

3-11-2005

# The Effects of Hand Fidgets on the On-Task Behaviors of A Middle School Student With Disabilities in an Inclusive Academic Setting

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The Effects of Hand Fidgets on the On-Task Behaviors of A  
Middle School Student With Disabilities in an Inclusive Academic Setting

by

Karen S. Voytecki

A dissertation submitted in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy  
Department of Special Education  
College of Education  
University of South Florida

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Date of Approval:  
March 11, 2005

Keywords: sensory strategies, single subject design, academic engagement,  
mild disabilities, intervention research

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## Dedication

This dissertation is dedicated to my family members. Each of them provides essential encouragement and assistance in their own way. They are the team that I depend upon, often giving me more than I am able to return.

My husband, Kevin, provides unending support and has ensured that our family was loved and cared for throughout this process. Our children - Darth and Luke, who are growing up knowing they will never be done with homework, are my future and my inspiration.

My brother, Steven W. Johnson, serves as a guiding light for implementation of more effective instructional approaches for students with exceptionalities. His talents and struggles give me the reason to “find solutions” for students who have Attention Deficit Hyperactivity Disorder (ADHD) and learning disabilities.

My graduate assistant, editor, coach, mentor, and father, Leon L. Johnson, has virtually earned three degrees along my path in special education and has been with me every step of the way - he should be granted a V.Ph.D. (Virtual Doctor of Philosophy). My mother, Judy, is a lovely person inside and out. She always finds a way to renew my creative energy and brightens my life.

## Acknowledgements

I will always be thankful to the dedicated scholars at the University of South Florida for having greatly enriched my life. The day that Dr. H. William Heller introduced himself to me and committed to granting sponsorship of my advanced studies was truly a turning point in my life. He has reinforced my understanding of the value of every individual and shares freely of his expertise and rich experiences in the field of special education. Dr. James Paul believed in me throughout my doctoral program. I “trusted the process” only because I trusted Jim, and for that I am forever grateful. Dr. John Ferron enhanced my insight to the strengths of quantitative methods by generously and enthusiastically sharing his sapient knowledge of single subject design. Dr. Tanice Knopp guided me in the area of transdisciplinary teams and has been instrumental in communicating the value of collaborative professional relationships. Our doctoral cohort provided exceptional support to me, to each other, and to the process. With gratitude, I acknowledge Dr. Pete Marsh who greatly influenced the direction of this study, and the future: Dr. Tandria Callins, Dr. Michelle Duda, Dr. Kati Fowler, Dr. Ben Graffam, Dr. Julie Greiss, Dr. Sarah Semon, and Dr. Glenda (Dee) Ubinas. Their professional and moral support has made this an exciting and rewarding journey.

Mrs. Nancy Marsh encouraged me to pursue sensory strategies and provided inestimable perspicacious guidance through her enlightened perspective as a distinguished occupational therapist. The teacher and the students involved in this study provided illimitable cooperation and fully embraced every arcane request. It is my hope that their assiduous commitment positively impacts future teachers and students.

## Table of Contents

List of Tables .....	iv
List of Figures.....	v
Abstract.....	vi
Chapter One - Introduction .....	1
Need for Research-proven, Data-driven Interventions.....	1
Current Approaches for Modifying Distractibility .....	2
Theoretical Framework .....	3
Purpose of the Study.....	4
Research Questions .....	4
Significance of the Study.....	5
Methods Probe.....	5
Operational Definitions of Terms.....	6
Organization of Remaining Chapters .....	8
Chapter Two - Literature Review .....	10
Students with Mild Disabilities at High Risk for Off-Task Behaviors .....	10
Connection Between On-Task Behaviors and Academic Performance .....	11
Current Approaches and Interventions for Distractibility .....	11
Medication.....	12
Counseling.....	13
Instructional Accommodations.....	15
Combination of Approaches.....	19
History of the Theory and Principles of Sensory Integration.....	19
General Role of Sensory Integration Theory.....	20
Premise and Assumptions of Sensory Integration Theory .....	21
Characteristics of Sensory Integrative Dysfunction .....	22
Assessment of Sensory Integrative Dysfunction .....	25
Interventions Based on Sensory Integration Theory .....	26
Role of Sensory Integration in Attention.....	28
Treatment Outcomes Supporting Use of Sensory Integration.....	29
Limitations and Contentions of Sensory Integration Theory and Constructs .....	30
Need for More Research Based on Sensory Integration Theory .....	31
Role of Collaboration Between Professions.....	32
Summary.....	34

Chapter Three - Method.....	36
Research Questions .....	36
Methods Probe.....	36
Teacher-Researcher Partnership.....	37
Population Characteristics .....	38
Sampling Procedure.....	38
Sampling Scheme .....	39
Sample Size .....	39
Sample Characteristics .....	40
Setting.....	40
Participants .....	42
Selection-Eligibility Criteria .....	43
Consent .....	44
Single Subject Design Participant .....	44
Research Paradigm .....	46
Research Procedures.....	48
Ethical Considerations for Data Collection.....	49
Preparation of Data Collectors .....	49
Research Instruments.....	49
On-Task Checklist.....	50
Procedural Reliability Checklist.....	50
Anecdotal Logs.....	51
Measures of Social Validity .....	51
Data Collection .....	52
Systematic Behavioral Observations .....	53
Administrators of the Instruments .....	54
Score Reliability .....	55
Study Validity.....	56
Delineation of Findings .....	57
Data Analysis.....	59
Method of Analysis .....	59
Chapter Four - Results .....	62
Systematic Behavioral Observations .....	62
Procedural Reliability .....	62
Inter-rater Agreement .....	63
Data Analysis.....	64
Social Validation .....	70
Social Validation for Classroom Teacher.....	70
Social Validation for Students.....	73
Summary.....	74

Chapter Five - Discussion.....	76
Results Associated with Research Questions .....	76
Research question #1 .....	76
Research question #2 .....	77
Delimitations .....	78
Limitations.....	79
Threats to External Validity .....	82
Implications for Future Research and Practice.....	84
Conclusions .....	86
References.....	88
Appendices.....	100
Appendix A: Methods Probe .....	101
Appendix B: Informed Consent.....	107
Appendix C: Teacher Preparation Session .....	125
Appendix D: On-Task Checklist .....	127
Appendix E: Procedural Reliability Checklist.....	128
Appendix F: Daily Observation Anecdotal Log.....	129
Appendix G: Teacher Input: Use of Stress Ball .....	133
Appendix H: Student Input: Use of Stress Ball.....	134
Appendix I: Randomization Test Programming Code .....	135
About the Author .....	End Page

## List of Tables

Table 1. Duration of Study Phases.....	47
Table 2. Co-rater Reliability .....	64
Table 3. Changes in Variability and Level of On-Task Behaviors.....	68
Table 4. Social Validation for Classroom Teacher.....	72
Table 5. Social Validation for Students .....	73

## List of Figures

Figure 1. Task Expectation Listen Held Constant .....	58
Figure 2. Including All Task Expectations .....	58
Figure 3. Overall % of On-Task Behaviors for Week by Task Expectations.....	59
Figure 4. Systematic Behavioral Observation Data.....	66
Figure A1. Time Line for Methods Probe Data Collection .....	101

The Effects of Hand Fidgets on the On-Task Behaviors of A  
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Karen S. Voytecki

ABSTRACT

Many students with mild disabilities display off-task behaviors during academic content classes. The off-task behaviors can negatively impact their academic progress. In primarily clinical settings, specific interventions derived from the theory of sensory integration have been shown to increase on-task behaviors in students with mild disabilities. Using a single subject A-B-A-B withdrawal design, the researcher investigated the effects of hand fidgets on on-task behaviors demonstrated by a middle school student with mild disabilities who typically displayed off-task behaviors when participating in an inclusive, academic content class (language arts). Social validity was assessed to evaluate student and teacher perceptions regarding the intervention. During baseline and withdrawal (A phases) participants followed their typical classroom routine and were not exposed to the intervention - hand fidgets. During the intervention (B phases) participants were provided with a hand fidget for use during the class period. Results indicated substantial increases in the percentage of on-task behaviors demonstrated by the participant, when presented with the opportunity to use a hand fidget, during activities in which listening to a lecture was the primary task expectation. Social validity findings indicated that both the students and classroom teacher preferred the use of hand fidgets to the condition of no hand fidget present. This study provides

preliminary support for the use of hand fidgets to increase on-task behaviors by students with mild disabilities who present tendencies for off-task behaviors during classroom lecture situations.

## Chapter One - Introduction

Many students with mild disabilities, such as attention-deficit/hyperactivity disorders, learning disabilities, emotional/behavioral disorders, and mild mental retardation, experience challenges with remaining on task during academic content classes. Time on task, attentiveness, active learning time, and similar terms have been shown to have significant causal relationships to educational achievement (Greenwood, Terry, Marquis, & Walker, 1994; Zera & Lucian, 2001). Conversely, studies have shown significant connections between distractibility and its negative impact on academic progress (Blatchford, Edmonds, & Martin, 2003). Students with mild disabilities, whose characteristics can include being easily distracted and off task, may be at risk for lower academic progress. Therefore, a need exists to increase their time on task to heighten their potential for the attainment of academic success. A prospective means of meeting this need is to explore interventions that may assist students with mild disabilities who manifest off-task behaviors to increase their time on task. Successful interventions would likely improve their academic progress.

### *Need for Research-proven, Data-driven Interventions*

The No Child Left Behind (NCLB) Act of 2001 mandates the use of data-driven interventions (Babkie & Provost, 2004). Since students with mild disabilities are increasingly being served in general education classrooms, which is supported by the

Individuals with Disabilities Education Improvement Act (IDEIA), it is essential for general educators to have research-proven, efficient interventions available to assist students with, and at-risk for, disabilities (Keel, Dangel, & Owens, 1999). The researcher conducted this study to explore an intervention and determine if the intervention had an impact on the on-task behaviors of a student with mild disabilities.

### *Current Approaches for Modifying Distractibility*

There are various methods currently being implemented in educational settings in an attempt to increase the engagement rates in students who are easily distracted. The use of medication for the treatment of distractibility, known as pharmacotherapy, is the most prevalent intervention (Keltner & Folks, 2001). Although pharmacotherapy has been shown to increase academic performance and positively impact behavior, social functioning, and overall well-being (Hall & Gushee, 2002), many serious adverse side effects are associated with these medications as well (Julien, 2001).

Another approach for modifying distractibility involves the use of individual and group counseling programs. Beneficial results have been obtained from counseling in relation to being able to facilitate self-control strategies in persons who are easily distracted (Webb & Myrick, 2003). A deterrent to this approach is that counseling can be both an obtrusive and intrusive approach that can require students to be removed for periods of time from their peers and their classes to discuss personal issues. Therefore counseling sessions may cause students to feel uncomfortable and prevent them from benefiting from full instructional time.

Instructional accommodations, provided by teachers, are another approach utilized to facilitate engagement in students who are easily distracted. Students who are distractible often approach learning in inefficient ways and therefore may benefit from instructional accommodations (Strichart & Mangrum, 2002). Instructional accommodations can include the teaching of learning strategies, varying methods of content delivery, providing a supportive learning environment, choosing appropriate curriculums, and enlisting the support of peers in the class. Indeed, instructional accommodations are beneficial to students with tendencies for distractibility. A limitation to this approach is that instructional accommodations are external to the individual and are dependent on the teacher, thereby being out of the student's control. When students are in a classroom where the teacher has orchestrated an optimal learning environment specifically for the students with tendencies for distractibility, they may do very well in that class. However, these accommodations do not lend themselves to an internal locus of control on behalf of the students. It is not feasible to rely on others to continually modify every environment that the individuals with distractible tendencies may encounter. As a result, students who are easily distracted continue to need an intervention approach that can be managed by themselves and would be beneficial to them in other environments (e.g., other classes, at home, in the community, etc.).

### *Theoretical Framework*

Sensory integration theory has provided a useful framework for exploring interventions for children who display deficits in behavior as a result of hypothesized deficits in neurological sensory integration. Specific interventions derived from the

theory of sensory integration (SI) have been shown to be useful with populations of students with mild disabilities such as attention-deficit hyperactivity disorders (Ayres, 1979), learning disabilities (Clark, Mailloux, Parham, & Bissell, 1989; Mauer, 1999; Price, 1977), emotional/behavioral disorders (Ayres & Tickle, 1980; Ottenbacher, Watson, Short, & Biderman, 1979), and mild mental retardation (Clark & Schuer, 1978; Price, 1977). This study explored an extension of the sensory integration theory to an educational setting where students with mild disabilities, having characteristics of inattentiveness and off-task behaviors, are included in general education classes.

#### *Purpose of the Study*

The purpose of this study was to investigate the effects of hand fidgets on the percentage of on-task behaviors demonstrated by a student with mild disabilities whose disabilities have characteristics of off-task behaviors when participating in academic content classes. The research questions were directly related to the purpose of the study.

#### *Research Questions*

The first research question is: does the use of hand fidgets increase the percentage of on-task behaviors of a middle school student with mild disabilities who exhibits off-task behaviors during typical academic content periods? The second research question is: do the teacher and students believe that the use of a hand fidget is an effective and socially valid approach for increasing on-task behaviors of middle school students during an academic content period?

### *Significance of the Study*

The theory of sensory integration is a medical theory and its application is generally clinically based, rather than school based. Implementing sensory integration into practice in an educational setting has the potential to extend the benefits of the theory into new settings and to achieve a higher level of use. In addition, the educational setting is a naturalistic environment for students, as opposed to the implementation of sensory integration theory in a lab or clinical setting as was the case for many of the previously conducted studies based on the theory of sensory integration.

### *Methods Probe*

In preparation for this study, the researcher conducted a methods probe (see Appendix A). Utilizing an abbreviated A-B-A-B study design, baseline data was gathered. The baseline data was analyzed and utilized to determine this study's research focus, phase lengths, and areas of data collection.

Piloting of the research methods, intervention approach, and measurement instruments was another integral component of the methods probe. The results of the methods probe were used to modify and enhance the design of this study, the measurement instruments, the data collection procedures, and the analyses processes. In addition, the information gathered in the methods probe provided a foundation for the development and refinement of the operational definitions of key terms.

### *Operational Definitions of Terms*

Operational definitions of key terms were derived through an analysis of both the relevant literature and the results of the methods probe. Operational definitions were detailed for dependent variables, the independent variable, and educational terms.

The dependent variables, which were operationally defined, include on-task and off-task behaviors. The operational definition of on-task behavior was adapted from a previous study conducted by Christle and Schuster (2003) who defined on-task behavior according to the following criteria

- (a) the student seated in his/her seat and facing the teacher or some object directed to or by the teacher; (b) the student having his/her hands on his/her own materials or raised when a question was asked by the teacher; and (c) the student not talking unless he/she was called on by the teacher. (p. 152)

This operational definition was revised to fit this study based upon an analysis of the methods probe observations. Deleted from Christle and Schuster's (2003) operational definition of "on-task behavior" was "(b) the student having his/her hands on his/her own materials or raised when a question was asked by the teacher." (p. 152). This was omitted since the eighth grade student in the methods probe did not present behaviors involving the use of hands in an off- task manner. "Following teacher directions" was added to the operational definition used in the methods probe, but was deleted in the operational definition of on task used in the present study since there was never an observation that occurred in which a student presented the other on-task behaviors (i.e., seated in seat, facing teacher or object directed to by the teacher, and not talking unless directed by the teacher) and simultaneously was not following teacher directions, as the

researcher initially predicted as a possibility. Therefore, for purposes of this study, on-task behavior was operationally defined according to the following criteria: (a) the student seated in her/his seat; (b) the student facing the teacher or object directed to by the teacher; and (c) the student not talking unless directed to by the teacher. Each of these criteria must be met for a student to be considered as displaying on-task behaviors. In relation to the operational definition of on-task behavior, off-task behavior is operationally defined as “not exhibiting the characteristics of on-task behaviors.”

The independent variable is the use, or non-use, of the hand fidget intervention. Hand fidget is operationally defined as a “stress ball” made of soft, pliable, non-toxic materials, approximately the size of a tennis ball, with an outer layer of cloth having gel and beads inside it. Each “stress ball” is composed similarly. However, the outer coatings have patterns that vary between solid blue, solid black, a leopard print, and a zebra print.

To clarify the educational terms used within the context of this study, operational definitions have been created for those as well. “Students with disabilities” were defined according to the following criteria: students with mild disabilities including, either existing independently or in combination: attention-deficit hyperactivity disorders, learning disabilities, emotional disorders, and mild mental retardation. It should be noted that there are two subtypes of attention-deficit hyperactivity disorders, specified as inattention and hyperactivity-impulsivity (American Psychiatric Association, 2000). For purposes of this study, students with either subtype of attention-deficit hyperactivity disorder are referred to as having attention-deficit hyperactivity disorders, as this is an encompassing term of both subtypes. Students are identified as having a mild disability through its depiction on the child’s individual education plan (IEP) or Section 504 plan.

“Typical academic period” is operationally defined as an academic content course (i.e., language arts, social studies, science) class that meets daily and is taken by all general education eighth grade students.

### *Organization of Remaining Chapters*

Chapter two is a review of the literature, which provides the context and perspective of this study. The history of the theory supporting this intervention approach, as well as the controversies of the field, are detailed. Main directions taken by others in the field are outlined as they pertain to the problem of distractibility. The theories and conceptualizations that have guided the work of studies relevant to this investigation, along with the strengths and weaknesses of those studies, are explored. Previous research is reviewed and analyzed to confirm that this study will contribute to knowledge in the fields of education and occupational therapy.

Chapter three, methods, describes the foundational design of this study. The research paradigm, research procedures, measurement instruments, data collection processes, study validity and reliability, and method of analysis are thoroughly detailed. Characteristics of the population to which this study can be applied, as well as detailed information regarding the participants and setting involved in this investigation, are discussed. Finally, the mutually beneficial teacher-researcher partnership that was instrumental in the successful formulation, implementation, and analysis of this study is detailed in this chapter.

The fourth chapter, research results, reports the findings of the study. Data obtained from the systematic behavioral observations, procedural reliability, inter-rater agreement, social validation evaluations, and data analysis are shared and explained.

Chapter five, the discussion section, draws together the purpose, design, and results of the study and directly responds to the research questions. Delimitations, limitations, and threats to external validity of this study are explored. Implications for future research and practice are shared and a culminating conclusion is presented.

The list of references and appendices follow the enumerated chapters.

## Chapter Two - Literature Review

Students with mild disabilities including attention-deficit hyperactivity disorders, learning disabilities, emotional/behavioral disorders, and mild mental retardation often present more off-task behaviors than their typical same-age peers. Barkley (1996) defines the construct of attention according to the relationship of behavior to environment. Off-task behaviors are associated with inattention.

### *Students with Mild Disabilities at High Risk for Off-Task Behaviors*

Numerous organizations and studies have connected off-task behaviors, such as inattention, to students with mild disabilities. The American Psychiatric Association reported that the primary symptom of attention-deficit hyperactivity disorder is inattention (Maynard, Tyler, & Arnold, 1999). According to Pearson, Yaffee, and Loveland (1996), deficits in attentional processes are displayed by children with mental retardation, increasingly so in childhood and when the tasks require more attentional effort. Pearson et al. (1996) have also concluded that, relative to peers without mental retardation, children with mental retardation have more difficulty controlling the focus of their attention.

