

ANXIETY AND ATTENTION IN BEGINNING READERS

by

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Dissertation submitted to the Faculty of the  
Virginia Polytechnic Institute and State University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

in

Curriculum and Instruction

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## (ABSTRACT)

This study investigated the relationship between anxiety and attention in high and low anxiety readers during the reading of materials of varying difficulty levels. An A-state reading anxiety scale was developed for the purpose of identifying high and low reading anxiety participants. Response times to a secondary task were measured while high and low reading anxiety participants were engaged in orally reading materials at easy, average, and hard difficulty levels and when not engaged by a primary task.

A repeated measures design was implemented to describe relations between response times to a secondary task and high and low A-state reading anxiety groups for a baseline measure and for the reading of easy, average, and hard materials. Response times served as the dependent measure. Reading anxiety groups (high and low) and difficulty levels (baseline, easy, average and hard) served as independent measures. Difficulty levels were identified relative to

both comprehension scores and word recognition scores and analyses were conducted separately for difficulty levels as identified by comprehension scores and for difficulty levels as identified by miscue scores.

The repeated measures analysis demonstrated a significant interaction effect between high and low anxiety groups and difficulty levels (baseline, easy, average, and hard). The results indicated that attention to the reading task differed for high and low anxiety readers at varied difficulty levels. It was demonstrated that high anxiety readers reached high levels of attention to reading materials only at easy reading levels. At average and hard reading levels, high anxiety readers were unable to maintain high levels of attention to the task. Low anxiety readers generally followed the predictions of the Yerkes-Dodson law (1908), allocating more attention to average reading tasks. Findings were discussed with regard to implications of the effects of anxiety on attention to reading and the development of this methodology.

## DEDICATION

To \_\_\_\_\_, my mother, best  
friend, greatest supporter, and the person who taught  
me to love reading.

## ACKNOWLEDGEMENTS

Recognition must be given to a number of people who made this research possible:

Jerome A. Niles, my advisor, mentor, and coach. I thank Jerry as much for what he didn't do as for what he did.

Rosary V. Lalik, John K. Burton, Thomas M. Sherman, Linda E. Scott, and Chris Peterson, who provided faculty support, advice, and friendship through the study.

, who got me started and believed that I could finish.

, and . I thank each of these family members of for their love, encouragement, patience and support.

, and . I thank each of these individuals for laughter, friendship, collaboration, love, and support.

Finally, I thank the students, classroom teachers, and principals of five anonymous elementary schools, and the supervisors of elementary education in these three anonymous school districts in southwest Virginia for their help, and cooperation in welcoming me into their schools to conduct this study. Their assistance is at the very heart of this project.

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## CHAPTER I

### INTRODUCTION

The research base on anxiety and reading demonstrates that anxious readers do not perform as well as non-anxious readers on measures of reading performance (Gaundry & Spielberger, 1971). Research on anxiety and reading has explored reading achievement and reading comprehension in high and low test anxiety students (Hill & Sarason, 1966; Lunneborg, 1964; Merryman, 1974; Sarason, Davidson, Lighthall, Saite & Ruebush, 1960). Reading was measured in these studies after reading tasks had been completed (measures of outcome such as performance, comprehension or achievement). Based on the results of these and other studies (Dillard, Warrior-Benjamin & Perrin, 1977; Murray, 1978; Proger, Cedric, Mann, Taylor, Bayuk, Morris & Reckless, 1973), it can be stated that high levels of anxiety are generally associated with lower levels of performance (outcomes) on reading tasks. However, very few studies have focused on the processing effects of anxiety on children while engaged in the act of reading, rather than the effects of anxiety on outcomes.

Sieber, O'Neil and Tobias (1977) suggest that the direct effects of anxiety are manifested during pre-processing and processing. Further, it has been suggested

that anxiety requires attention, and that during processing, anxiety may interfere with attention to a primary task (Eysenck, 1983; Eysenck, 1979 a & b).

Attention may be defined as the focalization and concentration of the mind on a specific object, thought or activity. Focalization suggests selectivity. At a given time, an individual perceives a variety of sensory stimuli. A selection of specific stimuli to be attended to is needed in order to avoid an information overload.

Concentration suggests mental effort. Capacity theories of attention consider the amount of mental effort which is allocated in order to make sense of stimuli. These theories propose that attention is limited (Kahneman, 1973; Reed, 1982). Capacity theorists have described attention through the construct of cognitive capacity.

#### Attention, Anxiety and Reading

Cognitive capacity is a general limit on available processing space for performing a specific task at a specific time (Kahneman, 1973). Kahneman (1973) points out that an important aspect of cognitive capacity is that it is finite. He also suggests that individuals have considerable control over how attention is allocated to tasks. Tasks vary in terms of the amount of attention which is required for task completion. When a task requires

little mental effort, individuals may be able to allocate attention to a focal task and accomplish the task successfully while also allocating attention to other activities. As the amount of mental effort needed to accomplish a task increases, the amount of attention which is allocated to task completion must increase. An individual may fail to accomplish a task successfully if there is not enough capacity to meet task demands, or if available attention is allocated to other activities (Kahneman, 1973).

Anxiety may affect cognitive capacity by occupying processing space which is needed in order to effectively deal with a task (Beck & Emery, 1985; Eysenck, 1979a). For example, when reading a text, an anxious individual may have difficulty concentrating on the task because the individual becomes focused on concepts of danger or threat in the reading setting. Rather than adequately attending to a given task, attention is diverted toward scanning for stimuli perceived as threatening (Beck & Emery, 1985). Smith (1975, p. 233) suggests that the interference of anxiety during reading may "make impossible the shifts of attention and tests of a variety of hypotheses that many learning situations demand." Thus, anxiety increases the amount of information a person must deal with in making decisions. Consequently, high anxiety conditions may result

in decreased performance related to reading tasks because a portion of available attention will be diverted and focused on anxious responses.

For readers who operate within normal ranges of anxiety related to reading, one would expect to find that the allocation of attention to the reading task would be focused on the reading task. On the other hand, readers who have developed high levels of anxiety related to reading may devote a portion of available attention to the attentional demands of anxiety when faced with reading tasks. Thus, less attention may be available for attention to the reading task. During text processing, the allocation of attention may be divided for high anxiety readers. While a portion of available attention may be focused on the demands of the reading task, another portion of available attention may be focused on aspects of anxiety such as worry about threatening aspects of the reading setting. It follows that a divided focus of attention may affect the quality of reading performance.

#### Attention, Reading and Text Difficulty

The difficulty level of a given task is another closely related variable that affects the allocation of attention to the task (Eysenck, 1983). Generally, for easy tasks, not all available attention is needed for successful task

completion, thus there is a large residual. For average tasks, most available attention is needed for successful task completion, and for hard tasks, more attention than is available is needed for successful task completion. Consequently, the information processor may have to extend the time of processing to cope with the increased attentional demands of a hard task.

When a task is easy for a reader, it requires little mental effort. When engaged with an easy reading task, a reader may be able to allocate attention to the task and accomplish the task successfully without exhausting available cognitive capacity. An average task requires increased mental effort, so an individual must increase the amount of attention which is allocated to the task in order to successfully complete it. So, when a reader encounters an average reading task, it is necessary to focus the major portion of available attention on successfully accomplishing the task. When the difficulty level of the task is great, the demands of the task require more attention than is available. When a reader encounters a hard reading task, as evidenced by poor comprehension or word recognition, the reader may fail to accomplish the task successfully because there is not enough available attention to meet task demands (Eysenck, 1983; Kahneman, 1973).

Attention, Anxiety, Reading, and Text Difficulty

It could be reasoned that the relationship between attention and difficulty level of a text may vary with differing anxiety conditions. It could be argued that, for low anxiety readers, presented with an easy reading task, only a portion of available attention may be allocated to accomplishing the task, while another portion of residual attention remains, or is used for other reader purposes. When low anxiety readers are presented with average reading tasks, the major portion of available attention may be utilized by the reading task, leaving little residual attention. A hard reading task may require more attention than is available and result in decreased reading performance. Perceived difficulty with the text may result in distractibility, manifested in increased levels of residual attention.

When high anxiety readers are faced with reading tasks, it could be hypothesized that a portion of available attention may be engaged in dealing with anxious responses related to the reading task. Regardless of the difficulty level, attention may be divided between the reading task and anxious responses to the task. When faced with an easy reading task, while a portion of available attention may be utilized in attending to the reading task, additional

available attention may be required and focused on anxious responses. Thus, most of the attention which is available may be utilized by combined task demands and anxiety responses. At average difficulty levels, the major portion of available attention is needed in order to successfully accomplish the reading task. For high anxiety readers at average difficulty levels, task demands combined with the demands of anxious responses may exceed available capacity. Hard reading tasks alone are expected to exceed available cognitive capacity. For high anxiety readers, when the demands of hard reading tasks are combined with the demands of anxious responses, available cognitive capacity would be exceeded once again.

#### Measuring Anxiety and Cognitive Capacity

Anxiety is classified in two categories: A-trait and A-state anxiety. Trait anxiety is a long-range tendency to anxious responses in a variety of situations. A-state anxiety is a short-term anxious response to a specific situation. This investigation focuses on anxiety related to reading, and it will be necessary to measure A-state reading anxiety. Anxiety (A-trait and A-state) is often measured using anxiety scales which rely on self-report to identify the degree to which an individual is anxious. A-state anxiety scales have been developed to measure anxiety

related to specific situations, such as test anxiety (Gaundry & Spielberger, 1977), however, an existing A-state reading anxiety scale was not available, so the development of such a scale was needed in order to identify high and low A-state anxiety readers.

Cognitive capacity has been measured using a primary task/secondary task paradigm (Bacon, 1974; Eysenck, 1979a; Eysenck, 1983; Hamilton, 1975). This paradigm engages participants in a primary task, such as reading a text, and a secondary task, such as responding to a tone. A measurement is taken of the time required to respond to the secondary task. Britton, Phia, Davis, & Wehausen (1978) studied cognitive capacity usage during reading tasks using the primary task/secondary task paradigm. Their study points out that reading requires cognitive capacity and they were able to document cognitive capacity utilization during reading tasks. It was demonstrated that the more cognitive capacity used in processing a text, the slower a reader will respond to a secondary stimulus presented during the reading. When less cognitive capacity was being utilized in attending to the reading task, response times to a secondary stimulus were faster (Britton, et.al., 1978).

Secondary task research has demonstrated that response times are arrayed in an inverted U-shaped curve with

relation to task difficulty and anxiety, following the predictions of the Yerkes-Dodson law (1908) (Eysenck, 1983). During low levels of engagement with a primary task (such as during easy reading), response time to a secondary task will be rapid at normal anxiety conditions. At lower levels of engagement, available cognitive capacity is not utilized by task demands, thus high levels of residual attention are available. This accounts for rapid responses to a secondary task. During levels of higher engagement with the primary task (such as during average reading), response times to a secondary task will be slower. Because high levels of available cognitive capacity are being utilized by the primary task, response times to the secondary task are slower. When difficulty levels are again increased (such as during hard reading), response times to a secondary task again become fast. At this level, the demands of the primary task have exceeded available cognitive capacity, interfering with the focus of attention on the primary task, and resulting in increased levels of residual attention (Eysenck, 1983).

If anxiety affects attention distribution, it can be hypothesized that attention to a reading task, defined as cognitive capacity, may vary between low-anxious readers and highly anxious readers because of the attentional demands of anxious responses for high anxiety readers.

Utilizing the primary task/secondary task paradigm, low anxiety readers may respond slowly to a secondary task when reading materials at average levels because task demands are expected to utilize available cognitive capacity. For low anxiety readers, easy reading and hard reading should result in faster reaction times. In the case of easy reading, available cognitive capacity may not be completely utilized by attention to the task, so response times should be fast. In the case of hard reading, task demands may exceed available cognitive capacity, again resulting in fast response times.

The cognitive capacity of highly anxious readers may be at peak levels of engagement only when reading easy materials. The reading task may initiate anxiety, but since it is an easy reading task, available cognitive capacity should not be exhausted by either task-related or anxiety-related demands. Thus, available capacity may be divided between dealing with anxiety and attending to the reading task. So, slower response times to a secondary task would be expected of these readers when reading at easy levels. When reading at average or hard levels, the combined attentional demands of the task and maintenance of anxious responses may exceed available cognitive capacity. Thus, for high anxiety readers at average and hard difficulty levels, response times to a secondary task would

be expected to be rapid. If one accepts the notion that more attention is engaged for anxious readers (thus less space is available for processing information), there are implications on text levels or task difficulty levels appropriate for these children.

