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**The Effects of Exposure to Yoga on the Academic Problems of  
Elementary School Students with Learning Disabilities and  
Students At-Risk for Reading Failure**

Nadia M. Mahabir

THE EFFECTS OF EXPOSURE TO YOGA ON THE ACADEMIC PROBLEMS OF  
ELEMENTARY SCHOOL STUDENTS WITH LEARNING DISABILITIES  
AND STUDENTS AT-RISK FOR READING FAILURE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for

the Degree of Doctor of Philosophy in

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Barry University

by

Nadia M. Mahabir, Ed.S.

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## ABSTRACT

# THE EFFECTS OF EXPOSURE TO YOGA ON THE ACADEMIC PROBLEMS OF ELEMENTARY SCHOOL STUDENTS WITH LEARNING DISABILITIES AND STUDENTS AT-RISK FOR READING FAILURE

Nadia M. Mahabir, Ed.S.

Barry University, 2006

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This study investigated the effects of exposure to yoga on the academic problems (memory, attention, and learning) of students with learning disabilities (LD) and students at-risk for reading failure. The design consisted of a single group, pre/post-test design including 31 participants between the ages of 7 to 11 from an urban, mostly Afro-American, elementary school. All students were administered the Learning Efficiency Test – II (LET-II), a measure of memory, prior to and following the intervention. Students' teachers were asked to complete the Behavior Assessment Scale for Children – Second Edition (BASC-2), a measure of teacher perception of student attention problems and learning problems, before and after the intervention. All students were invited to attend 10 after-school yoga classes for 45 min. per session. However, many students attended a fewer number of classes. It was found that exposure to yoga increases auditory short-term memory for students with LD and students at-risk for reading failure. It is suggested that this study be replicated with alternate assessments, a larger sample, more sessions, a longer period of instruction, and a control group before significant findings can be generalized to the population.

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## Chapter I

### The Problem

#### *Introduction*

In 2003, of the approximately 291 million people estimated to be living in the United States (U.S.) (FedStats, 2004), roughly 73 million were children between the ages of 0-17 (ChildStats, 2005). According to the U.S. Department of Education, in 2001 approximately 6.5 million children ages 3 to 21-years-old were served in federally supported programs for the disabled. The largest portion of this population is comprised of students with learning disabilities (LD) accounting for almost 3 million students (National Center for Education Statistics [NCES], 2003). In the state of Florida with a pre-kindergarten through 12<sup>th</sup> grade total population of 2,598,231, students diagnosed with LD equal 7% of all students and 46% of all students with disabilities (State Education Agency Profile, 2004). Similarly, within the school district of Miami-Dade County Public Schools with a PK-12 total population of 371,691, about 7% of the students are reported to have a diagnosis of LD (Florida Department of Education [FDOE], 2004a).

Nationally and statewide in Florida, research has predicted austere futures for students with disabilities compared to non-disabled students in terms of increased drop out rates, as well as higher rates of in-school and out-of-school suspensions (FDOE, 2004a; FDOE, 2004b; National Longitudinal Transitional Study, 1991). In terms of accountability, according to the Florida Department of Education, at the end of the 2004 school year, the state did not meet the overall Annual Yearly Progress (AYP) for its

public schools (FDOE, 2005). In particular, students with disabilities in the state did not make an adequate AYP in reading or mathematics.

There are documented negative repercussions for students who demonstrate poor academic progress particularly in reading in the early grades. Research shows that approximately 75% of poor readers in third grade continue to be poor readers in ninth grade (Lyon, 1995), and these reading disabilities persist into adulthood (Lyon, Alexander, & Yaffe, 1997 as cited in Mercer, Campbell, Miller, Mercer, & Lane, 2000). Moreover, high quality classroom instruction does not ensure learning for all students. Thus, an estimated 5% to 7% of students continue to fail to meet expected benchmarks associated with reading proficiency in the early grades even after appropriate teaching has been offered (Mathes, Denton, Fletcher, Anthony, Francis, & Schatschneider, 2005). Reading problems have been positively correlated with unemployment, low wages, poverty, crime, and low self-esteem (Brunner, 1993; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; National Institute for Literacy, 1997 as cited in Mercer et al.).

Not all children being serviced in the public education system are coming from middle class nuclear families with two parents in the home. Eighteen percent of all children ages 0-17 in the U.S. are living in poverty (Child Stats, 2005). In 2000, more than six million children – approximately 1 in 12 children – were living in households headed by grandparents or other relatives with a parent present. Approximately 2.5 million of these children are living in grandparent – or other relative-headed households, with no biological parents involved (Children's Defense Fund, 2005). In 2002, nationally, 532,000 children were reported to be in foster care. Unfortunately, the number

of children in foster care has increased nearly 30 percent in the past decade (Children's Defense Fund).

Shocking statistics reveal that children who live in families with annual incomes less than \$15,000, are 22 times more likely to be abused or neglected than children living in families with annual incomes of \$30,000 or more (Children's Defense Fund, 2005). It is plausible that this higher rate can be attributed to the stress that poverty places on parents and to the increased likelihood that child abuse and neglect will be detected, reported, and substantiated in low-income homes that are more closely supervised by social services and law enforcement agencies (Children's Defense Fund, 2005). Furthermore, 15 out of every 1,000 youths ages 12-17 are youth offenders of serious violent crimes (Child Stats, 2005).

Students with LD and students at-risk for reading failure comprise approximately 14% of the school-age population. Issues commonly associated with students in these at-risk populations are difficulties with attention, memory (Bender, W.N., 2001), and learning problems (Reschly & Hosp, 2004). With regards to attending skills, specifically the amount of time spent on task in the classroom, average performing students are on-task around 60 to 85% of the time during instruction; however students with LD are on-task only 30 to 60% of the time (Bryan & Wheeler, 1972; McKinney & Feagans, 1983 as cited in Bender, W.N. 2001).

The United States of America has undertaken the unique task of preparing every child in the country to be an educated member of our society. However, for some students the demands required to meet this high standard may be unrealistic, and in addition, taxing on their self-esteem and motivation (Amrein & Berliner, 2003). Schools

have been mandated to educate all children with disabilities; according to Public Law 94-142, all students with disabilities are guaranteed a free and appropriate public education. To ensure that students are appropriately placed, many poor achievers are referred to the school psychologist for assistance, and about 90% of those who are referred are formally tested. Of those who are tested, 73% are declared eligible for and receive special education services (Ysseldyke, 2001). The number of students who have been declared eligible and placed in special education has been growing at a rapid rate over the past 25 years [from 3.8 million in 1977-1978 to 6 million in 1997-1998] (Ysseldyke). Among the varying types of students in danger of academic failure, this study focused on two specific groups of students with a common denominator, which is their reading difficulty. The two groups are students diagnosed with a learning disability (LD), and students who are at-risk for reading failure. The at-risk for reading failure group was categorized through two criteria; 1) students reading two or more years below-grade level who have not yet been diagnosed or have not met eligibility for an educational disability, and 2) students who have not passed the state-wide reading examination.

### *Characteristics*

*Learning Disability (LD).* A plethora of researchers are in agreement that individuals who are diagnosed with LD form an extremely heterogeneous group (Fletcher & Morris, 1986; Kavale & Forness, 1995; Rourke, 1994; Torgesen, 1991 as cited in Zera & Lucian, 2001). A compounding contributory factor is the variability in the diagnosis of learning disabilities from state to state. Generally, individuals with LD have average or above average intelligence; nevertheless, they often fail to achieve the same academic levels as their nondisabled peers. The most fundamental characteristic of individuals with

LD is their weaker academic achievement, predominantly in reading, written language, and/or math. Significant deficits often exist in memory, metacognition, and social skills as well (Boudah & Weiss, 2002).

The majority of research suggests that students with LD are on-task less often than other children, are perceived as being more distractible, have lower rates of selective attention, and demonstrate a lag in the development of attention capability (Bender, W.N. 2001). Research has shown that inattention is strongly correlated with problems in academic achievement compared to hyperactivity which has a weaker correlation (Hartley, 1999), a finding that may affect intervention decisions. Additionally, research has linked memory deficits among children with learning disabilities with reading problems, language problems, difficulties in spelling, and other areas (Ceci, Ringstorm, & Lea, 1981; Cohen, Netley, & Clarke, 1984; Haines & Torgesen, 1979; McLeod & Greenough, 1980; Swanson, 1994 as cited in Bender, W.N. 2001). Furthermore, Bryan, Burstein, and Bryan (2001) describe the negative effects of poor language, attention, memory, reading, writing, and math on homework performance. These authors noted that not doing homework or doing it poorly is likely to have an adverse effect on academic achievement. On the contrary, Zera and Lucian (2001) posit that LD symptoms are simply manifestations of other problems and treating only observable symptoms does not necessarily address the underlying issues.

*At-risk.* Essentially, the at-risk population includes students who have been identified by teachers on in-class assessments as low-achievers and who have difficulty keeping up with the pace of the classroom. These students may have just been referred to the Child Study Team for assistance or they may be involved in the intervention and

monitoring stages of the Child Study Team process. Slavin and Madden (1989) described a student “at risk” to be “one who is in danger of failing to complete his or her education with an adequate level of skills” (p.4). Furthermore, Slavin and Madden discuss the effects on learning of possible risk factors such as low achievement, grade retention, behavior problems, poor attendance, low socioeconomic status, and attendance in schools with large numbers of poor students. In a study reviewed by Kawakami (1994), an at-risk student is “one who is in danger of failing to complete his or her education with adequate skills, knowledge, and attitudes to function as a responsible citizen of his or her community” (p.2). A student at-risk could be one who qualifies for either remedial services or special education services.

One of the characteristics of students at-risk for learning problems is their reading problems. Although there is not a single definition of term ‘at-risk for reading failure’, the literature in this area explore reading skills such as: phonemic awareness (Bowey, 1994; Goswami & Bryant, 1990), decoding (Foorman & Torgesen, 2001), fluency (Speece & Ritchey, 2005), vocabulary, and comprehension (National Reading Panel, 2000). It is speculated that reading failure may be related to any deficit combination of the aforementioned. An outside factor possibly contributing to being at-risk for reading failure may involve coming from low versus high-income families (Dickinson & Snow, 1987; Ramey & Ramey, 1998 as cited in D’Angiulli, Seigel, & Hertzman, 2004).

In addition to reading problems, other characteristics associated with students who are at-risk for academic failure include poor self-regulation skills and poor social skills, in addition to their need for more behavior management than the average student (Flanagan, Bierman, & Kam, 2003). Teachers usually engage at-risk students in the



prereferral intervention process when the students do not demonstrate the ability to listen attentively, follow directions, produce correct school work, and control their temper in conflict situations (Lane, Pierson, & Givner, 2003). In this study, students at-risk will be considered those who have reading problems.

*Similarities and differences in populations of students with LD & at-risk for reading failure.* Discussion regarding the etiology and symptomology of learning disabilities leads to an excess of unanswerable questions and no definitive answers. The same criticism could be directed to the term “at-risk.” Students in both populations suffer with decreased ability to maintain attention during academic work, exhibit poor memory, and demonstrate learning problems in general. Gresham, MacMillian, and Bocian (1996) found no differences among LD and low achieving students on measures of social skills, problem behaviors, or academic engaged time, or on most indices reflecting school history. Additionally, Shaywitz, Fletcher, Holahan, and Shaywitz (1992) compared children with LD with low achievers (LA) and found more similarities than differences between the LD and LA groups on a variety of child-, teacher-, and parent-based measures.

Academic interventions implemented with both students with LD and at-risk students have differed in the past based on funding. Currently, with the No Child Left Behind Act (U.S. Department of Education, 2002), funding sources support inclusionary intervention models that merge students with LD with students at-risk for reading failure and average students in the same classroom. Hence, the existence of perceived differences between students with learning disabilities and students at-risk are increasingly blurred. Researchers suggest there may be very few psychometric

differences between students with LD and low achievers (Kavale, Holdnack, & Mostert, 2005; Ysseldyke, 2001; 2005). Basically, a divergence between the two populations of students is that one has an educational diagnosis and is labeled, and the other is not. The difference is noted in one of two situations, either the low-achieving at-risk student has not been evaluated yet, or the low achieving at-risk student has been evaluated but does not have a significant difference between IQ and academic ability. Regardless of how students qualify for special education services, and whether they are diagnosed with a disability or not, they are all functioning academically below grade level in one or more subject areas which in turn may affect other areas of their development.

An area of difference for the LD and at-risk population is in the school grading policy and accommodations. In the state of Florida, according to the Pupil Progression Plan, there are a number of ways in which a student may obtain a grade. Most students are graded according to the Sunshine State Standards (SSS) which are published and shared with public educators. However, if a student has a documented disability and has been provided with an Individual Education Plan (IEP), the teacher has the option to either grade using the SSS, or document when the student is making gains towards the goals stipulated in the IEP. One more advantage of being a student with a disability is the opportunity to be assessed for state-wide, county-wide, or classroom assessment in a variety of alternative ways with flexible accommodations (if the need is evident). For instance, a student may require additional time to complete testing or may need to complete the examination in a smaller group setting. However, students in the at-risk range for school failure, without a documented disability, are not afforded the same accommodations for testing situations or shelters from poor grades.

### *Problems/Needs*

Many problems and needs exist for both students with LD and students at-risk for reading failure in the education system. There are overarching school problems as well as problems specific to student learning, attention and memory. The following section will introduce and summarize key issues in the field of education related to the present study.

*Academic Problems: Learning and Attention.* According to Reynolds and Kamphaus (2004), academic problems are closely linked to learning and attention problems, which will be the focus of this study. For both the student with LD and the student at-risk for reading failure, many types of academic problems (as defined by Reynolds & Kamphaus, 2004) interfere with school success. Although learning has been interpreted in many manners, achievement in math, reading, and spelling is one of the most common ways of measuring learning. Behaviors of a student having learning problems also may include difficulty with keeping up in class, difficulty completing tasks, and failing grades (Reynolds & Kamphaus, 2004). Students with LD and students at-risk for reading failure may have difficulty in one or more of these areas.

Boudah and Weiss (2002) noted that in the classroom some students with LD have difficulty remaining seated at their desks for a prolonged period of time in order to attend to classroom tasks, and may therefore develop social or behavioral problems in response to their frustrations with educational tasks. An additional set of problems encountered by Pathos and Kirk (2004) investigating students with Dyslexia were associated problems in memory, visual processing, auditory processing, and attention.

Even in the home, challenges arise which affect the attention of many low-achieving students. The National Center for Education Statistics [NCES] (1996) reported

a significant negative relationship between television watching and performance on achievement tests, in addition to other significant variables such as race and socioeconomic status (SES). It found that close to 25% of high school students who are Black from low SES households watch more than five hours of television on school nights (NCES). These students, in particular, are exposed to a string of television commercials interrupting programming every 10 minutes, thereby, training them to change focus and anticipate an intermission after short periods of time. This television training discourages children from focusing for long periods of time, which is essential for the student in the classroom. Indeed with the advent of technological growth, computer graphics, fast paced entertainment, games, and movies, students are decreasing their threshold for attending to one stimulus for prolonged periods of time. There is a need for more interventions directed at elongating attending skills in order to assist our technological youngsters. Attention is so essential, that without it, no learning may occur (Schworm, 1979).

*Memory Problems.* Students with and without disabilities display difficulties with memory, a trait associated with poor academic success. Educational research has documented interesting trends with reference to types of memory and implications for deficit areas. Frequently, poor academic students are reported to have deficits in short-term memory and/or working memory (Boudah & Weiss, 2002; Dighe & Kettles, 1996; Hulme & Mackenzie, 1992; McLoughlin, Fitzgibbon, & Young, 1994; Webster, 1998). Information may be obtained through different modalities, such as visual or auditory. The students can be measured in each modality for ability to remember information for immediate, short-term, working, or long-term periods of time. Immediate memory is the

ability to recall short bits of information succeeding presentation (Bender, W.N., 2001). Short-term memory is the ability to remember six to eight bits of information for up to 15 seconds (Klapp, Marshburn, & Lester, 1983). Working memory is the ability to hear or see stimuli, remember the information long enough to manipulate it, and offer the information back in either an oral or written form. Long-term memory is the ability to receive information, transfer it from short-term memory, attend to some type of distracting stimuli, and still retain the information for a long period of time (Sdorow, 1990). Difficulties in working memory can lead to difficulties in long-term memory wherein a person needs to search for and retrieve knowledge in a timely, organized manner (Boudah & Weiss, 2002). Thus, the struggling student in the classroom is less likely to apply learned knowledge spontaneously if he or she has not captured the information in the short-term or working memory process.

#### *Prior Solutions/ Strategies*

A plethora of interventions have been developed and researched for students with learning disabilities and students at-risk for reading failure. The interventions summarized in the following sections address academic, behavioral, and kinesthetic strategies.

*Academic.* A review of the literature reveals a vast array of academic strategies that have been developed, researched, and implemented to assist students with learning disabilities and poor readers in general (Boudah & Weiss, 2002; Ehri, Nunes, Willow, Schuster, Yaghoub-Zadeh, & Shanahan, 2001; Fulk, 2000; Mastropieri & Scruggs, 1998; McLaughlin, 1993; Swanson & Hoskyn, 1998). Swanson and Hoskyn espouse that the best instructional practices for students with LD include direct instruction of specific

skills and learning strategy instruction. Boudah and Weiss are in agreement that students with LD should be explicitly taught to complete a variety of academic tasks in a step-by-step fashion. They state that when taught appropriately, learning strategy interventions and direct instruction present students with appropriate modeling, practice, and feedback to master skills and cognitive strategies that can be generalized for independent use in a multiplicity of situations in and outside of school. Strategies such as applied behavior analysis (direct instruction, precision teaching, and curriculum-based measurement); strategy interventions - which are strategies to learn new material (cognitive strategy intervention, self-instruction strategy, and learning strategies curriculum); peer tutoring; and cooperative learning (McLaughlin) have also been recommended to work effectively with struggling students. Some researchers focus specifically on prerequisites of reading such as phonemic awareness (Ehri et al.) or memory strategies (Fulk; Mastropieri & Scruggs).