Comorbidity of learning disabilities and attention-deficit hyperactivity disorder has been reported as ranging from 40 percent to 80 percent (Tabassam & Grainger, 2002). Mayes, Calhoun, and Crowell (2000) found that children with learning disabilities

(LD) and attention-deficit hyperactivity disorder (ADHD) had more severe attention problems than children who had ADHD but did not have coexisting LD. However, children with LD without coexisting ADHD still exhibited attention problems (Barkley & Grodzinsky, 1994; Mayes et al., 2000; Robins, 1992).

#### *Connection Between On-Task Behaviors and Academic Performance*

“Pupils will learn to the extent that they are attentive to the topics being discussed or the work presented to them” (Blatchford et al., 2003, p. 17). Many students with disabilities have difficulty remaining on task. The literature clearly indicates that this negatively affects their learning. Student engagement and attention to instruction have been found to be strong predictors of achievement for students with academic difficulties (Brophy & Good, 1986; Keel et al., 1999; Mayes et al., 2000; Zera & Lucian, 2001). To maximize academic achievement of students with disabilities in an inclusive classroom, it is essential to maintain high levels of student engagement (Hendrickson & Frank, 1993).

#### *Current Approaches and Interventions for Distractibility*

Numerous approaches to intervene with distractibility are currently being employed in educational systems throughout the United States. Alternative interventions can include various types of medication, counseling, and instructional accommodations. Strengths and weaknesses are associated with each approach. Often a combination of approaches is required to meet the needs of the individual who presents off-task behaviors such as inattention and distractibility.

## *Medication*

The most prevalent intervention for the treatment of distractibility is the use of medication (Keltner & Folks, 2001). Stimulant medication can assist individuals in their ability to control their behaviors by lessening their distractibility and impulsivity tendencies. Although medication does not have a direct effect on academic success, school performance may improve as a result of the increase in behavior control exhibited by individuals taking medication for their distractibility. The increase in behavior control can improve their learning and educational performance (Montague & Wagner, 1997). Barkley (1998) reinforces this notion by stating that taking stimulant medication does not directly teach a person appropriate behaviors; however, it increases the probability that appropriate behaviors already in the person's repertoire will be displayed. In addition to increased academic performance, pharmacotherapy has been shown to positively impact behavior, social functioning, and overall well-being (Hall & Gushee, 2002).

Although positive effects have been documented for the use of pharmacotherapy, many aversive side effects are associated with these medications as well. Some of the most prevalent negative side effects include insomnia, appetite suppression, anxiety, headaches, sedation, diminished mental activity, blurred vision, and mild sexual dysfunction (Keltner & Folks, 2001). Medication complications are further intensified when medication is not taken consistently, is abruptly discontinued, or is used in combination with other drugs. Complications can include cardiovascular and neurological damage, exacerbation of the disorder, and/or suicidal tendencies (Julien, 2001).

The perceived benefits of pharmacotherapy are appearing to outweigh the associated risks, since medication is the most prevalent intervention currently utilized for

individuals with tendencies for distraction. Although the potential exists for negative side effects occurring as a direct result of employing pharmacotherapy to alleviate symptoms of distractibility, medication remains the primary intervention for distraction disorders such as Attention Deficit Hyperactivity Disorder. However, the seriousness of the side effects and potential long-term complications associated with the medications clearly indicate that pharmacotherapy is not an ideal intervention approach.

### *Counseling*

Individual and group counseling has been demonstrated to be effective in facilitating self-control strategies in persons who are easily distracted (Webb & Myrick, 2003; Ellis & MacLaren, 1998; Goldstein & Goldstein, 1998). Private practice therapists and school counselors can either exclusively or collaboratively provide counseling services to such individuals in need (Gabbard & Kay, 2001; Myrick, 2002). Furthermore, counseling can be used in combination with other approaches, such as pharmacotherapy, to produce heightened positive results (Gabbard & Kay, 2001).

Group counseling interventions have been documented as being beneficial to students with tendencies towards distractibility by teaching these individuals to understand their distractibility and its effects on their classroom performance (Webb & Myrick, 2003). When individuals understand how distractibility can affect their school performance, they are able to expand their capacity to self-manage themselves in their various environments (Goldstein & Goldstein, 1998).

Rational Emotive Behavior Therapy (REBT) is a specific approach that has been proven successful when used as a foundation for group guidance units that help students

learn how their distractibility can affect their learning behaviors and academic performance (Ellis & MacLaren, 1998). Rational Emotive Behavior Therapy increases student awareness of the value of practicing school success skills. The theory underlying REBT presumes that a person with distractibility tendencies cannot exhibit a behavior that has not been learned, therefore REBT emphasizes changes in behavior and improved self-regulation in regards to manifestations of thoughts, beliefs, feelings, and expectations (Ellis & Wilde, 2002). Rational Emotive Behavior Therapy is premised on the assumption that while the primary symptom of distractibility may be extremely difficult to completely eliminate, it may be possible to facilitate the development of self-competencies that minimize the potential of serious secondary difficulties (Braswell, 1993). A benefit of REBT is that it can be implemented in educational settings since this approach also lends itself to brief counseling sessions similar to those often used in schools (Myrick, 2002).

Counseling used in combination with pharmacotherapy has resulted in demonstrated improvements in academic and social success of students with distractible tendencies. Being true for both genders, current brain research indicates that psychotherapy, when combined with pharmacotherapy, is more effective than psychotherapy alone for the treatment of certain distraction disorders such as Attention Deficit Hyperactivity Disorder (MTA [Multimodal Treatment Study of ADHD] Cooperative Group, 1999a, 1999b). The new direction in neuroscience is focused on the combined influences of psychology and biology – psychotherapy and pharmacotherapy (Gabbard & Kay). Therefore, personnel in the medical field need to be aware of the strengths and limitations of psychotherapy and, likewise, psychotherapists must remain

current on the benefits and potential serious side effects associated with pharmacotherapy. The medication component, and its potential for serious side effects, makes this combined approach risky and not an optimal solution.

Although counseling continues to benefit individuals with distractibility, this intervention is considered to be an obtrusive approach. Time spent during individual and/or group counseling sessions in educational settings equates to time spent away from peers and removed from the instructional climate. Therefore individuals may feel uncomfortable with the counseling approach and may be prevented from full inclusion in the instructional setting.

#### *Instructional Accommodations*

An alternative treatment method to pharmacotherapy and counseling focuses on instructional strategies and accommodations presented by educators to individuals with tendencies toward distraction (i.e., students with Attention Deficit Hyperactivity Disorder). Students with distraction disorders, such as ADHD, often approach learning activities in inefficient ways and therefore may benefit from specific instruction in learning strategies (Strichart & Mangrum, 2002). In addition to teaching learning strategies, there are varied methods of instructional adaptation of content delivery that educators can utilize to increase student engagement in the classroom.

Students who display characteristics of distractibility often benefit from a supportive learning environment that promotes positive interactions between students and teachers (Zentall et al., 2001; Brim & Whitaker, 2000). Positive environments can be established by educators through capitalizing on students' strengths, providing student

leadership opportunities, involving students in the instructional process, offering choices to students and valuing their preferences, and increasing students' confidence levels by acknowledging both their academic progress and effort (Rademacher, 2000; Smith, Salend, & Ryan, 2001). Displaying a genuine enthusiasm for teaching and learning also facilitates the establishment of a positive rapport with students. Furthermore, teachers talking with students about topics that are interesting and relevant to them, participating in after-school activities with their students, and acknowledging meaningful events in their students' lives promotes a positive and supportive classroom environment (Salend, 2001).

Academic engagement can be increased in students who are easily distracted by providing students with an appropriate, meaningful, culturally relevant, creative, interesting, and challenging curriculum that relates to their lives (Brim & Whitaker, 2000; Desrochers & Desrochers, 2000; Zentall et al., 2001). Academic engagement and educational success can be further fostered by using appropriate teaching methods. These methods may include dividing large tasks into smaller components that are within the students' capabilities, working towards specific objectives and goals, providing instruction at a pace tailored to the students' needs, allowing students to participate in academic activities from a variety of locations and positions within the classroom (e.g., sitting at a desk, or laying on the carpet), varying response and presentation modes of assignments, using numerous and varied examples in multiple learning modalities (e.g., visuals, tactile reinforcements, auditory input), and maintaining ongoing evaluations of student progress (Brim & Whitaker, 2000; Desrochers & Desrochers, 2000).

Teachers and peers can assist students with distractibility tendencies to remain on task and complete their assignments. For instance, students who are easily distracted often experience difficulties with listening to directions and therefore do not complete, or incorrectly complete, their assignments. To facilitate student understanding, educators must provide clear, concise, and complete directions for expected tasks (Salend, 2001). Assignment modifications are often an integral component in classroom success for students who are easily distracted. Individualizing assignments to match students' strengths and needs can be accomplished through differentiation of student workload, interspersing new content with previously mastered material, strategically locating the most important items to be learned at the beginning of lessons and activities to maximize the students' optimal attention span, specifying individualized expectations for assignment completion, allowing for varied student response modes, and altering time limits for task deadlines (Boyer, 1998). Educators can further assist these students by scheduling time to provide one-on-one teacher assistance, monitor students' work, and enforce a prearranged system for responding to requests for assistance from the students. Being paired with a student partner for motivation, assistance, and academic support has also been proven effective in increasing the academic performance of students who are easily distracted (Gibson & Govendo, 1999).

Educational practitioners can implement many practices that positively impact academic and social factors of school and learning for students who are easily distracted. Direct instruction in learning strategies, adaptations to instructional content and delivery, establishing a positive and supportive learning environment, and utilizing peers for encouragement, motivation, and academic guidance can lead to opportunities for the

academic and social progress of students with mild disabilities. Providing meaningful content in a supportive environment can improve student engagement and thereby increase chances for academic and social success.

Although instructional accommodations are beneficial to students with tendencies for distractibility, a limitation to this approach is that these accommodations are external to the individual who benefits from them and are, therefore, out of that person's control. When students are in an optimal learning environment that has been created and modified by the classroom teacher specifically for the students with tendencies for distractibility, they may present increased rates of engagement in that class. However, these accommodations do not facilitate an internal locus of control within those students. Therefore, in order for the individuals to continue to be engaged in all areas of their lives, the environment around them would continually need to be accommodated and modified to meet their needs. Since this is not feasible, students who are easily distracted continue to need an intervention approach that can be managed by themselves and would be beneficial to them in other environments (e.g., other classes, at home, in the community, etc.). This is supported by Keel, Dangel, & Owens (1999) who state that a "goal for students with mild disabilities is to lead them from reliance on the more supportive, teacher-directed environment (teacher-directed strategies) to one in which they learn to become responsible for managing their own learning and behavior (student-directed strategies)" (p. 16, parenthetical emphasis in original).

### *Combination of Approaches*

Although interventions for students with tendencies for distraction are often focused on reducing inappropriate behaviors, a comprehensive program also includes educational interventions that address these students' unique learning needs and styles (Salend, Elhoweris, & Van Garderen, 2003). Counselors and educators may need to collaborate on plans that are specific to the students and their individual needs. Combined approaches may utilize behavioral management techniques, instructional accommodations, medication, and peer reinforcement programs.

All students are individuals who present very unique learning styles and needs. Being able to draw from a combination of approaches that may or may not involve instructional accommodations, medication, and counseling allows students to gain the maximum benefit to meet their specific requirements.

With this potential combination approach in mind, the researcher conducted this study in an effort to explore another intervention approach for distractibility, based upon the theory of sensory integration, as a possible alternative or enhancement to the existing treatment methods. Interventions derived from the theory of sensory integration have been shown to increase on-task behaviors of students with mild disabilities (Ayres & Tickle, 1980; Clark et al., 1989; Parham & Mailloux, 1996; Ray, King, & Grandin, 1988).

### *History of the Theory and Principles of Sensory Integration*

The theory of Sensory Integration (SI) was developed by Jeanne Ayres, an occupational therapist and licensed clinical psychologist. Sensory integration was based

on studies in the areas of neuroscience, physical development, and neuromuscular function (Fisher & Murray, 1991). Ayres became interested in brain behavior relationships, specifically the perceptual and motor aspects of learning, as a result of her early clinical work with children with cerebral palsy and her later work with children having learning disabilities (Mauer, 1999). Sensory integration therapy was developed from Ayres' hypothesis that deficits in neurobiological processes were related to learning disabilities (Ayres, 1964, 1972b, 1974; Fisher & Murray, 1991).

Ayres (1972b) originally defined sensory integration as "the ability to organize sensory information for use" (p. 1). As research in neurobiology evolved, Fisher and Murray (1991) extended Ayres' description to clarify three postulates of sensory integration theory. The first postulate states that individuals receive sensory information from their environment and movement of their bodies, then process these sensory inputs within the central nervous system, and finally use this sensory information to plan and organize behavior. The second postulate states that deficits in processing sensory input result in deficits in conceptual and motor learning. The third major postulate directly relates to intervention. It specifies the need for planned enhanced sensory experiences, provided within the context of a meaningful activity. Combined with the production of an adaptive behavior, these experiences can result in enhanced sensory integration, which may in turn lead to enhanced learning.

### *General Role of Sensory Integration Theory*

Sensory integration theory describes the relationship between the brain and behavior. The theory is used to explicate how sensory input affects behavior (DiMatties

& Sammons, 2003). Sensory integration utilizes the brain and other neurological processes to select, enhance, inhibit, compare, interpret, associate, and organize sensory input from one's own body and from the environment in order to process the information for the body to be used effectively within the environment (Mauer, 1999). Sensory integration theory is based on the premise that the integration of the sensory system is essential for the successful development of attention, organization, language, motor abilities and interpersonal relationships (Mauer, 1999).

There are seven basic sensory systems within the nervous system: tactile (touch), auditory (sound), visual (sight), gustatory (taste), olfactory (smell), vestibular (movement and balance sense), and proprioception (joint/muscle sense) (Dunn, Saiter, & Rinner, 2002). Sensory integration involves the processing of information and the organization of sensations, a primary function of the central nervous system for personal use (Ayres, 1983; Fisher & Murray, 1991). Processing refers to how the brain encodes, interprets, stores, and recalls incoming sensory information to formulate outgoing responses (Griffer, 1999).

#### *Premise and Assumptions of Sensory Integration Theory*

There are three underlying assumptions of sensory integration theory (Ayres, 1972b; Fisher & Murray, 1991). First, that the brain operates holistically with a hierarchical integration of information (Ayres, 1972b, 1979). Sensory integration theory's second assumption is that portions of the brain interact with other portions in order for individuals to function. The interdependent integrated levels of functioning reflect ascending control and specialization. The "lower level" within the brain filters and

refines sensory information and then relays the information to the cerebral cortex. The "higher level" analyzes details of the relayed sensory information and is responsible for abstraction, perception, reasoning, language, and learning. The third assumption is that there is an interdependent relationship among the sensory systems, in terms of both development and function. Furthermore, Ayres asserted that the brainstem and thalamus of the central nervous system are critical to sensory integration. Due to vestibular and somatosensory (tactile and proprioceptive) information being processed in the brainstem and thalamus respectively, sensory integration theory postulates that increased efficiency at the brainstem and thalamus enhance higher order functioning, such as complex learning and behavior (Ayres, 1972b).

#### *Characteristics of Sensory Integrative Dysfunction*

Sensory integration theory articulates how individuals perceive, recognize, and organize sensations from their bodies and their environments in order to accomplish self-directed, meaningful activities (Ayres, 1979). Typically sensory integration develops during ordinary childhood experiences. However, this is not the case with all individuals. It is premised that Sensory Integrative Dysfunction results from sensory input not being organized and integrated in the brain (Sensory Integration International, 1991). Sensory Integrative Dysfunction can lead to disorganization and maladaptive interactions within the environment. This can result in deviant or delayed development in the areas of learning, development, and behavior (Ayres, 1978; Ayres & Mailloux, 1981; Magrun, Ottenbacher, McCue, & Keefe, 1981; Sensory Integration International, 1991).

Four dependent and interactive systems are involved with Sensory Integrative Dysfunction (Mauer, 1999). The systems connected to Sensory Integrative Dysfunction, and their organization within the central nervous system, include the limbic, vestibular, tactile, and proprioceptive. Due to the complexity of the four systems, and the added impact of the individual's personality and environment, the symptoms that identify Sensory Integrative Dysfunction are not the same for all children and are discussed in terms of the system(s) involved (Mauer, 1999). The symptoms of Sensory Integrative Dysfunction are directly related to the system in which the sensory integration breakdown occurs and the demands of the environment (Mauer, 1999).

The first system is the limbic system (i.e., hippocampus, amygdala, hypothalamus). The limbic system translates the qualitative aspects of sensory stimuli, filters which sensory information deserve attention, and determines how to respond to that sensory input. If the limbic system fails to process the sensory information, the individual may ignore or over-register the auditory and visual inputs (Ayres, 1979). This can lead to the inability to remain alert and focused during an activity or task. Trott, Laurel, and Windeck (1993) found this to be true of language comprehension tasks involving intense amounts of auditory information that the nervous system must process. Tomcheck and Geis (1996) related the behavioral and language manifestations that are exhibited by children with autism to their inability to process and integrate sensory information. As a result, the child ignores or over-registers the auditory and visual inputs.

The vestibular system is the second system associated with Sensory Integrative Dysfunction. It is posited that the vestibular system organizes sensations (Ayres, 1978) and is responsible for directing muscular activity when communicating through body

language and nonverbal expression (Trott et al., 1993). A disorder in the vestibular system may create issues with personal space in terms of comprehending how close to stand to other people in a crowd (Mauer, 1999). Under-active vestibular systems are thought to result in delayed articulation, speech, and language acquisition of children with learning disabilities (Ayres, 1979). Children with autism often fail to modulate vestibular input (Ayres, 1979; Ayres & Tickle, 1980; Cook, 1990; Fisher, Murray, & Bundy, 1991; Zisserman, 1992). As a result, they may resist movement and/or be gravitationally insecure (Mauer, 1999). On the other extreme, they may exhibit excessive quantities of certain types of vestibular stimulation in the form of movement, such as extreme amounts of body whirling or jumping (Ayres & Tickle, 1980; Cook, 1990; Mauer, 1999). Over- or underresponsiveness to sensory stimuli can interfere with the activities and enjoyment of daily life. Disordered vestibular systems have also been determined to be the cause of difficulties with academic learning and language (Ayres, 1978; Ayres & Mailloux, 1981; Bailey, 1978; Magrun et al., 1981; Ray et al., 1988).

The third system connected with Sensory Integrative Dysfunction is the tactile system. Individuals with Sensory Integrative Dysfunction may have difficulty integrating tactile sensations and, as a result, be underreactive or overreactive to sensory stimulation (Baranek & Berkson, 1994; Fisher & Dunn, 1983; Royeen & Lane, 1991). A dysfunctional tactile system can lead to difficulties with learning fine motor skills (e.g., oral-motor skills, feeding, and writing) (Mauer, 1999). Individuals who process tactile information abnormally may have uncomfortable reactions to light tactile sensations. This is termed tactile defensiveness (Ayres, 1964, 1979; Cook, 1990; Dunn & Fisher, 1983). Individuals with tactile defensiveness may resist physical contact with other

people and/or objects (Mauer, 1999). To normalize this sensation, heavy touch-pressure is often used to elicit a positive response (Mauer, 1999). Symptoms of a dysfunction in the tactile system may include withdrawal from being touched, refusal to eat certain textures of foods, avoidance of particular types of clothing, and not using fingertips to manipulate objects (Mauer, 1999).

The proprioceptive system is the fourth system associated with Sensory Integrative Dysfunction. Symptoms of a proprioceptive dysfunction include clumsiness, lack of body position awareness in space, inability to easily manipulate small objects, and difficulty learning new motor activities. This system works properly when sensory information is relayed, organized, and interpreted efficiently and effectively (Mauer, 1999).