### Purpose of the Study

The purpose of this study was to determine if differences exist in the distribution of attention, as represented by cognitive capacity, between high and low anxiety readers for the reading of material of varying difficulty levels.

The study was designed to investigate the following questions:

For high and low anxiety readers, what is the relationship between anxiety and cognitive capacity during the reading of materials of varied difficulty levels?

#### Subquestions:

1. What is the relationship between anxiety and cognitive capacity for high and low anxiety readers during the reading of easy reading materials?
2. What is the relationship between anxiety and cognitive capacity for high and low anxiety readers during the reading of average reading materials?
3. What is the relationship between anxiety and cognitive capacity for high and low anxiety readers during the reading of hard reading materials?

## CHAPTER II

### REVIEW OF THE RELATED LITERATURE

The purpose of this chapter is to examine theory and research relevant to the relationship between attention, anxiety and reading. The chapter begins by providing a description of anxiety and the measurement of anxiety. Then, the relationships between anxiety and reading, attention and anxiety, and reading and attention are discussed. Finally, the remainder of the chapter discusses how anxiety, attention, and reading difficulty levels are related.

#### Anxiety

Anxiety includes a combination of somatic, cognitive, emotional and behavioral responses. These responses occur when an individual encounters a stressful situation and perceives that situation as dangerous (Rosenhan & Seligman, 1984; Spielberger, 1972). A situation, or combination of elements in a situation, may represent stress for an individual. If a stressful situation or setting is perceived as possibly dangerous by the individual, anxiety is a result.

In the context of anxiety related to reading, a stressful setting would be considered to be any situation

in which an individual is asked to read a text. Reading settings may be stressful to emerging readers due to perceived pressure to perform well in reading. The degree to which an individual perceives the reading setting to be threatening may determine the degree to which the individual displays anxious responses to the situation.

Anxiety is closely related to fear. Where fear is an emotion which has been studied and written about for centuries, anxiety is a relatively new concept. Rosenhan and Seligman (1984) define anxiety in terms of the characteristics of fear. Both fear and anxiety have like somatic responses. Externally, there may be responses such as: changes in facial expression, changes in muscle tension, and increased perspiration. Internally, the autonomic and central nervous systems initiate a series of responses including: redistribution of blood flow to the muscles and brain, changes in blood content in preparation for coagulation, speeding up of the heart rate, elevation in blood pressure, and increased supplies of oxygen and energy resources being sent to the bodily tissues.

Emotional responses to both fear and anxiety include feelings of dread, terror and panic. Behavioral responses to fear and anxiety are classified as either instrumental or classically conditioned. Instrumental behavioral responses are voluntary and generally fall into two

categories: fleeing and fighting. Classically conditioned responses are involuntary, learned responses.

The distinctive difference between fear and anxiety is only apparent in the cognitive response. In a fear response, an individual responds to a threat which represents a clear and specific danger. In an anxiety response, an individual responds to a threat which represents an unclear, non-specific danger.

Anxiety is classified in two main categories: trait anxiety (A-trait) and state anxiety (A-state). Trait anxiety is a long-range tendency to anxious responses in a variety of situations. Individuals with A-trait anxiety may view a wide range of situations as being harmful, resulting in chronic anxious responses to many situations. A-state anxiety is a short-term anxious response to a specific situation. A-state anxiety may differ in intensity and duration, depending on individual perceptions of given situations (Spielberger, 1975).

Anxiety is often measured using anxiety scales which rely on self-report to identify anxiety levels. A-trait anxiety scales have been developed which measure the tendency to anxiety as a relatively stable personality trait, and A-state anxiety scales have been developed to measure anxiety related to specific situations, such as test anxiety (Gaundry & Spielberger, 1977).

Physiological measures such as heart rate, galvanic skin response, and respiration rate have also been used to measure anxiety (Ferrara, 1978). This method may be problematic in the measurement of ongoing A-state anxiety due to the necessity of physically connecting individuals to monitoring devices. The use of this equipment may also affect the level of anxiety.

### Anxiety and Reading

The focus of research relating to anxiety in children in school settings has been test anxiety. Sarason et al. (1960) provide three explanations for the focus on test anxiety. First, test anxiety was of interest because testing is a common experience in schools. Secondly, testing is evaluative, and students are often under pressure to perform well on tests, so it was probable that high levels of anxiety related to testing settings would occur. Finally, in our society, many aspects of peoples' lives may be influenced by test performances. Because of the focus on test anxiety, much of the research on reading and anxiety has investigated the relationship between reading achievement and test anxiety.

To provide an overview of the research base on the relationship between reading achievement and test anxiety, a number of these investigations will be discussed.

In a longitudinal study of the relationship between anxiety and other school-related variables, Hill and Sarason (1966) found an increasingly negative relationship between achievement and test anxiety over the elementary grades. Reading achievement and test anxiety were most closely correlated in the lower grades. Math and reading achievement and test anxiety became more closely correlated in the higher grades (Hill & Sarason, 1966). Gaundry and Spielberger (1971) proposed that children were more able to assess their own progress in reading compared to their classmates in the early grades. Progress in math may be less obvious to children in lower grades, becoming obvious only in the later grades as difficulty level increases. Therefore, reading and math achievement and test anxiety were closely correlated by the time these children reached the later elementary grades.

Lunneborg (1964) found anxiety to be negatively correlated with achievement in both reading and math in grades 4, 5 and 6. The negative correlations became stronger as grade level increased. Correlations were found to be greater for girls than for boys (Lunneborg, 1964). Similarly, Sarason et al. (1960) found reading achievement to be more negatively correlated with test anxiety than math achievement.

Neville, Pfoest and Dobbs (1967) investigated the

relationship between test anxiety and reading vocabulary and comprehension gain during an elementary summer reading program. Separating subjects into high, middle and low anxiety categories, no differences were found in vocabulary gain for the three groups. Low gains in comprehension were found to be associated with both low and high test anxiety groups; middle levels of test anxiety were associated with higher gains in comprehension. Because comprehension can be considered a more complex learning task than vocabulary, these results could be explained in terms of higher anxiety levels being associated with more complex tasks.

In a study of reading and A-trait anxiety, Merryman (1974) studied the effect of anxiety on the vocabulary and comprehension achievement of fifth-graders. Students were separated into high, medium, and low A-trait anxiety groups and compared on the basis of performance on the Stanford Diagnostic Reading Test. Relationships were found between high A-trait anxiety and literal and inferential comprehension and vocabulary. Correlations between high anxiety and syllabication, sound discrimination, and blending were not found to be significant. Like Neville, Pfof and Dobbs (1967), Merryman (1974) suggested that more complex reading tasks, such as comprehension, were more likely to produce anxiety in students than less complex tasks, thus explaining the differences in findings for

various reading skills.

Waid, Kanoy, Blick, & Walker (1978) studied the relationship between A-state and A-trait anxiety and reading comprehension in undergraduate college students. Low A-trait anxiety subjects scored significantly higher than the high A-trait anxiety subjects on a comprehension test following the readings. It was suggested that, if high A-trait anxiety individuals could lower specific A-state anxiety levels prior to a performance task, performance levels might be increased (Waid et al., 1978).

The relation between reading achievement and test anxiety has not consistently been shown to be negative. Cox (1964) found that math scores were negatively correlated with test anxiety, but that there was no correlation between test anxiety and reading achievement. Similarly, Lynn (1957) found no consistent correlation between reading achievement and math achievement and anxiety.

A number of studies have investigated aspects of the relationship between anxiety and processing in reading. Fransson (1977) examined the relationship between free recall of a reading passage (deep- or surface-level processing), type of motivation and test anxiety. Among the results, it was shown that high A-trait anxiety individuals were more apt to surface-level processing of

the passage than low A-trait anxiety individuals.

In investigating the information processing effects of anxiety, Dusek, Mergler and Kermis (1976) found support for the hypothesis that highly test-anxious elementary students focus their attention on task-irrelevant information. In an expanded replication of this study, Ford, Pelham and Ross (1985) failed to substantiate these findings. Where both studies support the hypothesis that high test anxiety is related to lower performance, the failure of the Ford et al. study to replicate the Dusek et al. study leaves open the question of whether or not an effect of anxiety may be a tendency to attention to task-irrelevant information.

In conclusion, investigations of reading and anxiety have considered a number of issues including: achievement, performance, differences in reading and math anxiety, comprehension and vocabulary differences, levels of processing, and attention to task-irrelevant information. Based on these studies, it can be concluded that high levels of anxiety are usually associated with lower levels of performance on reading tasks.

### Anxiety and Attention

The information-processing approach to cognition identifies a number of stages of processing through which

information is acquired, stored, retrieved and utilized. This approach suggests that information is entered into a sensory store and is recognized for patterns. A selection process occurs, and selected items are attended to in short-term memory. Processing then proceeds between long-term memory and short-term memory (Reed, 1982).

Attention has been defined in terms of concentration of the mind on a specific object, thought or activity. Concentration suggests mental effort. Capacity theories of attention deal with the amount of mental effort which is allocated in order to make sense of stimuli. These theories propose that attention is limited and often describe attention relative to the construct of cognitive capacity. (Reed, 1982).

Cognitive capacity refers to a general limit on available processing space for performing a specific mental task at a specific time (Kahneman, 1973). Kahneman (1973) points out that cognitive capacity is finite. When an individual attempts any processing task there are a limited number of pieces, or chunks, of information which can be assimilated simultaneously, depending on the complexity of the task and the relevant information available in long-term memory pertinent to the task (Klatsky, 1980).

Cognitive capacity has been measured using a primary task/secondary task paradigm (Bacon, 1974; Eysenck, 1979a;

Eysenck, 1983; Hamilton, 1975). This paradigm engages participants in a primary task, such as reading a text, and a secondary task, such as responding to a tone. A measurement is taken of the time required to respond to the secondary task. Response time is taken to be a reflection of the proportion of attention engaged by the task.

Secondary task research has demonstrated that response times are arrayed in an inverted U-shaped curve with relation to task difficulty and anxiety, following the predictions of the Yerkes-Dodson law (1908) (Eysenck, 1979a). The Yerkes-Dodson law predicts that during low levels of engagement with a primary task (such as during easy reading), response time to a secondary task will be quick. During levels of higher engagement with the primary task (such as during average reading), response times to a secondary task will be slower. When difficulty levels are again increased (such as during hard reading), response times to a secondary task again become fast. (Eysenck, 1979a).

Anxiety may affect attention by occupying processing space which is needed in accomplishing a task (Beck & Emery, 1985; Eysenck, 1979a). Rather than focusing attention on a given task, attention may be split between scanning for threatening aspects of task completion and attention to the task (Beck & Emery, 1985). Consequently,

high anxiety may lead to decreased task performance because a portion of available attention will be focused on anxious responses.

A number of studies have shown that stress (Dunn, 1968; Pyke & Agnew, 1963; Quarter & Markus, 1971) and A-state anxiety (Hodges & Spielberger, 1969; Walker & Spence, 1964) reduced cognitive capacity. Hamilton (1976) assumed that if high-anxiety children required more effort than low-anxiety children to attend to a primary task involving recall a series of digits, they would perform slower on a secondary reaction time test than low-anxiety children. He found this to be the case, and his work represented one of a very few studies utilizing a secondary task paradigm with children rather than adults.

Anxiety can be considered one of many types of arousal. Some relevant explanatory attentional literature investigates the relationship between arousal and attention. In considering the effects of arousal on performance, Easterbrook (1959) proposed that responses to secondary task stimuli were the result of variations in cue utilization as arousal levels increased. During periods of low arousal, Easterbrook (1959) suggested that performance on a secondary task was rapid because subjects responded to a wide range of cues. At average levels of arousal, performance on the secondary task diminishes, and the focus

of attention (or range of cues) narrows to the primary task. This concentration of attention leads the subject to be less responsive to those cues irrelevant to the primary task (i.e., cues relevant to the secondary task). This accounts for slower reaction times. As arousal reaches higher levels, response times become faster due to further narrowing of cue utilization. At this level, according to Easterbrook (1959), only some relevant cues are attended to, and irrelevant cues receive a portion of available attention.

