level (0710) class only.

Pearson r Values For Age Effects. Separate correlation matrixes were run on the two age categories of traditional and non-traditional in the 0710 and 0820 classes. As shown in Table 5, more significant relationships were found in the traditional 0710 class. Positive significant correlations were found between RA1 and RA2, CA1 and CA^, and CA2 and CA^. Inverse significant relationships were found between RA1 and RA^, CA2 and CA^, and CA2 and RA2. In contrast, the traditional 0820 class evidenced significant positive correlations between RA1 and RA2, RA2 and RA^, and CA1 and CA^. One negative significant correlation was found between RA1 and RA^.

In the non-traditional 0710 class, two positive significant correlations were found between RA1 and RA2, and CA2 and CA^. One inverse correlation between CA2 and CA^ was found. In the non-traditional 0820 class, one positive significant correlation was found between RA1 and RA2, and two negative significant correlations between age and CA2, and CA2 and CA^.

Table 5

Effects of age on correlations among reading ability and calibration skills in two levels of classes.

Attribute Correlations	Traditional		Non-traditional	
	0710 (n=48)	0820 (n=108)	0710 (n=16)	0820 (n=23)
AGE * CA2	NS	NS	NS	-.44*
RA1 * RA2	.69*	.72*	.56*	.90*
RA1 * RA^	-.48*	-.37*	NS	NS
RA2 * RA^	NS	.37*	NS	NS
CA1 * CA2	.32*	NS	NS	NS
CA1 * CA^	.75*	.39*	.75*	NS
CA2 * CA^	-.33*	NS	-.70*	-.89*
CA2 * RA2	-.33*	NS	NS	NS

Note. Pearson r values are listed for those relationships that are significant; * = p-value < .05 (2-tail). NS indicates non-significant r values.

Pearson r Values For Gender Effects. Gender effects were determined by correlation matrixes run for both genders in two levels of classes. As shown in Table 6, in the 0710 class the male population was positively correlated with AGE and RA^, CA1 and CA2, RA1 and RA2; whereas, in the 0820 class positive correlations were found between CA1 and CA^, RA1 and RA2, and RA2 and RA^. Negative correlations in the male 0710 class were between AGE and RA1, CA2 and CA^, CA1 and RA2, and RA1 and RA^. In the male 0820 class, significant negative correlations were found between AGE and RA1, AGE and RA2, and CA2 and CA^.

In the female population, the 0710 class had two positive significant correlations, between CA1 and CA^, and RA2 and RA^. Positive correlations in the 0820 female class were between AGE and RA2, CA1 and CA^, and RA2 and RA^. Negative correlations in the 0710 class were between AGE and RA2, RA1 and RA2, and RA1 and RA^. In the 0820 female population, negative correlations were found between RA1 and RA2, and RA1 and RA^.

Confidence Judgements

A judgement was determined to be over-confident if the subject's predicted score on the calibration exercise was greater than the actual score. Likewise, a judgement was determined to be under-confident if the subject's predicted

TABLE 6

Effects of gender on correlations among reading ability and calibration ability in two levels of classes.

Attribute Correlations	MALE		FEMALE	
	0710 (n=20)	0820 (n=42)	0710 (n=44)	0820 (n=89)
AGE * RA1	-.49	-.42	NS	NS
AGE * RA2	NS	-.49	-.35	.26
AGE * RA^	.53	NS	NS	NS
CA1 * CA2	.54	NS	NS	NS
CA2 * CA^	-.82	-.97	NS	NS
CA1 * CA^	NS	.32	.85	.37
CA1 * RA2	-.48	NS	NS	NS
RA1 * RA2	.77	.87	-.68	-.69
RA1 * RA^	-.75	NS	-.34	-.41
RA2 * RA^	NS	.36	.33	.36

Note. The Pearson r values are listed only for those relationships that are significant; * = p-value < .05 (2-tail). NS indicates non-significant r values.

score was less than the actual score. Precise calibration judgements evidenced the same percentage correct on the actual and predicted scores. Therefore, a perfect calibration score would be 0. It was beyond the purposes of this research to be concerned with the range of deviations within the under- or overconfidence measure. Table 7 indicates under- and overconfidence determinations by percentages.