*Behavioral.* A wide range of behavioral interventions have been developed and recommended to assist students with academic school problems from general models such as Functional Behavioral Assessment and Positive Behavioral Support (Hoff, Ervin, & Friman, 2005; Safran & Oswald, 2003) to specific behavioral strategies such as strategic self-monitoring (Rock, 2005) and task analysis (Rothenberg, 1991). For students with severe attention problems, interventions involving contingency management (such as positive and negative teacher attention); classroom token economies; home-school contingencies; group contingencies, and other peer-mediated interventions; and cognitive-behavioral interventions have been attempted and researched (Abromowitz & O'Leary, 1991). Although behavioral strategies are taught to educators, the

implementation of behavioral interventions may be considered too time consuming and involve too much paperwork for many educators to actually employ despite research's encouragement of its use (Vaughn, Klingner, & Hughes, 2004).

*Kinesthetic.* Learning techniques related to body movement have been employed as intervention for poor academic functioning. Armstrong (2004) suggested the need to pay more attention to the role of physical movements in reading. The development of physical gestures for each of the 44 phonemes in the English language would benefit students who are more aware of their bodies. Another form of movement, dance, has been related to mathematics in terms of spatial exploration, rhythm, structure, and symbolization (Watson, 2005). Furthermore, Brown, Ilderton, and Taylor (2001) recommended the use of multisensory lessons to better address the learning style of students with attention problems. Lessons in the general education classroom that are bodily-kinesthetic in nature can be created to allow a student to display physical movements in the context of an academic lesson. Thus, the student's behavior can be viewed positively by his peers.

#### *Theoretical Framework*

The focus for the theoretical framework of this study is based on the work of Gardner (1983, 1999). Many of the aforementioned interventions for students either with LD or at-risk for reading failure are in alignment with Gardner's (1999) theory of multiple intelligences. This theory is rooted in the belief that the brain has evolved separate systems for different adaptive abilities which Gardner calls 'intelligences.' According to Gardner, there are ten types of intelligences, each of which is developed to a different degree in each of us: linguistic, logical-mathematical, spatial, musical, bodily-

kinesthetic, intrapersonal, interpersonal, naturalist, spiritual, and existential (Gardner, 1993, 1999). Using yoga training as an intervention allows individuals to utilize many different aspects of the intellect not readily assessed in classrooms and thus addresses the multiple intelligences of Gardner.

*Purpose of study*

Currently yoga, an ancient mindful exercise, has been growing throughout the United States at a rapid pace. Classes in yoga for students are being offered in the school setting in increasing numbers (Barnes, Bauza, & Teiber, 2003; Goldberg, 2004; Peck, Kehle, Bray, & Theodore, 2005; Slovacke, Tucker, & Pantoja, 2003). Recently, some researchers have documented the benefits of yoga and found it to have a positive impact on students with Attention Deficit Hyperactivity Disorder-Inattentive Type (Peck et al.), students with Autism, emotional handicaps, and students in general education classroom (Goldberg), as well as Afro-American adolescents with prior negative school behavior (Barnes et al.). Documented effects of yoga training include reduced student stress levels, increased attention, as well as reduced rates of absenteeism, rule infractions, and suspension. Moreover, increased levels in self-esteem, increased physical health, and overall gains in grade point averages gains were found in studies involving yoga students (Slovacek et al.).

Saraswati (1990), a yoga teacher from India, believes that yoga can have a significant impact on the students' attention skills. However, this hypothesis has yet to be formally researched with a broader population of students. Although there has been some quantitative research published, most documentation on the effects of yoga on students is qualitative in nature. Furthermore, there is very little published research regarding the



effects of yoga on students with learning disabilities or students at-risk for reading failure.

The purpose of this study was to investigate whether exposure to yoga has a significant impact on the academic problems and short-term memory of elementary school-aged students with learning disabilities and at-risk for reading failure, mostly Afro-American. More specifically, this study will explore the effects of yoga on academic problems including learning and attention as defined by Reynolds and Kamphaus (2004), and short-term memory as defined by Webster (1998). If yoga is found to have positive effects with this population, this study may provide another research-based intervention for schools to use with their students who are currently not achieving academic success and/or who have memory deficiencies.

#### *Research Questions*

Three general research questions with their corresponding sub-questions will be addressed in this study.

- 1) Are there significant differences in the memory of students with learning disabilities (LD) and students at-risk for reading failure before and after exposure to yoga?
  - a) Are there significant differences in the visual memory of students with LD and students at-risk for reading failure before and after exposure to yoga?
  - b) Are there significant differences in the auditory memory of students with LD and students at-risk for reading failure before and after exposure to yoga?
- 2) Are there significant differences in learning problems in students with LD and students at-risk for reading failure before and after exposure to yoga?

- 3) Are there significant differences in attention in students with LD and students at-risk for reading failure before and after exposure to yoga?

*Null Hypotheses*

H<sub>01</sub>: There are no significant differences in memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>01a</sub>: There are no significant differences in visual memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>01b</sub>: There are no significant differences in auditory memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>02</sub>: There are no significant differences in learning problems in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>03</sub>: There are no significant differences in attention in students with LD and students at-risk for reading failure before and after exposure to yoga.

*Definition of Terms*

*Adequate Yearly Progress (AYP)* – Under NCLB (2002), each state establishes a definition of "adequate yearly progress" (AYP). This is a series of performance targets that states, districts, and schools use each year to determine the achievement of each school district and school.

AYP is diagnostic in nature, and is intended to highlight where schools need improvement, and where they should focus their resources. The statute gives states and local educational agencies significant flexibility in how they direct resources and tailor interventions to the needs of individual schools identified for improvement. Under the

NCLB, schools are held accountable for the achievement of all students, not just general education student performances (U.S. Department of Education, 2002).

*Asana* – Sanskrit word that means “postures,” as in yoga or exercise postures.

*Attention Problems* – “The tendency to be easily distracted and unable to concentrate more than momentarily” (Reynolds & Kamphaus, 2004, p. 60). A T-score of 70 or higher on the Attention Scale of the Behavior Assessment System for Children – Second Edition (Reynolds & Kamphaus, 2004) indicates significant difficulty with attending in the classroom setting.

*Auditory Memory* – the ability to recall information that has been heard auditorily (Bender, W.N., 2001).

*Child Study Team* – A group of people (teacher, parent, guidance counselor, reading leader, math leader, school psychologist, and/or administrator) who meet to discuss concerns and interventions for a student’s problem area or need. After frequent monitoring and revisions of the intervention, if no significant improvement in student achievement is documented, then traditionally the team would decide if psychological testing is recommended to rule out an educational disability.

*Hatha-Yoga* – The word “hatha” means “force” or “forceful.” “Hatha-Yoga approaches self-realization through the vehicle of the physical body and its energetic template” (Feuerstein, 2003, p. 41). Hatha-Yoga seeks to strengthen the body so that practitioners have a chance to cultivate higher realizations.

*Immediate Memory* – the ability to recall short bits of information directly after it is heard or read (Bender, W.N., 2001).

*Kundalini-Yoga*- a form of Hatha-Yoga which includes a vast array of postures, breath control, chanting, and meditation techniques (Shannahoff-Khalsa, 2004). The purpose of this style is to awaken the serpent power, otherwise known as energy that lies at the bottom of the spine (Feuerstein, 2003).

*Learning Disability (LD)* – an educational diagnosis given after a student has been psychologically evaluated and is found to have a significant discrepancy (15 or 23 point difference) between one’s measured intellectual potential and one’s academic achievement in one or more areas, and then is measured to have a processing deficit. A student who is labeled LD has an Individualized Education Plan (IEP) with documented goals and objectives.

*Learning Problems* – “The presence of academic difficulties, particularly understanding or completing homework” (Reynolds & Kamphaus, 2004, p. 60). A T-score of 70 or higher on the Learning Problems Scale of the Behavior Assessment System for Children – Second Edition (BASC-II) (Reynolds & Kamphaus, 2004) indicates significant difficulty with learning problems in the classroom.

*Long-term memory* - the ability to receive information, transfer it from short-term memory, attend to some type of distracting stimuli, and still retain the information for a long period of time of more than 30 seconds (Bender, W.N., 2001; Sdorow, 1990).

*Memory* – the ability to retain information. Obtaining a standard score between 90-110 on the Learning Efficiency Test – II (LET-II) Global Memory Index indicates average ability (Webster, 1998).

*Mild Disability* – an educational diagnosis of Learning Disability, Emotional-Behavioral Disturbed, or Educable Mentally Handicapped given to a student following a psychological evaluation and development of an Individual Education Plan (IEP).

*Psychometric Differences* – differences in standard scores or differences in trends of scores on individually administered intellectual or process testing.

*School Problems* - defined by Reynolds and Kamphaus (2004) as a score on the School Problems Composite of the BASC-2 Teacher Rating Scale – Child. This Composite consists of the Attention Problems and Learning Problems Scales. “This composite reflects academic difficulties, including problems of motivation, attention, learning, and cognition. A high score on this composite is a sign that the teacher perceives behaviors that are very likely to interfere with academic achievement” (p. 67).

*Short-term memory* – the passive storage of information (six to eight bits) for usually less than 15 seconds (Klapp et al., 1983).

*Transcendental Meditation* – this technique has been described as “a simple mental procedure practiced for 15-minutes twice a day while sitting comfortably with eyes closed” for the purpose of quieting the mind (Roth, 1994).

*Visual Memory* - the ability to remember information that has been observed (Bender, W.N. 2001).

*Working Memory* – “processing resource of limited capacity involved in the preservation of information while simultaneously processing the same or other information” (Cantor & Engle, 1993; Engle, Cantor & Carullo, 1992; Just & Carpenter, 1992; Salthouse, 1996 as cited in Swanson, 2000).

*Yoga* - “Yoga is the art and science of living, and is concerned with the evolution of mind and body. Therefore, yoga incorporates a system of disciplines for furthering an integrated development of all aspects of the individual” (Saraswati, 1990). “Yoga is the control of the whirls of the mind” (Yoga-Sutra, 1.2) “The word yoga is derived from the verbal root *yuj* (‘to yoke’ or ‘to harness’). What must be yoked or harnessed is attention, which ordinarily flits from object to object” (Feuerstein, 2003, p.4). Part of Yoga involves postures or ‘asanas’. According to Pattbhi Jois (as cited in Swenson, 1999), asanas are not the goal; they are a vehicle to access a deeper internal awareness.

*Yoga Class* – a class which guides the individual through a series of physical movements or postures on a yoga mat, lasting for approximately one hour led by a certified yoga instructor.

*Yoga Instructor* – one who has studied for at least 200 hours under a certified practitioner. The course of study involves the philosophy of yoga, postures, physiology, anatomy, Sanskrit, and practicum hours.

## Chapter II

### Review of Literature

#### *Introduction*

This study focuses on measuring the short-term effects of yoga exposure on the academic problems (learning, attention, and memory) of elementary-school students with learning disabilities and students at-risk for reading failure. Fortunately, some research has been conducted on the effects of exposure to yoga on the emotions of students with learning disabilities and students who are at-risk for reading failure. However, there exists a lack of investigation into the academic effects of exposure to yoga. This chapter aims to define LD (learning disabilities) and provide the reader with relevant information related to LD. Then, background regarding attention, learning, and memory of students with LD and at-risk for reading failure will be addressed. In addition a concise overview of yoga and studies which include the use of yoga are included. The chapter concludes with an explanation of the theoretical framework used to bind the concepts of academic problems and yoga as a possibility for positively effecting students.

#### *Students with Learning Disabilities (LD)*

*History of Definition of LD.* As early as 1877, professionals used the term “word blindness” to describe individuals with aphasia and an inability to read (Kusssmaul, 1877 as cited in Mather & Goldstein, 2001). Kirk (1962) stressed the importance of defining learning disabilities using objective data. Following this movement, many researchers worked to define the characteristics and pinpoint the etiology of learning disabilities (Kavale & Forness, 1995; Reschly, 1992; Reschly & Hosp, 2004; Ysseldyke, 2001). Mattis, French, and Rapin (1975) identified three types of learning disabilities 1) children

with language problems, 2) children with articulation and graphomotor problems, and 3) children with visual-spatial perceptual disorders.

In the United States, the majority of students accessing appropriate education with the aid of Public Law 94-142 hold a diagnosis of Specific Learning Disabled. A study by Reschly and Hosp (2004) found that the LD classification criteria of the State Education Agency (SEA) have three main features. They are: severe discrepancy between intellectual ability and achievement, specified achievement areas, and exclusion factors; however, student identification with a disability depends on the definitional criteria used. These criteria change from state to state, district to district, and year to year (Reschly & Hosp; Ysseldyke, 2001).

According to Kavale and Forness (1995), the definition and etiology of learning disabilities are highly debatable. Depending upon how one views the etiology will stipulate the mode of intervention one might select to assist a student. For example, if the learning disability is perceived to be a result of neurological deficits, the intervention may involve the utilization of neurological strengths or the rehabilitation of weak areas. It is equally important to note that the states are given the flexibility to interpret their own classification criteria, thus adding additional variation in definition (Reschly & Hosp, 2004).

The public educational system has historically attempted to assess, classify, and provide services to those who qualify for special education services depending on differing state criteria. However, Kavale and Forness (1995) said that defining learning disabilities is a very difficult task that should be scrutinized and assessed in a very intuitive way. Reschly (1992) posits a future trend toward greater consistency in the



conceptual definition and narrowing of the classification criteria of LD similar to what has occurred in mental retardation in the 1950s and 1960s.

*Special Education and the Law.* The Education for All Handicapped Children Act (EAHCA) is also known as Public Law 94-142 which was passed in 1975 (20 U.S.C. 1400 et seq). This law was created to provide a free and appropriate education to all students aged 3 through 18. EAHCA required an Individualized Education Program (IEP) for students with any labeled diagnosis, and defined the term “least restrictive environment (LRE).” LRE refers to the relative restrictiveness of the setting in which students with disabilities are educated (Yell, 1998).

After some revisions to EAHCA, in 1990 the public law became known as the Individuals with Disabilities Education Act (IDEA) (Public Law 101-476). The law was amended again in 1997 with the most significant changes since the original passage of P.L. 94-142 in 1975 (Yell, 1998). Emphasis was placed on improved performance of students with disabilities and a stronger role for parents. Interestingly, IDEA was reauthorized in July 2004 allowing the states more choice in how students with learning disabilities may be diagnosed and calling for more highly qualified special education teachers (Samuels, 2005). The following two sections briefly describe two different ways LD may be diagnosed; first the traditional way, the Discrepancy Model, and second, the possible way of the future, Response-To-Intervention.

*Discrepancy Model.* IDEA originally considered the use of the “discrepancy model” as a way to diagnose the presence of a learning disability (Reschly & Hosp, 2004). The “discrepancy model” refers to comparing one’s measured intellectual potential (intelligence quotient) with one’s measured academic ability in reading,

mathematics, written expression, oral expression, or listening comprehension. If there is a significant difference between the two scores, the person is deemed eligible to receive services for a learning disability. The states have interpreted the discrepancy model in their own ways, with some states requiring additional criteria such as a measured processing deficit. Prior to the recent reauthorization of IDEA, only two states did not have the discrepancy requirement in their state rules [Iowa and Louisiana] (Reschly & Hosp). It should be noted, however, that many researchers believe that various learning disabilities may be overlooked where an IQ-achievement discrepancy is utilized for an LD diagnosis (Fletcher, Francis, Shaywitz, Lyon, Foorman, Stuebing, & Shaywitz, 1998; Siegel, 1999; Stanovich, 1999 as cited in Zera & Lucian, 2001).

*Response-To-Intervention.* In 2004, the U.S. Department of Education reauthorized the Individuals with Disabilities Education Act. In this reauthorization, states have the option of using the historically used “discrepancy model” to diagnose learning disabilities for at-risk students or they may document students’ needs for exceptional student services by showing a lack of response to intervention (Kavale, Holdnack, & Mostert, 2005; Samuels, 2005).

The argument has been made that there is little empirical support for test-based discrepancy models in the identification of students as LD (Ysseldyke, 2005). More importantly, Ysseldyke (2001) noted that teachers should begin the referral process for evaluation after observing a student’s slow rate of academic progress. Data reflecting academic growth may be obtained through direct and frequent measurement. In terms of diagnosing learning disabilities, at this time, the state of Florida is continuing to utilize

the discrepancy model; however, the state is asking for quantitative and qualitative data based on response-to-intervention (RTI).

### *Students At-Risk for Reading Failure*

Slavin and Madden (1989) conducted a meta-analysis on effective intervention programs for students at-risk for academic failure. For those authors, the risk factors considered included low achievement, retention in grade, behavior problems, poor attendance, low socioeconomic status, and attendance at schools with large numbers of poor students. It was generally found that effective programs for students at-risk of school failure were comprehensive, included effective preventative and intensive remedial programs, and frequently assessed student progress to meet student needs (Slavin & Madden).