Eysenck (1983) reported that Easterbrook's (1959) hypothesis was inadequate in suggesting that intense concentration with a narrow focus of attention occurs during periods of high arousal. Rather than a narrow focus of attention to a primary task, Eysenck (1983) cited evidenced that highly-aroused subjects report heightened distractibility. Deffenbacher (1978) found that highly-anxious subjects reported spending less time attending to task than low-anxiety students.

The effects of arousal on performance may not be direct, as the Yerkes-Dodson law (1908) and Easterbrook's (1959) hypothesis assume, but rather they may be indirect effects. Individuals may mediate between the effects of arousal or anxiety and the demands of the tasks. Quicker reaction times to secondary tasks at high-anxiety levels

may be a function of a variably divided focus of attention rather than further narrowing of cue utilization (Eysenck, 1979a). Broadbent (1971) also suggests that the theories of arousal implying direct affects of arousal on performance lose sight of the possibility that individuals possess control systems which mediate these affects.

Beck and Emery (1985) discuss the activation of cognitive sets based on specific perceptions of specific events matched with schemata for these events. The concept of activation and utilization of cognitive sets complements Broadbent's (1971) suggestion that control systems operate which mediate the effects of arousal. Beck and Emery (1985) theorize that specific cognitive schema are activated when individuals perceive threatening situations. Schemata act as filters which provide information for the processing of information related to the situation. An individual's interpretation is thus the result of the interaction between the situation and the schemata activated. "A cognitive set comprises specific concepts, assumptions, overlays, and rules that are applied to a given situation at a given time" (Beck & Emery, 1985, p. 56).

Cognitive sets may be voluntarily and readily activated and de-activated. For example, a student may voluntarily activate a cognitive set for test-taking which includes "automatic derogation of the student's own ability" (Beck &

Emery, 1985, p. 57). In this case, the involuntary activation of this cognitive set arouses anxiety. This anxiety acts as a stimulant for action. The unpleasantness of the anxious response encourages the anxious individual to plan a strategy (which may be contained in schemata) to reduce the danger, which should reduce the anxiety. This planning may occupy cognitive capacity. Anxiety persists until there is some modification in the cognitive set (Beck & Emery, 1985). Beck and Emery's (1985) "cognitive sets," relative to anxiety may be quite similar to Broadbent's (1971) "control systems," relative to arousal. Cognitive sets, or control systems may be effective in mediating anxious responses to the degree that an individual is able to formulate and act on strategies which modify the cognitive set and allow for anxiety reduction.

It can be concluded that anxiety has indirect affects on attention and utilizes available processing space. Individuals may utilize cognitive sets in mediating between the demands of anxious responses and task demands, thus the affects of anxiety may not be consistent from moment to moment in a given task situation. As an individual completes the task, anxiety levels may vary at a given moment based on the degree to which the task is stress-producing for the individual and the degree to which the individual is able to modify the cognitive set to reduce

anxiety. Additionally, Eysenck (1979a) reports that, while anxiety may lead to attention to task-irrelevant cognitive activities, highly anxious individuals may compensate with increased effort. Increased effort could be a chosen strategy in a cognitive set. However, Eysenck (1979a) states that increased effort does not typically compensate entirely for the reduction in attentional capacity.

### Reading and Attention

The relation between attention and performance in reading has recently been an active area of inquiry, and many investigations have considered the role of selective attention in reading. Selective attention theories suggest that when reading, individuals evaluate the importance of textual elements and devote extra attention to important elements, therefore these elements are learned better (Anderson, 1982). Because these investigations have not considered anxiety level as a variable, and many have focused on specific kinds of textual elements and variations, generally they are not meaningful in light of the current investigation.

However, one study will be discussed because it established that cognitive capacity as measured using the primary task/secondary task paradigm is a viable method of defining attention during reading. Britton, Phia, Davis, &

Wehausen (1978) studied attention during the reading of texts in which adjunct questions were varied using the primary task/secondary task paradigm. Their study points out that reading requires attention and they were able to document cognitive capacity utilization during reading tasks. Supporting the Yerkes-Dodson law (1908), it was demonstrated that the more cognitive capacity readers used in processing a text, the slower these readers responded to a secondary stimulus presented during the reading. When less cognitive capacity was being utilized in attending to the reading task, response times to a secondary stimulus were faster (Britton, et al., 1978).

#### Anxiety, Attention, and Reading Difficulty Level

Eysenck (1979a & b, 1983) discussed the relationship between task difficulty and attention when a measure of cognitive capacity was taken using the primary task/secondary task paradigm. It was noted that, based on difficulty levels, response times to secondary tasks were consistently arrayed in an inverted U-shaped curve, as predicted by the Yerkes-Dodson Law (1908). An easy primary task, results in quick responses to a secondary task. An easy task required a portion of available attention so some attention remained and was not focused on the task. This remaining attention allowed for quick responses to a

secondary task. When engaged in an appropriate, or average task, attention to the task required utilization of all available cognitive capacity. Because available attention was focused on performing the primary task, response times to secondary tasks were slow. When engaged in a hard task, task demands exceeded available cognitive capacity. In this case, there were more relevant cues which need to be attended to relative to the task than the individual was able attend to. This resulted in quick responses to the secondary stimulus. The individual may be aware that the task is difficult task, and that he/she is having difficulty. Awareness of this nature may be related to increased distractibility (as described by Deffenbacher, 1978) resulting in more rapid response times.

Relating anxiety to task difficulty, Eysenck (1979a) reported that high anxiety is related to improved performance on easy tasks, and reduced performance on difficult tasks. If anxiety effects processing by interfering with available attention, anxiety levels and their effects may vary according to the difficulty level of the material being read. Thus, the effects of anxiety on processing during easy reading may be minimal; and, as the reading difficulty level increases the affects on processing may increase.

The attention of low anxiety readers to reading tasks

would be expected to follow the predictions of the Yerkes-Dodson Law (1908). These readers may respond slowly to secondary tasks when reading materials at average levels because task demands will utilize available cognitive capacity. Easy and hard reading should result in faster reaction times. In the case of easy reading, available cognitive capacity will not be utilized by attention to the task, resulting in fast response times. In the case of hard reading, task demands will exceed available cognitive capacity, again resulting in fast response times.

Because the attention of high anxiety readers will be divided between task-related demands and anxiety-related demands, it would not be expected that response times would follow the predictions of the Yerkes-Dodson Law (1908). The attention of highly anxious readers may be at peak levels of engagement when reading easy materials. While the reading task may initiate some anxiety, because it is an easy task, available attention should not be exhausted by combined task-related and anxiety-related demands. If available attention is divided between dealing with anxiety and attending to the reading task, slow response times to a secondary task would be expected of these readers. When reading at average or hard levels, combined attentional task demands and maintenance of anxious responses may exceed available cognitive capacity. For high anxiety

readers at average and hard difficulty levels, response times to a secondary task may be expected to be rapid.

### Summary

Research on the relationship between reading and anxiety has demonstrated that high levels of anxiety are generally associated with lower levels of performance on reading tasks. It was been suggested that the direct effects of anxiety on reading occur during processing (Sieber, O'Neil and Tobias, 1977). Eysenck (1979a) proposes that anxiety has indirect affects on attention to tasks and utilizes available processing space. During reading, attention may be divided between anxious responses and task demands.

In discussing anxiety and task difficulty, Eysenck (1979a) reported that high anxiety is related to improved performance on easier tasks, and reduced performance on more difficult tasks. If anxiety effects processing by interfering with attention allocation to the reading task, the affects of anxiety would be expected to vary based on the difficulty level of the material being read. For high anxiety readers, the affects of anxiety on attention to easy reading may be minimal, so higher levels of attention may be allocated to the reading task. As reading difficulty levels, (reading task demands) increase, the

affects of anxiety on attention to the reading task may increase. This may result in the allocation of lower levels of attention to average and harder reading tasks.

Readers who do not operate with above normal anxiety levels would be expected to follow the predictions of the Yerkes-Dodson Law (1908) in attention to reading tasks (Eysenck, 1979a). That is, higher levels of attention may be allocated to reading texts of average difficulty levels and lower levels of attention may be allocated to easier and harder reading texts.

## CHAPTER III

### METHOD

The study was designed to investigate the relationship between anxiety and cognitive capacity in high and low anxiety readers during the reading of materials of varied difficulty levels. Response times to a secondary task were measured while participants were engaged in orally reading materials at easy, average, and hard difficulty levels.

#### Development of the Reading Anxiety Scale

The design required identification of high and low A-state reading anxiety participants. Because there were no existing scales designed to measure A-state anxiety related to reading, a scale was developed.

#### Phase 1 - Item Development

Research on anxiety related to sports competition indicates that somatic and cognitive aspects of anxiety operate differently (Martens, Burton, Vealey, Bump, & Smith, 1983). For example, related to sporting events, it has been shown that aspects of cognitive anxiety begin operating at a mean of four days prior to a sporting event, where aspects of somatic anxiety begin one to two hours prior to a sporting event (Martens, et al., 1983). Because

this evidence indicates potentially cumulative effects of cognitive and somatic aspects of anxiety, both cognitive and somatic anxiety items were developed. For example, one cognitive item read:

"I worry about making mistakes when I read."

An example of a somatic item is:

"I begin to feel very warm when I am reading out loud."

Two criteria were used in the development of items designed to measure A-state anxiety related to reading. First, items were designed for face validity in measuring A-state reading anxiety. Secondly, items were designed to use language which would be familiar to and understood by a population of beginning readers.

Sixty questions (40 cognitive and 20 somatic) were initially developed to form a base pool of test items. Many of these items were designed by modifying items from existing anxiety scales to relate to reading. Items were modified from C.D. Spielberger's How I Feel Questionnaire, Form C-2 (1970), and R. Marten's Sport Competition Anxiety Test (1977). For example, an item from Marten's Sports Competition Anxiety Test (1977) is:

"Before I compete I feel uneasy." (Martens, R., 1977)

This item was revised for the reading anxiety scale to read:

"Before my turn to read out loud, I feel uneasy."

To assure that the language used in items would be understood by second- and third-graders, four eight and nine year olds were interviewed by the examiner. In these interviews, participants were asked a series of open-ended questions designed to elicit their descriptions of cognitive and somatic anxious feelings, particularly as they relate to reading. It was found that it was confusing to use the word "anxious" with these children. They took "anxious" to mean "eager," as in "anxious to get to the beach." These children responded to the word "nervous" with descriptions of anxiety.

These interviews were audiotaped and participant statements relating to anxiety were listed. Words and phrases used by these children in describing anxiety were used to design twenty additional reading anxiety items (14 cognitive and 6 somatic). These items were added to the pool of items which had been designed based on existing anxiety scales, for a total pool of 80 items.

The sixty items which had been developed based on

existing anxiety scales were read to each of the interviewed participants. After hearing each item, participants were asked to restate the item in their own words. The restating activity provided information on how well these participants understood the items. Participants also provided answers to the items (never, hardly ever, sometimes, and often). By having participants provide answers to the items, information was gathered on the ability of eight- and nine-year old children to answer using the response scale which had been developed. The children demonstrated understanding of the items in that they were readily able to restate them. For example, one student was read an item which stated, "I make mistakes in reading when I get nervous." When asked to explain what the question meant in her own words, she said, "It means if I get afraid I don't know the words, sometimes I miss those words and some of the words I really know, too."

Some negatively worded items were found to be problematic. For example, one negatively worded item read: "I don't worry about reading in school." One of the possible responses to the scale was "never," and it was discovered that for these items, double negatives were created when answering with this response. These negatively worded items were revised to avoid confusing double negatives.

## Phase 2 - Judgement of Validity (Item Elimination)

When 80 items had been developed and field tested with interview participants, an elimination process was used to increase face validity of items, establish reliability for the scale, and reduce the scale to a reasonably sized task for beginning readers.

