EFFECT OF A SENSORY INTEGRATION INTERVENTION ON AGGRESSIVE BEHAVIOR IN ALTERNATIVE SCHOOL ELEMENTARY STUDENTS

by

Joshua Anthony Lutz

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A Dissertation Presented in Partial Fulfillment

of the Requirements for the Degree

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ABSTRACT

The purpose of this quasi-experimental time series designed study was to determine the effect of a sensory integration intervention on aggressive behavior of students enrolled in an alternative elementary school for students with disabilities. Twenty (20) students participated in the study. Data was collected through behavioral observations over the course of 16 consecutive school days with the individual student's frequency of aggressive behaviors in four domains being recorded on 8 days with a weighted vest on and 8 days without a weighted vest on. The four observed and recorded domains were verbal aggression, aggression toward property, aggression toward self, and physical aggression toward others. A series of paired samples *t*-tests were used to analyze the data. Results of this study are reported at its conclusion.

Keywords: alternative-education, students with disabilities, aggression, sensory integration, weighted vests, intervention, at-risk.

Dedication

I want to dedicate this work to my wife and children, for without their constant patience and support over the past few years, this would not have been possible. I also recognize the privilege and grace bestowed upon me by our Lord and Savior, Jesus Christ, through whom all things are possible.

Acknowledgments

I would like to formally acknowledge the support and dedication of Dr. Margaret Ackermann, Dr. Kurt Michael, and all of the professors and students in the Ed.D. program at Liberty University for their guidance and support.

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List of Abbreviations

Applied Behavior Analysis (ABA)

Adequate Yearly Progress (AYP)

American Occupational Therapy Association (AOTA)

Attention Deficit Hyperactivity Disorders (ADHD)

Autism Spectrum Disorder (ASD)

Ayres' Sensory Integration (ASI)

Behavior Intervention Plan (BIP)

Deep Pressure Therapy (DPT)

Emotionally Disabled (ED)

Elementary and Secondary Education Act (ESEA)

Free and Appropriate Public Education (FAPE)

Functional Behavior Assessment (FBA)

Individuals with Disabilities in Education Act (IDEA)

Individual Education Plan (IEP)

Least Restrictive Environment (LRE)

Local Educational Agency (LEA)

Multiple Disabilities (MD)

Other Health Impaired (OHI)

Pervasive Developmental Disorder (PDD)

Positive Behavior Intervention and Supports (PBIS)

Students with Disabilities (SWD)

School Wide Positive Behavior Supports (SWPBS)

Sensory Based Intervention (SBI)

Social Learning Theory (SLC)

Student Centered Learning (SCL)

Sensory Integration Theory (SIT)

CHAPTER ONE: INTRODUCTION

Overview

Student placement in private alternative schools is an option used by public schools when students are unsuccessful in the comprehensive public-school environment (Caroleo, 2014). While students can be placed at a private alternative school for many reasons, a majority are placed due to difficulty managing their behaviors and emotions in public school (Simonsen & Sugai, 2013). Within the subset of private alternative schools exists a group of schools dedicated to working with students who have emotional and behavioral needs and who are identified as students with disabilities (SWD). Historically, students placed in private alternative schools have met with poor outcomes (Burnett, 2010). More recently, the effects of various interventions that are available in the alternative setting have led to higher rates of success (Foley & Pang , 2006; Nelson, Martella, & Marchand-Martella, 2002; Tobin & Sprague, 2000). Research has demonstrated that sensory based interventions on students with autism spectrum disorder have been effective in decreasing aggressive behaviors and, to a lesser extent, on students with Attention Deficit Hyperactivity Disorder (Ben-Sasson, Carter, & Briggs-Gowan, 2009; Bundy, Lane, & Murray, 2002; Case-Smith, & Arbesman, 2008; Faramarzi, Arjmandi, & Abedi, 2016; Jasmin et al.,2009; Lane et al., 2010; Losinski et al. 2017).

Little has been written about the effect of sensory based interventions on the aggressive behavior of students who have disabilities other than autism. This chapter provides the background for the current study as well as the problem statement, purpose statement, significance of the study, and the research questions.