In the lower level (0710) class, CA1 and CA2 showed a greater amount of overconfident judgements in both calibration measurements. The number of overconfident judgements increased with the second measure of calibration ability from 55% to 63%. Underconfident judgements decreased in the 0710 class from 39% to 36%. Precise judgements decreased in the second calibration measure by five percent, from CA1 of 6% to CA2 of 1%.

Similar results were found for the upper level (0820) class in the first measure of calibration ability (CA1). Overconfident judgements were greater by a margin of ten percent. However, in the second measure (CA2), underconfident judgements (54%) were greater than overconfident judgements (38%). In contrast to the 0710 class, precise judgments increased in the second calibration measure by four percent, from CA1 of 4% to CA2 of 8%.

Table 7

Over- and under-confidence judgements for all students.

	0710 (n=64)		0820 (n=131)	
	CA1	CA2	CA1	CA2
Underconfident	39%	36%	43%	54%
Overconfident	55%	63%	53%	38%
Precise	6%	1%	4%	8%

Note. Precise calibration judgments consist of equal percentages of actual scores and predicted scores.

Summary

Descriptive data were determined through means for age, reading ability, and calibration skills for two levels of remedial/developmental reading classes. Change in reading ability and calibration skills were also presented as a result of a semester of reading instruction. Means were further separated by age categories (traditional and non-traditional), and gender.

A correlation matrix was run for all variables in two levels of classes to determine relationships among variables. Separate matrixes were run for traditional and non-traditional age categories, and male, female gender. Pearson r values were determined among all variables, some of which were significant. Over- and underconfidence judgements in calibration ability were also calculated.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION AND IMPLICATIONS

The purpose of this research was to extend general knowledge about metacognition to adult at-risk populations. With this in mind, there were three distinct goals. The first was to determine how well at-risk college reading students were able to calibrate as measured by predicting performance on the vocabulary subtests of the Nelson-Denny Reading Test (NDRT). Another purpose was to examine the relationships in each class level among accuracy of calibration, age, gender and reading ability. The final purpose was to determine whether or not a semester of reading instruction or, more specifically, a semester of intense exposure to print, would effect an increase in subjects' ability to calibrate accurately.

Two levels of remedial and developmental reading classes at Walters State Community College in Morristown, Tennessee were tested for reading ability using the Nelson-Denny Reading Test, Form G at the beginning of the semester and Form H at the end of the semester. The 0710 class is the remedial reading class and is considered the lower ability level. The 0820 class is the developmental or upper ability level reading class. Placement in remedial or developmental classes depends on entrance exam scores and past academic performance. Students placed in remedial or developmental courses are

considered at-risk academically due to poor performance and a general failure to meet regular college entrance requirements. Students were randomly assigned to classes within each level. The total population of remedial/developmental students comprised the subjects of this research.

Checklists were developed which listed the vocabulary words taken from the vocabulary subtests of the Nelson-Denny Reading Test (NDRT), Forms G and H. Subjects were asked to mark the words on the checklists they believed they answered correctly on the vocabulary subtests in order to determine calibration ability. The checklists were also used to gather data including age and gender. Grade equivalency scores were derived from the Total Reading Score of the NDRT.

Correlation matrixes representing a sampling over time were run to determine relationships among reading levels, calibration ability, age, and gender for each class level. Age data were separated into two distinct categories of traditional (ages 17 through 25) and non-traditional (ages 26 and above). The change in reading and calibration ability levels from the beginning of the semester to the end was calculated. Descriptive data on each variable were also examined.

RA1 was used to represent the first measure of reading ability taken from the NDRT, Form G. RA2 was used to represent the second measure of reading ability from the NDRT, Form H. RA^ was used to represent the change in ability from

the first measure (RA1) taken at the beginning of the semester to the second measure (RA2) taken at the end of the semester. Similarly, CA1 was used to represent the first measure of calibration ability taken from the checklist based on the vocabulary subtest of the NDRT, Form G. CA2 was used to represent the second measure of calibration ability taken from the checklist based on the vocabulary subtest of the NDRT, Form H. CA^ was used to represent the change in calibration ability from the first measure (CA1) taken at the beginning of the semester to the second measure (CA2) taken at the end of the semester.