To eliminate less valid items, the complete pool of eighty items was independently reviewed by six judges. These six judges were professors and graduate students in reading, psychology, and tests and measurement. The researcher met with each judge, provided a copy of the pool of items, and explained the purpose of the development of the scale. In addition, judges were given the following statement of purpose and set of instructions:

The following scale is being developed to be used to identify anxiety related to reading in beginning readers (specifically, second- and third-graders). The pool of items which follows has been developed based on existing anxiety scales and on interviews with two second- and two third-grade participants. The first 54 items are identified as "cognitive anxiety items." These items are designed to measure the degree to which young readers have anxious thoughts about reading, or thoughts which represent worry about reading. The second 26 items are identified as "somatic anxiety items." These items are designed to measure the degree to which young readers have anxious physical feelings or sensations when they read, or prior to reading.

I would like for you to serve as a judge and rate each item on a scale of 1 to 10; 1 being an item which you think is a poor measure of anxiety related to reading, and 10

being an item which you think is an excellent measure of anxiety related to reading. Please write your judgement of each item in the margin next to the item. When the scale is used, it is not designed to be read by beginning readers. As indicated by the instructions at the beginning of the scale, it is designed to be read to the students by adults so that more complex language may be used than is readable to young readers. For each item, focus on your judgement of the face validity of the item and on clarity of the item. It is essential that these items provide measurements of student anxiety about reading. It is also essential that these items be clear to, be understood by, and be meaningful to second- and third-grade readers. If you feel that rewordings of specific items would improve them, please note your suggested rewordings. If you have additional suggestions for improving the scale, please state them at the end of the scale. Thank you for your expertise and your time.

Judges were given the opportunity to read this statement and question the researcher. Each judge reviewed and rated each item. Results were compiled and mean ratings for each item were obtained. Based on these mean ratings, the 29 least valid items were eliminated. A revised scale contained 31 cognitive and 20 somatic reading anxiety items. Based on suggestions by the six judges, the wording of some items was modified to reduce ambiguity.

### Phase 3 - Field Testing for Reliability (Item Elimination)

The revised reading anxiety scale of 51 items was field tested for reliability with two participant groups. One group consisted of twelve, elementary reading students (ages 7- 12) in a university, reading-clinic setting. Undergraduate tutors read instructions and items to these

participants individually, while participants responded on individual answer sheets. Participants were provided with markers for the purpose of keeping their places while completing the task. Tutors asked participants to restate designated items in their own words to assure that participants understood the items. Different tutors asked their students to restate different items in order to assure that all items were restated by some participants. Tutors administered the scale to these participants on three tutoring sessions. Tutors were asked to comment in writing on how well participants understood instructions, and how well participants were able to independently respond to items on their answer sheets.

A second participant group was composed of one second-grade and one third-grade classroom in a public school system in southwest Virginia. A total of 45 students (22 second-grade and 23 third-grade) participated. The researcher visited each classroom three times to administer the scale to each whole classroom group. The researcher read the instructions and items to each group. Each participant was provided with an answer sheet and a marker. Participants were assigned identification numbers to be used on each answer sheet, thus the names of these participants were not revealed.

The responses from these groups were combined for

analysis. The combined responses represented 57 participants who each responded to the scale three times for a total of 171 responses. Individual item analyses and total scale analyses were conducted. The coefficient alpha was computed, indicating that reliability on the 51 item scale was .813.

The Comprehensive Questionnaire Analysis System was used to perform item analyses. This analysis was used to choose more appropriate items based on standard test construction evaluation criteria (Magnusson, 1966). Based on test-retest reliability findings for individual test items, 31 less reliable items were eliminated, leaving a completed 20 item reading anxiety scale. Items with reliability scores ranging from .40 to -.40 were eliminated first. Items with reliability scores ranging between .41 and 1.00 (representing positively worded items) and between -.41 and -1.00 (representing negatively worded items) were considered for the completed scale (Martens, 1983). Items with correlations closer to 1 and -1 correlated more highly with the total scale than items with correlations closer to 0. Because they would degrade the reliability of the completed scale, items with correlations closer to 0 were eliminated. Of the remaining items, only 7 were positively worded to indicate feelings of comfort related to reading. For example, one of these 7 items said, "I feel sure of

myself when I read to my teacher." These 7 items were included for the completed scale. Thirteen additional items were chosen. These were the 13 items with the highest correlations (closest to -1.0). Of the 20 items which were chosen for the completed scale, 15 were cognitive items, and 5 were somatic items. All items included in the completed scale demonstrated an item analysis coefficient of between .47 and 1.00 or -.47 and -1.00.

#### Phase 4 - Reliability Testing of Completed Scale

The completed A-state reading anxiety scale was tested for reliability with a group of 127 second- and third-grade participants in six classrooms in a southwest Virginia public school. The researcher administered the scale orally in whole group settings in each classroom. The researcher read instructions and items to each class. Each participant was provided with an answer sheet and a marker. The scale was administered on three occasions over a three week time span. Participants were assigned identification numbers, thus their names were not revealed.

On the average, the scale was administered to third-grade classrooms in 15 to 20 minutes. It took slightly longer, 20 to 25 minutes to administer the scale in second-grade classrooms. The second-graders were less familiar with responding to a scale with response choices such as

"never, hardly ever, sometimes," and "often." For example, students were asked what "often" meant to them, and they would provide examples such as "I brush my teeth often." Extra time was spent explaining and modeling how to respond to the possible choices. As the scale was administered, the researcher monitored students by walking around and checking to assure that they moved from one item to the next and responded only once for each item.

The combined responses represented 127 second- and third-grade participants who each responded to the scale three times for a total of 381 responses. Using the Comprehensive Questionnaire Analysis System, the coefficient alpha was computed, indicating that reliability on the completed 20 item scale was .92.

### Sample Selection

The researcher tested students from 12 second- and third-grade classrooms in three schools in two public school systems in southwest Virginia using the completed reading anxiety scale. The three schools were chosen as representative of normal populations in southwest Virginia. One school could be characterized as urban, one as suburban/rural, and one as rural.

Parental permission was necessary during this phase of the study. A parent permission form explained that a study

was being conducted which would investigate the relationship between children's feelings about reading and their attention during reading. A decision was made not to use the word "anxiety" in these permission forms because of the potential to alarm parents unnecessarily, and because of the potential for effects on the results of the study. The permission form was brief, and parents were encouraged to call the researcher for more information if desired. Three parent phone calls were received.

In the three schools, there were a total of 209 second- and third-graders, of which 163 returned their permission slips with parent permission to participate. A total of 27 students did not return their permission slips, and 19 parents did not give permission for their children to participate in the study, accounting for 22% non-participation in the study.

The researcher administered the reading anxiety scale to the students in each classroom who had permission to participate. Before giving out materials, the researcher used a script to explain participation to the students. The following script was used:

I am interested in how children feel about reading, and I have a kind of a test I would like for you to take which will tell me about how each of you feel about reading. This test is not like many of the tests you take in school because there are no right or wrong answers. Whatever you

think is the right answer is the right answer. You can help me in a research project by answering the questions on the test. But, before we get started, I want you to know that you do not have to do this if you don't want to. If you don't want to take the test, you can just stay here and not take it, or you can leave and go to (where your teacher is) now, or at any time while I am reading the test. Are there any questions about this?

After reading the script and answering any questions, an answer sheet and a marker were provided for each student. The instructions for responding to the scale were read to each group, and any student questions were answered. As was previously mentioned regarding field testing for reliability, some additional instruction was required for second-grade groups. Discussion regarding how to respond to the possible choices (never, hardly ever, sometimes and often) was needed. Each item was read to each group. It was necessary to monitor some participants to assist them in moving from one item to the next.

Student answer sheets were graded by the researcher. Responses of "never" were counted as worth 0 points, "hardly ever" as 1 point, "sometimes" as 2 points, and "often" as 3 points. Scoring was reversed for items 3, 4, 9, 13, 16, 18, and 20. These were items which expressed comfort related to reading, where the other items expressed worry related to reading. Scoring possibilities ranged from 0 to 60.

In order to underscore A-state reading anxiety

differences, the highest and lowest scoring students were chosen for participation in the primary/secondary task study. A breakdown of participants is presented in Table 1.

Table 1

Participants

	Total with permission	High Anxiety	Low Anxiety	High and Low Anxiety
School 1	44	5	5	10
School 2	54	5	5	10
School 3	65	10	10	20
<hr/>				
Total	163	20	20	40

In Schools 1 and 2 (see Table 1), the students with the five highest and lowest scores were chosen for participation. In School 3, the students with the ten highest and lowest scores were chosen for participation.

To verify that appropriate high and low anxiety identifications were made, teachers in each classroom were provided with a list of student scores, and were informed as to which students had been identified as high and low A-state anxiety readers. The researcher discussed each chosen participant with each teacher to determine whether the teacher felt that the reading anxiety scale had appropriately identified high and low A-state reading anxiety students. In the majority of cases (approximately 80%), teachers agreed with findings. In a number of cases, teachers stated that they were surprised that certain students had been identified as either high or low. These cases were discussed, and in no case did teachers feel that identified students were not representative and should not be used as participants.

High and low A-state reading anxiety participants were also identified by grade levels, sex, and present reading level within classrooms. It was noted that no participants were enrolled in special education programs, and a total of 6 participants were enrolled in Chapter 1 reading programs.

A breakdown of participant characteristics is presented in Tables 2 and 3. Note that A-state reading anxiety was spread across second- and third-grade levels, male and female participants, and classroom reading level placements.

Table 2

High A-State Reading Anxiety Participants

		School 1	School 2	School 3	Total
Total Participants		5	5	10	20
Grade Level	2nd	2	0	4	6
	3rd	3	5	6	14
Sex	M	4	2	4	10
	F	1	3	6	10
Reading Placement	+	1	2	4	7
	On	2	3	3	8
	-	2	0	3	5
Score Range		35-41	38-54	35-44	35-54 Mean=40.5

+ = above grade level

On = on grade level

- = below grade level

Table 3

Low A-State Reading Anxiety Participants

		School 1	School 2	School 3	Total
Total Participants		5	5	10	20
Grade	2nd	4	4	3	11
Level	3rd	1	1	7	9
Sex	M	1	2	5	8
	F	4	3	5	12
Reading	+	0	4	5	9
Placement	On	4	1	3	8
	-	1	0	2	3
Score Range		4-8	3-9	1-8	1-9 Mean=5

+ = above grade level

On = on grade level

- = below grade level

### Procedures

During each data collection session, participants were asked to read orally to the researcher while responding to a secondary task. Following the reading of each passage, the researcher asked participants ten comprehension questions related to the passage.

At a time agreed upon between the classroom teacher and the researcher, the researcher went to the classroom and got each participant. The participant met with the researcher in a room in the school where data collection could take place without interruption. When settled in said room, the researcher used a script to explain the process to the participant. The following script was used:

Today I am going to ask you to take part in an unusual activity. Again, this is going to help me with my study about how children feel about reading. First, I am going to teach you how to use this machine. After you have learned how to use the machine, and have practiced some, I am going to ask you to read out loud for me. Then, I will ask you to read to me and use the machine at the same time. I will ask you to read some easy things, some average things, and some hard things. You do not have to do this if you do not want to. If you don't want to do this, you can go back to your room now. If you decide later on that you don't want to do this, you can go back to your room then. Do you have any questions about this?

### Measuring Response Time

Following the reading of the script, participants were instructed in using the response time instrument. A Multi-

Choice Reaction Timer, model number 63014, produced by Lafayette Instrument Company, Lafayette, Illinois, was used to measure response times. This instrument has three pieces, a control panel, a response lever, and a speaker. The instrument produces a tone when initiated, and a lever must be pushed down to stop the tone. The instrument provides a reading of the length of time passing from initiation of the tone to pushing of the lever.

Measurements of response times during the reading of passages were used as a measure of cognitive capacity usage. Measures of response time were also taken prior to the first reading and between readings of passages to serve as a baseline response time measure. A baseline measure was taken to serve as a comparison between primary use of cognitive capacity and secondary use of cognitive capacity during a reading task.

The instrument was set to produce the tone one second after initiation. This decision was made in order to assure consistency in the points during sentences at which the tone would sound. It was assumed that similar processing would be occurring for participants if measures were taken during the reading of identical sentences. Thus, the tone was initiated once the participant had said the first word in a sentence. Three target sentences were designated in each passage to be used, and the tone was

consistently initiated following the pronunciation of the first word in these sentences. Therefore, only three response time readings per passage were collected. Pilot testing of the design showed that more than three uses of the tone were unreasonable and overly disruptive during the reading of 100 word passages.