Roley and Wilbarger (1994) have theorized that a deficit in sensory perception resulting in the inefficient coordination of sensory input affects speech, language, interpersonal relationships, organization, and attention. Other potential characteristics of individuals with Sensory Integrative Dysfunction include difficulties with planning, organizing, sequencing thoughts, and initiating and completing tasks (Schwarzbeck, 1994).

#### *Assessment of Sensory Integrative Dysfunction*

Uniform standards of professional practice are promoted by the American Occupational Therapy Association (AOTA) and Sensory Integration International through established evaluation and training guidelines related to Sensory Integrative Dysfunction (Mauer, 1999). The AOTA recommends that licensed occupational or

physical therapists conduct multifaceted evaluations to assess characteristics of Sensory Integrative Dysfunction. An evaluation typically consists of medical and developmental histories, observations and interviews with family members and school/work personnel to determine if an individual's ability to organize and interpret sensory information is interfering with daily life, and an evaluation of sensory integrative functioning using standardized tests such as the Sensory Integration and Praxis Test (SIPT) (Ayres, 1989).

The Sensory Integration Praxis Test (SIPT) consists of 17 subtests in the areas of sensory processing, sensory modulation, visual-spatial perception, bilateral integration and sequencing, coordination, and motor planning (praxis) on verbal command. An analysis of the SIPT's standardized results reveals possible areas of sensory processing with which the child may be experiencing challenges. This test is utilized to identify specific areas of sensory processing deficits, however it does not produce specific treatment plans or recommended strategies to assist with remediation of the identified dysfunction.

### *Interventions Based on Sensory Integration Theory*

Ayres advocated for a multifaceted sensory integration treatment based on the needs of the individual (Mauer, 1999). The intended result of sensory integration therapy is the normalization of sensory processing and, thus, the enhancement and development of higher, dependent, cortical functions such as oral and written language (Mauer, 1999). According to Ayres (1979), the goal of sensory integration therapy is to improve "the way the brain processes and organizes sensations" (p. 184). The brain functions as an integrated whole, but is composed of systems that are hierarchically organized. To

function normally, it is essential for sensory integration therapy to provide sensory information that assists in organizing the vestibular, tactile, and proprioceptive systems to develop higher functioning abilities, such as attention, language, interaction, and motor abilities (Mauer, 1999). Sensory integration therapy is intended to provide individuals with Sensory Integrative Dysfunction with a foundation for complex learning and behavior as well as the ability to relate to others (Mauer, 1999).

Ayres hypothesized that it may be possible to remediate neural systems that impair an individual's function. Based on the premise that plasticity exists within the central nervous system, interventions for Sensory Integrative Dysfunction are grounded on the theoretical constructs of typical sensory integration processes and the patterns of Sensory Integrative Dysfunction (Griffer, 1999). In order to effect changes in the brain, therapy focuses on improving the efficiency with which the nervous system interprets and uses sensory information for functional use (Griffer, 1999).

Traditional sensory integration therapy incorporates "the use of enhanced, controlled sensory stimulation in the context of a meaningful, self-directed activity in order to elicit an adaptive behavior" (Ayres, 1979, p.140). Ayres (1972b, 1979) stated that although sensory integration involves all of the senses (auditory, visual, olfactory, gustatory, vestibular, tactile, and proprioceptive), sensory integration therapy was to be grounded in the stimulation of the less cortically processed vestibular, tactile, and proprioceptive systems accompanied with motor planning. This is theorized to enhance the functioning of the central nervous system (Fisher et al., 1991). Treatment options are based on the individual's characteristics of Sensory Integrative Dysfunction and appropriate levels of challenge (Koomar & Bundy, 1991).

Ayres (1979) stated that sensory integration is a continuous process, with each level of integration making the next level possible. The tactile, vestibular, and proprioceptive systems provide the foundation upon which certain skills, such as eye-hand coordination and auditory language, are formed (Mauer, 1999). In the next level, these three systems then interact with the visual and auditory systems in order to develop meaningful associations of what is experienced both in movement and in touch (Mauer, 1999).

A variety of interventions based on sensory integration theory can be used with children depending on their individual needs. Examples of interventions include: having a sensory diet that “consists of a carefully planned practical program of specific sensory activities that is scheduled according to each child’s individual needs” (DiMatties & Sammons, 2003, p. 3), use of the Wilbarger Protocol which is based on deep pressure touch followed by proprioception with joint compressions (Wilbarger & Wilbarger, 1991), and changes to daily routine (e.g., increased movement, listening to relaxing music) that can help children to self-regulate their attention levels (Fisher et al., 1991; Mauer, 1999; Williams & Shellenberger, 1994).

### *Role of Sensory Integration in Attention*

Interventions based on sensory integration theory promote optimal attention for tasks at hand by modulating sensory information in order for individuals to adjust to the environmental demands (DiMatties & Sammons, 2003). Cohn and Cermak (1998) identified the following six categories of outcomes for children with mild disabilities, or

at risk for mild disabilities, who received interventions based on the theory of sensory integration

(1) increased frequency or duration of adaptive responses; (2) development of increasingly complex adaptive responses; (3) increased self-confidence and self-esteem; (4) improvement in gross and fine motor skills; (5) improvement in daily living and personal-social skills; and (6) improvement in language and academic performance. (p. 542)

Sensory integration interventions can improve an individual's ability to attend to language and academic tasks and thereby improve language use and academic achievement (Parham & Mailloux, 1996). As a result, the implementation of sensory strategies in classrooms can improve the academic performance of students with mild disabilities (Kimball, 1999; Mulligan, 1996).

#### *Treatment Outcomes Supporting Use of Sensory Integration*

Although originally described as beneficial to children with learning disabilities (Ayres, 1972b; Clark et al., 1989; Price, 1977), sensory integration therapy has been found to have a positive impact on performance across ages and other diagnostic groups as well. These include attention-deficit hyperactivity disorders (Ayres, 1979), pervasive developmental disorders (Ayres, 1979; Fallon, Mauer, & Neukirch, 1994), mental retardation (Clark & Shuer, 1978; Price, 1977), neurological impairment (Fallon et al., 1994; Ottenbacher, 1982; Price, 1977; Roley & Wilbarger, 1994), and social/behavioral disorders (Ayres & Tickle, 1980; Ottenbacher et al., 1979). The American Occupational Therapy Association has supported the use of sensory integration

therapy with children who have been diagnosed with the conditions of learning disabilities, pervasive developmental disorder/autism, and chronic psychosocial dysfunction (Gorman, 1997; Hinojosa, Anderson, Goldstein, & Becker-Lewin, 1982).

Sensory integration treatments have been shown to produce beneficial results both during and after sensory integration interventions. Following sensory integration treatment, intervention studies have observed improvement in higher-level skills such as cognition, language, and academics (Ayres, 1972a, 1972b, 1978; Ayres & Mailloux, 1981; Magrun et al., 1981; Ottenbacher, 1982; Ray et al., 1988; White, 1979). Clinical reports have documented significant changes in behavior during and after therapy, including the improved ability to organize responses to the physical environment (Humphries, Wright, Snider, & McDougall, 1992), increased language and reading development (Ayres, 1972a, 1978; Ayres & Mailloux, 1981; Fallon et al., 1994; Grimwood & Rutherford, 1980; Magrun et al., 1981; Ray et al., 1988; White, 1979), improved social interactions and play (Fallon et al., 1994), and an increased ability to attend to the task or maintain emotional control when stressed (deQuiros, 1976; Rosenwinkel, Kleinert, & Robbins, 1980). These results support the empirical base of sensory integration.

### *Limitations and Contentions of Sensory Integration Theory and Constructs*

Research results of sensory integration interventions are both controversial and inconsistent. Many studies have been criticized for their small sample size, inconsistent definitions of the dependent and independent variables, and sensory integration treatment methods (Mauer, 1999). Schaffer (1984) asserted that Type 1 errors (i.e., leads the

researcher to reject the null hypothesis when in fact he/she should not) compromised the validity of Ayres' studies. Fisher and Murray (1991) state that sensory integration theory was designed for individuals with mild-to-moderate learning disabilities and behavior disorders that cannot be directly linked to central nervous system pathology. Despite the clear boundaries of sensory integration theory, Fisher and Murray (1991) concluded that many studies have exceeded these boundaries. Polatajko, Kaplan, & Wilson (1992) found "the review has failed to find any statistical evidence that SI treatment improves the academic performance of learning disabled children more than a placebo (the positive impact of attention or the therapeutic relationship)...the clinically expected effect of these therapies may be minimal" (p. 33). After examining the multiple regression analyses in Ayres' studies, Cummins (1991) concluded that there was no validity for either the sensory integration diagnostic label, the protocol for Sensory Integrative Dysfunction, or the hypothesis that sensory integration therapy is an effective approach for improving children's language function and/or learning disorders. In regards to the effectiveness of sensory integration therapy with individuals who have mental retardation, Arendt, MacLean, and Baumeister (1988) completed a qualitative review of eight studies and concluded that "there exists no convincing empirical or theoretical support for the continued use of sensory integration theory with that population outside of a research context" (p. 410).

#### *Need for More Research Based on Sensory Integration Theory*

It is apparent that inconsistencies in results and quality of experimental designs are evident in the literature as it relates to sensory integration. The varying results

obtained from studies conducted, based on sensory integration theory, reveal a need for more quality research to be conducted in this area.

Consensus regarding definitions, assessment interpretations, and intervention effectiveness for sensory integration techniques has not been well established in the literature or in clinical practice (Mauer, 1999). More research is needed to delineate treatment effects, compare the sensory integration methods with other interventions, and evaluate the relationship of the proposed theoretical constructs to improved individual functioning in meaningful areas (Mauer, 1999).

Further research is needed to identify which populations of individuals are most likely to benefit from sensory integration therapy (Mauer, 1999). According to Densem, Nuthall, Bushnell, and Horn (1989), research needs to shift its focus from "How effective was the program?" to "How does it work and for whom?". Sensory integration therapy is currently being used with a variety of clinical populations. However, most of Ayres' empirical research regarding its efficacy had been conducted with children who had learning disabilities (Griffer, 1999). Although further studies have incorporated other developmental disabilities (Lane, 1994), more research is needed with all populations of individuals with diverse ages and diagnoses. The results of this study will be used to expand the literature on sensory integration and to explore the usefulness of interventions based on the theory of sensory integration in application to students with mild disabilities.

#### *Role of Collaboration Between Professions*

Meeting the needs of individuals with mild disabilities who exhibit characteristics of sensory integrative dysfunction can be a multifaceted task. Since

different types of professionals view sensory integrative disorders from varying perspectives, a collaborative and integrated multiprofessional approach is needed (Kruger, Hugo, & Campbell, 2001). Therefore, occupational therapists, physical therapists, speech pathologists, teachers, parents, and the individual of concern may work together to address issues such as auditory processing, organization, communication, and educational needs of the individual. It is recommended that professionals use sensory interventions that are part of ongoing evaluations combined with an effective integrated approach (Mauer, 1999).

Due to the nature and complexity of Sensory Integrative Dysfunction, the evaluation and intervention processes are often conducted in an interdisciplinary manner (Mauer, 1999). Occupational therapists with advanced training in sensory integration can evaluate students for further sensory needs. Assessments used in this evaluation can include: assessing performance in daily life tasks within various settings (e.g., classroom, school, home), clinical and systematic observations of planned activities to view student's response to varied types of sensory input, caregiver questionnaires, standardized checklists (e.g., Sensory Profile by Dunn, 1999), caregiver interviews, and standardized tests (e.g., Sensory Integration and Praxis Test Battery (SIPT) by Ayres, 1989).

Collaborative relationships between professionals in special education and occupational therapy are necessary to determine children's behavior and sensory needs (DiMatties & Sammons, 2003). As a team, interventions based on sensory integration theory can be implemented to support the child's educational performance.

As a treatment approach, sensory integration has also been shown to be effective when utilized in combination with other multidisciplinary approaches (Ayres &

Mailloux, 1981; Kantner, Kantner, & Clark, 1982). Within an educational setting, school-based clinicians may choose to use a sensory integration approach in combination with other educational programs to address students' goals (DeGangi, Weitisbach, Goodin, & Scheiner, 1993; Dunn & DeGangi, 1992; Murray & Anzalone, 1991). Other options that occupational therapists may employ at the school setting include collaborating with teachers to discuss possible adaptations to the classroom environment and/or modification of instructional methodology and providing direct service to students through therapy sessions (Mauer, 1999).

### *Summary*

Currently there is a lack of consistent evidence demonstrating that sensory-based treatments have specific effects (Dawson & Watling, 2000). However, a lack of empirical data in and of itself does not determine that a treatment is ineffective, but merely that efficacy of the treatment has not yet been demonstrated (Rogers, 1998). This study responded to a need in the field of occupational therapy that called for well controlled, systematic studies of the effectiveness of sensory-based treatments (Lord & McGee, 2001). The need is to know if sensory-based interventions are effective, with whom, and under what conditions.

This study focused on an intervention based on the peripheral receptors of the somatosensory system, specifically on the modalities of the tactile and proprioceptive sensory systems located within the nervous system. The tactile system has sensory receptors that are located within the skin, with the hands being the area having the greatest density of sensory receptors (Myles, Cook, Miller, Rinner, & Robbins, 2000).

These sensory receptors are responsible for discriminative touch, which is the perception of pressure, vibration, and texture. The proprioceptive sensation relies on receptors located in the muscles and joints. By processing tactile and proprioceptive input in the thalamus, it is postulated in the theory of sensory integration that increased efficiency at the thalamus will lead to enhanced higher order functioning, such as complex learning and behavior (Ayres, 1972b).

The focus of hand fidgets was chosen due to the practicality of the intervention (i.e., inexpensive, small, seemingly minimally intrusive to class environments and academic lessons) and ease of use. Tactile stimulation in combination with proprioceptive input is one small component of the larger framework of sensory integration theory.

## Chapter Three - Method

A thorough review of the literature led to the development of the research questions that served as a foundation for this study. The research methods and procedures employed in this study were specifically designed and implemented to address the research questions. Therefore, the research questions have influenced the research paradigm, research procedures, measurement instruments, data collection processes, study validity and reliability components, and method of analysis.

### *Research Questions*

1. Does the use of hand fidgets increase the percentage of on-task behaviors of a middle school student with mild disabilities who exhibits off-task behaviors during typical academic content periods?
2. Do the teacher and students believe that the use of a hand fidget is an effective and socially valid approach for increasing on-task behaviors of middle school students during an academic content period?

### *Methods Probe*

The researcher conducted a methods probe (see Appendix A) to gather baseline data used to develop this study as well as to pilot the methodology, intervention, and measurement instruments. Institutional Review Board approval, from the University, was

not sought or required for this methods probe as it was conducted in partial fulfillment of the requirements for a doctoral course taken by the researcher as a doctoral student. The names of the participants and teacher associated with this study have been changed to protect the identities of all individuals involved.

Many extraneous variables were explored through the application of the methods probe and have been addressed in the design of this study. First, in case the assigned teacher was absent or left her current teaching position, administration buy-in was pursued in order to ensure that the study would continue. Second, a substitute instructional plan on how to continue the study in the absence of the teacher was developed by the assigned teacher and the researcher and in place throughout the study. Third, in the event that new students entered the class while the study was being conducted, a training system was in place whereby the teacher and students initiated new students into the study procedures. Considering these three components designed to minimize the influence of potential extraneous variables by incorporating them into the design of this study, the resulting internal validity of this study has been increased.

#### *Teacher-Research Partnership*

The researcher continued to work closely with the classroom teacher through all phases of this study as “building effective teacher-researcher partnerships to implement collaborative research can be mutually beneficial and result in more effective interventions for children with disabilities” (Agosta, Graetz, & Mastropieri, 2004, p. 276). Positive outcomes that derive from successful studies involving teachers as researchers include improvement in student performance and revision of educational

practices based on the new knowledge obtained (Langerstock, 2000; Torres, 2001; Welch & Chisholm, 1994). The teacher remained a critical member of the research partnership throughout the entire research process. The teacher who facilitated this study in her classroom was the same teacher who implemented the methods probe. Through input, observations, and reflective thoughts on the methods probe, the teacher was invaluable and greatly shaped the design of this study.

### *Population Characteristics*

The target population for this study was students with mild disabilities including attention-deficit hyperactivity disorders, learning disabilities, emotional/behavioral disabilities, and mild mental retardation. These disabilities are often associated with off-task behaviors such as inattention (Gunter, Venn, & Patrick, 2003; Maynard, Tyler, & Arnold, 1999; Montague and Rinaldi, 2001; Pearson, Yaffee, & Loveland, 1996). Due to the inherent inattention in children diagnosed with mild disabilities, these students often experience frequent academic failures (Bender, 1997). During the 1999-2000 school year, more than 4,000,000 students were served for mild disabilities (American Psychiatric Association, 2000; U.S. Department of Education, 2001).

### *Sampling Procedure*

In response to the literature and the characteristics of the population to which this study's result could potentially be generalized, systematic procedures were in place for determination of the sampling scheme and sample size. In order to address the

research questions in this study, areas taken into consideration at the onset of this investigation included the setting of the study, the study criteria related to participant selection, and the availability of participants meeting those criteria.

*Sampling scheme.* A convenience sample was used, based on voluntary participation, within an urban middle school located in a large school district in the southern region of the United States. This study was conducted entirely within the participants' middle school setting. The class selected was an academic content course, language arts class, with an inclusive student setting consisting of both typical students and students with exceptionalities. The classroom teacher held national board certification in the content area taught.

*Sample size.* This study employed a single subject design that focused on a sample size ranging from one to six students. The exact number of students participating in this study was determined based on the number of students who met the inclusion criteria. Participants with mild disabilities, within the convenience sample, were selected for participation in all phases of data collection based upon meeting the criteria of having an individual educational program (IEP) or Section 504 Plan and being nominated by the teacher for displaying atypical amounts of off-task behaviors during typical academic content periods. Students who met these criteria were selected to participate in all phases of data collection, up to a maximum of six students. If no students had met the study criteria, then a new class would have been selected for the study. If more than six students had met the criteria, then the six students who presented the lowest average of

on-task behaviors during the baseline (A<sub>1</sub>) phase of the study would have been selected. Therefore, a minimum of one student and a maximum of six students would become the focus of this study.

### *Sample Characteristics*

Detailed sample characteristics are provided to allow for replication of this study. Demographic data is presented for the school district, school, and class in which this study was conducted. Participant characteristics including the teacher and the class of students who were involved in this investigation are described.

*Setting.* The study was conducted in a large, urban school district within the southern region of the United States. At the time of the study, the district's enrollment exceeded 148,000 prekindergarten through adult public school students. Twenty-six percent of middle school students in this district had at least one exceptionality; with 9% being gifted and 17% having a disability.

This study was implemented at a middle school in an eighth grade, inclusive, academic content class (language arts). Language arts was a required eighth grade course in the state in which the study was conducted. Being that it was an inclusive class, both typical students and students with exceptionalities were in the class.

The middle school consisted of grades sixth through eighth, having a total student population of 1,400 youth. Per pupil expenditure was around \$3,700. This school received an "A" grade based on state determined criteria involving statewide assessment results (i.e., reading, mathematics, and writing), adequate yearly progress in the students

who present the lowest scores, and the percentage of students who participated in the standardized assessment. The racial demographic profile of student enrollment consisted of 87% Caucasian, 5% Hispanic, 3% mixed race, 3% black, and 2% Asian.