Methodology Considerations

One goal of researching calibration at the word level was to address some of the concerns about research methodology on calibration found in the literature. Early research into calibration abilities used contradiction paradigms to determine self-monitoring behavior during reading (Glenberg, Sanocki, et al., 1987; Schommer & Surber, 1986). In these studies, subjects were generally asked to read text with embedded contradictions or information omitted (Maki, et al., 1990; Walczuk & Hall, 1989). More often than not, subjects did not realize the existence of these contradictions and tried to answer questions about the text accordingly. A direct comprehension approach was also used by giving subjects text to read, asking for a confidence rating from each reader,

then testing that confidence rating through a multiple choice exam, or just one question of comprehension or inference based on the reading (Glenberg & Epstein, 1987; Maki & Berry, 1984).

Finally, expertise of text domain was researched to determine how or if background knowledge of the text domain influenced calibration abilities (Glenberg & Epstein, 1987; Lichtenstein & Fischhoff, 1977; Morris, 1990). Several conclusions about calibration skill were reached as a result of this research focus. Subjects appeared to base understanding of text read on their self-perceived level of expertise in the text domain rather than gathering of knowledge through reading the text. Morris (1990) called this the "domain familiarity hypothesis", reflecting the idea that perceived expertise in text domain is not based on comprehension of the text itself, but on an individual's self-evaluation of background expertise in the domain (Weaver, 1990).

Several problems resulted from these early research methods. The majority of methodologies restricted the number of test items based on the text read. At times one inference question was asked or a true/false, yes/no paradigm was used. The resulting binomial representation was found to provide only a crude estimation of calibration ability. Calibration skill levels were found to be affected by the number of test items per text. Adding a greater number of test items per text read was found to provide a more accurate and reliable

assessment of calibration ability (Weaver, 1990).

Homogeneous sample texts were also found to lower actual calibration scores. Based on the premise that people encounter variation in everyday reading, whether in academia or other areas of life, it was reasoned that homogeneous text samples restricted an accurate measure of calibration by setting up an artificial testing situation (Erev, Wallsten, & Budescu, 1994; Horgan, 1990). Also, since expertise in text domain was determined to make a difference in calibration measures, different types of text and different areas of text domain are needed to create a more accurate picture of calibration skill in an individual.

The question of calibration ability over time has remained open in the literature devoted to calibration studies. Maki and Berry (1984) found that calibration skill increased when subjects were presented with delays between text reading, answering questions (or question) based on text, and confidence judgements concerning comprehension. On the other hand, Glenberg, Sanocki, et al. (1987) found that calibration ability decreased when subjects were presented with the same delays. The role of short-term memory in measures of calibration ability has not been fully researched, and all the implications of short-term memory on calibration skills have yet to be determined (Begg et al., 1989).

Overconfidence in calibration judgements have been found consistently in the literature (Lichtenstein & Fischhoff,

1977; Maki & Berry, 1984; Walczyk & Hall, 1989; Erev et al., 1994). Most judgements of whether calibration values were over- vs. underconfident have been determined by computing subjects' subjective ratings on comprehension (predicted results) compared with objective ratings (actual results) using comprehension test results. If the subjective rating is higher than the objective rating, overconfidence is said to occur. Underconfidence is the opposite; the objective rating is higher than the subjective rating.

Three reasons that readers are consistently overconfident have been hypothesized. First, readers have been shown to be reliant on short-term memory to answer objective questions. In other words, readers base understanding of text on the last few sentences instead of the whole passage (Magliano et al., 1993). It is clear to see how objective ratings would be low if subjects evaluate a passage by such a small amount of actual text. Next, overconfidence has been found to occur directly after reading text, again indicating that subjects might assimilate facts presented in the text, but do not fully grasp the more intricate relationships in the text (Glenberg, Sanocki, et al., 1986). And finally, as previously mentioned, subjects may assess general knowledge of a text domain and not the knowledge gained from a recent reading of text in that domain (Glenberg & Epstein, 1987; Morris, 1990). As a result of this, subjects may base confidence on an incorrect premise.