Time was spent familiarizing participants with the response time instrument, and participants were not rushed into reading tasks. In order to avoid anxiety resulting from use of an unfamiliar instrument in an unfamiliar setting, participants were given opportunities to get used to the instrument by spending time practicing responding to it, and by spending time operating it. This also provided an opportunity for participants to become more familiar with the researcher and the data collection setting.

In familiarizing participants with the instrument, first, the researcher modeled use of the instrument, showing each participant how the tone was initiated and how the lever was pressed. The resulting response times were displayed for the participants to see, and an explanation of what they represented was provided. Participants were given opportunities to respond to the tone when initiated. Participants then operated the instrument while the researcher responded to it. The researcher then read two passages while the participants operated the instrument.

The participants practiced reading two passages without responding, then they practiced reading two passages while responding to the instrument. Following the reading of each passage, participants practiced answering comprehension questions. The passages used during these familiarization activities were passages which the researcher expected to be easy for participants.

It might be noted at this point that these participants apparently liked the sessions from beginning to end. No child chose not to participate during the data collection sessions. Quite to the contrary, on many occasions, participants did not want to stop the activity and return to their classrooms. One child liked the activity so well that he said that "he wanted a machine like that for Christmas." He wondered if the researcher could tell his mother where she could get a response time instrument for him.

Handedness was considered, and dealt with because in many cases, participants needed to use both hands at once. Many young readers use a finger to lead themselves, or keep their places as they read. Right-handed readers tended to use the right index finger, and left-handed readers tended to use the left index finger. If one hand was to be used to keep one's place in the passage, the other hand needed to be used to respond to the instrument. Handedness was

determined and a comfortable placement of the lever was negotiated. A sticker was placed on the table on the approximate spot where the participant would keep his/her hand while reading. (The sticker was to be under the palm of the hand to be used to press the lever.) The sticker was used to insure that participants kept their hands at approximately the same distance from the lever. The closest finger to the lever could touch, but not be on the wooden base on which the lever was placed.

Once the familiarization activities had taken place, and handedness and hand placement had been settled, the control panel was placed such that the participant could not see when the tone was initiated or the resulting response time readings. Because the control panel was about ten inches tall, the researcher used this height to protect against participant observation of notations of response times, miscues, and comprehension scores. Audiotapes were used in case they were needed later in identifying miscues and determining comprehension scores.

#### Text Materials and Difficulty Levels

Passages from John's Basic Reading Inventory (1978) were used in each session. This inventory was selected to maintain consistency in the passages which were used since it contains three sets of 100 word passages at preprimer

through eighth grade reading levels.

As each participant read a passage, miscues in word recognition were identified. John's (1978) definition of miscues (oral reading errors) was used. Miscues were identified as any omissions, repetitions, substitutions, insertions, reversals, pauses, or pronunciations of partial words. Oral reading miscues were used to identify difficulty levels. For oral reading miscues, criteria for identified reading levels are presented in Table 4.

Table 4

Criteria For Establishing Difficulty Levels

Percentage of correct word recognition in context

96-100%	= Easy
91-95%	= Average
90% and below	= Hard

Percentage of correct comprehension responses

90-100%	= Easy
65-85%	= Average
60% and below	= Hard

Following the reading of each passage, the comprehension questions accompanying each passage from John's Basic Reading Inventory (1978) were asked of each participant. For each passage, John's Basic Reading Inventory (1978) provides ten comprehension questions. Factual, main idea, inferential, and interpretive comprehension questions are included with guidelines as to acceptable responses for each question. The provided guidelines were used in scoring answers to comprehension questions. Comprehension was also used to identify reading levels. For comprehension of passages, criteria for identified difficulty levels are presented in Table 4.

A significant point is that difficulty level designations of easy, average, and hard were determined based on individual readings of individual passages. For example, when a participant read a passage and had 6 miscues during oral reading, this was recorded as 94% word recognition, average level. Then comprehension questions were asked related to the passage. If, for example, the participant missed two of ten comprehension questions, this was recorded as 80% comprehension, average level. Thus, it was possible for a passage to be at one level relative to word recognition, and at another level relative to

comprehension. For instance, a participant's word recognition score for a specific passage might indicate that the passage was at an easy reading level while the comprehension score for the same passage indicated that it was at an average reading level.

Because difficulty levels were identified based on performance in reading and answering questions on individual passages, it was possible for identified reading levels to conflict with numerical/sequential reading levels as designated by Johns (1978). To illustrate this, one second-grade participant was presented with a passage identified as being at first-grade level by Johns (1978). In reading the passage, he missed the word "snow" several times, and later missed the word "sled." With these, and other miscues, his word recognition score indicated that the passage was at a hard level for him. Because the knowledge that it had snowed was critical to understanding the passage, his comprehension score also indicated that it was a hard passage for him. A second-grade level passage was presented to this participant and he had one miscue (99%) and missed one comprehension question (90%), so it was identified as an easy passage for him. When a third-grade level passage was presented to this participant, he had 7 miscues (93%) and missed 3 comprehension questions (70%), indicating that the passage was at an average

reading level for him. Thus, the first-grade passage was hard, the second-grade passage was easy, and the third-grade passage was average for this participant.

The researcher used a computer produced list of random orderings of designated reading levels of passages to assure that the order of presentation of passages did not effect the results. Because identifications of easy, average, and hard were based on individual readings of individual passages, expectations of reading levels (based on reading levels designated by Johns [1978]) did not hold true, and natural randomization occurred. The researcher handled this by continuing to have participants read passages following the randomized list until each participant had read at least two easy, two average, and two hard passages.

In some cases, participants read more than two passages at some levels. In order to have equal portions of data for each participant, where more than two sets of data at a level were collected, only two sets were included for data analysis purposes. In these situations, the last two data sets collected at any given level were analyzed. This decision was made based on the assumption that participants would become more comfortable with the setting and with using the response time instrument with time. Three baseline response time readings were recorded between the

readings of passages. The final six baseline response times were analyzed for each participant. Thus, six response times during reading (secondary task) were analyzed for each participant at each level, and six baseline response times (primary task) were analyzed for each participant.

### Analysis

A repeated measures design was used to describe relations among response times for reader groups (high and low A-state reading anxiety) and reading difficulty levels (baseline, easy, average, and hard). The dependent variable was response time to a secondary task, the operational definition of available capacity. Independent variables were A-state reading anxiety group (high and low) and reading difficulty level (baseline, easy, average, and hard). Analyses were conducted separately for difficulty levels as identified by comprehension scores and as identified by word recognition scores.

The repeated measures design was selected to reduce overall variability because a common subject pool was used for each condition. The impact of naturally existing individual differences in muscle reflexivity was considered. By including the baseline measure of response time with easy, average, and hard difficulty levels, these individual differences were entered into the error term.

The repeated measures design allows for removing subject differences through the error term, leaving the error components independent from condition to condition (Howell, 1987).

In review of the response time data set, some response times were noted as outlying from the data. These outliers were eliminated from the data set, leaving missing values. To maintain consistency, an outlier was defined as any response time by a participant which deviated from all other response times of the participant by more than .500. With an overall standard deviation of .102, these outliers were each at or over five times the standard deviation for the whole data set, and thus, not representative of the data. A total of six outliers from a data base of 960 response time measures were eliminated from the data set. These outliers occurred at average and hard difficulty levels for both high and low anxiety readers.

The repeated measures procedure was conducted once for difficulty level as determined by comprehension scores (baseline, easy, average, or hard), and a second time for reading level as determined by word recognition scores (baseline, easy, average, or hard). Analyzing difficulty levels by both comprehension and word recognition scores made it possible to determine whether results varied based on the method used to determine difficulty level

designations. Table 5 outlines this design for analysis.

Table 5

Design for Analysis

	Analysis 1	Analysis 2
Dependent Measure	Response Time	Response Time
Indep. 1 Anxiety Group	High or low	High or low
Indep. 2 Difficulty Level	By Comprehension	By Word Rec.
	(Baseline, Easy, Average, and Hard)	

## CHAPTER IV

### RESULTS

The study was designed to investigate the relationship between anxiety and attention in high and low anxiety readers during the reading of materials of varying difficulty levels. Cognitive capacity was monitored through the recording of response times to a secondary task while participants were engaged in orally reading materials at easy, average, and hard difficulty levels and when participants were not engaged by a task.

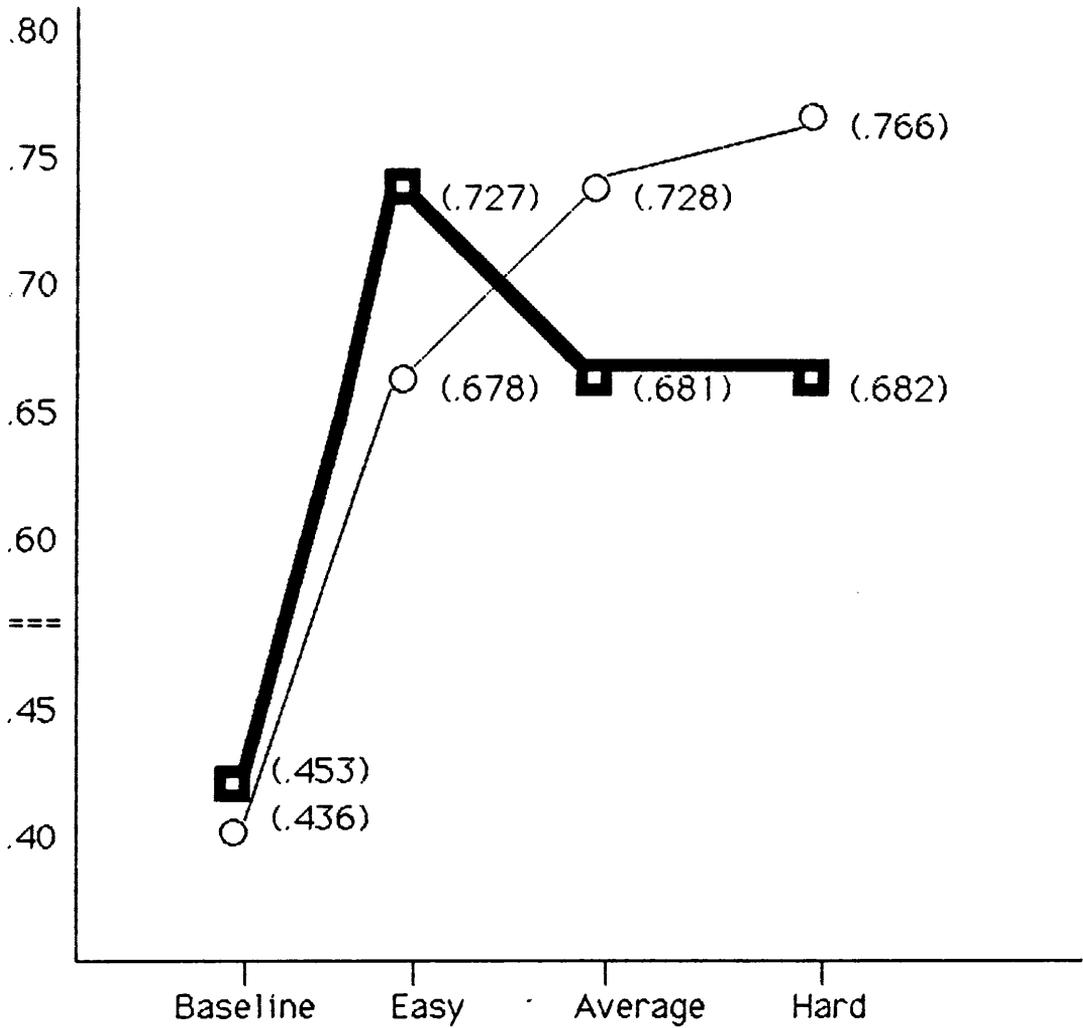
An analysis of variance for repeated measures with two levels of the anxiety variable (between) and four levels of the difficulty variable (within) was implemented to describe relations between response times to a secondary task and high and low A-state reading anxiety groups for the baseline measure and for the reading of easy, average, and hard materials. Response times served as the dependent measure. Reading anxiety groups (high and low) and task difficulty levels (baseline, easy, average and hard ) served as independent measures. Reading difficulty levels were identified for both comprehension and word recognition scores. Analyses were conducted separately for difficulty levels as identified by comprehension scores and for each difficulty level. All tests were conducted at the .05

level of significance.