Approximately 13% of the student population at this middle school were from low income families as demonstrated by qualification for free or reduced-price lunch, which is a substantially lower percentage than the district's incidence of 39% of middle school students receiving free or reduced-price lunch. Approximately 35% of the students had at least one exceptionality; with 12% being gifted (which is 33% higher than the district-wide incidence of middle school students who have been designated as gifted) and 13% having a disability (which is 24% less than the district-wide incidence of middle school students with disabilities). Based at that middle school to support the needs of students with exceptionalities on that campus, were the following programs: varying exceptionalities, speech/language, autistic, and gifted services.

The class was taught by a nationally board certified, language arts teacher. The teacher was a 56 year-old, female, Caucasian individual. She earned a bachelor of science degree in education and was certified in the following areas: 6-12 English; K-12 Specific Learning Disabilities; and K-12 Emotionally Handicapped. The classroom teacher also held a Middle School Endorsement and is nationally board certified in English, Language Arts, and Early Adolescence. She had taught for 33 years, the past 17 of those years at the middle school where the study was conducted. Throughout her teaching career, she has taught at the elementary, middle, and high school grade levels in the subjects of reading (to students aged 6-16 in a state certified mental health facility), special education

(primary students with emotional handicaps at the middle school level), and language arts (to eighth grade students from 1993 until the time of this study).

The study was conducted during the fifth class period of the school day, from 2:13pm-3:07pm and occurred directly following the students' lunch period. The student's school hours were from 9:45a.m. - 4:05p.m. The academic content period, in which this study occurred, was approximately 50 minutes in length. The typical routine of the content period lessons generally consisted of the following: (a) homework collection, (b) review of homework and lesson content discussed the previous day, (c) presentation of new content information materials, (d) guided practice, (e) independent practice, and (f) assignment of homework.

*Participants.* All class participants were eighth grade students. In this particular general education language arts class, there were 29 students with 14 males and 15 females. The students' ages ranged from 13 to 14 years of age. Five of the students were recognized as having specific learning disabilities, as determined by the presence of an individual education plan (IEP) and one student was in the gifted program.

Standardized reading assessment results document that, at the beginning of the school year in which this study took place, one student had a stanine of eight in reading; eleven had a stanine of seven; seven had a stanine of six; three had a stanine of five; one had a stanine of four; and one had a stanine of three. The remaining five students did not have reading stanine data available. The previous school year's statewide standardized reading assessment further demonstrated that 18 students in this class made a gain in reading compared to their evaluation results from the same assessment administered to

them as sixth grade students. Five of the students did not make a gain in their reading scores between sixth and seventh grades. Comparison data was not available for the remaining six students.

### *Selection-Eligibility Criteria*

For this study, the teacher introduced the study and requested student and guardian informed assent and consent for both study participation and videotaping procedures. The informed consent/assent forms (see Appendix B) were written to reflect a student-centered and parent-centered tone and vocabulary. The informed consent/assent forms detailed all aspects of the study including the intervention to be used and the participants' rights, including confidentiality and the freedom to withdraw from the study at any time without question. All of the students in the class were asked to consider participating in this study and to return the informed consent and assent forms, signed by their guardians and themselves respectively, if they were willing to participate. In order for the students in the class to participate in the videotaped portions of the study, use the intervention items, and complete the measure of social validity, informed consent and assent for study participation and videotaping were required.

Students were eligible to be included in all data collection and analyses aspects of this study if they met the following criteria: (1) participant had an individual education plan (IEP) or Section 504 plan indicating the presence of a mild disability, (2) participant was an eighth grade student in an inclusive general education academic content class, and (3) participant was nominated by the teacher for participation in this study due to presentation of an atypical amount of off-task behaviors displayed by the student during

typical class periods. Students were excluded from this study if parent/caregiver consent and/or individual assent was not obtained.

### *Consent*

The school district, school site administrator, classroom teacher, participants, and all of the participants' guardians were required to provide consent or assent prior to the onset of data collection (i.e., videotaping). Informed consent and assent was required for study participation and for the use of videotaping. Informed consent and assent forms (Appendix B) followed the guidelines of the University's Institutional Review Board. Institutional Review Board (IRB) approval was obtained from both the university and the school district to ensure the safety and confidentiality of individuals and entities potentially impacted by this study including the school district, school, teacher, students, and students' families. At the onset of this study, only one male student in the class failed to provide informed consent for the study. Towards the end of the study, three female students were added to the class and did not have informed consent for being videotaped. These four students were seated out of view of the video camera and did not participate in any aspects of the data collection portion of the study.

### *Single Subject Design Participant*

Although five students in this inclusive class setting were identified as having mild disabilities, only one student met the study criteria of being nominated by the teacher for displaying atypical amounts of off-task behaviors during typical class sessions in this language arts, inclusive, academic content course. Therefore this student

participated in all aspects of the study process and was focused upon during all data collection procedures. This participant was described with sufficient detail for replicability of the study with individuals who possess similar characteristics. The student's results were analyzed using the single subject design method.

The primary study participant, a 14 year-old Caucasian male, was identified as having Attention Deficit Hyperactivity Disorder (ADHD) and specific learning disabilities (SLD), as documented on his individual education plan (IEP). He had been diagnosed with the hyperactivity-impulsivity subtype (American Psychiatric Association, 2000) of attention-deficit hyperactivity disorders. He had taken medication to control his ADHD symptoms since the age of five. Throughout the duration of the study, the student's dosage of Adderall remained constant and was to be taken at home once daily each morning, prior to going to school. The primary study participant had a reported intelligence quotient of 138, with report card grades being erratic and varying from report card period to report card period, both within and between school years; ranging from "F"s to "A"s. The language arts teacher reported the student to be a likeable child who is easily distracted. She indicated that his distractibility caused him to miss important information that was transmitted in class.

The primary study participant had received special education services since the age of three at which time "tendencies" and "characteristic traits" of both ADHD and SLD were present. Until first grade, he was in full-time, self-contained exceptional student education (ESE) classes. Since first grade he has been in general education classes full-time with ESE supports.

### *Research Paradigm*

Single subject, A-B-A-B (Kazdin, 1982) interrupted time series design was utilized to analyze the effects of the independent variable (use of hand fidget) on the dependent variable (on-task behaviors). The A-B-A-B design, which is structured to provide a brief withdrawal of intervention between treatment conditions, was used to incorporate an acceptable degree of control in this study. The student who met the selection criteria was monitored during all phases of the study. During phases one and three, neither the participant nor the other class members used the intervention (hand fidget). During phases two and four, everyone was allowed to use the intervention (hand fidget), including the participant and all other class members.

The duration of the entire study was 11 weeks. The length of each of the four phases (i.e., baseline A<sub>1</sub>, intervention B<sub>1</sub>, withdrawal A<sub>2</sub>, and reintroduced intervention B<sub>2</sub>) was at least two school weeks in length with the beginning dates of phases B<sub>1</sub>, A<sub>2</sub>, and B<sub>2</sub> being randomly chosen. Phase length was determined based on an analysis of the variability of the participant's on-task behaviors within the baseline phase of the methods probe. Randomization of phase beginnings controlled Type I errors and reduced potential bias that can occur during responsive phase changes. Key weeks were designated for phase change transitions to occur between phases A<sub>1</sub>, B<sub>1</sub>, A<sub>2</sub>, and B<sub>2</sub> (see Table 1). The particular day of the week to begin the phase was determined by the roll of a die where a 1 = a Monday phase beginning, 2 = Tuesday, 3 = Wednesday, 4 = Thursday, and 5 = Friday. Therefore, the A-B-A-B design had a range of  $n=10-19$  sessions in each phase with a study total of  $N=55$  sessions. Ten to 19 sessions per phase and 55 sessions overall were incorporated into the study design to ensure that there would be a sufficient amount

of time to reveal behavior trends. Todman and Dugard (2001) support this study length as they state that at least eight sessions are needed per phase with an overall of at least 36 sessions.

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*Table 1. Duration of Study Phases*

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Week	Phase
1	A <sub>1</sub> (Baseline)
2	A <sub>1</sub> (Baseline)
3	Transition week: Phase B <sub>1</sub> will begin at some point during this week
4	B <sub>1</sub> (Intervention)
5	B <sub>1</sub> (Intervention)
6	Transition week: Phase A <sub>2</sub> will begin at some point during this week
7	A <sub>2</sub> (Withdrawal)
8	A <sub>2</sub> (Withdrawal)
9	Transition week: Phase B <sub>2</sub> will begin at some point during this week
10	B <sub>2</sub> (Intervention Reintroduced)
11	B <sub>2</sub> (Intervention Reintroduced)

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Each session lasted approximately 50 minutes, the length of the academic content period. The teacher conducted her academic lessons every day as planned. During the first and third phases of the study, the teacher conducted her class as usual. Following the completion of the first phase of the study, an introductory session followed in which the teacher answered questions and developed guidelines, with input from the students, as

to the proper use of the hand fidgets. The teacher prepared for this introductory session prior to the implementation of the study in the classroom setting (see Appendix C). During the second (B<sub>1</sub>) and fourth (B<sub>2</sub>) phases of the study, the teacher distributed the hand fidgets to all students at the beginning of each class period and collected the intervention items at the end of the same 50 minute period, thereby allowing student use of hand fidgets during the entire class session. The students were not told the purpose of the study or which members of the class would be involved in all aspects (i.e., data collection) of the study.

Criteria were measured in alternating five-second intervals (i.e., five second observation proceeded by five seconds to record the observation) during the middle 40 minutes of the academic content period. Therefore, with 240 observations per session, there were 2,400- 4,560 observations per phase with a total of 13,200 observations for the study. Data were graphed and analyzed for differences and trends both between and within phases. Furthermore, the random assignment of phase times allowed for the use of randomization tests to determine significance of treatment effects (Edington, 1980).

### *Research Procedures*

To ensure the study was conducted in accordance with ethical standards and in a replicable manner, systematic research procedures were in place throughout all phases of this study. The ethical considerations of the data collection processes are documented. The procedures used for preparation of the data collectors are explicated.

*Ethical considerations for data collection.* Study procedures were approved by the Institutional Review Board (IRB) and met the requirements of the school district where the study was implemented. Informed consent was obtained for all participants. Students in the class who did not provide informed consent were seated out of view of the video camera and were not involved in the study. Confidentiality was maintained by using fictitious names with all reporting and by keeping all videotapes, papers, and technological data recordings related to the study in the researcher's locked filing cabinet.

*Preparation of data collectors.* The researcher conducted a methods probe to pilot the methodology, intervention, and measurement instruments. The classroom teacher, who was involved for both the methods probe and the study, participated in a teacher preparation session prior to study initiation. The reliability rater received training prior to the observation sessions of this study.

### *Research Instruments*

Measurement instruments were designed to address the specific research questions that formed the foundation of this study. To respond to the first question, regarding the use of hand fidgets relating to the percentage of on-task behaviors exhibited by the participant, data collection instruments such as the on-task checklist, procedural reliability checklist, and anecdotal logs were utilized. To evaluate the second research question, relating to the teacher and students' perceptions of the intervention, measures of social validity were employed.

*On-task checklist.* To determine the amount of time the participant was on task, an on-task checklist was utilized during all phases of the study (see Appendix D). The focus of the on-task checklist was determined by the results of the methods probe. Observations conducted in the methods probe allowed for the determination of “low inference” behaviors (i.e., if a certain behavior is observed, then the student is on task). Low inference behaviors (e.g., the student is seated in a seat) are easier to identify than high inference behaviors (e.g., student is not paying attention). Therefore less judgment is involved on behalf of the observers, which should increase rater consistency. This checklist, adapted from Christle and Schuster (2003), incorporated the following aspects:

- (a) on-task behavior measures (i.e., seated in seat, facing teacher or object directed to by the teacher, and not talking unless directed to by the teacher; each of these criteria must be met for a student to have been considered as displaying on-task behaviors);
- (b) task expectation (i.e., listening to lecture, writing, and/or reading); and
- (c) use of hand fidget (used during study phases B<sub>1</sub> and B<sub>2</sub>; it was documented when the participant was touching the hand fidget).

*Procedural reliability checklist.* As it is imperative for single subject design studies to be implemented with documented fidelity (Odom, 2004), a videotape analysis assessed the degree of treatment integrity throughout the study. The researcher checked procedural reliability during each observed session. Items observed for procedural reliability included: (a) appropriate use, or non-use, of hand fidgets (depending on study phase); (b) appropriate operation of video equipment; and (c) no talk of study purposes

(see Appendix E). Procedural reliability was determined by dividing the number of procedural reliability criteria observed by the number of procedural reliability criteria planned, and multiplying by 100. When procedural reliability is high, this suggests that a study's fidelity measures remained constant during the study (Billingsley, White, & Munson, 1980).

*Anecdotal logs.* Both the teacher and the researcher maintained separate anecdotal logs regarding study influences. The logs were recorded in date order on an as-needed basis, determined individually by the teacher and researcher. Examples of items that could have been included in the log were: (a) changes in the daily schedule (e.g., a fire drill); (b) atypical student influences (e.g., the child complained of a headache); and (c) the lesson structure significantly deviated from the typical routine. These logs (see Appendix F) were used to interpret the corresponding data.

*Measures of Social Validity.* Measures of social validity were used in this study since it is possible for an intervention to result in positive changes in the dependent variable(s) while simultaneously being regarded by research participants as being an unacceptable intervention (Schwartz & Baer, 1991). Furthermore, the extent to which general educators view an intervention as being acceptable, influences the modifications that they are willing to implement to accommodate the needs of students with, or at-risk for, mild disabilities (Whinnery, Fuchs, & Fuchs, 1991). Adapted from Keel et al. (1999), the criteria for acceptability included the: (a) perceived appropriateness of the intervention, (b) amount of time required of the teacher, (c) skill level required of the

teacher, and (d) perceived effectiveness of the intervention. The occupational therapy literature states that “it is critical to know whether or not these approaches (sensory-based interventions) facilitate progress as additional interventions or hinder it by taking away valuable instruction time” (Lord & McGee, 2001, p. 102).

Questions on the social validity instruments were adapted, based upon the cited literature, from Duda’s (2002) Social Validation Classroom Survey. The social validation instruments, both the *Teacher Input: Use of a Stress Ball* (see Appendix G) and *Student Input: Use of a Stress Ball* (see Appendix H) were utilized to evaluate the teacher and students’ perceptions of the intervention in terms of its effectiveness, appropriateness, ease of use, and value.

At the completion of the study, during class time, the teacher and all students completed social validity surveys. Each respondent anonymously completed the social validity measure that incorporated Likert-type responses. The social validity surveys were used to measure the social validity of the intervention from the perspectives of the students and the teacher in terms of the usability and preferability of the use of hand fidgets in this and other settings. The results of all of the social validity measures were analyzed to determine the appropriateness and effectiveness of this intervention.

### *Data Collection*

For the single subject design participant, data collection included systematic behavioral observations via videotaped sessions, a social validation survey, and an anecdotal log. In addition to the single subject design participant, all study participants in the class and the classroom teacher were asked to complete a social validation survey.

Procedural reliability was determined by the researcher as documented on, and further analyzed from, the procedural reliability checklist.

### *Systematic Behavioral Observations*

Systematic behavioral observation data were collected on the single subject design participant to provide frequencies of on-task and off-task behaviors. These data were collected via videotaped classroom observations. The digital tape video camera was set up in the front corner of the classroom with a wide angled lens that allowed a full view of all study participants. Two students were assigned, by the teacher, to turn on the camera at the beginning of each class session and to turn off the camera and change tapes at the conclusion of each class session. Data collected from the video taped observations were tabulated using an alternating five-second recording tool. Data were collected in conformance with the specified operational definitions and expressed in terms of the percentage of intervals in which the measured behavior, either on task or off task, occurred. Therefore the researcher was able to determine the consistency and frequency of on-task and off-task behaviors both within and between all study phases. Hence, the researcher could analyze the frequency and consistency within and between baseline and intervention phases.

Systematic observation techniques gather data on the basis of careful recording of on-going behavior versus through ratings or judgments (Blatchford et al., 2003). During all baseline/withdrawal ( $A_1/A_2$ ) and intervention ( $B_1/B_2$ ) phases, criteria were measured in alternating five-second intervals; with observation occurring for five seconds and then recording of observation occurring during the proceeding five-second interval.

The researcher's laptop computer was programmed with a tone sounding every five seconds, indicating the systematic data collection and data recording points. This resulted in 240 observations per session per participant. The observation period occurred during the middle 40 minutes of the class period as this allowed approximately five minutes at the beginning of the class period for class preparation and late lesson starts and five minutes at the end of the class period for concluding activities and early lesson completion. During reliability sessions, the researcher and reliability observer independently and simultaneously observed and scored the on-task behaviors of the participant. The inter-rater agreement was evaluated and analyzed.

#### *Administrators of the Instruments*

In an effort to minimize researcher influence, participants did not see the researcher at any point throughout the study. The teacher implemented all study and intervention phases. An anecdotal log was maintained by the teacher throughout the duration of the study. The measures of social validity, completed by the students at the conclusion of the study, were administered by the teacher.

The researcher and reliability observer assessed the videotaped observations with a checklist format (see Appendix D). In addition, the researcher maintained an anecdotal log throughout all observational sessions. Documentation of procedural reliability was the responsibility of the researcher. The measure of social validity, completed by the teacher at the conclusion of the study, was administered by the researcher.

### *Score Reliability*

To minimize the “experimenter effect”, which can affect scoring procedures, interobserver agreement was determined and reported. An outside observer, recruited and prepared by the researcher, randomly analyzed more than 20% of the videotaped data throughout the study. A detailed protocol (e.g., description of operational definitions, evaluation of sample videotaped session, and review of methods probe processes) was used to prepare the outside observer. A minimum standard of at least 80% of interobserver agreement was needed in order to assure that reliability was achieved (Kazdin, 1982). Interobserver agreement was calculated for each behavior, both on task and off task, and overall total session agreement based upon the operational definitions of the dependent variables, on-task and off-task behaviors. For purposes of this study, agreement was defined as both observers having documented the same conclusion, either on task or off task. The researcher used the point-by-point agreement method to calculate reliability data for on-task behavior, in which the number of observer agreements was divided by the number of agreements plus disagreements and multiplied by 100 (Kazdin, 1982). When a difference in scores between the two raters occurred, the results of the primary researcher (who observed 100% of the videotaped sessions) were used in the analytical processes of the study.

In order to ensure accuracy, the researcher attempted to remain as consistent as possible throughout all training sessions on data collection and regularly reviewed operational definitions with the outside rater in order to reduce observer drift. Using a reliability observer procedure adapted from Gunter et al. (2003), during reliability sessions the researcher and reliability observer were distanced from each other by at least

two feet with each having a clear view of a high definition, wide-screen television. The researcher and reliability observer recorded data on the dependent variable of on-task behaviors. Therefore, on-task data was taken independently and simultaneously. The primary observer trained the reliability observer on how to watch for and record the presence of on-task behaviors. The reliability observer practiced with the primary observer during two 30-minute sessions as preparation for the interpretation of observations for this study. The reliability observer was a 26 year-old, female, teacher of exceptional student education (ESE), with a Master of Arts (M.A.) degree in teaching and dual certification in both general education (grades K-6) and varying exceptionalities (grades K-12).

To promote treatment integrity, the teacher participated in a teacher preparation session conducted by the researcher. The teacher preparation session included: (1) rationale for study design, (2) guidance on how to present and conduct each study phase, (4) modeling, and 5) rehearsal with performance feedback provided. Further details of this preparation session can be found in Appendix C. This training session lasted approximately 20 minutes and was conducted in advance of study initiation.