Background

Over 600,000 youth each year are hospitalized due to being injured in aggressive acts by others in school (Forster, Grigsby, Unger, & Sussman, 2015). Thirty to forty percent of boys and 16-30% of girls have committed a violent offense before age 17 years old and 30% report being in a physical fight in the past year (Forster et al., 2015). Furthermore, over 1,000,000 youth have been identified as gang members in the United States (Forster et al., 2015). Antisocial behavior patterns and high levels of aggression evidenced early in a child's life are among the best predictors of delinquent and violent behavior years later, and these behavior patterns become more destructive over time (Muratori et al., 2014). The prevalence of aggressive youth has influenced policy development in at the federal, state, local, and school levels (Kalberg, Lane, & Lambert, 2012).

The *Safe and Drug Free Schools and Communities Act of 1994* recommends that state and local education agencies develop school-wide violence prevention programs. The impact of these recommendations is further seen in *the Individuals with Disabilities in Education Improvement Act* (IDEA, 2004) where school wide approaches for behavior interventions and supports were called for. This has led to the creation of zero-tolerance policies for dangerous and disruptive behavior in many schools and the implementation of three tiered approaches to behavioral management as well (Bradshaw, 2013; Kalberg, Lane, & Lambert, 2012; Simonsen & Sugai, 2013)

Many approaches to behavior management have embraced the tenets of behaviorism, social learning theory - based in the work of Alfred Bandura (1973, 1977a)

and, to an extent, in student centered education as advocated in the work of John Dewey (1922). The effect of a positive reinforcement system on student behavior has been studied (Horner & Sugai, 2015; Simonsen & Sugai, 2013) and the importance of students' social experiences in relation to behavior has also been addressed (Clingempeel & Henggeler, 2003; Prati, 2012; Wilhite and Bullock; 2012).

When evaluating the needs of special education students, IDEA mandates that students be educated in the least restrictive environment (LRE). The least restrictive environment for any special education student is enrollment in public school with maximum exposure to non-disabled peers. The underlying thought for the insistence on LRE is based on the belief that public schools in the United States are critically important to the development of academic, behavioral, and social skills of the students whom they serve (Hochschild & Scovronick, 2004). Often, students in the public-school setting exhibit behavioral deficits that limit their ability to be successful both academically and behaviorally (O'Hanley, Radley, & Cavell, 2016). Students with disabilities who are unsuccessful managing their behavior in a comprehensive public-school environment are often referred to public or private alternative schools to meet their educational and emotional/behavioral goals most effectively.

Students with disabilities who present with challenging educational and behavioral needs may require an alternative to public school placement (Farkas et al., 2012). Private alternative schools are staffed with individuals who are trained specifically to work with students with emotional and behavioral concerns. Many of these private alternative schools are focused on provision of services for students in special education. All students in special education have an Individual Education Plan (IEP) that sets forth

goals and objectives to measure progress for students with a disability. Private alternative schools for special education students are chosen by a student's IEP team as the least restrictive environment (LRE) where the student can receive a free and appropriate public education (FAPE) and are committed to working toward the goals and objectives set forth by the student's IEP.

The first alternative schools appeared in the United States in the latter half of the 1960's and early 1970's (Fantini, 1973) and were well supported by the Elementary and Secondary Education Act (ESEA) of 1965. The purpose was to provide an educational environment that was different from what had become the traditional school environment. Early advocates of alternative education included Mario Fantini and Mary Anne Raywid, who created schools with the purpose of helping socioeconomic, racial, and cultural minorities as well as other at-risk students (Garner, 2010). At-risk students assigned to alternative schools identified several characteristics of public education that had negative impacts on their abilities to learn: Poor student-teacher relationships, lack of engagement in school, lack of flexibility in rules/procedures, and poor peer relationships were just a few (Lagana-Riordan et al., 2011; Foley & Pang, 2006).

Alternative schools have been designed to provide the needed support for students that is absent in mainstream public education. Research has shown that while public school teachers have a generally positive outlook regarding the effectiveness of alternative schools in helping at-risk students improve both academically and behaviorally (Caroleo, 2014), the outcomes for students in alternative schools have been less positive. Unfortunately, many of the programs were unsuccessful in large part due to poor funding and increased calls for academic and behavioral accountability (Decker,

2012). When school districts started to determine strategies to better meet the needs of their at-risk students, the use of private day schools became a viable intervention and the number of schools began to increase (Conrath, 2001; Foley & Pang, 2006). The increased pressure for accountability with test scores and higher academic standards helped create an increased need for more alternative schools (Lange, 1998). Recent approaches in alternative and public education have met with higher levels of success and have been focused on the inclusion of research-based interventions in schools.