Mean results for difficulty levels as identified by comprehension scores and word recognition scores are displayed graphically in Figures 1 and 2.

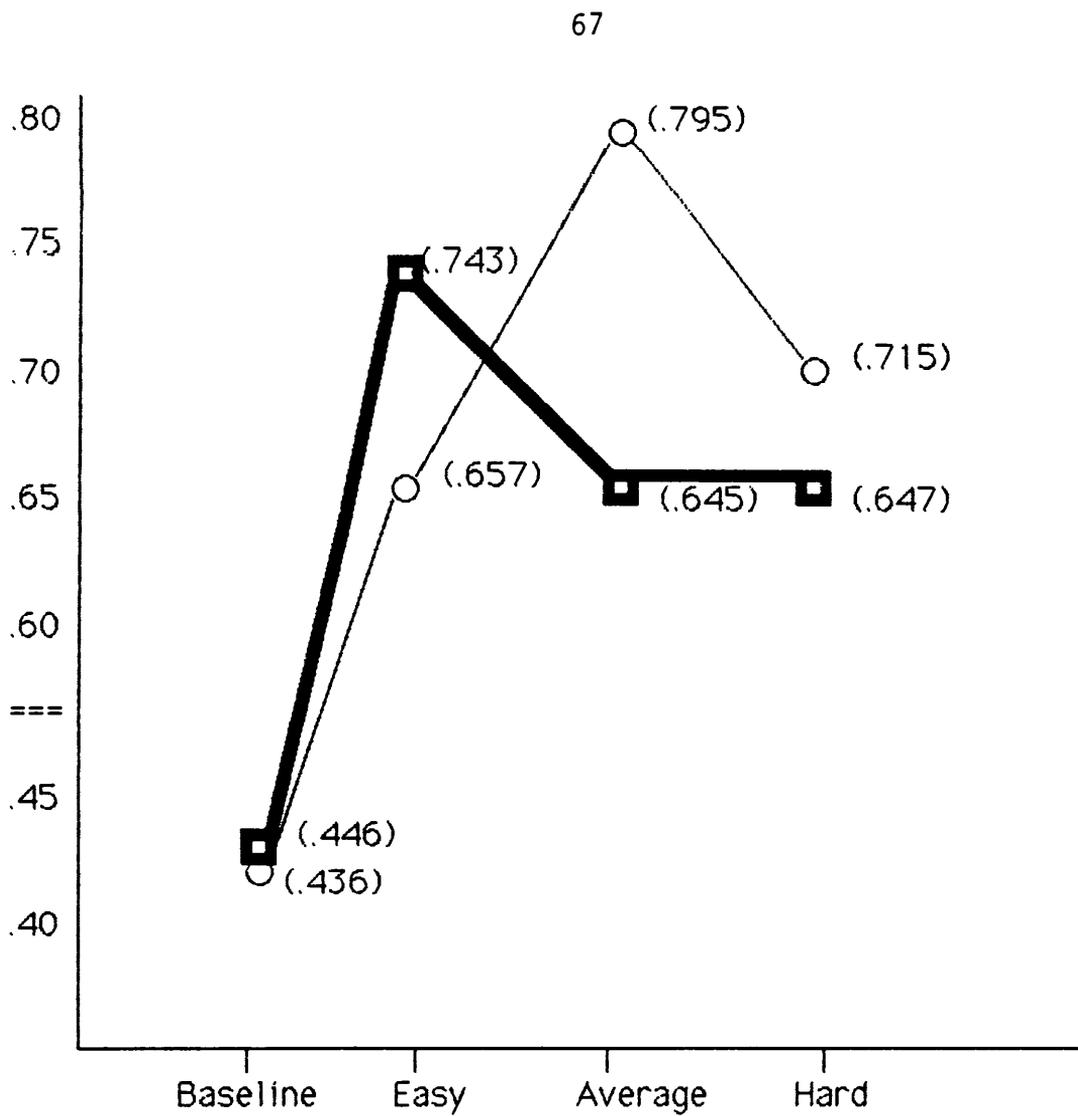
Findings on the baseline measure of response time as a primary task indicated that response times did not differ for high (comprehension mean = 0.453, word recognition mean = 0.446) and low anxiety readers (comprehension mean = 0.436, word recognition mean .436). This finding showed that high and low anxiety readers did not differ in basic response tendencies.

At easy difficulty levels, response times were faster for low anxiety readers (comprehension mean = 0.727, word recognition mean = 0.743) than for high anxiety readers (comprehension mean = 0.678, word recognition mean = 0.743). This pattern reverses at average and hard difficulty levels. At an average difficulty level, response times for low anxiety readers (comprehension mean = 0.728, word recognition mean 0.795) were slower than for high anxiety readers (comprehension mean = 0.681, word recognition mean = 0.645). Similarly, at hard difficulty levels, response times for low anxiety readers (comprehension mean = 0.766, word recognition mean = 0.715) were slower than for high anxiety readers (comprehension mean = 0.682, word recognition mean = 0.647).



Means for Difficulty Levels as Identified by Comprehension

○, —, Low Reading Anxiety  
 ■, —, High Reading Anxiety



Means for Difficulty Levels as Identified by Word Recognition

○, —, Low Reading Anxiety

■, —, High Reading Anxiety

Repeated Measures Analysis

Tables 6 and 7 display the summary of analysis of variance procedures for repeated measures for comprehension and word recognition scores. No main effect was evident for anxiety on the dependent measure for comprehension  $F(1, 38) = 0.28$ , or for word recognition  $F(1, 38) = 1.43$ . One explanation for this finding is related to the fact that the baseline measure was entered into these analyses. T-tests demonstrated no significant differences between high and low anxiety groups on the baseline measure for comprehension or word recognition. Also, for comprehension, T-Tests showed no significant differences between high and low anxiety groups for easy and average reading.

A main effect was revealed for difficulty level as identified by comprehension  $F(1, 38) = 184.60$  and word recognition  $F(1, 38) = 167.00$ . However, because this is not a consideration of the study, these results will not be discussed in detail.

It is the interactive effect of difficulty with anxiety that is of central interest. The repeated measures analysis revealed a significant interaction between anxiety and level of difficulty for both comprehension  $F(3, 114) = 9.41$  and word recognition scores  $F(3, 114) = 25.15$ .

Table 6

Repeated Measures Procedure for Anxiety X Difficulty for Comprehension

Between Subjects Effect

Source of Variation	SS	DF	MS	F	Sig. of F
Within Cells	1.39	38	0.04		
Constant	66.37	1	66.37	1810.63	0.000
Group	0.01	1	0.01	0.28	0.597

Within Subjects Effect

Source of Variation	SS	DF	MS	F	Sig. of F
Within Cells	0.44	114	0.00		
Difficulty	2.14	3	0.71	184.60	0.000
Group by Difficulty	0.11	3	0.04	9.41	0.000

Table 7

Repeated Measures Procedure for Anxiety X Difficulty for Word Recognition

Between Subjects Effect

Source of Variation	SS	DF	MS	F	Sig. of F
Within Cells	1.00	38	0.03		
Constant	64.61	1	64.61	2463.68	0.000
Group	0.04	1	0.04	1.43	0.239

Within Subjects Effect

Source of Variation	SS	DF	MS	F	Sig. of F
Within Cells	0.46	114	0.00		
Difficulty	2.04	3	0.68	167.00	0.000
Group by Difficulty	0.31	3	0.10	25.15	0.000

### I-Tests Between Groups

To examine the nature of this interaction, paired T-Tests were conducted to test for mean differences among the two anxiety groups for each difficulty level. Tables 8 and 9 display T-Test results for comprehension and word recognition scores.

Significant differences between high and low anxiety readers were found only at hard difficulty levels for comprehension, ( $p < .05$ ). T-Tests on response times of high and low anxiety readers indicated that no significant differences existed between the two groups at easy and average difficulty levels. The baseline measures for the two groups also did not differ significantly, which verified the equivalence of the two groups in their basic response tendencies.

When comprehension was used as the dependent measure, mean response times showed that high and low anxiety readers allocated equivalent levels of attention to reading at easy and average levels. At hard difficulty levels, low anxiety readers allocated higher levels of attention to the reading task than high anxiety readers.

Significant differences between high and low anxiety readers were found at easy, average, and hard difficulty levels when word recognition was used as the dependent measure. As with the comprehension scores, a reversal is

noted at the average and hard difficulty levels in that the high anxiety readers exhibited the slowest response times. In addition, the differences at the easy levels were magnified as the response times for low anxiety readers were significantly lower than their high anxiety counterparts.

When considering word recognition, mean response times demonstrate that high anxiety readers had slower response times at easy reading levels than at average and hard difficulty levels. Thus, high anxiety readers apparently allocated more attention to the easy task than the average and hard tasks. They were unable to maintain as much attention on reading at the more difficult levels. Thus, low anxiety readers did not allocate as much attention to the easy reading task, although they became more engaged when the text increased to average and hard difficulty levels.

Table 8

I-Test Results Between Groups For Comprehension

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Baseline					
Low	0.436	0.068	-0.72	38	0.479
High	0.453	0.081			
<hr/>					
Easy					
Low	0.678	0.123	-1.24	38	0.221
High	0.727	0.128			
<hr/>					
Average					
Low	0.728	0.106	1.33	38	0.191
High	0.681	0.116			
<hr/>					
Hard					
Low	0.766	0.132	2.20	38	0.034*
High	0.682	0.108			

N = 40

Table 9

I-Test Results Between Groups For Word Recognition

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Baseline					
Low	0.436	0.067	-0.41	38	0.687
High	0.446	0.084			
<hr/>					
Easy					
Low	0.657	0.098	-2.39	38	0.022*
High	0.743	0.126			
<hr/>					
Average					
Low	0.795	0.123	4.48	38	0.000*
High	0.645	0.085			
<hr/>					
Hard					
Low	0.715	0.093	2.31	38	0.027*
High	0.647	0.094			
<hr/>					

N = 40

### I-Tests for Differences Within Groups

To explain differences in attention to reading tasks at easy, average, and hard difficulty levels, selected additional paired I-Tests were conducted to test for mean differences for each anxiety group at each difficulty level. These I-tests were conducted individually for high and low anxiety students between the baseline measure and easy reading, between easy reading and average reading, and between average reading and hard reading.

Between the baseline response times and response times during easy reading, no significant differences were found for high or low anxiety readers when both comprehension and word recognition served as the dependent measure ( $p < .05$ ). Across all conditions, response times were slower when participants were reading than when they were not reading. (see Tables 10, 11, 12, and 13).

### I-Tests for Low Anxiety Readers

When comprehension served as the dependent variable, significant differences were found between easy and average, and average and hard difficulty levels for low anxiety readers ( $p < .05$ ). So, low anxiety readers allocated differing amounts of attention to easy, average, and hard reading materials. More attention was allocated to hard reading than to average reading, and more attention was

allocated to average reading than to easy reading (see Table 10).

When word recognition served as the dependent variable, again, significant differences were found between easy and average, and average and hard difficulty levels for low anxiety readers ( $p < .05$ ). Again, low anxiety readers allocated differing amounts of attention to easy, average, and hard reading. In this case, more attention was allocated to average than to easy reading and more attention was allocated to average reading than to hard reading (see Table 11).

Table 10

I-Test Results For Low Anxiety Readers For Comprehension

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Base	0.435	0.068	-12.04	19	0.000*
Easy	0.678	0.123			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Easy	0.678	0.123	-3.05	19	0.007*
Average	0.728	0.106			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Average	0.728	0.106	-2.17	19	0.043*
Hard	0.766	0.132			

N = 20

Table 11

I-Test Results For Low Anxiety Readers For Word Recognition

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Base	0.436	0.067	-11.67	19	0.000*
Easy	0.657	0.098			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Easy	0.657	0.098	-6.48	19	0.000*
Average	0.794	0.123			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Average	0.794	0.123	3.35	19	0.003*
Hard	0.715	0.093			

N = 20

I-Tests for High Anxiety Readers

For high anxiety readers, when comprehension served as the dependent variable, significant differences were found between easy and average reading ( $p < .05$ ). No significant differences were found between average and hard reading. Thus, more attention was shown to be allocated to easy reading than to average reading (see Table 12).