In an attempt to overcome these research methodology

concerns for determining calibration skills, calibration at the word level was decided on as the focus of the present research. By researching calibration on the word level, concerns about calibration of comprehension such as text domain could be alleviated. Using the vocabulary subsections of the Nelson-Denny Reading Test provided a naturalistic reading task by representing many different text domains within the minimal context presented with the word choices. Eighty text items were available to each subject, depending on how many items were attempted during the fifteen minute time limit. In this way, a nominal representation of calibration skill was avoided. Since subjects were asked to rate word items directly after the completion of the vocabulary subtest, and had the test booklet on their desks during the calibration exercise, short-term memory use was not a limiting factor.

Good vs. Poor Calibration Measures

As determined in the literature, perfect calibration is zero, indicating no difference between predicted and actual scores. It is more difficult to determine what is considered good vs. poor calibration in the literature. There is apparently no consistent rating system because the system used to rate poor skills or good skills often reflects the type of measurement taken; nominal or hit rate percentages. A hit rate is the number of test items attempted that the subject predicts will be correct that are actually correct

(Lichtenstein & Fischhoff, 1977). Hit rate data are usually presented in percentages, and in the case of this research, were plugged into the formula used to calculate calibration values (Horgan, 1990).

Because of the difficulty in determining a consistent scale for labeling good or poor calibration ability, a scale was established to meet the parameters of this research by examining the range in calibration hit rate scores. Calibration skill was labeled good if the predicted score and the actual score yielded a calibration value of less than one. Average calibration ability based on the range of scores was a value between one and five. Furthermore, calibration skill was labeled poor if the predicted and actual scores yielded a calibration value greater than five. This scale remains effective even when considering negative and positive values of calibration measurement.

Descriptive Data

The mean results for the 0710 and 0820 class levels were consistent with the designations of lower and upper levels of reading classes. The 0710 or lower level class had a slightly higher (one year, one month) age mean than the 0820 or upper level class. Age ranges within the class levels are not usually consistent year to year. In other words, age assignment to course level is incidental; course assignment is done by entrance scores only. As expected, the upper level

class evidenced a higher reading ability score on both measures (RA1 and RA2), and also had the greatest increase in ability (RA^) after a semester of reading instruction.

Mean calibration scores are more difficult to interpret. Both class levels were essentially the same on the first and second measures of calibration ability. Change in calibration ability over time reflected a much greater mean increase in the upper (0820) level class. The increase was substantial (3.0) and signified a change towards better calibration ability. This can tentatively be linked to the higher reading scores. This would be consistent with previous research which found that better readers were also better calibrators of performance (Glover, 1989; Maki & Berry, 1984).

Age Effects. When means were separated by age category, it became clear that the traditional students scored consistently the same or higher on reading ability in both class levels. The gap between traditional and non-traditional scores was particularly wide in the lower (0710) level class. This probably reflects the fact that many of the non-traditional students have been out of school for some time and have not participated in a testing situation or specifically a reading comprehension test in many years. It should be noted, however, that the non-traditional upper (0820) level class evidenced the greatest increase in reading ability at the end of the semester. This is frequently the case, as the non-

traditional age students often exhibit the strongest motivation to improve reading ability and move into college level courses.

Calibration ability separated by age levels can be directly contrasted to the reading ability measures. Non-traditional students had consistently better calibration scores. In the traditional aged 0710 level students, calibration ability actually showed a minor decrease, a situation mirrored in the non-traditional 0820 students. In contrast, the non-traditional 0710 class showed a small increase in calibration ability. A substantial mean increase in calibration ability was apparent in the traditional upper (0820) level students. Results indicate that the traditional lower (0710) level students and the non-traditional upper (0820) level students evidenced average calibration ability, the traditional upper (0820) level students and the non-traditional lower (0710) level students showed average to poor calibration skills.