Some characteristics associated with students who are at-risk for academic failure include poor self-regulation skills and poor social skills, in addition to their need for more behavior management than the average student (Flanagan, Bierman, & Kam, 2003). Teachers usually engage at-risk students in the prereferral intervention process when the students do not demonstrate the ability to listen attentively, follow directions, produce correct school work, and control their temper in conflict situations (Lane, Pierson, & Givner, 2003).

Reading problems is one of the characteristics of students at-risk for learning problems. Although there is not a single definition of term 'at-risk for reading failure', the literature in this area explore reading skills such as: phonemic awareness (Bowey, 1994; Goswami & Bryant, 1990), decoding (Foorman & Torgesen, 2001), fluency (Speece & Ritchey, 2005), vocabulary, and comprehension (National Reading Panel,

2000). According to the research, any deficit combination could be related to reading failure.

In this study, students at-risk were considered those who have reading problems. Students were identified with reading problems in two different ways. First, students who failed a reading screener, Dynamic Indicators of Basic Early Literacy Skills – 6<sup>th</sup> Edition [DIBELS] Oral Reading Fluency (Good, Kaminiski, & Dill, 2002) were considered. The DIBELS is a way to measure pre-requisite reading skills that are believed to be predictors of future reading success or failure. The second consideration was any student retained in the third grade due to failing the FCAT Reading test.

*NCLB Implications.* No Child Left Behind Act (2002) includes provisions for the local educational agency (LEA) to efficiently locate students who may be at risk for reading failure or who are having difficulty reading, by using screening, diagnostics, and classroom-based instructional reading assessments (U.S. Department of Education, Office of Elementary and Secondary Education, 2002). The emphasis is on using data to create appropriate intervention in order to remediate student academic deficiencies for both special needs and underachieving pupils. Some students identified as being at-risk for reading failure may still require an evaluation and possible placement in special education, but many more students will not need placement (National Association of State Directors of Special Education, Inc. [NASDSE], 2002).

#### *Educational Changes in the 21<sup>st</sup> Century*

Although there are many specific needs and problems for students with LD and at-risk students, there are global societal issues pertinent to the conversation. Large-scale

trends will be discussed in this section, with global economy issues first and then recent specific educational changes.

*Global Economy.* Future opportunities for low SES American students and citizens are predicted to be unequal in education, occupational opportunities, and available resources in general. The Education Commission of the States (1999) enumerated three points related to economic trends in the United States. First, the public school systems may be greatly affected by the increasing wealth that continues to accumulate in a shrinking elite population. Second, although the 2000 census shows a small proportion of Americans who are unemployed or employed only part-time, these calculations may be leaving some 20 million unemployed persons unaccounted for. The impact of globalization and automation has displaced hundreds of millions of workers (Education Commission of the States). Thus, implications regarding funding for schooling may need to be reconsidered as well as what and how we teach our students. Third, there is a high demand for technically skilled workers who are able to use technology in the work force. Yet, funding for vocational and technical programs has been cut from federal education budgets and redistributed for the No Child Left Behind support. The U.S. government has devised and recently implemented revolutionary legislation, No Child Left Behind Act, in an attempt to counter the impact of these negative economic trends by providing more equitable assistance for all American students.

*No Child Left Behind Act (NCLB).* Currently, NCLB has mandated that students in grades 3-8 undergo annual academic testing nationwide (U.S. Department of Education, Office of Elementary and Secondary Education, 2002). When students are

found to be performing below grade-level, intense interventions are prescribed in attempts to remediate these students' academic functioning. Prior to this law in 2001, many states had implemented their own forms of state-wide testing based on the belief that testing improved student motivation and raised student achievement (Amrein & Berliner). However, research show that high-stakes testing actually decreases student motivation, decreases student learning as recorded by independent measures of student learning, and increases the proportion of students who drop out of school early (Amrein & Berliner, 2003). Students and teachers across the nation are increasingly pressured to focus solely on information and thinking strategies covered on the test out of fear of failing the child in his or her class grade or of receiving a poor school rating. As a result, teachers do not have the flexibility to inspire students to learn new information and think critically merely for the love of learning.

#### *Academic Problems*

Generally, the term “academic problems” for school-aged students includes a wide range of issues. Attention problems and learning problems tend to fall under this category of academic problems. A study by Gresham, MacMillian, and Bocian (1996) investigated characteristics of students with LD, low achievement, and mild mental retardation. It was found that all three groups functioned well below national normative levels in the social skills areas of cooperation, assertion, and self-control. In terms of externalizing behaviors, the groups had elevated scores for behavior problems, hyperactivity, and inattention relative to normative standards. Interestingly, this study also found children with LD performed more poorly in reading than low achieving children, even when the LD group has higher cognitive ability. Gresham et al. (1996)

suggest the differences that do exist between the three groups are probably not educationally relevant in terms of differential placement options or interventions. The authors also argue the point that well-controlled empirical studies do not exist that show differential performances of these groups in various placements using multiple intervention strategies. In a review by McKinney and Feagans (1983), it was concluded that LD elementary students have been shown to exhibit a relatively stable pattern of classroom behavior that distinguishes them from average achieving students and contributes to their difficulties in school learning. For instance, compared to students without LD, students with LD were found to have more difficulty with task orientation/distractibility, were less attentive, had poor social skills, and were less organized.

In developing countries, research tends to investigate mostly the effects of poor cognitive ability on low academic performance. Durbrow, Schaefer, and Jimerson (2001), however, found children's academic performance to be greatly influenced by attention and anxiety problems, not just their cognitive abilities. The aim of the study investigated the prediction of children's achievement and academic scores from their learning-related behaviors and intellectual ability. A two-year study was conducted with 65 students the first year and 68 the second, who were between eight and ten years of age. Students were individually administered the Raven Coloured Progressive Matrices (Raven, Court, & Raven, 1990) which is a measure of abstract reasoning ability. The teachers were asked to complete the Quay and Peterson's Revised Behavior Problem Checklist for each student (Quay & Peterson, 1987) and the Learning Behaviors Scale (McDermott, Green, Francis, & Scott, 1999); both of these instruments measure attention, with the prior instrument also

measuring anxiety. The dependant variables were measured by end-of-term grades in five major subjects and a curriculum-based achievement test. At the one-year interval all three predictors (intellectual ability, attention, and anxiety) contributed almost equally to the same prediction. However, at the two-year interval, the intellectual ability failed to predict achievement while attention and anxiety accounted for 32% of the variance,  $F(3,64) = 15.48, p < .0001$ ). Their study suggested the need for a reduction in attention problems to better improve academic performance (Durbrow et al.).

*Attention Problems.* The term ‘attention problems’ refer to global characteristics such as: short attention span; easily distracted from class work; and/or difficulty listening to directions (Reynolds & Kamphaus, 2004). Attentional problems such as poor concentration, short attention span, and distractibility have been linked to poor reading and dyslexia (Brannan & Williams, 1987), as well as academic failure (Hinshaw, 1992; Rabiner, Coie, & Conduct Problems Prevention Research Group, 2000 as cited in Fleming, Harachi, Cortes, Abbott, & Catalano, 2004).

From a positive angle, Durbrow et al. (2001) discussed characteristics of students with good attending skills in open noisy classrooms. They found that there are many possible reasons why children with good attention skills may have an advantage in crowded noisy classrooms. First, children with few attention problems may be better able to concentrate on the material presented by the teacher. Second, they may be able to sit longer in the classroom and thus have greater exposure to learning materials. Third, they may be able to focus their attention during test taking times. Fourth, they are less likely to engage in disruptive behavior that is perceived and treated negatively by the teacher. All of these points may be kept in mind when investigating attention problems.



*Types of Attention.* There are various ways of defining attention depending on what viewpoint is considered. Researchers say that attention is not a unitary concept, and it is generally accepted that various types of attention can be distinguished as selective processes in the nervous system (Wolfe & Horowitz, 2004). Some important aspects of attention include: selective attention, divided attention, sustained attention, and flexibility of attention (Minder, Das-Smaal, Brand, & Orlebeke, 1994). The literature on attention in children with LD focuses on selective and sustained attention (Shalev & Tsal, 2003).

Selective attention involves focusing on pertinent information in a problem-solving task (central memory) and excluding any extraneous information (incidental memory) (Day & Peters, 1989; Gibson, 1969; Schworm & Abelseth, 1978). Concerning another aspect of attention, it was believed that tasks that require the maintenance of attention over time, sustained attention, are especially difficult for children experiencing problems with learning (Keogh & Margohs, 1976). However a study by Richards, Samuels, Turnure, and Ysseldyke (1990) suggested some clarification. The study included 30 students with LD from grades 4, 5, and 6, with a matched control sample of an additional 20 non-LD students. Students with ADHD were identified in both groups. The students participated in one 30 minute session with a computer program that presented the stimuli and recorded the responses. The computer showed letters in a 40-column format. Students were then presented with two target stimuli and they needed to press the space bar when the target stimuli were observed in the columns. They found that if students with LD have impairments in sustaining attention, these impairments were not as evident as they were for children with ADHD. Moreover, students with LD were found to have longer response times,  $t(30) = 1.70, p < .05$ , on several presented attentional

tasks, possibly linked to delayed information-processing speed. It is important to note that for children to be successful, they must make use of different kinds of attention behavior when they are involved in academic learning (Naglieri & Rojahn, 2001).

Different models of attention have been proposed. In 1984, Posner and Cohen posited that attention is comprised of three actions: disengage, shift, and engage. Basically, one must remove attention from a currently fixated target (disengage), shift attention to a newly relevant target (shift or move), and focus attention upon that new target (engage). Then later Mirsky, Anthony, Duncan, Ahearn, and Kellam (1991) contended that attention involves four components: focus, encode, sustain, and shift.

In most applied educational research, the term attention is usually referred to as the ability to concentrate in a learning situation (Norman & Breznitz, 1992). It was found that the ability to ignore distractions and concentrate on a task at hand is essential for learning (Cruickshank & Hallahan, 1975; Hallahan & Reeve, 1980; and Lahadarne, 1968 as cited in Norman & Breznitz). Additionally, shifts in the quality of attention affect learning performance (Ammons, Booker, & Killmon, 1995; Dunn, 1983).

*Influences on Attention.* Research has found numerous possibilities for differing levels of attention. Muyskens and Ysseldyke (1988) believed that attention was influenced primarily by classroom ecology. They believed it should be possible to increase learning effectiveness by initiating individual and group activities which improve concentration.

Time of day may also have an effect on student attention. A study by Klein (2001) investigated the differences in 5<sup>th</sup> and 10<sup>th</sup> graders math achievement and self-reported attention levels during three intervals (early morning, mid-morning, and afternoon). The

study found that fifth graders' attention levels were significantly higher in the afternoon ( $p < .001$ ); however, the attention differences between high and low achievers at different times of the day were not significant. However, the tenth graders had a significant interaction ( $p < .05$ ) between mathematics achievement and attention levels at various times of the day.

It was also found that exposure to lead may have an affect on attention problems for children. A study by Minder and associates (1994) found that children with relatively high concentrations of lead in their hair were significantly ( $p = .022$ ) less flexible in changing their focus of attention. Other effects on student attention and concentration include socioeconomic status (Norman & Breznitz, 1992), sociocultural-educational and environmental-hygienic factors (Das-Smaal, Vrije, de Leeuw, & Orlebeke, 1987), and heavy prenatal exposure to alcohol (Mattson, Calarco, & Lang, 2006). However, beyond just the etiology, focus must also be placed on interventions for attention problems.

*Attention Intervention.* Students with attention problems have been found to have difficulty with academic and behavioral functioning (Barkley, Fischer, Edelbrock, & Smallish, 1990 as cited in Durbrow et al., 2001). These children may be unable to succeed in school tasks that require continuous concentration such as test taking or listening to a story. Children who are inattentive and hyperactive may engage in behaviors not conducive to learning, such as fighting, substance use, and non-attendance at school. Research has been conducted in the education field in an attempt to remedy attention problems and their secondary effects.

A study in the 1960's focused on trying to reduce the distracting stimuli in the environment of the inattentive student (Cruickshank, Bentzen, Ratzeber, & Tannhauser,

1961). However, there appeared to be little generalization to settings outside of the experimental one in studies that approached inattention from this angle (Argulewicz, 1982). More successful research has been reported using operant conditioning techniques; Patterson (1965) successfully used visual cues and candy as reinforcers in increasing the attending time of distractible students. Research has also found token economies (such as earning points or coins after completion of a task which may be exchanged later for a chosen prize) successful in improving the attending behaviors of distractible school children (Bushell, Wrobel, & Michaelis, 1968; McKenzie, Clark, Wolfe, Kothera, & Benson, 1968; Novy, Burnett, Powers, & Sulzer-Azaroff, 1973; Packard, 1970; and Wagner & Guyer, 1971 as cited in Argulewicz, 1982).

Studies in the past five years appear to utilize advances in technology or psychology/spirituality as possible interventions for inattention. A study by Navarro, Marchena, Alcalde, Ruiz, Llorens, and Aguilar (2003) found that ten training sessions with a specific computer software program significantly improved ( $p < .001$ ) student attention. The participants involved 155 sixth, seventh, and eighth grade students, who were separated into an experimental group and two control groups. Later in Sweden, Norlander, Moås, and Archer (2005) implemented a four-week long relaxation treatment for 88 eleven-year-olds to investigate effects on classroom noise level, pupil stress level, and pupil ability to concentrate. The treatment consisted of some stretching and then seated breathing exercises. Relaxation training was provided for the treatment group, and a significant increase ( $p = .04$ ) in ability to concentrate among the pupils was found.

*Attention and Learning Problems.* Connections have been made between attention and learning throughout educational research. For instance, it was found that poor readers

have more difficulty paying attention to reading tasks (Elkind, Larson, & Van Doorninck, 1965; Mondani & Tutko, 1969; Pelham & Ross, 1977; and Staats, 1968). Additionally, low school achievers have trouble maintaining attention over time (Barkely, 1977; Douglas, 1980a, 1980b; and Ross & Pelham, 1981). Actually, in the 1970's it was suggested that selective inattention be added to the definition of LD (Hallahan & Kauffman, 1976; Ross, 1976 as cited in Argulewicz, 1982).

A study by Forness and Esveldt (1975) carefully observed 24 boys identified with school learning or behavior problems. Results indicated that normal children had greater rates of attending or on-task behavior compared to students with academic difficulties. Later, a study by Gadeyne, Ghesquiere, and Onghena (2004) investigated behavior problems, academic motivation, social preference, and self-concept of children with LD. The participants were 276 first graders who were given academic achievement tests, a brief measure of cognitive ability, two measures of self-concept, two pictorial measures of motivational concepts, an assessment of social relationships in class, and had parents and teachers complete a behavior checklist. Among the many findings, they assert that children with learning problems had significantly more attention problems ( $p = .03$ ) than children without learning problems.

Zera and Lucian (2001) stated that deficits in attention have a direct effect on learning and therefore may have a severe impact on learning. For example in reading, if a student does not possess the ability to maintain attention as the information load increases, this may impact and be impacted by slow, laborious computations or letter-by-letter decoding due to lack of automaticity (Zera & Lucian). The point noted is that a lack in attending skills may be closely related to learning problems. In addition, attention is

directly related to memory, in that if one is not attending to information being presented, one will be less likely to store information in short-term memory, recall it, and then store it in long-term memory. Hence, less learning will occur.

*Learning Problems.* Learning problems encompass a wide-range of behaviors. Reynolds and Kamphaus (2004) consider the following behaviors to be indicators that a learning problem exist: has trouble keeping up in class; complains that lessons go too fast; does not complete tests; has poor handwriting or printing; has reading problems; has problems with mathematics; has spelling problems; and/or gets failing school grades. Other issues related to learning problems involve motivation issues. Bender and Wall (1994) stated that students with LD have lower scores in academic self-regulation and are less motivated for on-task performance (as cited in Gadeyne et al., 2004).

Teacher perception has a large influence on labeling students with learning problems. In a study by Taylor, Anselmo, Foreman, Schatschneider, and Angelopoulos (2000), the sensitivity of kindergarten teachers to learning problems in the students as well as the validity of teacher-identified problems over time was investigated. To identify early learning problems, kindergarten teachers in a suburban school district rated student progress toward six academic objectives as satisfactory or unsatisfactory. Results of testing during kindergarten revealed poorer academic achievement in identified children than in nonidentified children. Children from the identified group were rated by teachers as having more behavior and attention problems and lower social competence. Follow-up of the sample in first grade documented continued learning problems in the identified group. These findings support the use of teacher judgments in early detection of learning problems and argue against reliance on learning disability discrepancy criteria.

Indicators of learning problems versus proper classroom behavior have been noted. Lane et al. (2003) found that kindergarten through 12<sup>th</sup> grade teachers rated five skills as critical for classroom competence: (a) follows directions, (b) attends to your instructions, (c) controls temper in conflict situation with peers, (d) controls temper in conflict situation with adults, and (e) responds appropriately to physical aggression from peers. It was concluded that students who lack these skills are unlikely to meet their teachers' behavioral expectations and are at-risk for pejorative outcomes including poor school adjustment and academic underachievement.

### *Memory*

Another area with relevance to students with LD and students who are at-risk for reading failure is memory. Numerous types of memory have been classified, and a myriad of intellectual processes are involved in supporting good memory performance (Torgesen, 1985). Powers (1973) defined memory as “the storage and retrieval of information carried by neural signals” (p.205).