Similarly, when word recognition served as a dependent variable, I-Tests demonstrated significant differences ( $p < .05$ ) between easy reading and average reading for high anxiety readers. Between average and hard difficulty levels, no significant differences were found. So, high anxiety readers allocated more attention to easy reading than to average and hard reading (see Table 13).

Table 12

I-Test Results For High Anxiety Readers For Comprehension

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Base	0.453	0.081	-12.45	19	0.000*
Easy	0.727	0.128			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Easy	0.727	0.128	2.34	19	0.030*
Average	0.682	0.116			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Average	0.681	0.116	-0.02	19	0.982
Hard	0.682	0.108			

N = 20

Table 13

I-Test Results For High Anxiety Readers For Word Recognition

	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Base	0.446	0.084	-14.39	19	0.000*
Easy	0.743	0.126			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Easy	0.743	0.126	4.42	19	0.000*
Average	0.645	0.085			
<hr/>					
	Mean	Standard Deviation	T Value	Degrees of Freedom	2-Tail Prob.
Average	0.645	0.085	-0.13	19	0.899

N = 20

## CHAPTER V

### CONCLUSIONS

The study was designed to investigate the relationship between anxiety and attention in high and low anxiety readers during the reading of materials of varying difficulty levels. The findings indicate that A-state reading anxiety indeed does affect the allocation of attention during reading. These findings supported the suggestion that there are direct effects of anxiety on processing during reading (Sieber, O'Neil & Tobias, 1977).

Findings on the baseline measure for high and low anxiety readers will be discussed first. Further, to highlight the effects of anxiety on attention during reading, the performance of low and high anxiety readers will be discussed separately, followed by a discussion of differences between the two groups. Next, a discussion of methodological issues in studying reading anxiety will be provided. In demonstrating a relationship between A-state reading anxiety and attention to reading tasks, this study represents a starting point in building a research base on the direct effects of anxiety during reading. Thus, the findings of this study are of a preliminary nature, and direct instructional recommendations are not made.

Implications for further research will be discussed first in terms of the need for research relative to anxiety and cognition, and then in terms of the need for research relative to anxiety and instruction.

### Baseline Response Time Findings

For difficulty levels as identified by comprehension and word recognition scores, baseline measures were not significantly different for high and low anxiety readers. This indicated that the two groups did not differ in basic reaction tendencies. Further, baseline measures for high and low anxiety groups were significantly faster than response times during reading at easy difficulty levels. This demonstrates that the reading tasks required the allocation of attention, and resulted in slower response times to secondary tasks, supporting the findings of Britton, Phia, Davis, & Wehausen (1978).

### Low Anxiety Readers

Secondary task research has demonstrated that response times are arrayed in an inverted U-shaped curve with relation to task difficulty and anxiety as predicted by the Yerkes-Dodson law (1908) (Eysenck, 1979a). It was hypothesized that the response times of low anxiety readers would follow this pattern. When presented with an easy

reading task as compared to more difficult reading, only a portion of available attention would be allocated by the readers to the task, while another portion of available attention would remain unused, yielding relatively faster response times to a secondary task (Eysenck, 1979 a & b, Beck & Emery, 1985). When low anxiety readers were presented with average reading tasks, it was expected that the major portion of available attention would be utilized by the reading task, leaving little attention unused and resulting in slower response times (Eysenck, 1979 a & b, Beck & Emery, 1985). Finally, a hard reading task was expected to require more attention than available, resulting again in faster response times (Eysenck, 1979 a & b, Beck & Emery, 1985).

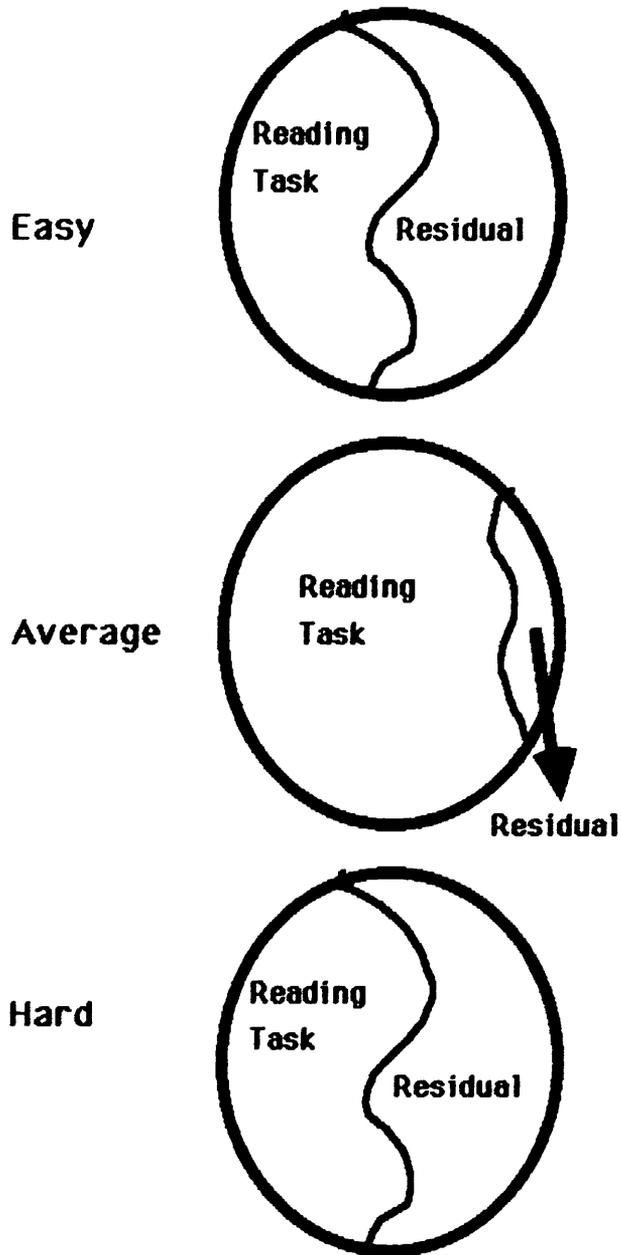
In general, the results of this study are consistent with the above predictions. When considering word recognition criterion, response times for low anxiety readers supported the predicted pattern of the Yerkes-Dodson law (Eysenck, 1979a). That is, response times were significantly faster during the reading of easy and hard materials than during the reading of average materials. This shows that low anxiety readers allocated significantly higher levels of attention to average reading tasks than to easy and hard reading tasks.

The explanation for this pattern is that the easy

task demands less attention because the reader can use more automatic processing (Laberge & Samuels, 1974). During easy reading, it was not necessary to focus high levels of attention to the reading task, and fairly high levels of residual attention remained (see Figure 3). These high levels of residual attention provoke the faster response times. Conversely, the hard passage places readers in an information overload situation and causes them to break fluent processing and divert attention more easily. So, at hard difficulty levels, the breakdown in fluent processing leads to relatively high levels of residual attention, again yielding faster response times. The average level passages provide the ideal information processing balance. That is, there is enough uncertainty to keep the reader aroused and prevent overly automatic processing, while at the same time not overloading the system. At average difficulty levels, high levels of attention are focused on the reading task, and only low levels of residual attention remain. These low levels of residual attention result in slower response times.

Similar to word recognition, when difficulty was identified by comprehension errors, the predicted pattern (Eysenck, 1979a) of slower response time was evident for low anxiety readers for the shift from easy to average difficulty. However, the pattern (Eysenck, 1979a) of an

**Low Anxiety Readers**



**Figure 3**

**Attention to Reading Tasks in Low Anxiety Readers**

increase in response times was not upheld for the shift from average to hard difficulty levels. At the hard levels, response times of low anxiety readers were slower than their response times at average difficulty levels. Thus, these findings indicated that low anxiety readers allocated more attention to average than to hard reading tasks.

One explanation for this finding might be in the measurement of task difficulty. The word recognition measure was less inferential than the comprehension measure. As participants orally read passages, the pronunciation of words was more clearly either correct or incorrect to the researcher. For example, in one passage, the words in the sentence "These ancient stories are called myths," were either pronounced correctly or incorrectly. While John's (1978) criteria for comprehension responses were strictly followed, determining whether responses were correct or incorrect required some inferencing. For example, referring to the passage about myths, one comprehension question was, "What are ancient stories called?" The stated acceptable answer to the question was "myths." An answer such as "I can't remember that M-word, but they are history, like real old stories," required that a decision be made by the researcher as to whether the answer provided should be scored as correct or incorrect.

Another possible explanation can be seen by comparing

the methodology of the current study with the methodologies supporting the Yerkes-Dodson law (1908) (Eysenck, 1979a). In these studies, normal populations were used in demonstrating that response times were arrayed in an inverted U-shaped curve in relation to arousal and anxiety (Eysenck, 1979 a & b). In this study, students with medium levels of reading anxiety were eliminated, and only students with high and low levels of reading anxiety were studied. When difficulty levels were identified by comprehension scores, this population of low anxiety readers differed from normal populations in response times to hard reading tasks.

Low anxiety readers may be able to focus more attention on harder reading tasks than normal reading populations. In normal populations, hard tasks constitute an information overload, and increased distractibility results. This increased distractibility may be related to the awareness that the task is difficult and that a high success rate is not being achieved. For readers with normal levels of anxiety, the focus of a portion of attention on the high difficulty level of the task and low success may constitute an increase in residual attention, resulting in faster response times. Perhaps low anxiety readers are less concerned when they realize that they are performing a hard task with a low success rate, and do not focus their

attention on these aspects of the task. Thus, high levels of attention may be allocated to the reading task, and little residual attention will be available, resulting in slower response times. So, low anxiety readers may be able to focus attention on harder tasks, where success rates are lower than those which are acceptable for high and normal anxiety readers. It would be expected that at "harder" difficulty levels, where success rates are dropped below the levels typically identified as "frustration levels," (Betts, 1946; Durrell, 1937; Johns, 1978; Spache, 1963) response times for low anxiety readers would become faster, as is the case for easy reading.

#### High Anxiety Readers

For readers who experience normal levels of anxiety, response times are arrayed in an inverted U-shaped curve with relation to task difficulty as predicted by the Yerkes-Dodson law (1908) (Eysenck, 1979a). During an easy reading task, only a portion of available attention is allocated by the readers to the task, while another portion of available attention remains unused and yields relatively faster response times to a secondary task (Eysenck, 1979 a & b, Beck & Emery, 1985). Average reading tasks require the allocation of the major portion of available attention, leaving little attention unused and resulting in slower

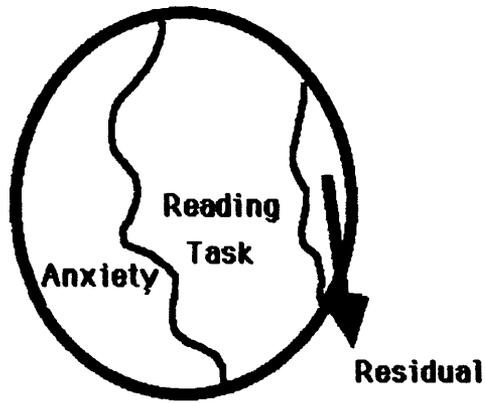
response times (Eysenck, 1979 a & b, Beck & Emery, 1985). Hard reading tasks require more attention than available, which results in faster response times (Eysenck, 1979 a & b, Beck & Emery, 1985).

Smith (1975) suggested that anxiety increases the amount of information which must be dealt with during tasks. During reading tasks, high anxiety conditions were expected to result in decreased performance related to reading tasks because a portion of available attention would be focused on anxious responses. When high anxiety readers were faced with reading tasks, it was hypothesized that a portion of available attention would be allocated to deal with anxious responses related to the reading task. Regardless of the difficulty level, attention was expected to be divided between the reading task and anxious responses to the task.