In the case of private day schools serving students with disabilities, public funding has been made available through the establishment of various funding sources. Laws have allowed for federal and state monies to be used to provide tuition for students with disabilities who required private alternative school placement as determined in their IEPs. With financial needs being met, this subset of schools has shown more success as the private alternative school is able to focus on the emotional, social, and academic needs of the child in a highly structured and therapeutic environment. (Conley, 2002).

Success in the private alternative school is largely dependent on the ability for students to respond to interventions that address the underlying causes of the behaviors which resulted in the student being initially referred for services in the school (Horner & Sugai, 2015; Hopson, 2011). Aggressive behavior and social-emotional issues are leading reasons for students to be referred to the private alternative school (Foley & Pang, 2006). Aggressive students are at-risk of higher levels of suspension and expulsion, lower grades, higher levels of dropping out of school, and higher levels of legal involvement (Baker, Clark, Maier, & Viger, 2008). Sensory integration

interventions have been shown to be effective in managing behaviors in students exhibiting hyperactivity and inattention, but little is known on the effect of sensory integration interventions on aggressive behavior (Yunus, Liu, Bissett, & Penkala, 2015).

It has been proposed that behavioral problems in children are linked to dysfunctions in sensory processing (Ayres, 1972). Private alternative schools for students with disabilities have adopted multiple approaches to managing and intervening with student behavior (Gelbar, Jaffery, Stein, & Cymbala, 2015; Simonsen, Jeffrey-Pearsall, Sugai, & McCurdy, 2011). Among these strategies is the use of sensory integration interventions in the form of sensory rooms, classroom activities that engage the senses, and a focus on curricula that allows for sensory integration in three primary areas; proprioceptive (sense of self in space), vestibular (awareness of movement), and tactile (touch) (Yunus et al., 2015). These approaches are heavily based upon Sensory Integration Theory (Ayres, 1972) and have been primarily focused on addressing behavioral concerns in students who are diagnosed with Autism Spectrum Disorder or other pervasive developmental disorders (Ben-Sasson, Carter, & Briggs-Gowan, 2009; Bundy, Lane, & Murray, 2002; Case-Smith, & Arbesman, 2008; Faramarzi, Arjmandi, & Abedi, 2016; Jasmin et al.,2009; Lane et al., 2010; Losinski et al. 2017).

Problem Statement

Students who have been placed in alternative schools have traditionally shown negative overall results due to the punitive nature of the programs (Turton, Umbreit, & Mathur, 2011). Given this, multiple intervention approaches have been attempted to help students in alternative schools improve their behavioral and emotional regulation with a goal of returning to public school (Baker et al., 2008; Bradshaw, Waasdorp, & Leaf,

2012; Caroleo, 2014; Conrath, 2001; Horner & Sugai, 2015). Many of the school wide interventions have a basis in behaviorism, particularly interventions such as Positive Behavior Interventions and Supports (PBIS), School Wide Positive Behavior Support (SWPBS) and other similarly designed, school-wide interventions (Horner & Sugai, 2015; Simonsen & Sugai, 2013). The general findings are that system wide approaches are generally effective for approximately 95 - 98% of students who are exposed to them (Farkas et al., 2012; Gelbar et al. 2015; Horner & Sugai, 2015; Kalberg, Lane, & Lanbert, 2012; Simonsen & Sugai, 2013).

In addition to the system wide approaches, significant studies have reviewed the use of sensory based interventions (SBI) with individual or small groups of students, primarily those with Autism Spectrum Disorder (ASD) or other pervasive developmental disorders (PDD) (Ben-Sasson, Carter, & Briggs-Gowan, 2009; Bundy, Lane, & Murray, 2002; Case-Smith, & Arbesman, 2008; Faramarzi, Arjmandi, & Abedi, 2016; Jasmin et al. ,2009; Lane et al., 2010; Losinski et al. 2017). The results of these studies are inconclusive as to the overall effect of SBI on the levels of aggressive behavior in students with ASD or PDD. While much discussion and research has focused on the applicability of SBI to these specific populations, little is known regarding the effect that SBI have on students with behavioral problems, specifically aggression, who do not have ASD or PDD. The problem is that sensory integration theory claims that sensory based interventions will have a positive effect on behavior of students, but little research has been conducted that studies the effects of SBI on students without Autism or Pervasive Developmental Disorders.