*Types of memory.* Traditionally, memory has been differentiated into two levels: short-term memory and long-term memory (Ellis, 1963; Swanson, 1994). Short-term memory represents passive storage of a limited amount of information (six to eight bits) for a limited amount of time (usually less than 15 seconds), and then reproduced in a sequential fashion (Klapp et al., 1983). Long-term memory has been defined as a memory of an interval longer than 15 seconds (Bender, W.N., 2001). Then in 1974, Baddeley and Hitch introduced the concept of working memory. Working memory represents the ability of a student to hold a small amount of information in short-term memory while working with that information and integrating it with other information (Baddeley &

Hitch, 1974; Baddeley & Logie, 1999; Engle, Kane, & Tuholski, 1999; Just & Carpenter, 1992). Learning occurs when one moves information from short-term memory, through working memory, and retains the information in long-term memory. The information once encoded in long-term memory may be retrieved at a later time period.

A review of the literature by Fahey and De Los Santos (2002) discussed different aspects of memory or “The multiple ‘R’s of memory” which are record, rehearse, retain, reconstruct, and retrieve. When information is moved from short-term to long-term memory, it is considered recorded. Gurowitz (1969) discussed the importance of protein and RNA in relation to the chemistry of memory and recording information. Rehearsal involves repetition and practice which reflects demonstrated improvement in learning. Fahey and De Los Santos reported that sufficient chemistry and neurotransmitters are needed in the storage process. To retain information involves “storing information through repetitive processes, mnemonic devices, and contextual association” (Fahey & De Los Santos, p. 382). Optimal conditions for retention of information were discussed in the review. Jensen (1998) suggested the importance of protein in long-term memory, the need for calcium, choline and acetylcholine in aiding the chemical processes of memory, while Fahey (2000) noted the importance of water in the entire memory learning process. To reconstruct is when one searches for information and has the “ah-ha” moment of finding the correct file. According to Sprenger (1999), individuals have a variety of neural pathways to search for information. Information is stored in context and this context provides a prompt in the recognition process. Embedding knowledge in context assists in memory and recall (Fahey & De Los Santos). Retrieval is recognizing information and using it in the correct context. Milner (1999) discussed activity-induced



changes at the synaptic level in the brain related to learning. Milner found proteins necessary for storing (learning) and changing receptor site synapses which aids in the ability to recall information (retrieving). Through repeated activation, this process strengthens the synapses and recall of information is facilitated.

*Memory and Physiology.* The review of literature by Fahey and De Los Santos (2002) concludes that our brain needs specific chemicals to function, just as our body does. Specifically, the brain needs the amino acids that come from proteins, calcium, and vitamins for optimal functioning.

Research has been reviewed in an attempt to link different working memory functions with specific parts of the brain (Baddeley & Logie, 1999; Swanson & Siegel, 2001). An association was found between verbal working memory tasks (i.e., phonological loop) and the left parietal lobe. However, visual-spatial working memory tasks may be related to the right posterior parietal lobe as well as some other parts of the brain. Neuropsychological evidence suggests that children with LD experience difficulties related to these structures (Bull, Johnston, Roy, 1999; Crosson, 1999). Based on the type of task, of course, studies suggest that children with LD have processing difficulties related to regions of the frontal lobe (Lazar & Frank, 1998), left parietal lobe (Pugh, Mencl, Shaywitz, Shaywitz, Fulbright, & Constable, 2000; Shaywitz, Shaywitz, Pugh, Fulbright, Constable, & Mencl, 1998), as well as problems related to the interhemispheric transfer and coordination of information across the corpus callosum (Obrzut, Hynd, Obrzut, & Pirozzolo, 1981; Swanson & Obrzut, 1985 as cited in Swanson & Siegel, 2001).

*Memory and Learning Disabilities.* Many studies have been conducted to investigate the effects of memory on the academic performance of students with LD. A recent study by Gathercole and Pickering (2001) compared three types of working memory of students with learning disabilities with students making normal curricular progress. The sample consisted of fifty-seven students from two different primary schools. All students were tested individually at the age of 7 and again at the age of 8. The instrument used to collect the data for all students was a preliminary version of the Working Memory Test Battery for Children (Gathercole & Pickering, 2000). Findings indicated students with LD performed very poorly on many measures of working memory function. Children with special educational needs were also impaired on their memory for visuo-spatial patterns.

In another study, Swanson (1994) compared students with and without LD on a number of short-term memory and working memory tasks and indicated that working memory was more influential in reading skills than short-term memory for both groups. Short-term retention of isolated facts is less important than the skill of short-term retention in combination with the need to integrate that information with previous knowledge (Bender, W.N., 2001). In other words, when a student engages in a class lesson, it is most beneficial if the student begins by accessing prior knowledge and then incorporates the new information.

Swanson (2003) conducted an additional investigation of age-related differences in LD and skilled readers' working memory. The study included participants from age 6 to 30 for both the LD ( $n = 100$ ) and skilled reader ( $n = 126$ ) groups. All participants were given three working memory tasks: recall of phonological, semantic, and visual-spatial

information. Results suggested no age-related differences, but that verbal and visual-spatial working memory performance of skilled readers were better than LD readers' working memory ( $p < .001$ ).

Interestingly, not only have students with LD been found to have poor recall of academic information, they also have difficulty remembering everyday information (McNamara & Wong, 2003). A study by McNamara and Wong compared students with and without LD on their recall of academic and daily life information ( $n = 60$ ). Academic working memory was tested using the Swanson Cognitive Processing Test (Swanson, 1995); specifically, a verbal measure called Rhyming Words and a nonverbal measure called Visual Matrix. Everyday memory measures were formed in three groups: common objects, procedures, and episodes.

*Memory Intervention.* The fields of education and psychology have attempted to intervene with memory difficulties in a variety of ways. The effects of a variety of strategies, including the use of music with physical exercise, have been explored with students suffering from memory deficiency.

A review by Ritchie (1996) suggests eleven different elaboration strategies for increasing knowledge retention and recall of information. The elaboration strategies discussed are divided into two groups, microlevel and macrolevel. Ritchie explains that microlevel elaboration involves remembering specific pieces of information in the lesson, and macrolevel elaborations help students to create mental models that facilitate comprehension of entire lessons. The microlevel elaboration techniques may be further divided into two subgroups, transformational elaborations (alter content to make it more meaningful) (Levin, 1982) and situational elaborations (build on meaning found in

context). Teachers may use strategies such as associating similar sounding words (keywords), using visual cues (mathemagenic) (Merrill, 1983), or help students rearrange information into a more personal way (representational) to aid in transformational elaborations by creating a chart, graph or drawing (Merrill). Rivera and Smith (1988) found an improvement in long-division for LD students after the use of visual strategies. Situational elaboration strategies include: imagery techniques, introduction of prerequisite information (Ellis, Deshler, Lenz, Schumaker, & Clark, 1993), and strengthening the connection to the new content by integrating additional content. The macrolevel elaboration strategies may be divided into two sub-groups as well, generality and general-to-detailed. Generality elaboration techniques include comparison strategies such as: advanced organizers (comparative), comparisons to personal experiences, and comparison to knowledge in a different subject domain. General-to-detailed techniques (Reigeluth, 1983) involve teaching simple, concrete ideas related to the lesson content and teaching abstract ideas before the lesson content (advanced organizer - expository).

On the other end of the intervention spectrum, De Los Santos (2000) designed an experiment that combined certain classical music compositions with physical exercises to stimulate memory and learning. The study was conducted in a pilot school of 402 elementary school students with pre- and post-tests, and teachers' observations for both a treatment and control group. Results successfully indicated an effect on academic achievement (basic skills or reading, writing, and arithmetic) for all grades involved in the study.

## *Yoga*

*Definition.* Throughout time, yoga has been defined by many. Around 200 A.D., Patanjali wrote the Yoga Sutras (1.3) and stated "Yoga is the process of becoming free from limited definitions of the field of consciousness." Another statement from Patanjali's *Yoga Sutras* (1.2) reads, "Yoga is the restraint (nirodha) of mental activity (chitta vritti)." Literally the word 'yoga' is derived from the Sanskrit root 'yuj' which means 'to join' or 'to yoke;' the related meaning is 'to focus attention on' or 'to use.' (Iyengar, 2001).

According to Saraswati (1990), "Yoga is the art and science of living, and is concerned with the evolution of mind and body. Therefore, yoga incorporates a system of disciplines for furthering an integrated development of all aspects of the individual." Swenson (1999) defined yoga as "a place of refuge and a soothing balm for the stresses of modern life. Within each practice, one finds ways to refine existing understanding in order to continue to grow.

The most familiar definition of yoga in the Western culture involves postures or 'asanas'. According to Pattbhi Jois (as cited in Swenson, 1999), asanas are not the goal; they are a vehicle to access a deeper internal awareness. Yoga, with regard to postures, involves a 60 to 90 minute class with an assortment of physical movement, breathing techniques, meditation, chanting, and/or deep relaxation. Usually a yoga class is guided by a skilled instructor.

*Types.* Over the course of approximately 5,000 years in India, yoga developed into three major forms: Hindu Yoga, Buddhist Yoga, and Jaina Yoga. Hindu-Yoga branched into seven main types of yoga. The branches include: Rāja-Yoga, Hatha-Yoga, Jnāna-Yoga, Bhakti-Yoga, Karma-Yoga, Mantra-Yoga, and Tantra- or Laya-Yoga

(Feuerstein, 2003). Yoga entered the Western hemisphere mainly through the missionary work of Swami Vivekananda, who represented Hinduism at the Parliament of Religions in 1893. Since then, yoga has undergone a unique metamorphosis. In the hands of numerous Western yoga teachers, most of whom have learned Hatha Yoga from other Western teachers rather than native Indian gurus, Yoga has been tailored to suit the specific needs of their countrymen and women. Thus, by and large and in spite of the protest of a few purists, yoga has been secularized and turned from a rigorous spiritual discipline into an “instant” fitness system (Feuerstein, 2003).

The term Raja-Yoga derived from 200 A.D. when Patanjali wrote the Yoga-Sutra. This work of art set forth the disciplines of yoga, which were involved with the transformation of the mind and body through input and modification of information from the external and internal environments (Slede & Pomerantz, 2001). The Yoga-Sutra described Pantanjali’s eightfold path which leads practitioners out of the maze of their own preconceptions and confusions to a sublime state of freedom (Feuerstein, 1990). One of the eight limbs is called asana, or posture (specifically for meditation), and serves as the focus for many yoga practitioners.

Another rather large branch of Hindu Yoga is Hatha-Yoga. This form of yoga seeks to strengthen or “bake” the body so that practitioners have a chance to cultivate higher realizations. The chief processes of Hatha-Yoga are postures (asanas), breath control (pranayama), relaxation, and meditation (Feuerstein, 2003).

*Yoga and the Body.* Yoga has been found to have positive impacts on the body in relation to child development. Some findings have been formally tested with quantifiable data; however, much of the research in the field appears to still be in its infantile stages.

The following studies offer a brief glimpse into the research that has been conducted with relation to the body (pineal gland, lungs, and autonomic nervous system) and the benefits of yoga.

Yoga is said to assist in the preservation of the pineal gland (Saraswati, 1990).

The pineal gland is situated in the brain at the top of the medulla oblongata. It has a controlling influence over the pituitary gland and the whole endocrine system. According to Marieb (1992), the pineal gland secretes the hormone melatonin and, along with hypothalamic nuclei, seems to be involved with regulation of the sleep-wake cycle and some aspects of mood. The pineal gland is very active in children, but by the time they reach the age of eight or ten, it begins to calcify, and in elderly people, it has little or no role to play in life (Saraswati).

When the pineal gland starts to degenerate, the pituitary gland comes into action and the emotions shoot up (Saraswati, 1990). Specifically, during childhood, melatonin secreted from the pineal gland acts on the hypothalamus to inhibit the release of gonadotropin-releasing hormone (GnRH). This apparently inhibits precocious sexual maturation (Marieb, 1992). This may be a contributing reason as to why so many children become emotionally unbalanced and disturbed during their pre-adolescent and adolescent years (Saraswati). The pineal gland has a balancing influence on the activities of the brain that help keep the whole brain in receptive order. Saraswati found that those children in whom the pineal could still be commanded or monitored were much more receptive than those whose pineal gland was no longer active.

On a more global level of the body systems, it has been stated that the process of yoga deactivates the sympathetic division and stimulates the parasympathetic system

resulting in a sense of calm, emotional balance, tranquility, and increased concentration (Brosnan, 1982 as cited in Peck et al., 2005). Essentially, the sympathetic and parasympathetic systems are oppositional parts of the autonomic nervous system. The sympathetic division is referred to as the “fight-or-flight” system and mobilizes the body during extreme situations (such as fear, exercise, or rage). On the other hand, the parasympathetic division is sometimes called the “resting and digesting” system, and allows us to unwind as it performs maintenance activities and conserves body energy (Marieb, 1992).

A different area of the body that yoga may have an impact on is the lungs. Saraswati (1990) stated that the number of minute alveoli (air sacs) in the lungs goes on increasing until the eighth year. After this age, the alveoli increase in size only, there being no further duplication of alveoli occurring. Doctors note that this is the ideal age for the introduction of pranayama into the daily routine. In this way, the cardiovascular and respiratory mechanisms will be trained systematically, ensuring vitality and high levels of resistance and endurance throughout the different stages of life (Saraswati).

*Yoga and Attention.* According to Saraswati (1990), the practices of yoga not only help to keep the young body strong but also strengthen mental activities. These mental activities provide discipline to develop attention and concentration, and stimulate the creative abilities that are latent within the child. An example of how attention and concentration are cultivated comes from a technique reported to be used in the Bihar School of Yoga, India. There, children are directed to focus on the space in-between their eyebrows during part of their yoga practice. To make this practice more interesting, they ask the child to visualize at the same time. They name about fifty items and let the child



visualize them one by one. The child keeps on moving his or her awareness, repeating to himself or herself and picturing a pink rose, a flowing river, a snow-capped mountain, a moving car, an airplane in flight, a guava fruit, a church, and so on (Saraswati). With relation to the school setting, there are three ranges of objects to visualize: those which the child has seen, those he has not seen, and abstract concepts such as love/hatred. This yoga practice not only helps the child to maintain psycho-emotional balance, it also develops his ability to visualize. Later on, when he is at school studying geography, history and mathematics, he will have a visualizing mind as well as a thinking mind (Saraswati).

Saraswati (1990) recognized four types of attention in the classroom. It is suggested that teachers should be aware of each student's state in order to know what type of exercises to introduce into the class at anytime. The first type is slack attention, known as tamasic. The whole face usually has a dull and slack expression, signifying lack of interest and apathy. This is an indication of a child who needs much more stimulating rather than tranquilizing exercises. The second is called uneven attention, known as rajasic. Here the eyes are darting, the tongue and teeth are frequently moving, either biting or licking the lips. The child reacts to the slightest noise, is easily distracted, and fidgety. These children need relaxing exercises and learning how to relax will be extremely beneficial for them. The third type of attention is concentrated attention, known as sattwic. Here the eyes are more concentrated; they look obviously absorbed in the lesson. This is found in 'good' children who are lucky enough to possess a well-balanced neurovegetative system which make learning easy for them. They are able to work hard regularly; they listen well and their answers are relevant. If the child is too

conforming and tied to routine, this may be a negative aspect. The fourth type of attention is perfect attention. Here the child's eyes are completely bright, sparkling and alert. There is often a smile and the facial muscles are relaxed – no tension. The child's reactions are usually spontaneous, appropriate and confident. This form of attention is most uncommon, and found in children with gifted abilities (Saraswati).

Feldman (2005) wrote of her personal experiences and observations while teaching yoga to school-aged children. The children reported that they experience and appreciate increased focus. Some of the children with disabilities who struggled to maintain attention had shown substantial improvements in portions of class that require concentration (Feldman, 2005). However, this author did not conduct quantitative research to prove that yoga had a significant effect on student concentration and attention.

A recent study by Peck and others (2005) investigated the effects of yoga on children with attention problems. Ten students with attention problems from the same elementary school (aged 6-10) between three grade levels (Grades 1, 2, and 3) were recruited to participate in the study. The students were exposed to a 30 minute yoga video tape, published by Gaiam, twice a week, for a period of three weeks. The Behavioral Observation Form, a structured instrument, was used to calculate the percentage of on-task student behavior. A multiple baseline design was used with a comparison group to investigate if yoga increased student on-task behavior. The researchers of this study calculated effect sizes to interpret the data. The difference in the treatment groups compared to the control group was noted; however, the reader is warned to interpret the data with caution. Another critic of this study was the small sample size and short intervention period.

*Yoga and Education.* Forms of yoga have been used in prior studies that have demonstrated the significant positive effects of yoga on school-aged students. Slovacek and others (2003) developed and measured the effects of a yoga education curriculum that showed significantly increased self-esteem ( $p < .001$ ), decreased discipline referrals ( $p < .01$ ), increased physical health, and increased grade point average (GPA) ( $p < .01$ ). This study involved 405 students in a K-8 urban charter school, with only grades 3-8 ( $n = 310$ ) completing the pre and post questionnaires about the effects of yoga instruction on students. All other information, such as grades, attendance, demographics, and discipline were obtained via school records. Elementary grade children (grades 3-5) received yoga instruction for 60 minutes per week and middle school students (grades 6-8) for 120 minutes per week throughout the school year. A limitation to this study was the nature of the research design, which employed only correlational analysis; therefore, while a relationship between the variables was determined, it is not clear that the yoga caused students to perform better in schools (Slovacek et al.).