Based on this data alone, no definite conclusions can be reached regarding age and calibration ability. The majority of the research examining reading ability, calibration skills and age examine the developmental aspects of these variables and not age as a variable alone. It is important to note that while reading and language abilities are developmentally acquired, metalinguistic awareness can be an ongoing acquisition, well up into the adult years. Academically at-

risk students such as the subjects in this research are still in stages of developing reading, language, and metacognitive skills.

Gender Effects. Separating the means for gender effects produced some surprising results with regard to calibration skills. Gender effects, in particular predominance of reading disabilities in males and greater female verbal ability, have been part of reading research for many years (Stanovich, 1986). On the other hand, there is no direct documentation of gender effects on calibration ability. Reading ability means showed the greatest increase in reading scores in the male subjects in the 0710 class, and the only decrease in reading ability in the female subjects in the 0710 class. Whether or not this is a trend can only be determined through future research into gender related differences in calibration skill at the adult or college level. The upper level (0820) class had the same (0.6) increase in reading ability in both gender categories.

Separating the means for calibration skills with regard to gender showed that both populations of male subjects (0710 and 0820) had substantial decreases in calibration ability after a semester of reading instruction, or more specifically, a semester of intense exposure to print. Conversely, both populations of female subjects (0710 and 0820) evidenced increases. The upper level (0820) female population actually

had a dramatic increase (6.1) in calibration ability.

The reason for this gender effect on calibration ability is unclear. It can only be noted that substantial increases occurred in the female populations, decreases in the male populations. This may substantiate theories of greater verbal ability in female populations in general. The decrease demonstrated in the male population can only remain unexplained within the limitations of this research.

Correlation Data

Correlation matrixes representing a sampling over time (one full semester of reading instruction) indicate several reciprocal relationships worthy of discussion among reading ability, calibration ability, gender and age. The strengths of these relationships differ within the different class levels and are often inconclusive with respect to why these relationships exist.

The relationship between RA1 and RA2 was found to be positively correlated in both class levels which is essentially inherent in the relationship of reading measures. As the first measure of reading ability increases, it is logical that the second measure will increase somewhat proportionately. This is not always the case, as the second reading measure can and does decrease in a small percent of students tested with the NDRT. The relationship between RA1 and the change in reading ability was found to be negatively

correlated in both class levels. On the other hand, RA2 was found to be positively correlated with reading ability change in the 0820 class. This could be indicative of the inherent relationship as well. As reading ability increases and moves directionally upward, the relationship between reading scores could become more positive, assuming the change in reading ability from one score to the next also improves, or moves in a positive direction.

With regard to calibration ability, CA1 was found to be positively correlated with calibration change in both class levels. Interestingly, RA1 was negatively correlated with reading change in both class levels, and RA2 was positively correlated with reading change in the 0820 class. Conversely, CA1 was positively correlated with calibration change in both class levels, and CA2 was negatively correlated with calibration change in the 0710 class. There is no way within the limitations of the present research to draw a conclusion concerning these relationships. However, the opposite nature of these results may be reason for future research into whether or not this is a trend.

There can be no determination from the correlational data how or if reading ability directly affects calibration ability. Reading ability measures showed no significant relationships with calibration ability measures in the correlation matrix. This is disappointing because the literature has consistently associated greater reading skills

with greater calibration ability (Glover, 1989; Maki & Berry, 1984). If the results of this study had been consistent with the literature, reading ability change and calibration ability change would have shown a significant positive relationship. The reason for this cannot be answered within the limitations of this research.

It could be, however, that because these subjects are at-risk academically, other factors that inhibit calibration ability may be obscuring more positive results. Locus of control, for example, may be a contributing factor to subjects' at-risk status. An external locus of control has been found to be evident in most academically at-risk populations (El-Hindi, 1993). Students with an external locus of control may look for outside influences related to academic success or failure, rather than internal characteristics such as motivation and effort. An external locus of control may inhibit a subject's ability to approach a calibration exercise with enough confidence to produce results with any accuracy. An internal locus of control has been characteristically associated with the ability to accurately self-evaluate (Mabe & West, 1982).