### *Study Validity*

Components of this study were checked for validity by an expert in the field of occupational therapy. The expert was an Occupational Therapist Registered (OTR), had specialized training in sensory integration, held certification in NeuroDevelopmental Treatment (NDT), and earned a Master's degree in Occupational Therapy. Aspects of the

study that were validated by this expert included: the theoretical framework, operational definitions, and measurement instruments.

### *Delineation of Findings*

The percentage of on-task behaviors demonstrated by a student with mild disabilities, during lecture-only segments of an inclusive academic content period (language arts), was determined and analyzed. These data were extracted from the observational data collected with the task expectation of “listening to lecture” (i.e., lecture-only) held constant, while data taken from writing, reading, or combination patterns was disregarded. The choice to analyze lecture-only data resulted from an analysis of the methods probe, which revealed the range of on-task behaviors to be 14% to 29% from day-to-day of the baseline week (see Figure 1), with an overall average of 23% of time displaying on-task behaviors during lecture-only segments of the class during baseline. Lecture-only segments were more consistent, had less variability in the data, presented the lowest average of demonstrated on-task behaviors, and displayed a flatter baseline as compared to the percentage of on-task behaviors displayed overall regardless of task expectations, which had a daily range of 37% to 58% (see Figure 2) with an average of 45% for the baseline week. Excluding lecture-only, the results ranged from weekly baseline averages of 58% (writing) to 100% (a combination of listening and writing, with minimal observation points) (see Figure 3). Therefore, the methods probe participant consistently displayed the least amount of on-task behaviors during lecture-only scenarios. Hence, holding the task expectation of lecture-only constant had the

potential to demonstrate the most significant effects and to maximize the variation across phases, in the event that differences were found to exist.

Figure 1.

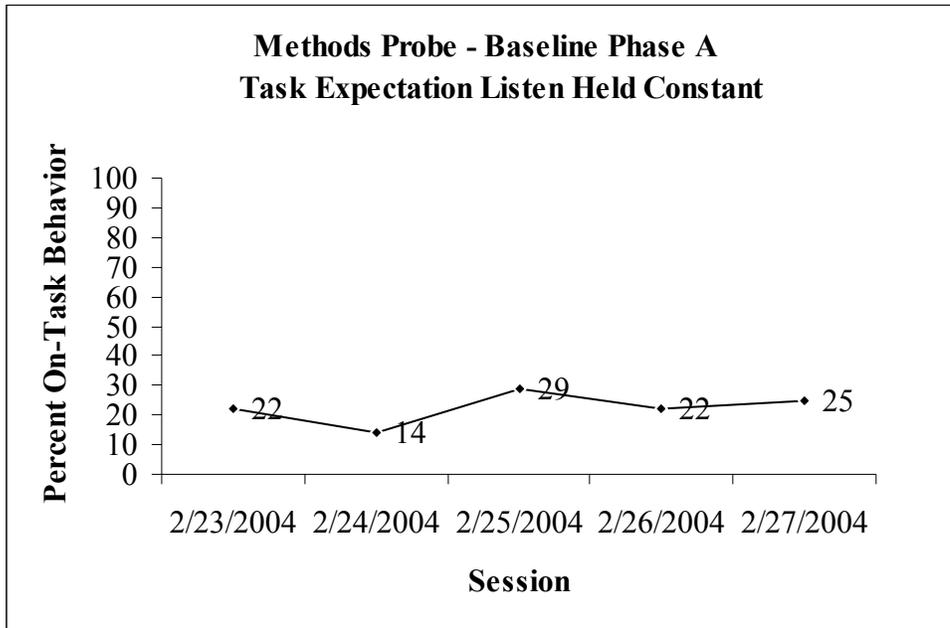


Figure 2.

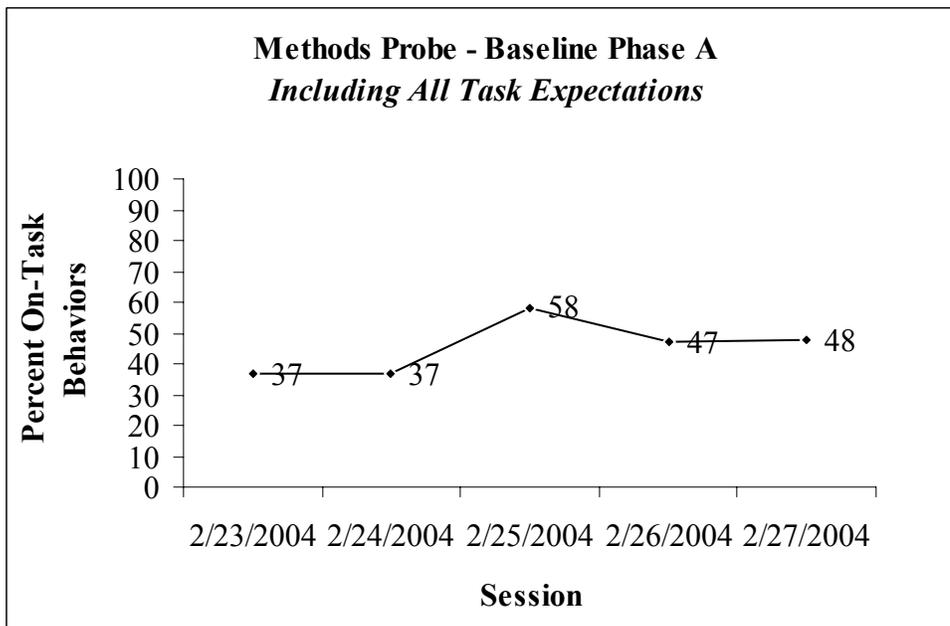
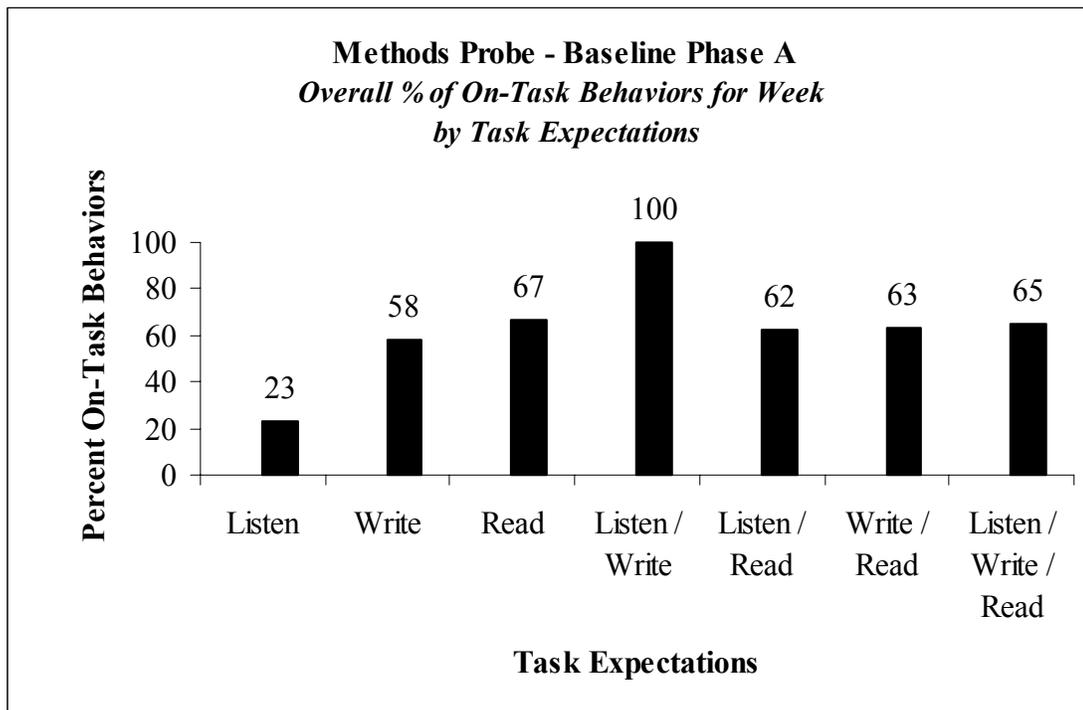


Figure 3.



### Data Analysis

A graph was created and visually analyzed for variability and trends within and between study phases, based on the observational data collected. The vertical axis included the percent of intervals the participant was on task. The horizontal axis documented the session number. A data table, providing specific information for each observed session, was also created and analyzed.

### Method of Analysis

Visual analysis of the graph, which included all observations in each phase, was utilized in order to determine trends both within and between study phases for the single subject design participant. Although it is often reported that less Type I errors are made in

visual analyses of data trends as compared to statistical analysis (Kazdin, 1982; Parsonson & Baer, 1986), conflicting study results have also shown the converse to be true (Matyas & Greenwood, 1990). Therefore, the use of randomization tests was also incorporated into this study design, which allowed for stronger predictions about trends, versus the reliance on solely visual analysis of the data.

A randomization test procedure (Edington, 1980) was used to determine the statistical significance between phase means as it pertained to the percentages of demonstrated on-task behaviors. The conventional significance level of  $\alpha=.05$  was used to determine the significance of all results. The null hypothesis for each randomization test was that there would be no differential effect of the phases for any measurement times (Onghena, 1992). The test statistic T was the average of the phase B means minus the average of the phase A means:  $T = (\text{Mean of } B_1 + \text{Mean of } B_2)/2 - (\text{Mean of } A_1 + \text{Mean of } A_2)/2$ . This provided T, the observed test statistic. If time on task was higher during the phase B intervention phases, a positive number should result. Statistical significance was then determined by comparing the obtained value of T to the distribution of values obtained by recalculating T for every possible assignment that could have been made. Since the phase start dates were randomly chosen from 5-day intervals, there were five possibilities of picking the first intervention time, five possibilities of picking the next phase shift, and five possibilities of picking the final phase shift. This provided a total of  $5*5*5$ , or 125, possible assignments. T was calculated for each of these 125 possibilities. The p-value was then computed as the proportion of this distribution that is equal to or exceeds the obtained value of T. If the proportion of test statistics was as extreme as T, with the probability value or p-value

being smaller than or equal to  $\alpha$ , then the null hypothesis would have been rejected (Onghena, 1992). Following the analytical procedures incorporated within this study design, the researcher evaluated the effectiveness of the intervention based on the theory of sensory integration.

## Chapter Four - Results

This study was designed to investigate the effects of hand fidgets on the percentage of on-task behaviors demonstrated by a student with mild disabilities, in lecture situations, who typically displayed off-task behaviors in an inclusive academic content class; specifically, language arts. Data were collected and analyzed based upon both the systematic behavioral observations and the measures of social validity.

### *Systematic Behavioral Observations*

Systematic behavioral observation data were documented on the on-task checklists, procedural reliability checklists, and anecdotal logs. The data were then analyzed and the corresponding results were reported.

*Procedural reliability.* Through a videotape analysis, the researcher assessed procedural reliability during each observed session. The degree of treatment integrity was documented for individual sessions throughout the study and analyzed for the overall study as well, since it is imperative for single subject design studies to be implemented with documented fidelity (Odom, 2004). Procedural reliability criteria included (a) appropriate use, or non-use, of hand fidgets (depending on study phase); (b) appropriate operation of video equipment; and (c) no talk of study purposes (see Appendix E). Procedural reliability was determined by dividing the number of procedural reliability

criteria observed by the number of procedural reliability criteria planned, and multiplying by 100. Procedural reliability was determined to be 97%, which suggests that the study's fidelity measures remained constant during the study (Billingsley, White, & Munson, 1980).

*Inter-rater agreement.* Inter-rater agreement was analyzed utilizing the following formula: Total Number of Agreements divided by the (Total Number of Agreements + Disagreements) multiplied by 100 (Kazdin, 1982). Overall inter-rater agreement was determined to be 98%. Table 2 indicates the sessions that were co-rated for reliability and reports the resulting percentage of inter-rater agreement per session. Due to the high degree of inter-rater agreement, the data obtained by the primary researcher, who analyzed 100% of the sessions, were used for the interpretation of study results when disagreements in observations did occur.

*Table 2. Co-rater reliability*

Session date	Number of agreements	Total number of agreements + disagreements	Percent of inter-rater agreement
10/20/04	73	76	96%
10/25/04	237	240	99%
11/02/04	238	240	99%
11/11/04	119	120	99%
11/16/04	145	150	97%
11/29/04	236	240	98%
12/9/04	49	50	98%
12/14/04	22	25	88%
1/4/05	236	240	98%
1/11/05	182	186	98%
1/19/05	196	202	97%

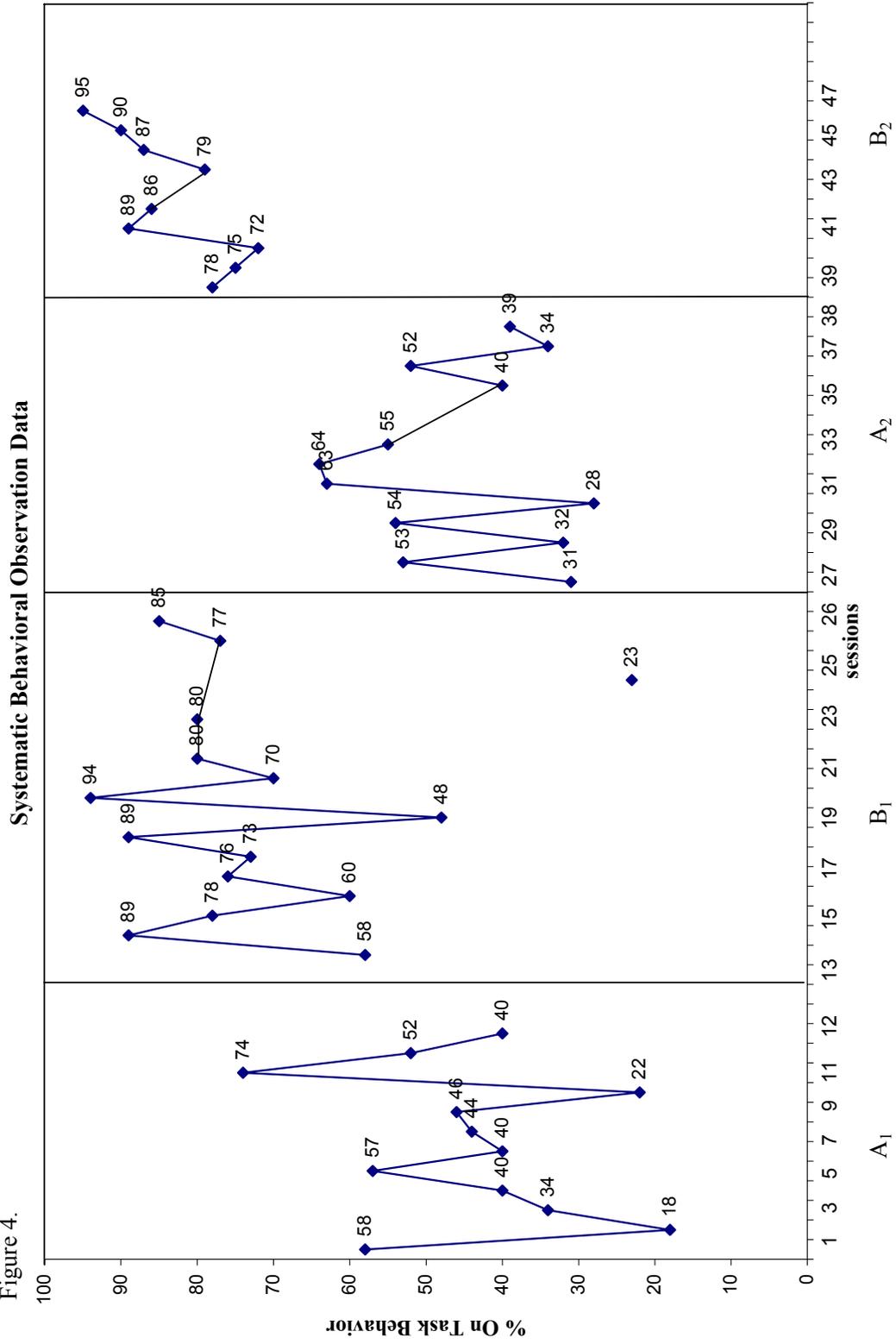
*Data analysis.* Fifty-five class period observations were initially included in the study's design, however an actual total of 52 class period observations were actualized due to one absence of the student who was the focus of all data collection aspects, and two days of which students were not allowed to attend school (i.e., a holiday and a district-wide in-service training day). Although less class period observations occurred than initially were planned, an overall count of 52 sessions in this study, with at least nine sessions per phase, ensured that this remained a robust study length. This is supported by

Todman and Dugard (2001) who state that at least eight sessions are needed per phase with an overall total of at least 36 sessions. With 240 observations recorded per class period, this resulted in a total possibility of 12,480 observations. Portioning out the “listening to lecture” task expectations equated to an actualization of 6,492 observations being analyzed and included in the results of this study.

Analysis of the data, both visual and statistical, were employed to evaluate changes of the dependent measures both within and between study phases. Changes in trend, variability, and level across study phases were assessed through visual analyses of the graphed data (Kazdin, 1982). Changes in direction and variability differentiation, both within and between study phases, were additional components of the visual analyses. The mean scores of the study phases provided data for an analysis of the variability in levels across study phases.

Graphical representation of the systematic behavioral observation data, reported in terms of the percentage of observed intervals of on-task behaviors, are presented in Figure 4. Sessions in which either the student was absent or no lecture occurred were left blank on the graph. However, the trend line was continued and connected the on-task behavior percentage points to allow for more efficient and effective analyses of the visual data.

Figure 4.



Visual analyses of trend suggests that the participant's rates of on-task behaviors remained within the 18%-74% range, having a mean of 43.75 and moderate variability occurring with a standard deviation of 15.49 in the baseline condition phase A<sub>1</sub>. The rates of on-task behaviors, in the first intervention phase B<sub>1</sub>, were sharply increased and remained in the 48%-94% range, with a majority of the observations being on or above the mean of 75.5 for the phase. Variability was significant in this phase as well, with a standard deviation of 12.97. Two issues are important to note for the data contained within phase B<sub>1</sub>. First, prior to study initiation the researcher determined that a possibility existed in which the participants may have reacted abnormally to the first-time use of a hand fidget. Therefore, it was initially planned that the data collected on the first day of phase B<sub>1</sub>, when the intervention was first introduced, would not be used in the determination of the phase mean or for purposes of statistical analysis. However, since the observed percentage of on-task behaviors was similar to other data points that occurred during that phase; and furthermore because the data on the first day of phase B<sub>1</sub> provided more conservative data for this intervention phase, the researcher made a conscious decision to incorporate that data into all study analyses. Second, during one session the participant was out of the classroom (on an errand for the teacher) during the distribution of the hand fidgets. He inadvertently did not receive a hand fidget upon his return to the room. Hence, the participant was not exposed to the intervention during that class period. This session is marked on the graph, however the trend line does not connect with that point on the graph as the participant was not exposed to the intervention during this "intervention phase".

The reversal phase A<sub>2</sub> presented significant variability of on-task behaviors as well, with a standard deviation of 12.84 and a range of 28%-64%, and having a phase mean of 45.42. The second intervention phase B<sub>2</sub> resulted in a sharply increasing trend with the rate of on-task behaviors being in the 72%-95% range, having a phase mean of 83.4. Variability and level data are presented in Table 3.