Another program used Transcendental Meditation (another form of yoga) in the school setting to consider the behavioral benefits. This study found this form of yoga to have a significant beneficial impact on rate of student absenteeism, rate of rule infractions, and rate of suspension in African-American adolescents (Barnes et al., 2003). In this study, forty-five students were randomly assigned to either the Transcendental Meditation group or health education control group. The meditation group engaged in 15-min sessions at home and at school each day for four months. The control group was presented 15-min sessions of health education at school each day for four months. Grade point averages and levels of anger, measured with the Spielberger Anger Expression

Scale (Spielberger, Johnson, Russell, Crane, Jacobs, & Worden, 1985) were not found to significantly vary for the two groups. However, this study did not include students with disabilities in the sample.

Goldberg (2004) has been using yoga-based relaxation techniques with both regular and exceptional students since 1981. This publication describes case study information on working with students in their classrooms to create positive outcomes by considering learning styles and student needs. In addition, Goldberg conducted a single-subject design pilot project to teach relaxation skills to upper elementary students with autism so that they could function more effectively in stressful situations. Six students with autism from a self-contained classroom participated in 30-minute sessions three times a week for approximately eight weeks. The relaxation program included a variety of techniques including yoga exercises and breathing, role-playing, guided imagery (i.e., student has eyes closed and instructor asks the student to visualize himself or herself at a favorite most peaceful place), discussion, visual aids, music and soft lighting, stories, and mnemonics (Goldberg). Stress levels reported by teacher and parent, and measured pulse rate (pre and post) demonstrated lower stress levels for these students.

*Yoga and Psychology.* Some studies have documented the psychological effects of yoga (Campbell & Moore, 2004; Shannahoff-Khalsa, 2004). Campbell and Moore conducted a study that measured yoga as a preventative for, and treatment, of depression, anxiety, and stress. The researchers conducted a six-week program which incorporated breathing techniques (pranayama), exercises for strength, vitality, and flexibility (asanas), guided relaxation (yoga-nidra), and meditation. The aim of this process was to enhance self-awareness, encourage the perspective that emotional states are somewhat transient,

and encourage a self-accepting and calm attitude through concentrating on synchronizing gentle movements and breathing. By developing calmness, self-acceptance, a balanced perspective, and enhanced concentration, it was hypothesized that participants in the six-week program would strengthen their resistance to emotional distress (Campbell & Moore). The yoga beginners group showed lower average levels of symptoms of depression, anxiety, and stress after intervention, but levels were stable for regular yoga practitioners and people who did not practice yoga (Campbell & Moore).

Recently, another type of yoga, Kundalini, was found to have significant effects on adults with obsessive-compulsive disorder (OCD) (Shannahoff-Khalsa, 2004). This two-year investigation appeared to be important in terms of the variables measured, the type of research design, and the instruments used to collect the data. The first trial was an open uncontrolled pilot (Shannahoff-Khalsa & Beckett, 1996), and the second was a randomized controlled trial (Shannahoff-Khalsa, 1997; Shannahoff-Khalsa, Ray, Levine, Gallen, Schwartz, & Sidorowich, 1999). In the pilot study, five adult patients with OCD completed a 12-month trial of the Kundalini treatment. It was reported that the Symptom Checklist-90-Revised (SCL-90-R) (Derogatis, 1993) Obsessive Compulsive (OC) scale, and Global Severity Index (GSI) showed mean improvements of 53.3% and 52.7% respectively (Shannahoff-Khalsa, 2004).

In the randomized blind controlled matched trial, approximately 20 adults were divided into two groups for a 12-month trial. Group 1 used the Kundalini yoga meditation protocol (Shannahoff-Khalsa, 1997) and group 2 used the Relaxation Response plus Mindfulness Meditation technique, each for 30 minutes in order to accommodate the time requirements with the Kundalini yoga protocol. Six psychological rating scales were used

at 0-month baseline and all 3-month time points: Yale-Brown Obsessive Compulsive Scale [Y-BOCS] (Goodman, McDougle, & Price, 1992); The Symptom Checklist-90-Revised Obsessive Compulsive scale [SCL-90-R-OC] and the Global Severity Index [GSI] (Derogatis, 1993); Profile of Mood States [POMS] Total Mood Disorder score (McNaire, Lorr, & Dropplemann, 1992); Perceived Stress Scale [PSS] (Cohen, Kamarck, & Mermelstein, 1983); and Purpose-in-Life test [PIL] (Crumbaugh & Maholick, 1976). When the baseline mean was compared to the 15-month mean, the improvements at 15 months were 70.1% (Y-BOCS), 58.8% (SCL-90-R OC scale), 60.6% (SCL-90-R GSI scale), 70.1% (POMS), 48.3% (PSS), and 19.7% (PIL test), and all changes were statistically significant (Shannahoff-Khalsa, 2004).

A study by Young (2001) considered the investigation of effects of yoga on an older population of participants, mean age 65. The researcher conducted a quasi-experimental non-equivalent comparison group intervention to investigate the effects of yoga on symptoms of psychological distress in individuals recovering from heart disease. Thirty-four students practiced yoga for one-hour sessions over six weeks. Participants in the yoga classes made significant improvements in their scores on Anxiety, Somatization, Tension, Depression, and the global measures, General Severity Index and Mood Disturbance.

It has been suggested by Slede and Pomerantz (2001), that in order to add to the existing knowledge base, future studies will need to more clearly define yoga and develop better controls for variables, such as cultural expectations and personal motivation. Ultimately, a second generation of studies might point to the different types of populations who would most benefit from yoga versus more conventional treatments.

Furthermore, there has been some literature (Barnes et al., 2003; Goldberg, 2004; Slovacek, Tucker, & Pantoja, 2003) on yoga and the impact it has in the education field; however, there is not much research-based information on yoga and its academic effects on students with learning disabilities or students at-risk for school failure.

### *Theoretical Framework*

*Multiple Intelligences.* Gardner (1999) discussed the historical implications of original thought regarding intelligence testing. He argued that former beliefs are one-dimensional in nature in terms of how to assess students and what set of facts everybody should know. However, Gardner espoused an individual-centered model that takes into account a multitude of cognitive strengths. Gardner was intrigued with more naturalistic sources of information.

Through Gardner's work (1983), the following seven types of intelligences were theorized: musical; bodily-kinesthetic; logical-mathematical; spatial; interpersonal; and intrapersonal. In 1999, three new intelligences were added to the list: a naturalist intelligence, a spiritual intelligence, and an existential intelligence (Gardner, 1999).

Traditionally, Gardner's linguistic intelligence and logical-mathematical intelligence appear to be the ones more focused upon by the education system (Lister, 2005). Syntax and phonology lie close to the core of linguistic intelligence (Gardner, 1983). Examples of those with highly developed linguistic intelligence would be writers, poets, essayists, or novelists. Movement from concrete to higher-order thinking of objects in relation to mathematics and science involves logical-mathematical intelligence. Given the recent increased emphasis on results in reading and mathematics state-wide exams throughout the nation, it would appear as though the U.S. educational goals focus on only

these two intelligence areas. However, if the scope of public education were to broaden, to assist all educationally struggling students, educational goals will need to change.

Gardner (1999) implied that activities that cultivate multiple intelligences offer an opportunity for students to use a cognitive strength that they may not usually have the chance to experience in an otherwise traditional setting. Non-traditional methods of teaching may allow students with Learning Disabilities and students who are at-risk for reading failure to have an opportunity to improve their memory, attention, and problems with academics in general. Yoga is a type of class that offers students the chance to explore non-traditional types of intelligences, such as, bodily-kinesthetic, spatial, intrapersonal, interpersonal, and spiritual intelligences.

Bodily-kinesthetic intelligence is the ability to solve problems or to fashion products using one's whole body, or parts of the body. Dancers, athletes, surgeons, and craftspeople all exhibit highly developed bodily-kinesthetic intelligence (Gardner, 1999). In yoga, the student constantly learns to become aware of parts of the body and how the body feels while holding a posture or moving from posture to posture. For instance, while seated in class, if the student notices his or her foot tapping or another body part moving, he or she may notice that attention or concentration towards the prescribed task is not being put forth.

Spatial intelligence is the ability to form a mental model of a spatial world and to be able to maneuver and operate using that model. Examples of people who have highly developed intelligence (in the area of spatial intelligence ) include sailors, engineers, surgeons, sculptors, and painters (Gardner, 1999). When one participates in yoga, one has the opportunity to practice visualization techniques while listening to the instructor's



directions. This visualization may assist the student to better remember things or events spoken about in class.

The last set of Gardner's related theories involves personal intelligences such as interpersonal intelligence and intrapersonal intelligence. Intrapersonal intelligence involves the capacity to discriminate among different emotions and personal states of being. This in turn assists one in understanding and guiding behavior. During a yoga session, the student may be provided opportunities for introspection when facing a perceived difficult movement. After recognition of frustration, sitting in a restorative non-movement pose may offer the student a chance to reflect on feelings and then rejoin the group. Interpersonal intelligence is the ability to understand other people, in terms of what motivates them, how they work, and how to work cooperatively with them (Gardner, 1993). Often times in a yoga session, thoughts of comparison and judgments arise, which in turn affects behavior. The student can practice recognizing the similarities and differences that exist between people, and may learn how to not personalize perceived actions.

In Gardner's latest book published regarding multiple intelligences, spiritual intelligence is explored. Gardner makes the distinction between spiritual concerns that are approached through traditional or organized means and spiritual concerns that are approached in a more personal, idiosyncratic, or creative manner. In three areas, Gardner describes facets of spirituality with regard to intelligence; first, spiritual intelligence as concern with cosmic or existential issues; second, spiritual intelligence as achievement of a state of being; and third, spiritual intelligence as effect on others. If in fact, children are given the opportunity to learn that they are a small piece of a much larger puzzle, their

approach to interpersonal issues may be different. Their approach to normally unpreferred tasks may change. If students can be taught to shift the state of being frustrated or angry to a state of peace, they may have more concentration and attention leading to an increase in academic gains. If students can assist others around them to achieve a state of peace and focus, then possibly positive benefits can be seen in the classroom. Yoga may provide failing students an opportunity to cultivate their spiritual intelligence in order to have more personal awareness and control in an effort to affect rates of learning.

Essentially, when a student is aware of the body, emotions, perceptions, and is given the opportunity to cultivate concentration through non-traditional modes of learning, the outcomes may involve increased memory and reduced school problems.

### *Conclusion*

This chapter defined LD (learning disabilities) and provided relevant information related to LD. Research related to students at-risk for reading failure was presented. General information regarding attention, learning, and memory of students with LD and at-risk for reading failure was shared. A concise overview of yoga and studies which include the use of yoga were included. Additionally, an explanation of Gardner's theory of multiple intelligences was used to bind the concepts of academic problems and yoga as a possibility for positively effecting students in a non-traditional manner.

Research is beginning to investigate yoga with education, and yoga in relation to its psychological effects. A review of the literature suggests areas of research that have not yet been explored and documented with systematic analysis. Specifically, an area of interest that has yet to be investigated is the effects of yoga on school academic problems.

The current study investigated whether yoga can significantly increase skills needed for academic achievement within a school-aged population. Variables that were considered include: learning problems, attention problems, and short-term memory problems of urban elementary-aged school students with learning disabilities and students at-risk for reading failure.

## Chapter III

### Procedure and Methodology

#### *Design*

The research design of this study was a one group pre/post test design about the effects of exposure to yoga on the academic problems and memory of students with learning disabilities and students at-risk for reading failure. For this study, 60 Afro-American urban elementary school-aged students (LD and at-risk for reading failure) were invited via a flyer (see Appendix A) to participate in a free, after-school exercise program. After gaining permission, thirty-one students attended after-school yoga classes. All 31 students were given assessments (see Appendix E and F) prior to and following the yoga classes, in an attempt to measure the effects of a non-traditional intervention, yoga, on academic problems (learning and attention) and memory (visual and auditory). Prior to conducting the research, permission was sought from the Barry University Institutional Review Board (IRB) and the Miami-Dade County Public Schools.

#### *Participants*

*Demographics.* The participants in this study were second, third, and fourth grade students from a small urban elementary school located in south Florida. The school was chosen as a convenience sample. The chosen school was comprised of students from the area called 'The Triangle' which is designated by the White House Committee on Crimes as one of five areas with the highest rate of violent crime in the U.S. The area has also been targeted as a Neighborhood Revitalization Strategy Area by the Miami-Dade Office of Community and Economic Development under the U.S. HUD Community Development Block Grant program. According to the U.S. Census Bureau (2000), 'The Triangle' is a low-income and high poverty area where the poverty rate is 35%,

considerably higher than Miami-Dade County's poverty rate of 18%. About 42% of all children under 18 in 'The Triangle' are poor compared to the county's rate for children of 23%. Household poverty rates range between 31% and 49% for female householders and their children living in poverty. Furthermore, 52% of these female householders are actually grandmothers. In 2000, 17% of the labor force in this selected school community was unemployed; this percentage which was worse than the unemployment rate in 1990 of 13% and is almost twice the current Miami-Dade County rate of 9% (U.S. Census Bureau, 2000).

*Sampling.* The current study involved a convenience sample of Afro-American low SES second, third, and fourth grade students from the same school. The total sample of invited students was gleaned from two school categories: 1) students with a diagnosed learning disability and an Individual Education Plan, and 2) students at-risk for reading failure. More specifically, the students from the at-risk group were identified because they were retained in the third grade due to a failing grade on the state-wide test (Florida Comprehensive Assessment Test [FCAT]), and/or they were students who scored within the high-risk to moderate-risk ranges of the Dynamic Indicators of Basic Early Literacy Skills – 6<sup>th</sup> Edition (DIBELS) Oral Reading Fluency (Good et al., 2002). According to the NCLB Act (2001), factors such as measured poor reading ability or failure to pass state-wide assessment indicate “at-risk” behavior.

From a list that stratified children, either as LD or at-risk for reading failure based on the aforementioned criteria, 60 students were identified. All identified students were given a flyer (see Appendix A) that briefly explained the activity and purpose of the study. Additionally, consent forms (see Appendix B) were sent home with the interested

students and signed by both parent/guardian. The consent form explained the general purpose of the study, a brief explanation of yoga, the risks involved, timelines, and testing. When students returned their signed consent forms, they were asked to sign the assent form (see Appendix C) for minors. Parents were then further notified of the logistics: what students needed to bring, when, and where the sessions will meet via a note home (e.g., a towel and comfortable clothes for exercise) (see Appendix D).

Participation in the study was completely voluntary, and students were given the option of withdrawing from the study at any time without penalty. Two participants choose to discontinue participation in the study or wished to stop attending yoga classes and did not want to complete post-test data; their data was destroyed and was not included in the data analysis.

The interest of the current study was the academic effects of exposure to yoga on students. At the outset, sixty students were invited to participate in the study which was scheduled to be a pre/post quasi-experimental design. It was proposed that thirty students be randomly assigned to the yoga intervention, and thirty students be randomly assigned to an after-school reading tutorial program. Unfortunately, the reading tutorial program that began in the beginning of the school year at the school site was discontinued after the state-wide examinations were completed. Therefore, a control group was unable to have an alternate after-school program. In addition, only 31 students returned signed permission slips when 60 students were needed to conduct a pre/post quasi-experimental design. Thus, the design of the study then changed to a pre/post single-group design.

The frequency of the gender, age, grade, and type of student that participated in the study are presented in Table 1. There was an almost even ratio of girls to boys (16 to

15) that participated in the study. The majority of students were aged 9 (45.2%), but ranged from ages 7 to 11. There were more second and third graders ( $n = 26$ ) than fourth graders ( $n = 5$ ). In terms of category of students who participated from the two groups, there were more than twice as many students who were at-risk of reading failure (70%), and less students in the LD category (30%). Due to the limited amount of participants from the two categories, the participants (students with LD and at-risk for reading failure) were collapsed into one group. Both groups of students have a major characteristic in common, poor reading performance.

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Table 1

*Frequency Table for Participant Gender, Age, Grade and Category*

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Gender	<i>n</i>	%
Male	15	48.4
Female	16	51.6
Age		
7	5	16.1
8	4	12.9
9	14	45.2
10	4	12.9
11	4	12.9

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Grade		
2	11	35.5
3	15	48.4
4	5	16.1
Participant		
Learning Disabled	9	29.0
At-Risk for Reading Failure	22	71.0

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Table 2 provides information regarding how many sessions of yoga were completed. The participants varied considerably in the number of sessions they attended. Nearly half of the participating students completed 10 sessions ( $n = 14, 45.2\%$ ). The average number of students per class was 11.18 ( $SD = 3.94$ ), with a range of 3 to 19 students.



Table 2

*Total Number of yoga classes for students included in sample*

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Yoga sessions attended	<i>n</i>	%
1	4	12.9
2	4	12.9
3	1	3.2
4	3	9.7
5	2	6.5
7	2	6.5
8	1	3.2
10	14	45.2

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### *Data Collection Measures*

One week before the yoga classes began, two different standardized instruments (The Behavior Assessment Scale for Children – Second Edition, see Appendix E; and The Learning Efficiency Test – Second Edition, see Appendix F) were used to assess teacher perceived academic problems and students' memory. One week following the end of the yoga classes, these same two instruments were used again with teachers and students. To ensure confidentiality, the participants' names were not used; all instruments were coded with identification numbers. All data was kept in a locked file cabinet in the researcher's office and will be held for five years.

*BASC-2.* The first instrument that was used in the current study is the Behavior Assessment Scale for Children – Second Edition (BASC-2), developed by Reynolds and Kamphaus (2004). This instrument is used to measure a teacher's perception of a student's school problems. The BASC-2 is designed to assist professionals in the differential diagnosis and educational classification of an array of emotional and behavioral disorders of children and to support the design of intervention plans (Reynolds & Kamphaus). The BASC-2 has several instruments which are used to measure the behavior of children from the ages of 2 to 25. Although the BASC-2 Teacher Rating Scale – Child has the capacity to assess a child in a number of areas, only the Teacher Rating Scale – Child Attention and Learning questions/scales were used for the present study.