Age Effects. Age effects are clearly indicated through the correlation data. The traditional students (age 17 through 25) in the 0710 level class evidenced significant relationships with almost every measure of reading and

calibration ability. Also, a number of significant relationships with reading and calibration ability can be found in the traditional students in the 0820 class. The reason why the traditional aged subjects showed more relationships with reading and calibration ability than the non-traditional students (age 26 and over) can only be speculated on. Reasons can possibly be associated more with the fact that traditional-aged students have been out of school for a shorter period of time than actual age factors.

Gender Effects. The effects of gender on calibration ability found in the descriptive data were reinforced in the correlational data. Female subjects evidenced strong relationships between calibration measures and change in calibration ability. The male students showed mostly inverse relationships among the same variables. Reading ability measures were also strongly correlated with both class levels of female subjects. As previously stated, there is no body of research investigating calibration skill and reading ability with respect to differences related to gender. Further research replicating this methodology may determine whether this was an anomaly or a possible trend.

Confidence Judgements

Judgement frequencies of overconfidence and underconfidence were consistent with the literature

(Lichtenstein & Fischhoff, 1977; Maki & Berry, 1984; Walczyk & Hall, 1989). Judgements of overconfidence were predominant. Since the literature is based on confidence judgements on calibration of comprehension, it is difficult to interpret why this trend is apparent on the word level. Comprehension as a reading skill was involved with the vocabulary subtests minimal context. However, this calibration exercise was clearly different than a comprehension question based on larger amounts of text.

Overconfidence may be more a function of vocabulary recognition than has been previously indicated. By measuring calibration through vocabulary with minimal context, subjects may have partially judged correctness of answers by judging word recognition, i.e. how many times subjects have encountered the word, whether the meaning was known or not. This has been partially determined through the literature because ease of word processing has been found to positively influence self-assessment of comprehension (Begg et al., 1989). Since minimal context offers what most reading disadvantaged students might consider an easier word processing task than larger text reading, overconfidence may be a result of processing ease.

Summary of Research Purposes and Conclusions

One purpose of this research was to determine how well at-risk college reading students were able to calibrate on the

vocabulary subtests of the Nelson-Denny Reading Test. Results of this study have shown that calibration ability of at-risk college reading students ranges from average to poor, even after a full semester of reading instruction. The second purpose, to determine if at-risk college reading students evidenced an increased ability to calibrate after a semester of intense exposure to print and reading instruction, was also addressed by this data. This study indicates that exposure to print and reading instruction as presented in the classes researched do not automatically lead to significant increases in calibration ability.

A correlation matrix was run in order to establish whether a relationship exists among accuracy of calibration, age, gender and reading ability; the final purpose of this research. No significant relationship was found between reading ability and calibration skill. Age as defined by this research appeared to make only minor differences in reading skill and calibration ability. Gender, on the other hand, might make a difference in ability to calibrate accurately. Females in both class levels were found to develop a substantial increase in calibration skill, while males of both class levels decreased in ability.

Several tentative conclusions can be drawn from the results of this research; tentative because this study would need to be duplicated in order to establish trends and further substantiate these results. Calibration skills and reading

ability of adult at-risk students may need to be researched using tighter parameters to be able to associate more closely at what point increased reading ability affects calibration ability, if in fact, there is a reciprocal relationship. Since the greatest increase in calibration ability was found in the upper (0820) level class, a certain level of reading ability may need to be reached before metacognitive awareness increases and calibration ability increases as a result.

The traditional-aged students (ages 17 through 25) scored higher in reading ability in both levels of classes. This may be because students in this age category have more recently participated in formal school activities such as tests and other academic exercises as compared to non-traditional aged students who have not been in formal learning environments for several years. Another aspect which may be reflected in these results among age is that the non-traditional students (ages 26 and above) are generally non-readers, that is, they have the ability to read (although somewhat disadvantaged) but choose not to. Through intense exposure to print and one semester of reading instruction these students increased their reading ability substantially. Stronger motivation and effective reading instruction may have made the difference between the greater ability increase in the non-traditional students. Again, there was no significant relationship found between reading ability and calibration ability. While the traditional students scored higher in reading ability in both

class levels, the non-traditional students had higher mean calibration scores. This may be because non-traditional students have had greater (longer) experience with reading and language in general. Since it is hypothesized that metalinguistic awareness continuously develops through exposure to print, even in adults, these results may lend credibility to this theory.