Purpose Statement

The purpose of this quasi-experimental time series designed study is to determine the effect of a sensory based intervention on the number and type of aggressive behaviors exhibited by students with disabilities who are enrolled in a private alternative school. The independent variable in this study will be the use of the sensory based intervention and the dependent variable will be the number of instances of verbal aggression, physical aggression, aggression towards property, and aggression toward self-displayed by students while receiving the intervention as compared to the same factors while the students are not receiving the intervention. The population to be studied consists of students enrolled in a private, alternative school in grades K-5 who were given parental permission to participate in the study in the piedmont area of Virginia. Each participant also provided individual consent for participation.

Significance of the Study

The significance of understanding the level of student aggression when a sensory integration intervention is applied is found in the potential outcomes for students exhibiting aggressive behaviors. Aggressive behavior in students interrupts the learning of the individual student, the class/school, and can prove dangerous to any person in the school when the behavior occurs (Muratori et al., 2015). McGroder and Hyra (2009) report that aggressive behavior in childhood, if left unchecked, can lead to criminal activity later in adulthood. The social and economic cost associated with this pattern are estimated to be close to 2.0 million dollars per individual (McGroder & Hyra, 2009; Muratori et al., 2015).

While research on the impact of sensory integration interventions has been

conducted with both disabled and non-disabled students who exhibit hyperactivity and inattention (Faramarzi, Rad, & Abedi, 2016) little to no research has been done to determine if the introduction of a specific sensory integration method has any effect on the frequency of aggressive behavior. The research conducted in this study could be beneficial to educational and behavioral planning for both public and private alternative schools. The results of this study could help to impact the general operating guidelines of alternative schools and could increase the awareness of effective programming for students with behavioral and emotional needs across school environments. With recent increases in the number of alternative schools providing services to students, it is imperative that schools carefully consider the risks and benefits of the programs in order to create or use programs that best meeting the needs of their at-risk students (Caroleo, 2014).

Careful review of literature on alternative schools reveals that successful interventions have a significant effect on the positive outcomes of alternative school programs (Baker et al., 2008; Gelbar et al., 2015; Khalifa, 2013; Mottern, 2012; Simonsen & Sugai, 2015). While most substantial research is focused on the application of system-wide interventions such as PBIS and SWPBS it is believed that approximately 2-5% of students will require more individualized interventions (Bradshaw, 2013; Farkas et al., 2012). The majority of publications on alternative schools detail experiences, results, and program components but none are specific to determination of the effect of a sensory integration intervention in these environments. The research conducted in this area provides additional information that is useful for programming in alternative schools.

Sensory Based Interventions are theorized to help students decrease inappropriate behaviors (Bundy, 2002; Case-Smith & Arbesman, 2008; Faramarzi, Arjmandi, & Abedi, 2016; Lane et al., 2010) but studies have been primarily focused on the use of SBI with students with autism or other pervasive developmental disorders. Through the use of a sensory based intervention with students who have aggressive behavior, but who do not have autism or other pervasive developmental disorders, this study aims to determine the effect of a SBI on the frequency of aggressive behaviors in elementary, alternative school students. Results could inform the intervention strategies in alternative school settings.

Research Question

The following research question guided this study:

RQ1: Is there a difference in in the frequency of aggressive behaviors of alternative school elementary students with disabilities who undergo sensory integration intervention when compared to the same students not receiving a sensory integration intervention?

Definitions

1. *Alternative school* – Alternative schools include public and private alternative schools, special day and/or residential treatment facilities, hospital and clinical schools, and similar settings that serve students whose behaviors are not responsive to practices and supports delivered in typical general education settings. (Simonsen, Jeffrey-Pearsall, Sugai, & McCurdy., 2011)
2. *At-Risk* – At-risk students are those who traditionally have poor academic performance, poor attendance, lower levels of engagement, and higher levels of behavioral problems in school (Williams, Ernst, & Kaut, 2015).