According to Reynolds and Kamphaus (2004), the BASC-2 has been found to have good reliability and validity. However, it was noted that the validity of the Teacher Rating Scale – Child (TRS-C) outcome may be compromised for a range of reasons,

including positive or negative response sets, intentional dissimulation, emotional difficulties, stress on the part of the teacher or parent, or the inadequate knowledge of the respondent with the child being evaluated. Therefore, the BASC-2 TRS-C includes an F index which assesses the possibility that a teacher may have responded to the test items in an inordinately negative manner or may have attempted to make the child “look good.” In terms of reliability, the BASC 2-TRS-C School Problems composite has been found to have good internal consistency (.94), which shows the degree to which all of the items of a scale are measuring the same ability or behavioral dimension and good test-retest reliability (.91), which reflects the consistency of ratings from the same teacher over a brief time interval (Reynolds & Kamphaus).

For the present investigation, the BASC-2 Teacher Report Scale for Children (TRS-C) ages 6-11 was completed by each student’s classroom teacher ( $n = 7$ ) for the pre- and post- measures. In its entirety, this personality inventory consists of a 139-item four-point Likert scale, ranging from Never, Sometimes, Often, and Almost Always. The TRS-C takes about 10 minutes to complete (Reynolds & Kamphaus, 2004). For the purposes of this study, teachers needed to complete only the TRS-C items from the Attention and Learning Problems scales (15 items). A high score on this composite is a sign that the teacher perceives behaviors that are very likely to interfere with academic achievement. (See Appendix C for specific items included in the Attention Problems and Learning Problems scales.)

The Attention Problems scale measures a student’s the inability to maintain attention and a tendency to be easily distracted from tasks requiring attention. Hartley

(1999) suggested the importance of treating attention problems through behavioral or medical means as an avenue to advance academic outcomes for children.

The Learning Problems scale is comprised of a variety of academic domains, including reading, writing, mathematics, and spelling. Scores registering in the at-risk range or higher on this scale indicate a need for careful investigation of academic skills (Reynolds & Kamphaus, 2004). The Learning Problems scale has been shown to be a significant correlate of academic achievement outcomes for children in elementary school (Hartley, 1999; Oehler-Stinnett & Boykin, 2001).

Upon completion of all items on the TRS-C, responses were entered into the BASC-2 scoring computer software by a trained research assistant. T-scores for each scale and interpretation of scores were created for each student observation. T-scores have a mean of 50 and a standard deviation of 10. Any score falling between a standard score of 40 and 60 is in the average range, between 60 and 70 is in the at-risk range, and scores over 70 are in the clinically significant range (Reynolds & Kamphaus, 2004).

*LET-II.* The second measure that was utilized in this study is The Learning Efficiency Test – Second Edition (LET-II), created by Webster (1998). The LET-II was administered to each child as a pre- and post- measure of memory for the yoga participants. This is an individually administered instrument usually used with people suspected of learning difficulties or memory impairments. The LET-II is a norm-referenced diagnostic test which examines how successfully a person processes and retains information offered both visually and auditorily (Webster). This instrument was normed for use with people from the ages of 5 to 75 year olds. Research has demonstrated the LET-II to be highly predictive of the actual classroom levels of

performance in reading and mathematics for students of average ability, as well as students with disabilities (Brantley, 1991; Crampton, 1989; Craver, 1985; Webster, 1981 as cited in Webster, 1998).

According to the LET-II manual, the LET-II is reported to have good reliability and validity. A sample size of 1,126 people between the ages of 5 years, 0 months to 85 years, 4 months was used for standardization purposes. Test-retest reliability was calculated involving 55 children with learning disabilities in grades 4 through 12, and was found to have a median test-retest coefficient of .80 (Webster, 1998). During the development of the LET-II, four types of validity evidence were examined: (1) content validity, which concerns the suitability of the task demands of the LET-II for assessing memory characteristics; (2) diagnostic validity, which concerns the test's ability to discriminate distinct learning patterns in diverse types of students; (3) predictive validity, which concerns the test's value for determining academic placement; and (4) construct validity, which refers to the extent to which the instrument measures visual and auditory memory processing (Webster). The different types of validity were found to be appropriate.

The LET-II measures visual and auditory memory in a similar fashion. On the Visual Memory subtests, the examiner shows the student letters individually presented on cards, then asks the student to say the letters aloud in the order they were seen (Immediate Recall). Next, the examiner asks the student to count from one to ten, and repeat the letters again (Short-Term Recall). Last, the examiner asks the student to repeat a sentence, and state the letters one more time (Long-Term Recall). The Auditory Memory subtest is the same basic procedure but the letters are said aloud by the

examiner. All student responses are scored on the protocol and later scored (see Appendix F).

#### *Data Collection Procedures*

The teachers of the enrolled students were requested to complete a short questionnaire (BASC-2 TRS-C) one week before and one week after the intervention, and all teachers agreed to participate ( $n = 7$ ). The teachers were offered free Bath & Body Works hand soap upon completion of the pre- and post- data for the BASC-2 rating scales, as a token for their collaboration. Two of the six teachers completed eight questionnaires each on their students; the others had less.

A research team of four volunteers was trained on the administration of the LET-II, and each volunteer practiced administering the test five times before assisting with data collection. During the one-week period before the yoga instruction began and during the one-week after the yoga instruction ended, the research team worked to test all 31 students with the LET-II. The LET-II pre- and post-tests were scored by hand by a trained research assistant to ensure fidelity (i.e., the procedures for calculating and scoring each protocol were done appropriately).

#### *Yoga Class*

Thirty-one students agreed to participate in a yoga class twice per week for seven weeks. The type of yoga used for the course presented was a combination of Hatha Yoga postures. Two registered yoga instructors were utilized to teach the students participating in the current study. One main yoga instructor was present for all classes, and the second taught just three classes total aimed at working with the some of the second grade yoga classes. The instructors were certified to teach both individuals and groups of people. The

yoga sessions were taught in an elementary school classroom for one hour, with groups of 10 to 15 students. Each session focused on a variation of approximately 15 to 20 different yoga poses. These poses involved a variety of standing, seated, and laying on the floor sequences. Standing poses involved sequences of movements such as: 1. two feet together, hands stretched straight over-head, 2. bend down forward with hands on the floor, 3. plank position or top of a push-up, 4. bottom of push up, 5. arms straight with shoulders off floor looking up at ceiling, 6. keep hands and feet on floor with hips up in the air, 7. step both feet up to hands and hang down, 8. raise hands over-head and stand, and 9. release hands down. Seated poses involved some of the following movements: 1. sit on floor, 2. feet together and hands on feet, 3. inhale with back straight, 4. exhale with back rounded. One of the laying down poses involved the following movements: 1. lay on back, knees bent, feet flat on the floor, 2. raise hips up and interlace hands together underneath the body, 3. hold for five breaths 4. release hands and lower hips back to floor.

The yoga instructors also used guided imagery/visualization techniques to relax students at the beginning and end of each session. The majority of the classes were tailored for the age and maturity levels of the kids, and involved yoga games such as “Yogi Says.” This game is very similar to “Simon Says”, where students are required to listen and follow directions while completing a variety of yoga poses. The postures were given names suitable for children such as “howling wolf” and sometimes paired with a sound when appropriate. Another game which allowed the students to be more engaged reviewed eight poses such as “mountain, tree, warrior, boat, wolf, dragon, goddess, and child pose.” Students were then asked to form groups of three or four and asked to create

a story using the different yoga poses that were taught, with adult supervision. Finally, the groups came together and presented their yoga story to the rest of the class. An example of a story that was created and acted by the children was, “The goddess was traveling on a boat and sailed past a mountain. She found three warriors and asked them for help to slay the mighty dragon. After the warriors killed the dragon they rested under a tree.”

All participating students were provided with 6' x 2' yoga mats. The students were told if they finished ten yoga classes they would be allowed to keep a yoga mat and would be given a yoga music c.d. in appreciation for their participation. The students were instructed to wear a comfortable change of clothing. A water dispenser was kept in the room at all times for student to use as necessary.

### *Analysis*

The Statistical Package for the Social Sciences (SPSS) for Windows Release 14.0 was used to analyze the data for the participants. In addition to the administration of pre- and post-test data collection for both groups, demographic statistics were assessed for the participants (age, grade, gender, and type of student). First, paired t-tests were initially used to analyze data for all thirty-one students, in order to compare the mean pre- and post- test scores for each scale administered. In order to create a balance as to Type I and Type II errors, the alpha level .05 was used (Salkind, 2003). Second, correlations were conducted which analyzed possible relationships between the differences of mean pre- and post- test scores for each scale with the number of sessions completed. Upon further investigation of the data, additional questions were asked; these questions will be addressed in the next chapter.



## Chapter IV

### Results

#### *Introduction*

The primary purpose of this study was to investigate whether or not exposure to yoga has an effect on memory, attention and learning problems in students with LD and students at-risk for reading failure. Memory was measured with the LET-II, which is a measure of visual and auditory short-term memory, immediate memory, and long-term memory. Attention and learning problems were measured with the BASC-II Teacher Rating Scale, which assessed teacher perceptions of student behavior. Three main null hypotheses were evaluated for the entire sample using paired samples t-tests of pre- and post-test data. The hypotheses were:

H<sub>01</sub>: There are no significant differences in memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>01a</sub>: There are no significant differences in visual memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>01b</sub>: There are no significant differences in auditory memory in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>02</sub>: There are no significant differences in learning problems in students with LD and students at-risk for reading failure before and after exposure to yoga.

H<sub>03</sub>: There are no significant differences in attention in students with LD and students at-risk for reading failure before and after exposure to yoga.

Additional questions were asked investigating the effects of yoga on the individual six subtests of the LET-II, and correlational effects between all variables measured and the number of yoga sessions that were attended.

Thirty-one students in second, third, and fourth grades completed this study. The students either were diagnosed with LD, or were at-risk for reading failure (those who were High Risk or Moderate Risk on the DIBELS and those who did not pass the reading state-wide exam). The students were all from the same urban, mostly Afro-American elementary school.

This chapter describes the data collected to examine the hypotheses and additional questions, as well as presents the results of analyses pertaining to the study. The results of the study are presented in the following three sections. First, the research questions and hypotheses are restated followed by the results and analyses pertaining to that respective hypothesis. Then, the additional questions are stated followed by the analyses and results. Finally, the chapter concludes with a summary of the research findings.

As previously stated, due to the small number of participants, students with LD and students at-risk for reading failure were collapsed for analyses purposes. Both groups have similar characteristics, particularly poor reading ability.

*Hypothesis One.* There is no significant difference in memory for students with LD and students at-risk after exposure to yoga.

*Results.* A paired samples *t*-test was conducted to ascertain whether there was a significant difference between the means of the pre-test LET-II Global Memory scores and post-test LET-II Global Memory scores. Means and standard deviations for the pre- and post-test scores on the memory LET-II scales are reported in Table 3. Results showed

that there were no significant differences between the scores on the pre- and post-test LET-II Global Memory scores,  $t(30) = -1.25$ ,  $p = .221$  (two-tailed), for students in the sample. This finding suggests that overall global memory did not improve after exposure to yoga, and therefore null hypothesis one was accepted.

Table 3

*Means and Standard Deviations for Pre-test and Post-test scores of the LET-II and BASC-2*

Instrument Scale	Pre-test	Post-test
LET-II Visual Scale		
<u>M</u>	85.13	88.26
<u>SD</u>	14.78	11.48
LET-II Auditory Scale		
<u>M</u>	86.16	90.97
<u>SD</u>	12.95	13.82
LET-II Global Memory Scale		
<u>M</u>	79.29	84.71
<u>SD</u>	22.81	23.00
BASC-2 Learning Composite		
<u>M</u>	63.26	64.97
<u>SD</u>	9.72	10.52
BASC-2 Attention Composite		
<u>M</u>	56.90	56.81
<u>SD</u>	9.19	8.84

Note: the scores are standard scores (mean 100, SD 15).

*Hypothesis One (A).* There is no significant difference in visual memory for students with LD and at-risk students after exposure to yoga.

*Results.* A paired samples  $t$ -test was conducted to ascertain whether there was a significant difference between the means of the pre-test LET-II Visual Memory scores and post-test LET-II Visual Memory scores. Results showed that there were no significant differences between the scores on the pre- and post-test LET-II Visual Memory scores,  $t(30) = -1.37, p = .18$  (two-tailed), for students with LD and at-risk for reading failure who were exposed to yoga. This suggests that overall visual memory did not improve after exposure to yoga for the sample ( $n = 31$ ), therefore null hypothesis one (a) was accepted.

*Hypothesis One (B).* There is no significant difference in auditory memory for students with LD and students at-risk after exposure to yoga.

*Results.* A paired samples  $t$ -test was conducted to ascertain whether there was a significant difference between the means of the pre-test LET-II Auditory Memory scores and post-test LET-II Auditory Memory scores. Results showed that there were no significant differences between the scores on the pre- and post-test LET-II Auditory Memory scores,  $t(30) = -1.69, p = .10$  (two-tailed), for students exposed to yoga. This suggests that overall auditory memory did not improve after exposure to yoga for the overall group of participating students, therefore null hypothesis one (b) was accepted.

*Hypothesis Two.* There is no significant difference in teacher perception of student learning problems for students with LD and at-risk students after exposure to yoga.

*Results.* A paired samples *t*-test was conducted to ascertain whether there was a significant difference between the means of the pre-test BASC-2 Learning Problems scores and post-test BASC-2 Learning Problems scores. Results showed that there were no significant differences between the scores on the pre- and post-test BASC-2 Teacher Report Learning Problems scores,  $t(30) = -1.17, p = .25$  (two-tailed), for students exposed to yoga. This suggests that teacher perception of student learning problems did not improve after exposure to yoga, therefore null hypothesis two was accepted.

*Hypothesis Three.* There is no significant difference in teacher perception of student attention problems for students with LD and students at-risk after exposure to yoga.

*Results.* A paired samples *t*-test was conducted to ascertain whether there was an observed gain between the means of the pre-test BASC-2 Teacher Rating Attention Problems scores and post-test BASC-2 Attention Problems scores. Results showed that there were no significant differences between the scores on the pre- and post-test BASC-2 Teacher Rating Attention Problems scores,  $t(30) = .078, p = .94$  (two-tailed), for students exposed to yoga. This suggests that teacher perception of student attention problems did not improve after exposure to yoga, therefore null hypothesis three was accepted.

*Additional questions.* To further explore the main questions, paired samples *t*-tests were conducted for all sub-scales of the LET-II memory test to investigate if there was a significant gain between pre- and post-test scores for the students (LD and at-risk) who completed between one and ten yoga sessions. Means and standard deviations for the pre- and post-test results of the subscales of the LET-II memory test are reported in Table 4.

Table 4

*Means and Standard Deviations for the LET-II sub-scales*

LET-II Sub-Scale	Pre-test	Post-test
Visual Ordered Immediate		
<u>M</u>	6.52	7.13
<u>SD</u>	2.11	2.22
Visual Ordered Short Term		
<u>M</u>	5.97	5.65
<u>SD</u>	3.68	3.16
Visual Ordered Long Term		
<u>M</u>	7.13	6.23
<u>SD</u>	3.59	3.31
Visual Un-Ordered Immediate		
<u>M</u>	6.71	7.16
<u>SD</u>	2.21	1.95
Visual Un-Ordered Short Term		
<u>M</u>	7.16	7.13
<u>SD</u>	2.86	2.31
Visual Un-Ordered Long Term		
<u>M</u>	7.55	7.45

<u>SD</u>	2.69	2.19
Auditory Ordered Immediate*		
<u>M</u>	7.94	9.06
<u>SD</u>	1.98	2.31
Auditory Ordered Short Term		
<u>M</u>	5.39	5.55
<u>SD</u>	3.81	3.12
Auditory Ordered Long Term		
<u>M</u>	5.16	5.52
<u>SD</u>	2.77	2.95
Auditory Un-Ordered Immediate		
<u>M</u>	7.29	8.32
<u>SD</u>	2.56	2.18
Auditory Un-Ordered Short Term		
<u>M</u>	8.03	7.77
<u>SD</u>	3.09	3.03
Auditory Un-Ordered Long Term		
<u>M</u>	7.97	7.29
<u>SD</u>	2.81	2.81

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\* Significant difference at the  $p < .05$

Note: The scores are scaled scores (Mean 10, SD 3).



*Results.* The paired samples t-tests found the means of one sub-scale of the LET-II to show a significant increase for students who were exposed to yoga. There was a significance found in the LET-II Auditory Ordered Immediate Memory subscale,  $t(30) = -2.39, p = .023$  (two-tailed). This suggests an improvement in immediate auditory memory after exposure to at least one session of yoga. Additionally, although not significant, the scores on the Visual Ordered Immediate Memory,  $t(30) = -1.93, p = .06$  (two-tailed) and Auditory Un-ordered Immediate Memory,  $t(30) = -1.93, p = .06$  (two-tailed) were both found to approach significance. This suggests that after exposure to yoga, when presented with visual stimuli, this sample of students showed a slight improvement in recalling that visual information immediately in the correct order. Additionally, when presented with auditory stimuli the students showed a slight improvement in recalling that auditory stimuli immediately in a different order to the one presented in the test.