**Table 3. Changes in variability and level of on-task behaviors**

Condition	Range of scores	Mean score	Standard Deviation
Baseline Phase A <sub>1</sub>	(18%, 74%)	43.75	15.49
Intervention Phase B <sub>1</sub>	(48%, 94%)	75.50	12.97
Withdrawal Phase A <sub>2</sub>	(28%, 64%)	45.42	12.84
Intervention Phase B <sub>2</sub>	(72%, 95%)	83.40	7.73

The range of scores allows for comparisons to be made relative to differentiation in variability. The data presented in Table 3 indicate that the participant's rates of on-task behaviors varied to a moderate degree during the baseline phase A<sub>1</sub>, which represented the highest degree of variability within the study. Less variability was noted during both the first intervention phase B<sub>1</sub> and the withdrawal phase A<sub>2</sub>, however a significant degree of variability continued to exist. The least amount of variability was shown in the second intervention phase B<sub>2</sub>. However, it is important to note that this phase also had the fewest number of sessions. Phase B<sub>2</sub> consisted of nine sessions, while the remaining phases had

between 12 to 14 sessions. The average range of scores during both interventions phases was 35%, while scores ranged within 46% during baseline and withdrawal phases. Being a more stable indicator of variance than the range of scores, the standard deviation for each phase was analyzed in addition to the range means. Due to the inconsistent results obtained from an analysis of the within-phase variability, it is not possible to draw conclusions on the impact of the intervention on the variability of on-task behaviors displayed by the participant during this study.

Changes in level were analyzed and indicate that the mean rates of on-task behaviors were significantly higher, at least 25% higher, during the two intervention phases than during the baseline and withdrawal phases. Specifically, the mean percentage of intervals where on-task behaviors were scored during the baseline phase was 43.75, 75.5 during the first intervention phase, 45.42 during the withdrawal phase, and 83.4 during the second intervention phase.

The data were also analyzed for statistical significance utilizing a randomization test program written in SAS/IML code (SAS, 2004). The randomization test programming code (see Appendix I) was validated by using a random test algorithm employing a fictitious data set where the p-value was already known. The test statistic, resulting from the study's data, indicates that the on-task behaviors observed while the participant was presented with the opportunity to use the hand fidget intervention were 34.88% higher than the participant's documented percentage of on-task behaviors without having access to the intervention. With the obtained p-value of .025 being less than the preset alpha level of .05, an analysis of the randomization test program results

concluded that the study results were shown to be statistically significant and the null hypothesis was rejected.

In summary, both the visual analysis and statistical data obtained across study phases indicate that the participant's rate of on-task behaviors significantly increased during the intervention phases. This data suggests the presence of a legitimate treatment effect, thereby supporting the efficacy of the use of hand fidgets by this student who presented off-task behaviors during situations in which listening to lectures was the primary task expectation. Interventions based on the theory of sensory integration have been found to promote optimal attention for tasks at hand by modulating sensory information in order for individuals to adjust to environmental demands (DiMatties & Sammons, 2003). The results of this preliminary study of an intervention not previously investigated, when corroborated with future studies, suggests the potential for these results to be generalized beyond the participant involved in this investigation.

### *Social Validation*

Two social validation measures (Appendices H and I) were utilized to evaluate the methods and outcomes of this study. One measure was administered to the classroom teacher, while the other measure was administered to each student in the class. Both social validation measures assessed the respondent's perceptions of the intervention's effectiveness and appropriateness.

*Social validation for classroom teacher.* The social validation survey provided to the classroom teacher (see Appendix G) was composed of eight statements and used a

four-point Likert-type scale with a score of “1” indicating strong disagreement with the statement and a score of “4” indicating strong agreement with the item. The teacher’s responses indicated that the intervention was effective, simple to implement, and developmentally appropriate (see Table 4).

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*Table 4. Social validation for classroom teacher*

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Statement	Response
1. Using the stress ball helped the student(s) with mild disabilities to participate more in class.	3
2. Using the stress ball decreased off-task behavior(s) of the students with mild disabilities.	3
3. The stress ball is a developmentally appropriate intervention for middle school students.	3
4. The stress balls were easy to use class-wide.	3
5. I would allow another student with a mild disability to use a stress ball, if the child presented off-task behaviors.	3
6. I would recommend that other teachers allow their students with mild disabilities, who present off-task behaviors, to use stress balls.	3
7. Use of the stress balls did not require too much of the teacher's time.	3
8. I believe that general education teachers have the skill level required to use stress balls appropriately in their classes.	3

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Note: Questions 1-8 were rated on a 4 point scale with 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree

*Social validation for students.* The social validation survey provided to each student in the class (see Appendix H) was composed of five statements and used a 4-point Likert-type scale with a score of “1” indicating strong disagreement with the statement and a score of “4” indicating strong agreement with the item. Survey responses were returned by 28 students. The students’ responses indicated that the intervention was an effective, comfortable to use, developmentally appropriate intervention (see Table 5).

**Table 5. Social validation for students**

Statement	Total number of responses			
	4	3	2	1
1. Using the stress ball helped me to participate more in class.	7	14	6	1
2. I enjoyed using the stress ball.	18	8	2	0
3. The stress ball was comfortable to use.	17	11	0	0
4. I would like to continue to use a stress ball in this class.	13	10	5	0
5. I would use a stress ball in another class, if I were allowed.	11	8	9	0

Note: Questions 1-5 were rated on a 4 point scale with 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree

Further analysis of this data, conducted by collapsing the “agree” and “strongly agree” divisions into one category, revealed that 75% of the students perceived that using the stress ball increased their class participation, 93% enjoyed using the intervention, 100% felt the stress balls were comfortable to use, 82% wished to continue using the intervention during that class, and 68% would use the intervention in another class if they were allowed.

Interesting to note, although the measure of social validation for students was administered in a manner that allowed for respondent anonymity, the participant involved in all aspects of this study put his name on the survey. Therefore, although unplanned, his results can be reported here. The participant’s scores for each of the five questions on the survey were “4” – strongly agree. Therefore the participant concurred with the class’ results that the intervention was an effective, comfortable to use, developmentally appropriate intervention.

### *Summary*

In summary, two major findings emerged from the analysis of data. First, an interpretation of the visual and statistical data revealed that the participant’s on-task behaviors were significantly increased, by approximately 34.88%, when presented with the opportunity to use a hand fidget. These results were found to be statistically significant and the null hypothesis was rejected. Findings from this study and previous studies indicate the potential for interventions based on the theory of sensory integration to improve on-task behaviors (DiMatties & Sammons, 2003; Parham & Mailloux, 1996).

Second, the results of the social validity measures, which were administered to the classroom teacher and students, indicate that the hand fidget intervention used in this study may be an effective, appropriate, and valid approach for increasing on-task behaviors. Both the teacher's and students' responses on their respective social validation measures suggested that the intervention may lead to beneficial outcomes for students (i.e., increased class participation and on-task behaviors). These preliminary data suggest potential benefits for the use of this intervention in educational settings.

## Chapter Five - Discussion

The purpose of this study was to investigate the effects of hand fidgets on the percentage of on-task behaviors demonstrated by a student with mild disabilities whose disabilities have characteristics of off-task behaviors when participating in academic content classes. The results of this preliminary study indicate the potential for the use of a hand fidget intervention as an effective and socially valid approach to increase the percentage of on-task behaviors in middle school students with mild disabilities who typically present off-task behaviors in an inclusive academic environment.

### *Results Associated with Research Questions*

Further discussion of the study results and outcomes are presented along with the research question to which they are associated.

*Research question #1.* Does the use of hand fidgets increase the percentage of on-task behaviors of a middle school student with mild disabilities who exhibits off-task behaviors during typical academic content periods? This question addressed the extent to which the intervention contributed to increases in the participant's on-task behaviors. The results obtained from the systematic behavioral observations, through visual analyses of the data graphs and documented statistical significance of the study findings, indicate that the participant's percentage of on-task behaviors increased by approximately 34.88%

during the study's intervention phases. Being that time on task has been shown to have a significant casual relationship to educational achievement (Keel et al., 1999; Mayes et al., 2000; Zera & Lucian, 2001), this is a promising finding.

These findings do not guarantee that the hand fidget intervention alone was responsible for facilitating the increased percentage of on-task behaviors noted in the student's observational data. Alternative reasons for the increase in on-task behaviors could include the pattern of the school year calendar with frequent interruptions of days and weeks without school due to Thanksgiving, winter holidays, and Martin Luther King Day all occurring throughout the duration of this study. The presence of substitute teachers and varying task expectations could have also played a role in the study's findings.

With only one participant involved in all aspects of the single subject, A-B-A-B design, generalization of results to the population of students with mild disabilities who present off-task behaviors must be made conservatively. The results of this investigation are preliminary in nature. Until these results are replicated in future studies involving other researchers and varying populations, explanations of the hand fidget intervention yielding results of increased percentages of on-task behaviors remain speculative.

*Research question #2.* Do the teacher and students believe that the use of a hand fidget is an effective and socially valid approach for increasing on-task behaviors of middle school students during an academic content period? The purpose of the second research question was to determine the extent to which the classroom teacher and students perceived the hand fidget intervention to be an effective and valid approach to

increasing on-task behaviors. The majority of responses obtained on the measures of social validation, administered to the classroom teacher and each student in the class, reflected that the use of hand fidgets was both an effective and valid intervention for increasing on-task behaviors in an inclusive academic environment.

The social validity of the intervention was assessed through two social validation instruments. The survey measure, *Teacher Input: Use of a Stress Ball*, was administered to the classroom teacher. The social validation instrument, *Student Input: Use of a Stress Ball*, was administered to each student in the class. The survey items prompted the respondents to evaluate the intervention based on the effectiveness (in regards to class participation and levels of student engagement), developmental appropriateness, preferability, and ease of use of the intervention. Caution is noted that an alternative explanation for the results of the teacher's social validation measure could be the bias of the assessment process in that this survey could not be replied to anonymously since only one teacher was involved in the study. However, the researcher and classroom teacher have had frequent discussions throughout the methods probe and study process and the teacher has remained supportive of the hand fidget intervention. Based on the results of the social validation measures, the classroom teacher and students indicated that the hand fidget intervention may be a developmentally appropriate technique that is effective in increasing students' individual participation in the class.

### *Delimitations*

Findings of this study cannot be generalized to all students with mild disabilities. Due to the minimal number of studies in the sensory integration literature,

relevant to the nature of this single subject design study, the results obtained only pertain to the individual involved in this study at the point and time that the study was conducted. Further research needs to occur, with more participants from diverse backgrounds and conducted by varying researchers, in order to generalize the results to the general population being studied.

### *Limitations*

Despite the positive contributions of this study, there are limitations that need to be addressed. These limitations need to be taken into consideration and caution must be employed not to conclude undeniably that the hand fidget intervention was the only variable that was responsible for the documented changes in the participant's display of on-task behaviors.

The first limitation concerns the number of study participants. With only one single subject design participant, generalization to the larger population of students with mild disabilities who present off-task behaviors must be made with caution. However, the high number of observations analyzed for this study lends credibility to the study results obtained for this single participant.

Limitations to external validity exist within this study's results. Although the significant results of this participant reflect a degree of external validity, generalization of this study's results to students other than the study participant, regardless of age, culture, gender, socioeconomic status, or diagnosis should be made cautiously. Furthermore, generalization is limited for the study participant as well. The A-B-A-B research design has an internal degree of experimental control. However, statements regarding the on-

task behaviors of the study participant in settings beyond the classroom in which this investigation was conducted are not possible.

Internal validity may have been jeopardized with the measure of social validity administered to the teacher. Since only one teacher was involved in the study there was no way to anonymously complete the survey. This may have impacted the teacher's responses on the instrument. Conversations between the researcher and the teacher appear to confirm the results of that measurement tool in that the teacher has always remained positive about the intervention and its perceived effects on the students. However, the teacher-researcher partnership that existed may have biased these interactions as well.

Consistency is another limitation to this study. First, although more than 20 percent of the total videotaped sessions were monitored for inter-rater reliability and determined to have high inter-rater consistency, a minimal degree of error exists in the coefficients. Second, inconsistencies of the study occurred by the intervention agents (i.e., classroom teacher). Variability in classroom staff occurred throughout the study as there were four sessions that were led by a substitute teacher. Having a substitute teacher (of the opposite gender of the classroom teacher) and being out of the normal class routine may have had an impact on the participant's on-task behaviors during those sessions. Third, inconsistencies in routine occurred as a direct result of the evolution of the calendar year and its coinciding school year schedule occurring concurrently with the study phases. During the course of this study, the students had one full week without school during Thanksgiving week, a day off of school for a district-wide teacher in-service training day, two full weeks off of school encompassing Christmas and New Year's, and a day off of school for the Martin Luther King holiday. The analyses did not

account for variations in the school schedule within and between the study phases. Other changes in routine noted during the study include one day when the student was absent from class due to serving in-school suspension; seven sessions in which the student was out of the classroom for a portion of the class period (absence from classroom ranging from one minute to 28 minutes) for various reasons (e.g., getting homework from locker, errands for classroom teacher); one school-wide lock down drill (lasting five minutes); and one school-wide fire drill (lasting eight minutes). On-task behaviors may have been impacted as a result of the changes to the participant's normal routine. Inconsistency was also noted by the varying amounts of classroom activities that required "listening to lecture" as the primary task expectation. Daily rates of tasks that required "listening to lecture" as the primary task expectation ranged from two days where no lecture was presented (one was a test day and the other was an all-session writing activity) to sessions where 100% of the session was lecture-based. Although the researcher segmented out the data that specifically targeted "listening to lecture" for the analyses portion of this study, the analyses did not account for variations in amount of lectures given either within or between phases.

Procedural fidelity was analyzed for this study and the results revealed a high degree of procedural fidelity throughout the study. However, some discrepancies were found to exist. First, there were minimal times when the participant was blocked by view on the video camera. This occurred in approximately 0.002% of the sessions where listening to lecture was the primary task expectation. Second, there were two sessions in which the video camera was turned off early. In one session less than three minutes of data was unobtainable and in the other session one minute of data remained unavailable.

Third, there was one inconsistency relating to the implementation of the study procedures. The participant was out of the classroom while the hand fidgets were being distributed and did not receive the intervention item when he returned to the room. Since he did not have the intervention during the “intervention phase” this data was noted on the visual graph, but was not connected to the trend lines and was not used for statistical computation of phase means and significance.

Despite the inherent limitations in this study, a significant degree of internal validity does exist within this study. The use of within-subject comparisons in this A-B-A-B single subject design controls for threats to internal validity (Martella, Nelson, & Marchand-Martella, 1999).

#### *Threats to External Validity*

External validity, when using single subject designs, is established empirically across studies through replication of the study (Horner, Carr, Halle, McGee, Odom, & Wolery, 2004) with differing participants and in varied settings (Todman & Dugard, 2001). Inclusion of the precise details and explanations of this study’s procedures, operational definitions, and measurement instruments increased the external validity since it allowed for accurate replicability. This replicability may then lead to future generalizability of the study results.

A number of potential limitations that could possibly have threatened the external validity and generalizability of study results were addressed in the design of this study. First, due to the very small study population planned for in the design of this investigation (n=1-6), a large number of observations per treatment phase had been

incorporated into the study to increase the external validity of the study. Therefore, some degree of external validity was demonstrated. Second, these results are preliminary and future replicated research is needed before generalizations can be made to other children regardless of age, culture, gender, socioeconomic status, or diagnosis. In addition, despite the A-B-A-B design having afforded a degree of experimental control, generalizations of the study participant in settings beyond those in which this investigation was conducted are not possible. Third, the participants were volunteers and were not chosen as a randomized sample. This posed a threat to external validity since volunteers often represent a biased sample of the target population (Gall, Gall, & Borg, 2002). Fourth, the teacher who participated in this study was a nationally board certified educator and therefore the results of this study may not be generalizable to teachers with less experience or qualifications. Fifth, this study focused on an intervention for listening to lecture-only task expectations and therefore is not generalizable to other task expectations such as writing and reading. Sixth, the participants were presented with daily choices of various solid colored, multicolored, and patterned hand fidgets. Therefore the results will not be generalizable to students who are presented with hand fidgets without a choice of color(s) and/or patterns.

The structure and explicit details of this study's research design, such as clear operational definitions, scripts of training protocols, and the inclusion of all research instruments allows for future systematic replicability of this study. Systematic replication enhances the external validity of this study's results (Martella et al., 1999).

### *Implications for Future Research and Practice*

The results of this study will enhance the literature involving the use of specific interventions, based on the theory of sensory integration, within inclusive middle school academic settings. Study results indicate the potential for hand fidgets to be used as an effective and appropriate intervention for students with mild disabilities who present off-task behaviors. Specifically, this study revealed that the hand fidget intervention increased the on-task behaviors of the study participant. Future research and replication of this study are needed to further generalize this study's results. Also important to note is that the previous research in the area of sensory integration had been primarily based in clinical settings, however the results of this study suggest potential benefits of its use within educational settings.

Prior to this study, no other studies had systematically examined the use of hand fidgets as an intervention to increase on-task behaviors in children with mild disabilities who typically present off-task behaviors in inclusive academic content courses. Although the results of this study extend the literature on the potential for beneficial effects of this intervention, a need continues to exist for more research in the area of sensory strategies being applied to educational contexts. Replication of this study is warranted and could be enhanced with the addition of a qualitative component. Interviews of the students and their teachers, occupational therapists (if applicable), and parents could provide more insights into the connection between sensory strategies and on-task behaviors. It would also be beneficial to know if consistent results would be obtained from differing populations and/or settings. Therefore future research should focus on differing populations (e.g., students with varying disabilities, nondisabled students, both genders of

students, students from different cultural groups and ethnicities) and differing settings (e.g., varied content classes, nonacademic classes, other schools, varying grade levels). Future studies should also address the effects of the intervention on the participants over longer periods of time and in multiple settings. This study evaluated the effects of the hand fidget intervention in an inclusive middle school classroom with an academic focus of language arts during lecture situations. Therefore potential benefits exist for future research to concentrate on the effects of the hand fidget intervention longitudinally over multiple settings (e.g., social studies, science, art, music) and/or routines (e.g., reading and writing activities).

This was a preliminary study, which investigated the effects of a hand fidget intervention on the on-task behaviors of a middle school student with mild disabilities. The intervention was derived from the theory of sensory integration. The results of this preliminary study indicate the potential for this hand fidget intervention to be a socially valid, highly effective approach in increasing the on-task behaviors of middle school students with mild disabilities who present off-task behaviors during lecture scenarios. More research is needed to focus upon middle school students with mild disabilities in a variety of class environments, however the promising results of this study may influence future educators and students to attempt the use of a hand fidget as an acceptable intervention for increasing on-task behaviors during lecture situations in inclusive academic classes. The results of this study expand the literature on sensory integration and concur with other investigations that have found interventions based on the theory of sensory integration to increase on-task behaviors of students with mild disabilities (Ayres

& Tickle, 1980; Clark et al., 1989; Parham & Mailloux, 1996; Ray, King, & Grandin, 1988).

### *Conclusions*

Hand fidgets were distributed to all study participants in an inclusive language arts middle school classroom. A single participant met the eligibility criteria for all aspects of the data collection components of the study. Visual and statistical analyses of the data indicated that the participant's percentage of on-task behaviors significantly increased during both intervention phases. The documented results indicate that the participant's on-task behavior level with the intervention increased 34.88% compared to the on-task behavior level without the hand fidget intervention. Measures of social validity and anecdotal records revealed that both the classroom teacher and students perceived the hand fidgets to be an effective and socially valid intervention. Despite the need for future research, this preliminary study suggests there are potential benefits of using hand fidgets as a valid approach for increasing on-task behaviors in middle school students with mild disabilities who present off-task behaviors in lecture situations. The findings of this study suggest that the use of hand fidgets has promising implications for increasing on-task behaviors of students with mild disabilities in inclusive academic settings.