3. *Private Alternative School* – a non-comprehensive/non-public school enrolling students with disabilities who exhibit the need for a more therapeutic environment with a strong focus on alternative methods to instruction. (Simonsen et al., 2011)
4. *Sensory Integration:* Sensory integration is the process by which information from our senses (touch, sight, hearing, taste, smell, as well as balance) is interpreted by the brain so that we can respond appropriately to our environment. (Faramarzi, Rad, & Abedi, 2016)
5. *Students with Disabilities:* As defined by IDEA, the term "child with a disability" means a child: "with mental retardation, hearing impairments (including deafness), speech or language impairments, visual impairments (including blindness), serious emotional disturbance, orthopedic impairments, autism, traumatic brain injury, other health impairments, or specific learning disabilities; and who, by reason thereof, needs special education and related services" (Knoblauch & Sorenson, 1998, p. 1).

CHAPTER TWO: LITERATURE REVIEW

Overview

The existence of alternative schools is not a new concept in education. Schools that differed from the norm of publicly provided education have been in place beginning in the early 1800's with the establishment of transcendentalist schools opened by Amos Bronson Alcott and progressive schools opened by Francis Wayland Parker (Leiding, 2008). In the mid-20th century, alternative schools for at-risk students began to be established (Gable, Bullock, & Evans, 2006). Ideas espoused by these schools were centered around the belief that alternative programs for at-risk youth were a viable option for students who were troublesome or behaviorally challenged. Goals of the alternative schools were to remove disruptive students from the public-school classroom without expelling them from school completely and to provide an opportunity for these students to earn a high school diploma (Morely, 1996). This chapter provides a discussion of the theoretical framework in which the current study is based and a thorough review of currently available literature on the topic.

Theoretical Framework for Alternative School Education

Social Learning Theory

Alternative education has its basis in Social Learning Theory (SLT), championed by Bandura (1973, 1986). Social learning theory focuses on the behavior that individuals exhibit in response to their environment (Prati, 2012). Within SLT, the process of learning is based upon the observation of others and by individual experiences. Prati (2012) indicates that the likelihood of one modeling behavior observed in others is dependent upon three key factors: a) the role-model should have a position of authority or

power for the student b) the consequences of the learning are positive rather than negative, and c) the learner should be able to identify similarities between the model and him/herself.

Social Learning Theory is further based on the interaction between an individual's knowledge and their experiences as they related to their behavior (Bandura, 1977a). Underlying the theory is the concept that individual behavior is not the result of only the person or only the environment, but a combination of both. Bandura (1977b) noted a four-step process for learning within SLT: the individual observes something in their environment, they remember what was observed, they produce a behavior based on the observation, and the behavior results in a consequence in the environment that, if positive, increases the likelihood of the behavior recurring and, if negative, decreases the likelihood of repetition.

Bandura (1996) indicates that behavioral learning in children is rooted in their exposure to others in their environment that display appropriate behavior in problem solving and interaction with others. Observing others in the learning environment and mirroring the observed behavior is important and relevant in the environment of alternative schools. Students are often placed in alternative schools due to behavioral and emotional problems, many of which can be traced to the lack of appropriate instruction by role models in the student's social experiences, including within the family, the community, and the school (Crosbie-Burnet & Lews,1993). The overarching belief is that positive behavior is learned through experiences and involvement, rather than taught within a formal curriculum (Benn, 2000).

Numerous studies have investigated the relationship of social learning theory to behavior. Social learning theory has also been linked to the explanation of aggressive behavior in students, in particular in how the theory is applied to behavioral modification (Clingempeel & Henggeler, 2003; Bandura, 1973). Three principles of social learning theory as applied to behavior are described in Novak & Pelaez (2004) as follows:

1. Learning occurs through observation of structured and organized modeling of behavior which is then practiced and enacted. Associating the learned behavior with coding of words and actions assists in retention of the learning.
2. When outcomes of the modeled behavior are studied, the use of the modeled behavior is strengthened. Outcomes must be valued by the individual to produce behavioral changes.
3. When the behavior has practical, real-world value, a cognitive-behavioral connection is formed that reinforces the integration of the behavior by the learner.