*Additional question.* Since there was great variability in the number of sessions that students attended, an additional question was investigated. Is there a relationship between the number of yoga sessions attended and memory, attention, and learning?

First, calculations were conducted to attain the difference between the pre-test and post-test means for all the students exposed to yoga ( $n = 31$ ). Then, a Pearson  $r$  correlation was calculated to estimate the strength of the relationship between the exact number of sessions and each calculated pre-/post-test difference. No significant correlation was found, suggesting that more exposure to yoga is not necessarily correlated to changes in memory, attention, and learning. To corroborate that question, paired t-tests were calculated with a subgroup of students who attended at least seven

classes ( $n = 17$ ) for each of the scales and sub-scales measured. Means and standard deviations for the pre- and post-test results of the scales are reported in Table 5, and subscales are reported in Table 6. Similar to the larger sample group of 31 students, this subgroup was also found to have a significant improvement in auditory ordered immediate memory,  $t(16) = -2.781$ ,  $p = .013$  (two-tailed). This is to say that students who had seven or more sessions of yoga, consistent with the entire sample, improved their ability to recall the sequence of orally presented stimuli immediately.

Table 5

*Means and SD for Pre-test and Post-test scores of the LET-II and BASC-2 of students who attended 7 yoga sessions or more.*

Instrument Scale	Pre-test	Post-test
LET-II Visual Scale		
<u>M</u>	84.59	88.53
<u>SD</u>	13.12	13.43
LET-II Auditory Scale		
<u>M</u>	87.82	91.59
<u>SD</u>	11.70	13.26
LET-II Global Memory Scale		
<u>M</u>	78.71	86.12
<u>SD</u>	21.21	25.03
BASC-2 Learning Composite		
<u>M</u>	62.65	65.41
<u>SD</u>	8.85	10.85
BASC-2 Attention Composite		
<u>M</u>	55.24	55.47
<u>SD</u>	8.98	9.90

Table 6

*Means and SD for the LET-II sub-scales of students who attended more than 7 classes.*

LET-II Sub-Scale	Pre-test	Post-test
Visual Ordered Immediate		
<u>M</u>	6.24	6.71
<u>SD</u>	2.22	2.54
Visual Ordered Short Term		
<u>M</u>	5.76	6.53
<u>SD</u>	3.23	2.94
Visual Ordered Long Term		
<u>M</u>	8.00	7.24
<u>SD</u>	2.89	3.23
Visual Un-Ordered Immediate		
<u>M</u>	7.06	7.29
<u>SD</u>	2.16	2.20
Visual Un-Ordered Short Term		
<u>M</u>	7.82	7.88
<u>SD</u>	1.55	1.45

Visual Un-Ordered Long Term		
<u>M</u>	8.53	8.00
<u>SD</u>	1.46	1.46
Auditory Ordered Immediate*		
<u>M</u>	7.65	9.06
<u>SD</u>	1.87	1.89
Auditory Ordered Short Term		
<u>M</u>	5.18	5.29
<u>SD</u>	3.47	2.71
Auditory Ordered Long Term		
<u>M</u>	5.47	5.35
<u>SD</u>	3.11	2.57
Auditory Un-Ordered Immediate		
<u>M</u>	7.18	8.06
<u>SD</u>	2.94	1.89
Auditory Un-Ordered Short Term		
<u>M</u>	8.41	7.88
<u>SD</u>	2.76	2.76
Auditory Un-Ordered Long Term*		
<u>M</u>	8.59	7.18
<u>SD</u>	2.37	2.58

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\* Significant difference at the  $p < .05$

Note: The scores are scaled scores (Mean 10, SD 3).

*Additional question.* Is there a relationship between the two different measures and the subtests?

The difference between each pre-test and post-test mean for students exposed to yoga ( $n = 31$ ) was calculated for each scale and sub-scale. Then a Pearson  $r$  correlation was conducted to estimate the strength of the relationship within and between the different measures. The two BASC-2 scales of Attention and Learning were not found to correlate with any of the LET-II scales of memory or LET-II sub-scales. However, there was a significant relationship between the Attention Problems scale and the Learning Problems scale,  $r = .403$ ,  $p = .05$  (two-tailed). Additionally, there were many significant relationships between the different scales and sub-scales of the LET-II memory test.

#### *Summary*

This chapter presented the statistical analyses, and results related to the hypotheses and research questions in the study. Although yoga was not found to have a significant change on overall memory, attention, and learning scores, additional findings are present. After exposure to yoga, there was an improvement in the auditory immediate memory, and a near significant finding in the visual immediate memory. Based on the Pearson  $r$  correlation, more exposure to yoga may not show changes in memory, attention, and learning. Furthermore, there was no relationship found between the LET-II and the BASC-2, but there were relationships within each test scales and sub-scales. All of these findings will guide the discussion and recommendations in chapter five.

## Chapter V

### Discussion

#### *Introduction*

This chapter provides a summary of the purpose of the study and procedures, followed by a summary/interpretation of the findings and discussion based on the analysis of the data and the literature review. The chapter closes with implications, limitations of the study, recommendations for research, and conclusion.

#### *Purpose of the Study*

The primary purpose of this study was to investigate whether or not exposure to yoga has an effect on memory, attention, and learning problems of students with LD and students at-risk for reading failure. Secondary purposes involved exposure to yoga and effects on different types of memory, and to ascertain whether or not the number of yoga sessions is related to those effects.

#### *Procedures*

Paired sample t-tests were used to compare the pre- and post- test scores for the group on scales and sub-scales. A Pearson  $r$  correlation was performed to measure the relationship between the number of yoga sessions attended and the difference between pre and post test scores on memory, attention, and learning. An additional Pearson  $r$  correlation was conducted to search for a possible relationship between the two different measures, Let-II and BASC-2, and their subtests.

#### *Summary of Findings*

One of the main questions in this study asked if significant differences in memory exist for students with LD and students at-risk after exposure to yoga. The findings of

the current results suggest that global memory, visual memory, and auditory memory did not significantly change for the students. There has not been any prior investigation into the effects of yoga on memory on this population of students.

Although overall global measures of memory did not show significant change, one type of auditory memory was found to have significantly increased after exposure to yoga for the sample ( $n = 31$ ). Auditory Immediate Memory was significantly changed,  $t(30) = -2.39, p = .023$  (two-tailed). In other words, when the students were told a series of letters aloud they were better able to remember the letters in the same order when repeated back to the examiner immediately after being exposed to yoga. When analysis was conducted for a sub-sample of students, those who attended seven to ten sessions of yoga ( $n = 17$ ), the area of significance was consistent. This significance supports Watts' (2000) conception of the effects of yoga. Watts purposed that yoga would have an effect on stabilizing responses of the senses to distractions, which in turn frees one to focus more thoroughly on a stimulus. Increased focus provides the ability to separate peripheral stimuli and the object of focus, thereby increasing central mental processes such as understanding and remembering oral information. The current study suggests that yoga may have an effect on the way students block out distractions, and initially increase their ability to hear in order to remember bits of information.

Statistical analyses of the other subtests of the LET-II memory tests suggest a slight, although not significant, improvement for two sub-types of memory, Visual Ordered Immediate Memory,  $t(30) = -1.93, p = .06$  (two-tailed) and Auditory Un-ordered Immediate Memory,  $t(30) = -1.93, p = .06$  (two-tailed). This suggests that the sample of students exposed to yoga seemed to have an improvement in their abilities to



immediately recall letters in the correct order when presented visually, and to immediately recall letters heard auditorily in the incorrect sequence. Although the student scores were not significant, the trend should not be dismissed. With a larger and more homogeneous sample, these results may have been significant.

Another research question asked if there were significant differences in learning problems in students with LD and at-risk students before and after exposure to yoga. There is a scarcity of studies that consider yoga as an intervention for academic deficiencies. The current study found that, according to teacher perceptions, students with learning disabilities and students at-risk for reading failure did not have a change in learning after exposure to yoga. Two studies found in the literature (Barnes et al., 2003; Slovacek et al., 2003) measured the effects of yoga on GPA; however they support differing findings. Slovacek et al. (2003) found a strong correlation with participation in yoga class and the GPA of six through eighth graders, no control group was used. Barnes et al. (2003) used ANOVAs with pre-tests and post-tests and found no significant improvement in GPA, and a control group was used.

This study also investigated whether there was a significant difference in attention for students with LD and at-risk students before and after exposure to yoga. Based on a prior study by Peck and others (2005), it was expected that student attention would show improvement after exposure to yoga; however, according to the results of this study, student attention was not affected.

The first additional question asked if there was a relationship between the number of yoga sessions attended and academic behavior, such as memory, attention, and learning problems. There was no correlation or relationship between the numbers of yoga

sessions attended and measured changes in memory, attention problems, and learning problems. This is to say that the students who had the greatest changes in memory were not necessarily the students who attended more sessions of yoga. There was not a statistical relationship between the independent and dependent variables.

The next question asked if there is a relationship between the two different measures and the sub-scales. The present study did not find a relationship between the BASC-2 and the LET-II. This suggests that teacher perception of attention problems are not directly related to memory problems or that memory problems are not directly related to teacher perceived learning problems. However, as expected, there were many relationships within the LET-II sub-tests, to name a few, visual memory is related to global memory ( $r = .790, p < .01$ ), and auditory memory is related to global memory ( $r = .804, p < .01$ ).

There was also a relationship between the two sub-scales used on the BASC-2 ( $r = .403, p < .05$ ), suggesting a strong relationship between attention problems and learning problems. Historically, research has found much support for the relationship between attention and learning problems (Barkely, 1977; Douglas, 1980a, 1980b; Durbrow et al., 2001; Elkind, Larson, & Van Doorninck, 1965; Forness & Esveldt, 1975; Hallahan & Kauffman, 1976; Mondani & Tutko, 1969; Pelham & Ross, 1977; Ross & Pelham, 1981; and Staats, 1968), but in this study both aspects were measured by the same instrument; thus, a strong relationship would be expected. Usually if a student has difficulty with appropriate attending skills in class, there is a high chance that the student has difficulty with learning the material presented and vice versa.

*Discussion*

This discussion and the limitations that follow aim to address many of the possibilities of why there was no significance in most areas and significance in few. In relation to all three major hypotheses, it was surprising to find that exposure to yoga does not make a greater difference in global memory, attention problems, or learning problems. One factor is that all of the students were administered the post-test measures approximately seven weeks following the pre-test, regardless of the number of classes that they attended. It is possible that administration of the post-test following the last session attended may yield significance that reflects immediate or short-term changes. For example, if a student only attended a yoga session during the first week of classes, any effect the exposure may have had on the student's memory abilities would possibly regress after six weeks of no yoga classes. Only half of the students (15) were tested promptly after their last session of yoga.

There are some possibilities for the increase in student auditory short-term memory after exposure to yoga. Quite frequently throughout the yoga class, students were required to listen to the verbal directions of the yoga teacher and move their body accordingly. At the end of the class, while laying in relaxation on their backs (a yoga pose called savasana), the students were asked to listen to the instructor's voice with their eyes closed. The instructor then led the students on an adventure where the students were encouraged to visualize or create a picture in their head, like a movie, about what the instructor was saying. Students were provided many opportunities to practice concentration and focus on a heard voice, in an attempt to reduce daydreaming. This

practice may in turn help to strengthen student ability to visualize and to remember what was heard aloud.

The significant short-term memory findings of this study support the work of Harlem (1976). Harlem found that over a ten day period with ten minutes of relaxation techniques, seven-year-old children ( $n = 29$ ) improved their awareness, concentration, memory, and cognitive adaptation, compared to a control group ( $n = 30$ ). Furthermore, it is not a new belief that relaxing students is a way to increase memory and learning. A famous yoga teacher from Bihar, India, stated that relaxation is necessary to enhance memory (Saraswati, 1990), and uses these type of techniques to work with pupils from rural areas for many years.

There are many possible explanations for the lack of significant change in student attention after exposure to yoga. One major difference is found in considering a study by Peck and associates, which used The Behavioral Observation Form to directly observe and calculate on-task student behavior. A multiple baseline design was used to measure the effects of exposure to yoga twice a week for three weeks. However, in the present study, teacher perceptions of student attention problems was measured, not direct observations of student attention.

Two other studies that investigated student attention also support the use of direct observation. A study by Gambrell, Wilson, and Gantt (1981) used direct observation of student behavior every 15 seconds for ten minutes to measure when students were most on-task. This may have been a superior way of measuring student attention problems compared with having a teacher report their perceptions of each student. A different study by Shalev and Tsal (2003) used the flanker task (Eriksen & Eriksen, 1974) and Posner's

(1980) cost-benefit paradigm to directly measure student attending skills. The flanker task asks the participants to ignore distracting stimuli in the periphery and to simultaneously identify and focus on a central stimulus (Jonkman, Kemner, Verbaten, Van Engeland, Kenemans, & Camfferman, 1999 as cited in Shalev & Tsal, 2003). The cost-benefit paradigm is a way of comparing between attending and unattending processing. The participant is first presented with either a valid or invalid location cue, and then is asked to identify a stimulus (Epstein, Conners, Erhardt, March, & Swanson, 1997; McDonald, Bennett, Chambers, & Castiello, 1999; Nigg, Swanson, & Hinshaw, 1997 as cited in Shalev & Tsal, 2003). Shalev and Tsal believed their chosen instruments to be better than traditional measures because they are pure measures of attention. Thus, when measuring attending behaviors, it may be advantageous to utilize direct observation instruments to collect data.

In terms of reducing student learning problems, there are points to be considered. The current study involved students with disabilities and students without disabilities. Students with disabilities are graded differently with modifications and accommodations for what is presented to them, based on need. Due to the fact that the students in the current study are graded differently, a teacher questionnaire was utilized which focused on the teacher perception of each student's learning problems. An expectation of outcome for the current study was not created after consideration of the few prior studies that investigated the effects of yoga or meditation on academic problems. Due to the fact that this study did not find a change in the teacher perception of student learning problems after the student was exposed to yoga, future research may want to measure learning problems in a different way.

With regard to the lack of correlation between instruments, LET-II and BASC-2, a few points should be noted. Learning problems are not always related to visual or auditory short-term or long-term memory deficits. Students are often tested and found to have any combination of processing deficits. Different processing areas include but are not limited to: phonological awareness, phonological memory, receptive language, expressive language, visual, visual-spatial, visual-motor, visual working memory, auditory working memory. The students with learning disabilities that participated in the study were all not found to have processing deficits in the same areas. Therefore, it is not that surprising that there was no significant relationship between the test of memory used (LET-II) and the test of attention and learning (BASC-2).

*Theoretical Framework and Yoga.* Similar to a paper by Watson (2005) that proposes dance may be a non-traditional method for teaching mathematics, aimed at visual, aural, kinesthetic, musical, and logico-mathematical learners, this study explored yoga as a non-traditional method for enhancing learning. The results of the study were somewhat consistent with Gardner's Theory of Multiple Intelligence in the areas of linguistic, musical, bodily-kinesthetic, spatial, interpersonal and intrapersonal intelligence. The significant increase in auditory short-term memory for students exposed to yoga may be related to these different modalities of intelligences. By increasing the amount of time students are exposed to utilizing different forms of learning, they may have been assisted in their development of attending to auditory information and in remembering that information for short amounts of time.

Although limited quantitative data was collected, the investigator observed many instances that challenged student interpersonal and intrapersonal intelligences. For

instance, during the yoga session, often one or more students would become frustrated at any given time if he or she believed a pose was too difficult. Possibly as an escape from completing the pose, the frustrated student may have begun to distract other students around him or her or even try to distract the whole class. Many of the students in the yoga class seemed to have experience with understanding their classmates when they were stressed and had learned how to better work with them. Additionally, students were asked to reflect on their personal states. If a student became frustrated and did not want to participate, the student was asked to sit quietly on the mat in a meditative posture until he or she was relaxed enough to join the group again. This observation too was not quantitatively documented, but definitely observed as a possible enhancement of intrapersonal skills or intelligence.

*Attrition.* It is possible that attrition over the course of the seven weeks was related to the initial behavioral problems occurring in the class. In the first three weeks of the yoga classes, the class sizes were large with an average of 15 students and two adults. This may have been too many students to have in a beginning yoga class, especially at such young ages. During this period of time, the students frequently displayed disruptive behaviors such as talking aloud, leaving their yoga mat to bother another student, asking to go to the bathroom, and calling out for the instructor's attention. Later on, as the sessions progressed, the class size lessened to about 10 students with sometimes three adults in the room. One adult taught the class and the other adults walked around the room and attended to students who were off-task or in need of assistance. Students tended to be more focused and on task when there was more adult supervision in the room.

Often those students who were enthusiastic about the class would complain that too many kids were talking and disruptive and then later not attend classes regularly. Another possibility may be related to differing levels of student development; many times the older third graders would attend yoga classes with second graders, which led to difficulty with maintaining the interest of all students. For instance the second graders enjoyed more game-like activities while the older students enjoyed trying more difficult poses and listening to the soothing music. Therefore, it seemed as though students whose interests were held throughout the class did not attend classes regularly or stopped attending.

#### *Limitations*

1. Students with LD had to be collapsed with students at-risk for reading failure due to the small sample size. No analyses could be performed separating these two groups of students.
2. The present study occurred at the end of the school year, after state-wide testing, when there were many school-wide activities and field trips. The students may not have been engaging in as many academic tasks as usual. This may have affected teacher perception on student attention and learning problems.
3. The intervention period may have been too short to allow for generalizability of effects to other contexts.
4. There were too few students who participated in the study and not enough consistency in the number of sessions attended.
5. The yoga classes were not the same sequence of movements and activities each time. There was much variability in delivery of the lesson.