An additional strength of the hand fidget intervention, to teachers and students who may benefit from this approach, is the degree of internal control the intervention affords to the students. It is the student who decides if and when to use this intervention. This is important since students with mild disabilities need to be directed away from

reliance on teacher-directed interventions and guided towards interventions that are student-directed which allow them to become responsible for managing their own behavior and learning (Keel, Dangel, & Owens, 1999). If the results of future research studies concur that this intervention is effective for increasing on-task behaviors, the next step would be to teach the students how to use hand fidgets as a component of self-regulation of academic behaviors. Self-regulation, the ability to monitor and regulate one's own behavior and academic performance (Graham, Harris, & Reid, 1993) promotes independent academic and behavioral improvements within inclusive settings. The use of self-regulation strategies can increase task engagement, facilitate learning, and decrease off-task behaviors (Garner, 1992). Therefore, even though the theory of sensory integration remains controversial, this study clearly shows the need for further research related to the potential benefits of sensory interventions.

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## Appendices

## Appendix A: Methods Probe

A methods probe was conducted by the researcher prior to the design of this study. The timeline for the methods probe was detailed in Figure A1.

*Figure A1. Time Line for Methods Probe Data Collection*

<b>Date</b>	<b>Activity</b>
2/16/04	Consent forms were distributed. Video camera was present in classroom and, as soon as all consent forms were received, was operating in the room in order to predispose the students to the presence of the video camera.
2/23/04	One week of baseline data collection began (phase A <sub>1</sub> ).
3/01/04	Students were exposed to the intervention (allowed to use hand fidgets) for one week with no data collection in order to predispose students to the intervention.
3/08/04	One week of intervention data collection began (phase B <sub>1</sub> ).
3/15/04	One week of non-intervention (withdrawal/reversal phase) data collection began (phase A <sub>2</sub> ).
4/05/04	One week of re-introduced intervention data collection began (phase B <sub>2</sub> ).

## Appendix A (Continued)

### *Selection-Eligibility Criteria*

The teacher and class were selected based on convenience sampling in which the teacher and the students volunteered to participate in this study. The teacher introduced the study and provided a letter describing the study. The letter detailed aspects of the study, such as the intervention to be used and the participants' rights, including confidentiality and the freedom to withdraw from the study at any time without question. All students in the class were asked to consider participating in this study and to return the informed consent forms, signed by themselves and their guardians, if they were willing to participate.

### *Consent*

The school site administrator, classroom teacher, students, and all of the students' guardians were required to provide consent prior to the commencement of this study as a means of ensuring both permission and a degree of commitment to the completion of the study. Informed consents were required for both study participation and the use of videotaping. Signed informed consent forms were received for each student in the class, providing consent for full participation by the entire class.

### *Sampling Scheme*

This study was conducted entirely within the participants' middle school setting. A convenience sample was used, based on voluntary participation, within an

## Appendix A (Continued)

urban middle school located in a large school district within the southern region of the United States. The class selected was an academic content course, language arts, taught within an inclusive student setting consisting of both typical students and students with exceptionalities. The classroom teacher, Ms. Wundervoll, was a master teacher with national board certification in the content area taught, language arts.

### *Sample Size*

The methods probe employed a single subject design that focused on one student.

### *Sampling Characteristics*

Participant selection, within the class chosen by convenience sample, was based upon teacher referral of who she considered to be the most frequently off-task student in that class.

### *Participant Characteristics*

The participant, Schmi, was an eighth grade student in a third period language arts class at a middle school located in a large, urban school district within the southern region of the United States. Since sixth grade, Schmi's teacher remarked that he was often off task. Although his teachers stated that Schmi did try to control himself, according to Ms. Wundervoll, he did not appear to be successful at doing so. Schmi has been described, by his teacher Ms. Wundervoll, as being "a naturally loving-type person"

## Appendix A (Continued)

but went on to say that “sitting in a seat all day wore on his patience”. Schmi has also been described as being disorganized, often lacking school supplies, and not completing any of his homework. Classroom interventions, such as changing his seat assignment to the rear of the classroom so that he could see everything without disturbing others by turning around, had been tried and were unsuccessful in increasing his on-task behaviors.

This methods probe was conducted during the 2003-2004 school year. The following data were obtained regarding the same middle school during the 2002-2003 school year: a. the middle school was composed of 1,472 students; b. the school received an “A” letter grade (the highest possible grade) through the state’s public school grading system; c. 13.4 percent of the students received free or reduced-price lunch; and d. 13.1 percent of the students had a disability.

The language arts teacher, Ms. Wundervoll, was 56 years old, Caucasian, and middle class. Ms. Wundervoll earned a bachelor of science degree in education and was certified in the following areas: 6-12 English; K-12 Specific Learning Disabilities; K-12 Emotionally Handicapped. She also has a Middle School Endorsement and is nationally board certified in English, Language Arts, and Early Adolescence. Ms. Wundervoll has been teaching for 33 years, the past 17 of those years at the middle school where the methods probe was conducted. Throughout her teaching career, Ms. Wundervoll has taught at the elementary, middle, and high school grade levels in the subjects of reading (to students aged 6-16 in a state certified mental health facility), special education (primary students with emotional handicaps at the middle school level), and language arts (to eighth grade students since 1993).

## Appendix A (Continued)

The methods probe was conducted in Ms. Wundervoll's third period language arts class, which lasted from 11:47 a.m. -12:41 p.m. daily. The typical routine of the lessons presented in the daily language arts period generally consisted of the following: (a) collecting homework; (b) reviewing homework and/or content from previous day; (c) presenting new information; (d) guided practice activities; (e) independent practice assignments; and (f) discussing the homework assignment.

### *Research Question*

The methods and procedures used in this study were designed and implemented to address the following research question. Does the use of hand fidgets increase the percentage of on-task behaviors of a middle school student with mild disabilities who exhibits off-task behaviors during typical academic content periods?

### *Research Paradigm*

Single subject, A-B-A-B (Kazdin, 1982) interrupted time series design was utilized to analyze the effects of the independent variable (use of a hand fidget) on the dependent variable (on-task behaviors). During the baseline data collection phase (A<sub>1</sub>) and the reversal phase (A<sub>2</sub>), no intervention (i.e., no hand fidget) was used by either the participant or any other class member. During phases two (B<sub>1</sub>) and four (B<sub>2</sub>), everyone used the intervention (hand fidget). For the methods probe, a mini-study was conducted in which the phase lengths for each of the A-B-A-B phases were one week per phase.

## Appendix A (Continued)

Coinciding with the purposes of the methods probe, data was analyzed only for the baseline data phase.

### *Study Design Considerations taken into account from Insights of the Methods Probe*

Analyzing the processes involved with the implementation, conclusion, and analysis of the methods probe has provided useful information that has been instrumental in the design of this study. For instance, there is an awareness of the possibility of having defective equipment during the course of study implementation. To alleviate this concern, back-up study equipment such as an additional video camera, extra videotapes, and additional hand fidgets will be readily available. Another example of an insight learned from the methods probe is that there are times when the participant is out of view of the video camera for various reasons (e.g., bathroom break) and it is not possible to measure the results of on-task behaviors at that time. In these situations it will be noted in the data collection, to be later interpreted for coinciding trends and patterns. Planned data collection procedures will continue once the participant returns to the view of the video camera. The methods probe was a valuable component of this study as it enabled the researcher to gather baseline data and pilot the methodology, intervention, and measurement instruments associated with this study.

## Appendix B: Informed Consent

### **Informed Consent**

Social and Behavioral Sciences  
University

### **Information for People Who Take Part in Research Studies**

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The following information is being presented to help you decide whether or not you want to take part in a minimal risk research study. Please read this carefully. If you do not understand anything, ask the person in charge of the study.

**Title of Study:** The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting

**Principal Investigator:** Karen S. Voytecki

**Study Location(s):** Your school

You are being asked to participate because you are a national board certified educator and are teaching a middle school academic content course in an inclusive setting in which students both with and without disabilities are members of the class.

### **General Information about the Research Study**

The purpose of this research study is to investigate the effects of hand fidgets on the percentage of on-task behaviors demonstrated by students with mild disabilities whose disabilities have characteristics of off-task behaviors when participating in academic content classes.

### **Plan of Study**

As the teacher involved in the study, your participation would require a total of approximately one hour during the course of the study. This would include preparation on how to present the study components to the students, daily distribution and collection of the intervention (hand fidgets), and completion of a measure of social validity. Your class will be videotaped daily during the study.

### **Payment for Participation**

You will not be paid for your participation in this study.

### **Benefits of Being a Part of this Research Study**

You will most likely not directly benefit from taking part in this study. However, by participating, you will increase our knowledge regarding the effectiveness of interventions based on the theory sensory integration and their use with students with mild disabilities.

## Appendix B (Continued)

### **Risks of Being a Part of this Research Study**

There are no known risks associated with this research study.

### **Confidentiality of Your Records**

Your privacy and research records will be kept confidential to the extent of the law. The principal investigator will maintain confidentiality by coding data collected with fictitious names and storing all study related materials in a locked filing cabinet. Authorized research personnel, employees of the Department of Health and Human Services, and the USF Institutional Review Board and its staff, and any other individuals acting on behalf of USF, may inspect the records from this research project.

The results of this study may be published. However, the data obtained from you will be combined with data from others in the publication. The published results will not include your name or any other information that would personally identify you in any way.

### **Volunteering to Be Part of this Research Study**

Your decision to participate in this research study is completely voluntary. You are free to participate in this research study or to withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive, if you stop taking part in the study. Your decision to participate (or not to participate) will in no way affect your job/teaching status or your status with the University of South Florida.

### **Questions and Contacts**

- If you have any questions about this research study, please contact Karen S. Voytecki at (555)555-5555.
- If you have questions about your rights as a person who is taking part in a research study, you may contact the Division of Research Compliance of the University (555) 555-5555.

Appendix B (Continued)

**Consent to Take Part in This Research Study**

By signing this form I agree that:

- I have fully read or have had read and explained to me this informed consent form describing this research project called The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting.
- I have had the opportunity to question one of the persons in charge of this research and have received satisfactory answers.
- I understand that I am being asked to participate in research. I understand the risks and benefits, and I freely give my consent to participate in the research project outlined in this form, under the conditions indicated in it.
- I have been given a signed copy of this informed consent form, which is mine to keep.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Printed Name of Participant

\_\_\_\_\_  
Date

**Investigator Statement**

I have carefully explained to the subject the nature of the above research study. I hereby certify that to the best of my knowledge the subject signing this consent form understands the nature, demands, risks, and benefits involved in participating in this study.

\_\_\_\_\_  
Signature of Investigator  
Or authorized research  
investigator designated by  
the Principal Investigator

\_\_\_\_\_  
Printed Name of Investigator

\_\_\_\_\_  
Date

## Appendix B (Continued)

### **Consent of School Staff For Videotaping**

Social and Behavioral Sciences  
University

As a component of the research study called The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting, the staff and students who participate in the study will be videotaped daily during the study. To do this, we need permission to videotape you.

#### **What will we do to keep your study records from being seen by others?**

The videotapes will be stored in the researcher's locked file cabinet for a minimum of one year and until they are determined, by the researcher, to no longer be needed. The only people who will be allowed to see the videotapes are:

- The study staff.
- People who make sure that we are doing the study in the right way. They also make sure that we protect your rights and safety:
  - The USF Institutional Review Board (IRB) and its staff, and any other individuals acting on behalf of the University
  - The United States Department of Health and Human Services (DHHS)
- We may show certain parts of the videotaped material to other professionals in trainings, workshops, and educational conferences in order to share the outcomes found in this study. If we do, we will not use your name, your students' names, the name of your school, or anything else that would let people know who you are.

After at least one year, and when the researcher determines the videotapes are no longer needed, the videotapes will be destroyed. Up until the time that the videotapes are destroyed, they may be used for study purposes and to share the results of the study with other education professionals as described above.

#### **What happens if you decide not to be videotaped?**

You should only be videotaped in this study if you want to take part.

#### **If you decide not to be videotaped:**

- There will be no penalty or consequence associated with your job or your status with the University.

#### **What if you let yourself be videotaped and then later decide you want to stop?**

If you decide you want to stop being videotaped during the study, tell the study staff as soon as you can.

- You may stop being videotaped at any time.
- If you decide to stop, there will be no penalties or consequences associated with your job or your status with the University.

Appendix B (Continued)

**You can get the answers to your questions.**

If you have any questions about this study, call Karen Voytecki at (555)555-5555.

If you have questions about your rights as a person who is taking part in a study, call Research Compliance at (555)555-5555.

**Consent to be Videotaped in this Research Study**

It's up to you. You can decide if you want to be videotaped in this study.

**I freely give my consent to be videotaped as part of the research study on The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting. I understand that the researcher(s) in this study will videotape me in order to view my class for the study. I have been informed that the videotape(s) may be shown to other professionals at research meetings. I have received a copy of this consent form.**

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Printed Name of Participant

\_\_\_\_\_  
Date

**Investigator Statement:**

I certify that participants have been provided with an informed consent form that has been approved by the University's Institutional Review Board and that explains the nature, demands, risks, and benefits involved in participating in this study. I further certify that a phone number has been provided in the event of additional questions.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Printed Name of Investigator

\_\_\_\_\_  
Date

## Appendix B (Continued)

**Parental Informed Consent**  
Social and Behavioral Sciences  
University

### **Information for Parents**

#### **Who are being asked to allow their child to take part in a research study**

---

---

Researchers at the University study many topics. We are want to learn more about how students remain on-task while the teacher is discussing information. To do this, we need the help of people who agree to take part in a research study.

**Title of research study:** The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting

**Person in charge of study:** Karen S. Voytecki

**Study staff who can act on behalf of the person in charge:** Your child's teacher

**Where the study will be done:** Your child's school

#### **Should your child take part in this study?**

This form tells you about this research study. You can decide if you want your child to take part in it. He/she does not have to take part. Reading this form can help you decide.

#### **Before you decide:**

- Read this form.
- Talk about this study with the person in charge of the study or your child's teacher.
- You can have someone with you when you talk about the study.
- Find out what the study is about.

#### **You can ask questions:**

- You may have questions this form does not answer. If you do, ask the person in charge of the study or study staff as you go along.
- You don't have to guess at things you don't understand. Ask the people doing the study to explain things in a way you can understand.

#### **After you read this form, you can:**

- Take your time to think about it.
- Have a friend or family member read it.
- Talk it over with someone you trust.

It's up to you. If you choose to let your child be in the study, then you can sign the form. If you do not want your child to take part in this study, do not sign the form.

## Appendix B (Continued)

### **Why is this research being done?**

The purpose of this study is to find out if using a hand fidget (squeezing a stress ball made of cloth having gel and beads inside of it) helps students to pay attention to the teacher while he/she is talking. The class will be videotaped daily during the course of the study. At times, during the study, the students will have a stress ball to squeeze during instruction. At the end of the study, the students will be asked to complete a brief survey on their experiences with the stress ball.

### **Why is your child being asked to take part?**

We are asking your child to take part in this study because the child's teacher has volunteered to participate in this study. We want to find out more about what helps middle school students to remain on-task in their classes.

### **How long will your child be asked to stay in the study?**

Your child will be asked to spend about 12 weeks in this study.

### **How many other people will take part?**

About 30 people will take part in this study.

### **What other choices do you have if you decide not let your child take part?**

If you decide not to let your child take part in this study, that is okay. Students not participating in the study will be seated out of view of the video camera and will not be asked to complete the survey about stress balls at the end of the study. There are no consequences or penalties for the child if he/she does not participate in the study. Grades will not be affected due to participation, or lack of participation, in the study.

### **How do you get started?**

If you decide to let your child take part in this study, you will need to sign this consent form.

### **What will happen during this study?**

Your child's school records may need to be reviewed to gather information on the characteristics of the students in the study. Only the researcher will have access to this information and no identifying information will be reported with the study results. Certain parts of the study will involve students having access to a stress ball to squeeze during instruction, while during other parts of the study the students will not have a stress ball. Instruction will not be changed and will continue as usual throughout all parts of the study. The class period will be videotaped daily. At the end of the study the students who are participating in the study will be asked to complete a brief survey.

## Appendix B (Continued)

### **Here is what your child will need to do during this study**

Your child's teacher will let the students know what days the students are allowed to use the stress balls. Proper use of stress balls will be discussed in class by the teacher.

### **Will you or your child be paid for taking part in this study?**

We will not pay you or your child for the time your child volunteers in this study.

### **What will it cost you to let your child take part in this study?**

It will not cost you anything to take part in the study.

The study will pay the costs of the stress balls and surveys.

### **What are the potential benefits to your child if you let him/her take part in this study?**

We don't know if your child will get any benefits by taking part in this study.

### **What are the risks if your child takes part in this study?**

There are no known risks to those who take part in this study.

### **What will we do to keep your child's study records from being seen by others?**

Federal law requires us to keep your child's study records private.

All study records will be stored in the researcher's locked file cabinet. All data will be coded with fictitious names so your child's name will not be used in any reports.

However, certain people may need to see your child's study records. By law, anyone who looks at your child's records must keep them confidential. The only people who will be allowed to see these records are:

- The study staff.
- People who make sure that we are doing the study in the right way. They also make sure that we protect your rights and safety:
  - The Institutional Review Board (IRB) and its staff, and any other individuals acting on behalf of the University
  - The United States Department of Health and Human Services (DHHS)
- We may publish what we find out from this study. If we do, we will not use your child's name or anything else that would let people know who your child is.

### **What happens if you decide not to let your child take part in this study?**

You should only let your child take part in this study if both of you want to take part.

## Appendix B (Continued)

### **If you decide not to let your child take part:**

- You and your child won't be in trouble or lose any rights either of you normally have.
- You and your child will still receive the same educational services you would normally have. Your child will remain in the same class and receive the same instruction. Your child would be seated out of view of the video camera.
- There will be no penalty or consequence associated with your child's grades or classroom instruction.

### **What if you let your child join the study and then later decide you want to stop?**

If you decide you want your child to stop taking part in the study, tell the study staff as soon as you can.

- Your child may stop the study at any time.
- If you decide you want your child to stop, your child can go on getting his/her regular classroom instruction. There will be no penalties to your child's grade or classroom instruction.

### **Are there reasons we might take your child out of the study later on?**

Even if you want your child to stay in the study, there may be reasons we will need to take him/her out of it. Your child may be taken out of this study:

- If your child is not following the teacher's directions regarding the appropriate use of the stress balls.

### **You can get the answers to your questions.**

If you have any questions about this study, call Karen Voytecki at (555)555-5555.

If you have questions about your rights as a person who is taking part in a study, call USF Research Compliance at (555) 555-5555.

Appendix B (Continued)

**Consent for Child to Take Part in this Research Study**

It's up to you. You can decide if you want your child to take part in this study.

**I freely give my consent to let my child take part in this research study called The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting. I understand that this is research. I have received a copy of this consent form.**

\_\_\_\_\_  
Signature of Parent  
of child taking part in study

\_\_\_\_\_  
Printed Name of Parent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Child

**Investigator Statement:**

I certify that participants have been provided with an informed consent form that has been approved by the University's Institutional Review Board and that explains the nature, demands, risks, and benefits involved in participating in this study. I further certify that a phone number has been provided in the event of additional questions.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Printed Name of Investigator

\_\_\_\_\_  
Date

## Appendix B (Continued)

### Consent of Parent(s) For Videotaping

Social and Behavioral Sciences  
University

As a component of the research study called The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting, the students who participate in the study will be videotaped daily during the study. To do this, we need permission to videotape your child.