Gender results suggest some interesting ideas, but no definite conclusions. Males increased in reading ability and decreased in calibration ability; females evidenced the only mean decrease in reading ability and increased in calibration ability. Female subjects may have the necessary cognitive introspection necessary to accurately calibrate performance. On the other hand, male subjects may consistently perform better on a more traditional comprehension-based calibration exercise, rather than a calibration exercise on the word level. However, it must be pointed out that many other contributing factors may have affected these gender-based results. Poor academic performance as a result of test anxiety, for example, may be associated more strongly with one gender than the other.

Pedagogical Implications and Areas Of Future Research

Many areas for future research are suggested by the results of the present study. Further research is warranted because so little research into metacognitive skills exists

using at-risk populations. The educational implications of increasing metalinguistic and metacognitive abilities in students are important. Many instructors report incidents of dealing with academically poor students who claim they have learned and studied information, yet fail exams. Frequently these students lay the blame on the academic system or instructor involved (Maki & Berry, 1984). Increasing a students' ability to accurately judge performance and outcome of an academic task could prevent this scenario from occurring as frequently.

Locus of control is also involved. The propensity to blame poor performance on an outside person or situation is indicative of external locus of control (El-Hindi, 1993). For this reason, calibration abilities of at-risk populations may need to be researched by combining locus of control with the variables used in this research. In particular, gender relationships to calibration and reading ability may be further explained through locus of control data.

Previous studies have established that metalinguistic ability, calibration skills, and reading ability can be developed and increased over time (Barton & Hamilton, 1980; Burley, 1985; Hamilton & Barton, 1980; McAllister, 1989; Bowey et al., 1984; Warren-Leubecker & Carter, 1988). The wide range in ages may have been a limiting factor in determining when age coincides with the development of calibration skills in particular. Age ranges in future research may need to be

smaller in order to determine when calibration becomes more stable in an individual, as it has been established that self-monitoring is a flexible, controllable attribute of the subject (Schraw et al., 1993). It is quite probable that calibration ability is also a flexible, controllable attribute.

Several specific areas of general academic ability and reading instruction have been found to increase calibration ability. Examples include feedback from tests, increasing background knowledge or expertise, pre-tests designed to enhance self-monitoring, embedded questions, and text manipulated to increase deep-processing (Glenberg & Epstein, 1987; Glenberg, Sanocki, et al., 1986; Horgan, 1990; Morris, 1990; Pressley et al., 1990; Walczuk & Hall, 1989). It may be necessary to examine reading instruction through separate components of a class rather than reading instruction as a whole. It is clear at this point that reading instruction without direct instructional interventions to increase self-monitoring and calibration ability is not as effective as specific instruction designed for this purpose. A full understanding of what increases calibration skill in an individual student may lead to more effective instruction for enabling at-risk college students to be successful academically.

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APPENDICES

Appendix A

INFORMATION SHEET I

Subject Number _____ Circle One: 0710 0820

Age ____ Sex ____

Nelson-Denny Test Results

	Raw Scores	Grade Equivalent Scores
Vocabulary Score	_____	_____
Comprehension Score	_____	_____
Total Reading Score	_____	_____

****

You were just tested on these words on the Nelson-Denny Reading Test. Check the words you believe you answered correctly. Put a star by the last word you gave an answer to on the test and stop with this word.