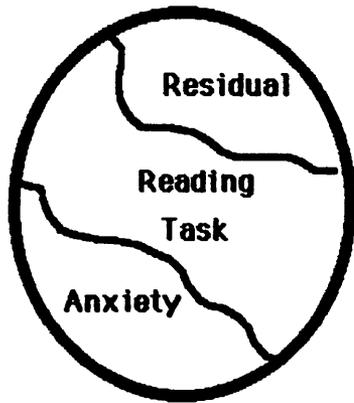
When high anxiety readers were faced with an easy reading task, it was expected that a portion of available attention would be allocated to the reading task while additional available attention would be focused on anxious responses. Thus, most available attention would be used by the combined reading task demands and anxiety responses, leaving little residual attention, and yielding slower response times (see figure 4). For high anxiety readers at average difficulty levels, task demands combined with the

**High Anxiety Readers**

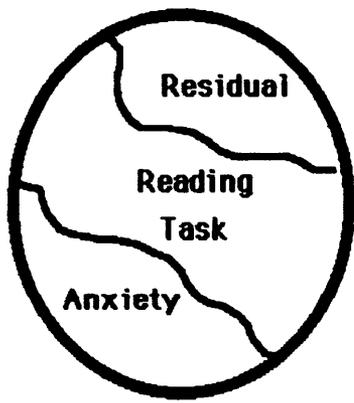
**Easy**



**Average**



**Hard**



**Figure 4**

**Attention to Reading Tasks in High Anxiety Readers**

demands of anxious responses were expected to require more available capacity. This overload was expected to result in increased distractibility, therefore higher levels of residual attention which would yield faster response times. For readers with normal levels of anxiety, hard reading tasks alone are expected to require the allocation of more attention than is available. For high anxiety readers, when the demands of hard reading tasks were combined with the demands of anxious responses, available cognitive capacity for successful task completion was expected to be exceeded. An increase in residual attention availability, and therefore faster response times were expected.

The findings from this study supported this line of reasoning. When word recognition scores served as the dependent measure, high anxiety readers had significantly slower response times during easy reading than during average and hard reading tasks. When comprehension served as the dependent variable, significant differences were found between easy and average difficulty levels. Thus, it was shown that high anxiety readers allocated higher levels of attention to easy reading. During easy reading, most of the available attention was allocated to reading and anxiety demands, leaving little residual attention and yielding slower response times. As difficulty levels were increased, attention needed to satisfy combined task and

anxiety demands was not available, so readers were distracted. That is, an increase in residual attention occurred and faster response times resulted.

If "easy" reading was defined as reading which demands less attention because the reader uses more automatic processing (Laberge and Samuels, 1974), resulting in high levels of residual attention and fast response times, in essence, there were no "easy" reading tasks for high anxiety readers. Anxiety occupied attention during each reading task. When the attentional demands of anxiety were combined with reading demands, there were no reading tasks which relied on automatic processing and used low levels of attention. High anxiety readers always had more information to process than their low anxiety counterparts.

### Summary

In comparing the attention to reading of high and low anxiety readers, it can be concluded that anxiety affected the allocation of attention to materials of differing difficulty levels. The higher levels of allocation of attention to reading occurred for low anxiety readers during average reading, and for high anxiety readers during easy reading. So, the attention of low anxiety readers during average reading looks like the attention of high anxiety readers during easy reading.

Lower levels of allocation of attention to reading were similar for low anxiety readers during easy reading and high anxiety readers during average and hard reading. For low anxiety readers, the decreased allocation of attention during easy reading reflected automatic processing which did not require the allocation of high levels of attention. On the other hand, for high anxiety readers, the decreased allocation of attention during average and hard reading represented an informational overload.

### Methodology

A second major conclusion is related to methodological issues in studying reading anxiety. This study provides evidence that A-state reading anxiety can be measured and that the secondary task technique can be used to gain a measure of the distribution of attention in young children during reading which overcomes the limitations of the post-only performance measure.

The design for this study included the development of a valid and reliable A-state reading anxiety scale which can be used to identify students with varying anxiety levels related to reading. A reliability coefficient of .92 was obtained for the instrument based on field testing. Further evidence of the usefulness of the scale was demonstrated in that the scale was used to identify high and low A-state

reading anxiety participants who differed significantly in attention to reading tasks, regardless of reading ability. Previous work on anxiety in reading had linked lower performance to higher anxiety (Gaundry and Spielberger, 1971; Hill and Sarason, 1966; Lunneborg, 1964; Merryman, 1974; Neville, Pfoest and Dobbs, 1967; Sarason et. al., 1960; Waid et. al., 1978). However, results from the scale developed for this study indicate that anxiety does not necessarily overlook the proficient reader. The scale was used to differentiate between high and low anxiety participants with varying reading abilities. High and low anxiety participants who performed above, on, and below grade level in reading were identified.

During reading, response times to a secondary task can be used to provide an on-line measure of attention to primary reading tasks. The secondary task technique provides a more proximal measure of processing during reading than post reading measures which attempt to infer information regarding processing based on what is remembered or pronounced once the reading has been completed. Additionally, this study provides evidence that the secondary task technique can be used in monitoring attention distribution in children, where it has typically been used only with adults. A "bonus" to the use of this technique with children is that they were not threatened by

the instrument, and indeed enjoyed working with it.

### Implications

Recommendations for further research will be discussed in terms of the need for research relative to reading anxiety and cognition, and in terms of the need for research relative to reading anxiety and instruction.

While focusing on attentional effects of anxiety on reading, this study has not dealt directly with cognitive activity relative to anxiety during reading. Beck and Emery (1985) suggest that specific cognitive sets are activated during specific events which match cognitive schema with elements of current situations. For high anxiety readers, schemata about reading may be associated with information about being anxious. So, when these reading schemata are entered into a cognitive set, the arousal of anxiety may be activated. Upon experiencing the unpleasant anxious response, a reader may begin to plan a strategy (which may be contained in schemata) to mediate anxiety (Beck & Emery, 1985). That is, a reader may be engaged planning a strategy for dealing with anxiety while dealing with reading. So, anxiety levels may vary based on the degree to which the reading task is currently stress-producing for the individual and the degree to which the individual is able to modify the cognitive set to reduce anxiety (Beck &

Emery, 1985). Investigation of cognitive activity in mediating anxiety during reading may lead to the study and development of interventions for high anxiety readers.

While the current study dealt with and demonstrated a relationship between cognitive aspects of anxiety and attention during reading for high anxiety readers, it did not consider possible relationships between somatic aspects of anxiety such as increased pulse rate and processing during reading. There is evidence that, related to sports competition, the somatic and cognitive aspects of anxiety operate differently, and operate on differing time frames (Martens, Burton, Vealey, Bump, & Smith, 1983). The development of an understanding of cognitive activity during reading may also provide insight into the relationships between somatic and cognitive aspects of anxiety.

Additionally, the work of Martens and colleagues (1983) provides evidence which implies that somatic and cognitive aspects of anxiety have cumulative effects on performance in sports. That is, the combined effects of somatic and cognitive aspects of anxiety result in decreased levels of performance. Future research should consider the effects of the somatic aspects of anxiety on reading and the potentially cumulative effects of the cognitive and somatic aspects of anxiety on reading.

These results showed that high anxiety readers were able to allocate more attention to easy reading tasks than to average and hard reading tasks. In their second- and third-grade classrooms, these high anxiety readers were learning to read in reading groups where it can be assumed that they were placed in materials at average difficulty levels. If combined reading-related demands and anxiety-related demands exceed available attention at more difficult levels, the placement of these readers in materials even at average difficulty levels may be inappropriate. These findings suggest that we might need to rethink the conventional wisdom of functional reading levels (Betts, 1946; Durrell, 1937; Gilmore, 1951; Johns, 1978; Spache, 1963) for some high anxiety readers. That is, these instructional levels need to reflect lower error rates, similar to those which are typically used for the independent reading level. High anxiety readers may be most appropriately placed at easy reading reading levels where anxiety interferes less with the allocation of attention to the task.

Conversely, for low anxiety readers, the operational definition of "hard" reading did not result in an informational overload, as reflected in an increase in residual attention. Again, the need to rethink conventional functional reading levels may be needed. It may be that

some low anxiety readers can more appropriately be placed instructionally in more difficult materials where high levels of attention to reading tasks are evident.

Of the twenty participants in the high reading anxiety group, fifteen were reading at or above grade level in their classroom reading groups. This suggests that these high anxiety readers were successful in these reading placements in spite of the effects of anxiety on their attention during reading. Eysenck (1979a) suggests that high anxiety learners may compensate for the effects of anxiety by focusing increased effort on learning tasks. Thus, it is apparent that two distinct populations of high anxiety readers may exist: high anxiety readers who are successful in classroom reading instructional settings, and high anxiety readers who are less successful in reading instructional settings. The need for further study of the processing effects of anxiety during reading and the relationships to success and failure in reading, as well as the study of appropriate text difficulty levels for these readers is indicated.

If many high anxiety readers are successful in reading instructional settings, it may be that their anxiety carries over to effect reading behaviors in noninstructional settings. For example, it may be that high anxiety readers do not enjoy reading and do not choose to

read for pleasure. Generally, the goals of education related to reading are to teach children to enjoy reading and to promote lifelong literacy (Bloome & Green, 1984; Shannahan & Hogan, 1983). It may be that, for some high anxiety readers, these goals are not met.

Relative to this study, performance anxiety should be considered. While asking that participants read passages and answer comprehension questions orally, the design required not only reading and comprehension of these participants, but also an oral performance. It may be that performance anxiety had an impact on these findings. To control for these possible effects, future research could employ silent reading and/or written comprehension tasks.

Similarly, it is important to note that this study dealt with the area of actual reading. The suggestion that anxiety may affect reading acquisition is frequently found in reading textbooks, (Gentile & McMillan, 1987; Gillette & Temple, 1982; Harris & Sipay, 1980; Smith, 1975) however little has been known about how anxiety affects reading and reading acquisition. This study demonstrated that anxiety affects attention to reading. It may be that in acquisition settings, anxiety has an intensified effect. As this methodology develops, research in acquisition settings will be needed, and this line of research may lead to intervention work.

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APPENDIX A  
READING ANXIETY SCALE

## FEELINGS ABOUT READING

Directions: The following statements describe how boys and girls say that they feel about reading, or how they feel when they read. Each statement will be read to you. You are to decide if it is never, hardly-ever, sometimes, or often true for you. Then for each statement, circle the words that seem to describe you best. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, choose the word which seems to describe how you usually feel.

- |     |   |       |                |                |       |
|-----|---|-------|----------------|----------------|-------|
| 1.  | I worry about making mistakes when I read.                      | never | hardly<br>ever | some-<br>times | often |
| 2.  | When I read out loud, I am worried that I won't know the words. | never | hardly<br>ever | some-<br>times | often |
| 3.  | I enjoy reading out loud.                                       | never | hardly<br>ever | some-<br>times | often |
| 4.  | I like it when my teacher asks me to read in my reading group.  | never | hardly<br>ever | some-<br>times | often |
| 5.  | My hands get sweaty when I read.                                | never | hardly<br>ever | some-<br>times | often |
| 6.  | I make mistakes in reading when I get nervous.                  | never | hardly<br>ever | some-<br>times | often |
| 7.  | Reading makes me feel sick.                                     | never | hardly<br>ever | some-<br>times | often |
| 8.  | I get upset when it is my turn to read.                         | never | hardly<br>ever | some-<br>times | often |
| 9.  | When I read out loud I feel very comfortable.                   | never | hardly<br>ever | some-<br>times | often |
| 10. | I worry about what others think of me when I read.              | never | hardly<br>ever | some-<br>times | often |
| 11. | I am afraid of reading in front of my class.                    | never | hardly<br>ever | some-<br>times | often |
| 12. | When I am reading, I feel nervous.                              | never | hardly<br>ever | some-<br>times | often |

- |  |       |             |            |       |
|--|-------|-------------|------------|-------|
| 13. I look forward to my turn to read.                                       | never | hardly ever | some-times | often |
| 14. I get a funny feeling in stomach when I read.                            | never | hardly ever | some-times | often |
| 15. I worry about reading in school.   | never | hardly ever | some-times | often |
| 16. I feel happy when I am reading.  | never | hardly ever | some-times | often |
| 17. When I read out loud, I feel uneasy.                                     | never | hardly ever | some-times | often |
| 18. I look forward to what my teacher will ask me to do in my reading group. | never | hardly ever | some-times | often |
| 19. I begin to feel very warm when I am reading out loud.                    | never | hardly ever | some-times | often |
| 20. I feel sure of myself when I read to my teacher.                         | never | hardly ever | some-times | often |

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