6. Teacher perception of student behavior was utilized rather than direct observation of attention problems.
7. The sample size was too small to conduct additional analyses focusing on only those who attended all ten classes ( $n = 14$ ).
8. There was no control group.
9. This study included a very homogeneous group in terms of ethnic composition and SES.

#### *Recommendations for Additional Research*

A study by DeBoear (1997) found a significant correlation between auditory memory span and reading achievement, even when IQ was controlled for. Furthermore, an early study by Warnock and Boss (1987) found similar evidence of a relationship between auditory perceptual abilities and school achievement. The findings of both DeBoear and Warnock, in addition to the findings of the current study, suggest that the improvement in student auditory short-term memory after exposure to yoga will improve student reading achievement. However, further investigation would be required to confirm such a hypothesis.

With regard to who should be included in future studies, a similar study should be conducted with students with LD only. If possible the group should vary in ethnic composition and SES. Further analysis with a larger sample would be beneficial to strengthen the notion of positive benefits for students with LD, if similar findings were brought to the surface.

This yoga study was implemented at the end of the day when most children want to get out and play. This may not have been the best time to attend a calming class like

yoga. If it is possible, future yoga studies should implement a 30-45 min. yoga class before school starts. This may help the students better prepare for their day and in turn yield changes in attention, learning, and memory, which teachers may observe immediately.

In terms of the structure of the yoga classes, future research may want to have no more than seven students to one instructor. A study by Vaughn and Linan-Thompson (2003) implemented a reading intervention to 77 second grade, struggling readers. The students were grouped in different sizes (either 1-to-1, 1-to-3, or 1-to-10). Results indicate that although all three groups showed significant gains, the two smaller groups outperformed the students in the 1-to-10 group. Additionally, future researchers may want to investigate academic effects of students who practice yoga in classes of similar grade or age as opposed to having second graders in the same class as fourth graders. The yoga instructor may want to consider using the same set of yoga postures, in the same order, throughout the sessions to assure proper reproduction of the treatment.

In terms of instrumentation, future research may want to closely monitor the completion of The Behavior Assessment Scale for Children – 2 by the teachers. In addition to the teacher observation, it may be beneficial to also choose instruments that are direct observational measures of the behaviors in question. Measurement of attention may want to use The Behavior Assessment Scale for Children – Student Observation System or some other type of direct observation system. Measurement of learning may want to involve academic testing, grade point average, or statewide tests. According to Omizo (1980) inner control is an essential prerequisite to learning, however, this has yet to be proven in relation to yoga and learning and is an area worthy of further exploration.

A review of the literature by Fahey and De Los Santos (2002) found evidence to support the belief that the brain requires specific chemicals to function such as amino acids that come from proteins, calcium, and vitamins for optimal functioning. In the current study, very frequently the students were observed to eat candy right before the yoga instruction. Often the investigator visited the students when they were eating lunch and informally noted that the students often preferred to eat the junk food served and skipped over the fruits and vegetables. Future research may find it useful to have the students track their diet to ascertain if this may be a factor affecting the efficacy of exposure to yoga.

### *Implications*

A broad implication of the study relates to a non-traditional way to teach students. Yoga may in fact enhance student ability to remember information heard aloud for short periods of time. Increases in short-term memory may be related to increased focus. Teachers, school settings, and/or parents may consider enrolling students with learning difficulties into regularly scheduled yoga classes as a way of increasing their auditory memory.

The current research served as a guide for future studies in the area of yoga related to academic progress. A limited number of studies were found in this area, especially quantitative studies related to students with disabilities and yoga. Educators interested in alternative methods of teaching students and working with usually unrecognized strengths in the classrooms may want to implement a yoga class in their school.

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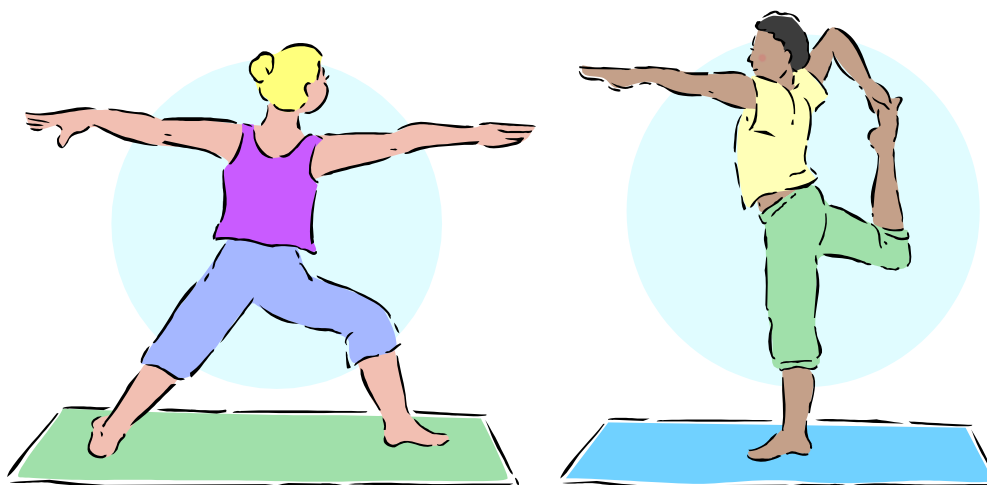
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Appendix A



COME JOIN AFTER-SCHOOL  
YOGA CLASSES or Reading Tutorial!!!

March 27-May 19

## Appendix B

**Barry University****Parental Consent Form for Children under 18**

Your child's participation in a research project is requested. The title of the study is "The effects of exposure to yoga on the learning, attention, and memory of elementary school-age students with learning disabilities and students at-risk for reading failure." The research is being conducted by Nadia M. Mahabir, a student in the Education department at Barry University, and is seeking information that will be useful in the field of Special Education. The aims of the research are to investigate the effects of yoga on students' academic problems and memory. In accordance with these aims, the following procedures will be used: student Individual Education Plan (IEP) and DIBELS data will be accessed, students will be taught yoga or participate in a reading tutorial, and all will take a memory test. Teachers will complete a short learning and attention scale about students. We anticipate the number of participants to be 60.

If you decide to allow your child to participate in this research, he/she will be asked to do the following: 1.) take a 10 minute memory test, 2.) participate in one-hour yoga classes after school twice a week for seven weeks or participate in an after school reading tutorial for one-hour twice a week for seven weeks. Those students who will have the reading tutorial will get the yoga classes 8 weeks after the beginning of the study. In addition, classroom teachers will complete a rating scale on learning and attention behaviors.

Your child's consent to be a research participant is strictly voluntary and should your child decline to participate or choose to drop out at any time during the study, there will be no adverse effects on your child's grades.

The risks of involvement in this study are minimal and include possible muscle soreness. The following procedures will be used to minimize these risks: warm-up exercises prior to stretching and the use of yoga props such as: thick yoga mat, yoga blocks, and straps. The benefits to your child for participating in this study may include increased health benefits, increased self-control, and increased school attendance.

As a research participant, information you and your child provide will be held in confidence to the extent permitted by law. Any published results of the research will refer to group averages only and no names will be used in the study. Data will be kept in a locked file in the researcher's office. Your signed consent form will be kept separate from the data. All data will be destroyed after five years.

If you have any questions or concerns regarding the study or your child's participation in the study, you may contact me, Nadia M. Mahabir, at (786) 246-4156, my supervisor, Dr. Clara Wolman, at (305) 899-3737, or the Institutional Review Board point of contact, Mrs. Nildy Polanco, at (305)899-3020. If you are satisfied with the information provided and are willing to allow your child to participate in this research, please signify your consent by signing this consent form.



**Voluntary Consent**

I acknowledge that I have been informed of the nature and purposes of this experiment by Nadia M. Mahabir and that I have read and understand the information presented above, and that I have read and understand the information presented on the previous page and I have retained a copy of each of these pages for my records.

I **DO** give my voluntary consent to allow my child to participate in this research.

\_\_\_\_\_  
*Signature of Parent or Guardian*      *Date*

\_\_\_\_\_  
*Print Child's Name*

I **DO NOT** give my voluntary consent to allow my child to participate in this research.

\_\_\_\_\_  
*Signature of Parent or Guardian*      *Date*

\_\_\_\_\_  
*Print Child's Name*

## Appendix C

**Barry University****Assent Form for Children under 18**

We are doing a research study that includes children such as you. We have explained the study to you, and we need to know whether you are willing to participate. Please sign your name below so that we can be certain whether you want to be in the study or not. Thank you.

\_\_\_\_ I am willing

\_\_\_\_ I am not willing

to participate in the research study which has been explained to me by

\_\_\_\_\_  
*Signature of Researcher*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Signature of Child*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Signature of Parent*

\_\_\_\_\_  
*Date*

## Appendix D

Dear Parent of \_\_\_\_\_,

Your child has been scheduled to attend yoga classes after school on Mondays and Thursdays from 3:15 pm to 4:15 pm. Classes will begin on March 27, 2006 and end on May 18, 2006. Please have your child bring something comfortable to change into for exercise and a towel. Water will be provided.

I look forward to working with your child ☺

Sincerely,

Nadia M. Mahabir

## Appendix E

## BASC-II Teacher Rating Scale (Modified)

Child's Code #: \_\_\_\_\_ Rater's Name: \_\_\_\_\_

Date: \_\_\_\_\_ D.O.B.: \_\_\_\_\_

Sex: M F

Circle N if the behavior never occurs.

Circle S if the behavior sometimes occurs.

Circle O if the behavior often occurs.

Circle A if the behavior almost always occurs.

Has a short attention span.	N	S	O	A
Is easily distracted.	N	S	O	A
Is easily distracted from class work.	N	S	O	A
Listens attentively.	N	S	O	A
Listens carefully.	N	S	O	A
Listens to directions.	N	S	O	A
Pays attention.	N	S	O	A
Complains that lessons go to fast.	N	S	O	A
Does not complete tests.	N	S	O	A
Gets failing school grades.	N	S	O	A
Has poor handwriting or printing.	N	S	O	A
Has problems with mathematics.	N	S	O	A
Has reading problems.	N	S	O	A
Has spelling problems.	N	S	O	A
Has trouble keeping up in class.	N	S	O	A

## Appendix F

**LET-II****Learning Efficiency Test (1992 Revision)**

Raymond E. Webster, PhD

Name \_\_\_\_\_ Sex **M** **F** Date \_\_\_\_\_ yr \_\_\_\_\_ mo \_\_\_\_\_ day  
 School \_\_\_\_\_ Date of Birth \_\_\_\_\_ yr \_\_\_\_\_ mo \_\_\_\_\_ day  
 Teacher \_\_\_\_\_ Age \_\_\_\_\_ yr \_\_\_\_\_ mo \_\_\_\_\_ day  
 Examiner \_\_\_\_\_ Grade \_\_\_\_\_ yr \_\_\_\_\_ mo

**Score Summary**

MODALITY:	VISUAL			AUDITORY			NOTE: FOR STRING LENGTH SCALED SCORES SEE APPENDIX A; FOR MODALITY STANDARD SCORES SEE APPENDIX B; FOR GLOBAL MEMORY STANDARD SCORES SEE APPENDIX C.
	RAW SCORE	SCALED SCORE	%ILE RANK	RAW SCORE	SCALED SCORE	%ILE RANK	
<b>ORDERED</b>							
IMMEDIATE	_____	_____	_____	_____	_____	_____	
SHORT TERM	_____	_____	_____	_____	_____	_____	
LONG TERM	_____	_____	_____	_____	_____	_____	
<b>UNORDERED</b>							
IMMEDIATE	_____	_____	_____	_____	_____	_____	
SHORT TERM	_____	_____	_____	_____	_____	_____	
LONG TERM	_____	_____	_____	_____	_____	_____	
<b>SUMMED</b>							<b>GLOBAL MEMORY</b>
RAW SCORE	_____	(VIS.)	+	_____	(AUD.)	=	_____ <b>SCORE</b>
STD. SCORE	_____			_____			_____ <b>STD SCORE</b>
	(from Appendix B)						(from Appendix C)

%ILE RANK	ORDERED RECALL			UNORDERED RECALL			%ILE RANK
	IMMED.	SHORT TERM	LONG TERM	IMMED.	SHORT TERM	LONG TERM	
99.9	19	19	19	19	19	19	99.9
99.6	18	18	18	18	18	18	99.6
99	17	17	17	17	17	17	99
98	16	16	16	16	16	16	98
95	15	15	15	15	15	15	95
91	14	14	14	14	14	14	91
84	13	13	13	13	13	13	84
75	12	12	12	12	12	12	75
63	11	11	11	11	11	11	63
50	10	10	10	10	10	10	50
37	9	9	9	9	9	9	37
25	8	8	8	8	8	8	25
16	7	7	7	7	7	7	16
9	6	6	6	6	6	6	9
5	5	5	5	5	5	5	5
2	4	4	4	4	4	4	2
1	3	3	3	3	3	3	1
0.4	2	2	2	2	2	2	0.4
0.1	1	1	1	1	1	1	0.1

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### VISUAL MEMORY

Discontinue testing after two consecutive errors on Immediate Recall.

Practice

M S

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 1 to 10  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The boy went to the larger dog.  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_  
 Comment: \_\_\_\_\_

X P

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 2 to 12  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The horse walked to the barn.  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_  
 Comment: \_\_\_\_\_

Y J L

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 10 to 20  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: A girl walked to the high hill.  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_  
 Comment: \_\_\_\_\_

R X H S

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 5 to 15  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The fish swam to the big boats.  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_  
 Comment: \_\_\_\_\_

F M J Q P

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 1 to 10  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: A dog bit the big boy on the leg.  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_  
 Comment: \_\_\_\_\_

Q Y F R X L

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 10 to 20  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The mouse ran up the clock  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_ and hid.  
 Comment: \_\_\_\_\_

S L R H M J Q

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 5 to 15  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: A small horse ate a bag  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_ of grass.  
 Comment: \_\_\_\_\_

P X Q S Y H F R

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 7 to 17  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The boy swam to the  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_ big boats.  
 Comment: \_\_\_\_\_

Q R H L S M J P F

Immediate Recall \_\_\_ \_\_\_ \_\_\_ Count: from 3 to 13  
 Short Term Recall \_\_\_ \_\_\_ \_\_\_ Repeat: The mouse ran to  
 Long Term Recall \_\_\_ \_\_\_ \_\_\_ the high hill.  
 Comment: \_\_\_\_\_

Raw Score	
Ordered	Unordered
Imm.	Imm.
ST	ST
LT	LT
Imm.	Imm.
ST	ST
LT	LT
Imm.	Imm.
ST	ST
LT	LT
Imm.	Imm.
ST	ST
LT	LT
Imm.	Imm.
ST	ST
LT	LT
Imm.	Imm.
ST	ST
LT	LT
Total Ordered	Total Unordered
<b>SUMMED</b>	
<b>RAW SCORE</b>	

### AUDITORY MEMORY

Discontinue testing after two consecutive errors on Immediate Recall.

Practice

L F

Immediate Recall    \_ \_ \_    Count: from 1 to 10  
 Short Term Recall    \_ \_ \_    Repeat: The boy went to the larger dog.  
 Long Term Recall    \_ \_ \_  
 Comment: \_\_\_\_\_

Q J

Immediate Recall    \_ \_ \_    Count: from 2 to 12  
 Short Term Recall    \_ \_ \_    Repeat: The horse walked to the barn.  
 Long Term Recall    \_ \_ \_  
 Comment: \_\_\_\_\_

P S R

Immediate Recall    \_ \_ \_    Count: from 10 to 20  
 Short Term Recall    \_ \_ \_    Repeat: A girl walked to the high hill.  
 Long Term Recall    \_ \_ \_  
 Comment: \_\_\_\_\_

Y Q H X

Immediate Recall    \_ \_ \_    Count: from 5 to 15  
 Short Term Recall    \_ \_ \_    Repeat: The fish swam to the big boats.  
 Long Term Recall    \_ \_ \_  
 Comment: \_\_\_\_\_

S L R Q J

Immediate Recall    \_ \_ \_    Count: from 1 to 10  
 Short Term Recall    \_ \_ \_    Repeat: A dog bit the big boy on the leg.  
 Long Term Recall    \_ \_ \_  
 Comment: \_\_\_\_\_

R J S H L F

Immediate Recall    \_ \_ \_    Count: from 10 to 20  
 Short Term Recall    \_ \_ \_    Repeat: The mouse ran up the clock  
 Long Term Recall    \_ \_ \_    and hid.  
 Comment: \_\_\_\_\_

J F R M S P L

Immediate Recall    \_ \_ \_    Count: from 5 to 15  
 Short Term Recall    \_ \_ \_    Repeat: A small horse ate a bag  
 Long Term Recall    \_ \_ \_    of grass.  
 Comment: \_\_\_\_\_

Q P Y R L X M S

Immediate Recall    \_ \_ \_    Count: from 7 to 17  
 Short Term Recall    \_ \_ \_    Repeat: The boy swam to the  
 Long Term Recall    \_ \_ \_    big boats.  
 Comment: \_\_\_\_\_

H X Q M P Y R J L

Immediate Recall    \_ \_ \_    Count: from 3 to 13  
 Short Term Recall    \_ \_ \_    Repeat: The mouse ran to  
 Long Term Recall    \_ \_ \_    the high hill.  
 Comment: \_\_\_\_\_

		Raw Score	
		Ordered	Unordered
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Imm.			
ST			
LT			
Total Ordered			
Total Unordered			
<b>SUMMED</b>			
<b>RAW SCORE</b>			