1. _____explain
2. _____elastic
3. _____similarities
4. _____massive
5. _____resources
6. _____quest
7. _____replication
8. _____migration
9. _____dependence
10. _____alter
11. _____tasteless
12. _____abruptly
13. _____grasp
14. _____segments
15. _____unworthy
16. _____mesh
17. _____surface
18. _____presumed
19. _____intoxicate
20. _____resistance
21. _____surplus
22. _____sensory
23. _____congregate
24. _____incentive
25. _____linear
26. _____delayed
27. _____void
28. _____vessel
29. _____insufficient
30. _____schemes
31. _____degenerate
32. _____unscrupulous
33. _____induce
34. _____syndrome
35. _____drudgery
36. _____disperse
37. _____placid
38. _____prodigious
39. _____contaminate
40. _____vivid
41. _____recessive
42. _____wreak
43. _____leniency
44. _____ailment
45. _____rigidity
46. _____fascinated
47. _____succulent
48. _____edit
49. _____sway
50. _____desist
51. _____lurking
52. _____diversity
53. _____verbatim
54. _____rampant
55. _____susceptible
56. _____robust
57. _____scathing
58. _____retention
59. _____surfeit
60. _____uncouth
61. _____quota
62. _____fulcrum
63. _____harrowingly
64. _____sparse
65. _____curtailed
66. _____idiosyncrasy
67. _____obscure
68. _____sardonic
69. _____demise
70. _____pseudo
71. _____imbued
72. _____caricatures
73. _____mundane
74. _____blatantly
75. _____partial
76. _____introspective
77. _____unequivocal
78. _____edifices
79. _____emulate
80. _____pungent

Appendix B

Information Sheet II

Subject Number _____

Nelson-Denny Test Results

	Raw Scores	Grade Equivalent Scores
Vocabulary Score	_____	_____
Comprehension Score	_____	_____
Total Reading Score	_____	_____

**********You were just tested on these words on the Nelson-Denny Reading Test, Form H. Check the words you believe you answered correctly. Put a star by the last word you gave an answer to on the test and stop with this word.

1. ____flexible
2. ____evidence
3. ____perfect
4. ____stabilize
5. ____resemblance
6. ____legal
7. ____robots
8. ____verified
9. ____pathetic
10. ____dependable
11. ____canines
12. ____retain
13. ____assist
14. ____subdivided
15. ____agenda
16. ____defense
17. ____random
18. ____rigorous
19. ____acquired
20. ____burrow
21. ____urgency
22. ____accumulated
23. ____consequence
24. ____eerie
25. ____decor
26. ____constrict
27. ____vary
28. ____excruciatingly
29. ____tactics
30. ____binge
31. ____protruding
32. ____queried
33. ____dwelling
34. ____humility
35. ____mandatory
36. ____contradictory
37. ____deficiencies
38. ____insomnia
39. ____devise
40. ____textured
41. ____tributes
42. ____mutely
43. ____prestige
44. ____immerse
45. ____futile
46. ____severe
47. ____stipulated
48. ____auk
49. ____interlude
50. ____viable
51. ____impelled
52. ____selective
53. ____hypothetical
54. ____absorption
55. ____resplendent
56. ____mutation
57. ____limbo
58. ____local
59. ____ordinances
60. ____valid
61. ____criterion
62. ____uninhibited
63. ____curt
64. ____tandem
65. ____cliches
66. ____innovations
67. ____heartily
68. ____colloquy
69. ____transpires
70. ____hospitable
71. ____prognostic
72. ____naught
73. ____antithesis
74. ____abominable
75. ____propensity
76. ____astute
77. ____cumbrous
78. ____altruistic
79. ____tycoon
80. ____fiasco

VITA

Peggy F. Hopper was born in Clarksdale, Mississippi on November 19, 1955. As the daughter of a career military officer, she attended both public and parochial schools in various states and overseas. She was graduated from Lowndes County High School in Valdosta, Georgia in 1973, and entered Mississippi State University in the fall of the same year. She received the Bachelor of Liberal Arts and Sciences in December, 1977. After working for many years in another discipline, she entered the profession of teaching through course work at Memphis State University where she received both a Master's degree in 1986, and an Education Specialist's degree in Curriculum and Instruction in 1991 with an emphasis in Reading. After moving to the Knoxville area in 1992, she entered the University of Tennessee to pursue the Doctorate of Education in Holistic Teaching/Learning with a major in Reading. She was graduated with the doctoral degree in May, 1996. She currently teaches remedial/developmental courses at the community college level in east Tennessee.