#### **What will we do to keep your child's study records from being seen by others?**

The videotapes will be stored in the researcher's locked file cabinet for a minimum of one year and until they are determined, by the researcher, to no longer be needed. The only people who will be allowed to see the videotapes are:

- The study staff.
- People who make sure that we are doing the study in the right way. They also make sure that we protect your rights and safety:
  - The USF Institutional Review Board (IRB) and its staff, and any other individuals acting on behalf of the University
  - The United States Department of Health and Human Services (DHHS)
- We may show the videotaped material to other professionals in trainings, workshops, and educational conferences in order to share the outcomes found in this study. If we do, we will not use your child's name, his/her teacher's name, the name of your child's school, or anything else that would let people know who your child is.

After at least one year, and when the researcher determines the videotapes are no longer needed, the videotapes will be destroyed. Up until the time that the videotapes are destroyed, they may be used for study purposes and to share the results of the study with other education professionals as described above.

#### **What happens if you decide not to let your child be videotaped?**

You should only let your child be videotaped in this study if both of you want to take part.

#### **If you decide not to let your child be videotaped:**

- You and your child will still receive the same educational services you would normally have.
- Your child will remain in the same class and receive the same instruction.
- Your child would be seated out of view of the video camera.
- There will be no penalty or consequence associated with your child's grades or classroom instruction.

Appendix B (Continued)

**What if you let your child be videotaped and then later decide you want to stop?**

If you decide you want your child to stop being videotaped during the study, tell the study staff as soon as you can.

- Your child may stop being videotaped at any time.
- If you decide to stop, your child can go on getting his/her regular classroom instruction. There will be no penalties to your child's grade or classroom instruction.

**You can get the answers to your questions.**

If you have any questions about this study, call Karen Voytecki at (555)555-5555.

If you have questions about your rights as a person who is taking part in a study, call University Research Compliance at (555)555-5555.

**Consent for Child to be Videotaped in this Research Study**

It's up to you. You can decide if you want your child to be videotaped in this study.

**I freely give my consent to let my child be videotaped as part of the research study on The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting. I understand that the researcher(s) in this study will videotape my child in order to view my child's class for the study. I have been informed that the videotape(s) may be shown to other professionals at research meetings. I have received a copy of this consent form.**

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

\_\_\_\_\_  
Printed Name of Parent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Child

**Investigator Statement:**

I certify that participants have been provided with an informed consent form that has been approved by the University's Institutional Review Board and that explains the nature, demands, risks, and benefits involved in participating in this study. I further certify that a phone number has been provided in the event of additional questions.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Printed Name of Investigator

\_\_\_\_\_  
Date

## Appendix B (Continued)

### **Child Informed Assent**

Social and Behavioral Sciences  
University

### **Information for Students**

#### **Who are being asked to take part in a research study**

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Researchers at the University study many topics. We are want to learn more about how students remain on-task while the teacher is discussing information. To do this, we need the help of students who agree to take part in a research study.

**Title of research study:** The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting

**Person in charge of study:** Karen S. Voytecki

**Study staff who can act on behalf of the person in charge:** Your teacher

**Where the study will be done:** Your school

#### **Should you take part in this study?**

This form tells you about this research study. You can decide if you want to take part in it. You do not have to take part. Reading this form can help you decide.

#### **Before you decide:**

- Read this form.
- Talk about this study with your teacher.
- You can have someone with you when you talk about the study.
- Find out what the study is about.

#### **You can ask questions:**

- You may have questions this form does not answer. If you do, ask your teacher as you go along.
- You don't have to guess at things you don't understand. Ask your teacher to explain things in a way you can understand.

#### **After you read this form, you can:**

- Take your time to think about it.
- Have a friend or family member read it.
- Talk it over with someone you trust.

It's up to you. If you choose to participate in the study, then you can sign the form. If you do not want to take part in this study, do not sign the form.

## Appendix B (Continued)

### **Why is this research being done?**

The purpose of this study is to find out if using a hand fidget (squeezing a stress ball made of cloth having gel and beads inside of it) helps students to pay attention to the teacher while he/she is talking. The class will be videotaped daily during the course of the study. At times, during the study, the students will have a stress ball to squeeze during instruction. At the end of the study, the students will be asked to complete a brief survey on their experiences with the stress ball.

### **Why are you being asked to take part?**

We are asking you to take part in this study because your teacher has volunteered to participate in this study. We want to find out more about what helps middle school students to remain on-task in their classes.

### **How long will you be asked to stay in the study?**

You will be asked to spend about 12 weeks in this study.

### **How many other people will take part?**

About 30 people will take part in this study.

### **What other choices do you have if you decide not to take part?**

If you decide not to take part in this study, that is okay. Students not participating in the study will be seated out of view of the video camera and will not be asked to complete the survey about stress balls at the end of the study. There are no consequences or penalties if you do not participate in the study. Grades will not be affected due to participation, or lack of participation, in the study.

### **How do you get started?**

If you decide to take part in this study, you will need to sign this assent form.

### **What will happen during this study?**

Your school records may need to be reviewed to gather information on the characteristics of the students in the study. Only the researcher will have access to this information and no identifying information will be reported with the study results.

Certain parts of the study will involve students having access to a stress ball to squeeze during instruction, while during other parts of the study the students will not have a stress ball. Instruction will not be changed and will continue as usual throughout all parts of the study. The class period will be videotaped daily. At the end of the study the students who are participating in the study will be asked to complete a brief survey.

### **Here is what you will need to do during this study**

Your teacher will let you know what days the students are allowed to use the stress balls. Proper use of stress balls will be discussed in class by the teacher.

## Appendix B (Continued)

### **Will you be paid for taking part in this study?**

We will not pay you for the time you volunteer in this study.

### **What will it cost you to take part in this study?**

It will not cost you anything to take part in the study.  
The study will pay the costs of the stress balls and surveys.

### **What are the potential benefits to you if you take part in this study?**

We don't know if you will get any benefits by taking part in this study.

### **What are the risks if you take part in this study?**

There are no known risks to those who take part in this study.

### **What will we do to keep your study records from being seen by others?**

Federal law requires us to keep your study records private.  
All study records will be stored in the researcher's locked file cabinet. All data will be coded with fictitious names so your name will not be used in any reports.  
However, certain people may need to see your study records. By law, anyone who looks at your records must keep them confidential. The only people who will be allowed to see these records are:

- The study staff.
- People who make sure that we are doing the study in the right way. They also make sure that we protect your rights and safety:
  - The USF Institutional Review Board (IRB) and its staff, and any other individuals acting on behalf of the University
  - The United States Department of Health and Human Services (DHHS)
- We may publish what we find out from this study. If we do, we will not use your name or anything else that would let people know who you are.

### **What happens if you decide not to take part in this study?**

You should only take part in this study if you want to take part and if your guardian(s) allow you to take part in this study.

## Appendix B (Continued)

### **If you decide not to take part:**

- You won't be in trouble or lose any rights you normally have.
- You will still receive the same educational services you would normally have. You will remain in the same class and receive the same instruction. You would be seated out of view of the video camera.
- There will be no penalty or consequence associated with your grades or classroom instruction.

### **What if you join the study and then later decide you want to stop?**

If you decide you want to stop taking part in the study, tell your teacher as soon as you can.

- You may stop the study at any time.
- If you decide to stop, you can go on getting your regular classroom instruction. There will be no penalties to your grade or classroom instruction.

### **Are there reasons we might take you out of the study later on?**

Even if you want to stay in the study, there may be reasons we will need to take you out of it. You may be taken out of this study:

- If you are not following the teacher's directions regarding the appropriate use of the stress balls.

### **You can get the answers to your questions.**

If you have any questions about this study, call Karen Voytecki at (555)555-5555.

If you have questions about your rights as a person who is taking part in a study, call USF Research Compliance at (555) 555-5555.

Appendix B (Continued)

**Child's Assent Statement**

My teacher has explained to me this research study called The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting.

I agree to take part in this study.

\_\_\_\_\_  
Signature of Child  
taking part in study

\_\_\_\_\_  
Printed Name of Child

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Parent  
of child taking part in study

\_\_\_\_\_  
Printed Name of Parent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of person  
obtaining consent

\_\_\_\_\_  
Printed Name of person  
obtaining consent

\_\_\_\_\_  
Date

If child is unable to give assent, please explain the reasons here:

\_\_\_\_\_  
Signature of Parent  
of child taking part in study

\_\_\_\_\_  
Printed Name of Parent

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of person  
obtaining consent

\_\_\_\_\_  
Printed Name of person  
obtaining consent

\_\_\_\_\_  
Date

Appendix B (Continued)

**Child's Assent Statement**

My teacher has explained to me this videotape request. I understand that the researcher(s) in this study will videotape me in order to view my class as part of the research study on The Effects of Hand Fidgets on the On-Task Behaviors of Middle School Students with Disabilities in an Inclusive Academic Setting. I have been informed that the videotape may be shown to other professionals at research meetings.

**I agree to be videotaped.**

_____ Signature of Child taking part in study	_____ Printed Name of Child	_____ Date
--	--------------------------------	---------------

_____ Signature of person obtaining consent	_____ Printed Name of person obtaining consent	_____ Date
--	--	---------------

If child is unable to give assent, please explain the reasons here:

_____ Signature of person obtaining consent	_____ Printed Name of person obtaining consent	_____ Date
--	--	---------------

## Appendix C: Teacher Preparation Session

The researcher conducted a 30 minute session to prepare the teacher for the guidelines of this study. During this session the researcher and teacher discussed the rationale for the study and its design as well as the classroom implications of the study.

A draft of the study introductory letter to be sent home to the parents of all students in the class selected for the study was shared with the teacher. Any needed edits or suggested alterations were discussed and a finalized letter was agreed upon by both the researcher and the teacher.

Procedures and guidelines for the introduction and continued use of the intervention (hand fidget) were developed at the teacher preparation session. Procedures for use of the stress balls that were developed in collaboration between the teacher and the researcher included: (a) how to introduce the hand fidgets to the students (e.g., have students assist with developing rules of use for the hand fidgets, role play examples and non-examples of appropriate hand fidget use, answer student questions); (b) processes for the daily distribution and collection of the hand fidgets; and (c) daily responsibilities for turning on the video camera and changing the videotapes. Co-developing these processes with the teacher continued the teacher-researcher partnership in place for this study.

Although both parties had input, there were some guidelines that were mandatory and had to be incorporated into the established processes: (1) the students were not to be made aware of the purpose of the study and (2) the students were not allowed to harm themselves or others with the use of the intervention.

### Appendix C (Continued)

At the end of this teacher preparation session, the teacher demonstrated to the researcher that she was knowledgeable of these guidelines and procedures and was prepared to implement this study and the use of hand fidgets in her classroom. A role play was conducted at the end of the teacher preparation session in which the teacher acted as herself and the researcher acted as a student. This satisfied to the researcher that the teacher was competent in the study procedures and guidelines and was ready to implement the study in her classroom.

Appendix D: On-Task Checklist

**On-Task Checklist**

**Date:**

**Day:**

**Participant:**

**Observer:**

Interval		On-Task Behavior Measures			Task Expectation			Use of Hand Fidget	Data
#	Time	Seated in Seat	Facing Teacher or Object Directed to by Teacher	Not Talking Unless Directed to by Teacher	Listening to Lecture	Writing	Reading	Touching Hand Fidget (y/n)	Scored as On-Task (*=y)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									



Appendix F: Daily Observation Anecdotal Log

Phase A<sub>1</sub>

<i>Date</i>	<i>Day</i>	<i># observations on-task (during lecture)</i>	<i>Total # of observations (lecture)</i>	<i>% on-task (lecture)</i>	<i>Anecdotal comments</i>
Mon.	10/18/04	78	135	58%	
Tues.	10/19/04	43	240	18%	
Wed.	10/20/04	26	76	34%	
Thurs.	10/21/04	62	155	40%	Block view-9 obs. (lecture); camera turned off early-16 obs. remaining
Fri.	10/22/04	132	230	57%	
Mon.	10/25/04	95	240	40%	
Tues.	10/26/04	105	240	44%	
Wed.	10/27/04	97	210	46%	Lock down drill-30 obs.
Thurs.	10/28/04	29	133	22%	
Fri.	10/29/04	86	116	74%	
Mon.	11/01/04	79	153	52%	
Tues.	11/02/04	97	240	40%	
Wed.	11/03/04				Absent (in-school suspension)

Appendix F (Continued)

Phase B<sub>1</sub>

<i>Date</i>	<i>Day</i>	<i># observations on-task (during lecture)</i>	<i>Total # of observations (lecture)</i>	<i>% on-task (lecture)</i>	<i>Anecdotal comments</i>
Thurs.	11/04/04	130	225	58%	First day of hand fidget use; Camera turned off early- 6 obs. remaining
Fri.	11/05/04	34	38	89%	Out of classroom-144 obs.
Mon.	11/08/04	159	204	78%	
Tues.	11/09/04	145	240	60%	
Wed.	11/10/04	177	233	76%	
Thurs.	11/11/04	88	120	73%	
Fri.	11/12/04	178	200	89%	
Mon.	11/15/04	108	224	48%	
Tues.	11/16/04	141	150	94%	Fire drill (48 obs.)
Wed.	11/17/04	168	240	70%	
Thurs.	11/18/04	137	172	80%	
Fri.	11/19/04				Test day-all writing, no lecture
	Week of 11/22/04				Thanksgiving break- no school
Mon.	11/29/04	192	240	80%	
Tues.	11/30/04	39	169	23%	Hand fidgets distributed while participant out of room on teacher errand; did not receive intervention
Wed.	12/01/04	180	233	77%	Camera turned off early- 7 observations remaining
Thurs.	12/02/04	45	53	85%	

Appendix F (Continued)

Phase A<sub>2</sub>

<i>Date</i>	<i>Day</i>	<i># observations on-task (during lecture)</i>	<i>Total # of observations (lecture)</i>	<i>% on-task (lecture)</i>	<i>Anecdotal comments</i>
Fri.	12/03/04				Test day-all writing, no lecture
Mon.	12/06/04	75	240	31%	
Tues.	12/07/04	126	240	53%	
Wed.	12/08/04	55	174	32%	Out of classroom-10 observations
Thurs.	12/09/04	27	50	54%	
Fri.	12/10/04	66	240	28%	
Mon.	12/13/04	92	145	63%	Male substitute teacher
Tues.	12/14/04	16	25	64%	Same male substitute teacher
Wed.	12/15/04	72	130	55%	Same male substitute teacher; Out of classroom-6 obs.
Thurs.	12/16/04				Same male substitute teacher; No lecture-test and movie
Fri.	12/17/04				No school – holiday break
	Weeks of 12/20/04 12/27/04				No school – winter holiday break
Mon.	1/03/05	68	170	40%	Out of classroom (restroom)-31 observations
Tues.	1/04/05	124	240	52%	
Wed.	1/05/05	43	128	34%	Out of classroom (getting homework)-31 observations; blocked view-4 obs.
Thurs.	1/06/05	48	124	39%	Out of classroom-30 obs.

Appendix F (Continued)

**Phase B<sub>2</sub>**

<i>Date</i>	<i>Day</i>	<i># observations on-task (during lecture)</i>	<i>Total # of observations (lecture)</i>	<i>% on-task (lecture)</i>	<i>Anecdotal comments</i>
Fri.	1/7/05				No lecture on this day; out of classroom (getting homework)-27 obs.
Mon.	1/10/05	136	174	78%	
Tues.	1/11/05	139	186	75%	
Wed.	1/12/05	68	95	72%	
Thurs.	1/13/05	186	210	89%	
Fri.	1/14/05	207	240	86%	
Mon.	1/17/05				No school Martin Luther King Day
Tues.	1/18/05	147	186	79%	
Wed.	1/19/05	175	202	87%	
Thurs.	1/20/05	44	49	90%	Out of room-168 obs.
Fri.	1/21/05	79	83	95%	

## Appendix G: Teacher Input: Use of Stress Ball

### Teacher Input: Use of Stress Ball

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Using the stress ball helped the student(s) with mild disabilities to participate more in class.	4	3	2	1
2. Using the stress ball decreased off-task behavior(s) of the students with mild disabilities.	4	3	2	1
3. The stress ball is a developmentally appropriate intervention for middle school students.	4	3	2	1
4. The stress balls were easy to use class-wide.	4	3	2	1
5. I would allow another student with a mild disability to use a stress ball, if the child presented off-task behaviors.	4	3	2	1
6. I would recommend that other teachers allow their students with mild disabilities, who present off-task behaviors, to use stress balls.	4	3	2	1
7. Use of the stress balls did not require too much of the teacher's time.	4	3	2	1
8. I believe that general education teachers have the skill level required to use stress balls appropriately in their classes.	4	3	2	1

## Appendix H: Student Input: Use of Stress Ball

### Student Input: Use of Stress Ball

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Using the stress ball helped me to participate more in class.	4	3	2	1
2. I enjoyed using the stress ball.	4	3	2	1
3. The stress ball was comfortable to use.	4	3	2	1
4. I would like to continue to use a stress ball in this class.	4	3	2	1
5. I would use a stress ball in another class, if I were allowed.	4	3	2	1

## Appendix I: Randomization Test Programming Code

```

proc iml;

*x={0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0,
    0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1};

x={58, 18, 34, 40, 57, 40, 44, 46, 22, 74, 52, 40, 58, 89, 78, 60, 76, 73, 89, 48,
    94, 70, 80, 80, 77, 85, 31, 53, 32, 54, 28, 63, 64, 55, 40, 52, 34, 39, 78, 75,
    72, 89, 86, 79, 87, 90, 95};

a1=x[1:12];
b1=x[13:26];
a2=x[27:38];
b2=x[39:47];
obs=(((sum(a1)/12)+(sum(a2)/12))-((sum(b1)/14)+(sum(b2)/9)))/-2;

rncount=0;
count=0;
nn=nrow(x);
do j = 11 to 14;
do k = 24 to 27;
do m = 35 to 39;
rncount=rncount+1;
a1=x[1:j-1];
b1=x[j:k-1];
a2=x[k:m-1];
b2=x[m:nn];
teststat=(((sum(a1)/(j-1))+sum(a2)/(m-k))-
    ((sum(b1)/(k-j))+sum(b2)/(nn+1-m)))/-2;
if teststat>=obs then count=count+1;
end;
end;
end;
pvalue=count/rncount;
print pvalue count rncount obs;
quit;

```

## About the Author

Karen S. Voytecki is a doctoral candidate at the University of South Florida. Ms. Voytecki graduated summa cum laude in 1995 from the University of Wisconsin – Milwaukee with a Bachelor of Science degree in Special Education and received a Masters of Arts degree in Varying Exceptionalities from the University of South Florida St. Petersburg in 2002. The Council for Exceptional Children (CEC) recognized her innovation in the classroom with the 2001 Clarissa Hug International Teacher of the Year award.

Ms. Voytecki is currently pursuing a Ph.D. in Curriculum and Instruction with an emphasis on Special Education in Urban Environments. As an experienced classroom teacher, university lecturer and active researcher, Ms. Voytecki is a popular presenter at conferences and workshops where she offers real-world insights for improving the lives of children with exceptionalities. Her scholastic areas of interest include teacher-researcher collaborative partnerships, sensory strategies, and single subject design intervention research.