While many studies have focuses on social learning theory as it relates to teacher-student relationships (Clingempeel & Henggeler, 2003; Prati, 2012; Wilhite and Bullock; 2011) few have reviewed the use of SLT and its results on student to student relationships. Herndon and Bembenutty (2013) investigated this topic and determined that students in alternative settings tend to exhibit a better influence as a peer when they are provided significant opportunities for positive interaction with one another. Within this context, SLT can be applied to group projects and interactive learning activities along with group therapy approaches to give students the opportunity to interact in a positive manner. Behland (2007) suggested that embedding social and emotional learning into a school

curriculum increases the likelihood of learning being relevant to students and would increase skill acquisition.

Wilhite and Bullock (2011) investigated the use of a SLT based intervention, the Why Try curriculum, that uses metaphors for team-building and group discussions. While geared toward secondary students, the program yielded a positive result for older, at-risk adolescents in an alternative school. Further, another study used interviews of alternative school students to determine themes in their views of the learning environments (Phillips, 2013). This study indicated that when students receive the needed level of social and emotional support they feel more in control of their environment and a greater connection to real life concepts.

Constructivist Theory

Dewey (1922) was an early proponent of student-centered education within constructivist theory, writing that alternatives should focus on experiential learning. Dewey (1922) further opined that reasonable and ethical organizations should use problem-solving and experimental focus to govern their approach. Dewey proposed that traditional methods of education, whereby a teacher treated knowledge as absolute and stable, with little to no regard for the characteristics of the learner, was a precursor to failure and boredom in students (Foote, Battaglia, & Vermette, 2001). He further proposed that education should center around active problem solving and that individual experience was the key factor for learning. Constructivist theory is well aligned with the experiential, learner-centered approach and indicates that learning cannot simply be given to an individual, it must be provoked through activity that is geared toward the experience of the student, not the teacher (Foote, Battaglia, & Vermette, 2001).

A primary tenet of constructivism is that of scaffolding learning, a process of building knowledge (Fox, 2001). Constructivism is centered on the precept that knowledge is acquired through a process of active construction. Fox (2001) summarizes the claims of constructivism as follows:

1. Learning is an active process.
2. Knowledge is built, not absorbed.
3. Knowledge is invented, not discovered.
4. Knowledge is personal and is socially constructed.
5. Learning is a process of making sense of the world.
6. Effective learning requires challenges for the learner to solve.

In the constructivist view, learning a new word in reading or a new number series in mathematics occurs when the learner connects the experience to their existing knowledge. Constructivism emphasizes that learning is not a rote process but is about understanding and applying knowledge to one's own existence.

Given that alternative schools are focused on student-centered learning and the applicability of social experiences to learning, it is critical for teachers to adopt the constructivist approach and teach students based on that which the students already know. If the lesson is too far removed from the learner's own personal experience, the learner may well abandon their desire to determine meaning from the lesson, become bored or confused, or otherwise give up on the lesson. Lessons must make sense to the learner in order to be maximally effective.

In addition to making sense for the learner, constructivism indicates that learning must also be viewed as both easy and satisfying (Fox, 2001). Simply having a basis in

prior learning, while important, does not guarantee that new information will be easily obtained. Teachers must work toward the individual strengths of the students in their classrooms to ensure that learning is easy for each student. When working to make learning satisfying it is important to recognize that in constructivism, learning is viewed as a natural process that learners want to make sense of. For teachers, it is crucial to identify the learning styles of each of the students, deliver instruction in those styles, and recognize how past learning impacts current knowledge acquisition(Lee & Hannifin, 2016; Hannafin et al.,2014).

The constructivist approach in alternative schools has led to a focus on student-centered learning (SCL) that was designed to increase the personal development of the student (Tan, 2015). Student centered learning within constructivism, while seemingly self-explanatory, is a complicated and multi-nuanced approach that requires specific constructs and implementation methods (Neumann, 2013). Within SCL students generate their own learning opportunities through experiences and integrate learned knowledge in an environment that allows for personalization. (Lee & Hannifin, 2016; Hannafin et al.,2014). Difficulties within public-school environment to address the needs of the at-risk student have led to the creation of alternative schools. Alternative schools have a significant focus on student-centered instruction, (Wilkerson et al., 2016; Tern, 2003; Foley & Pang, 2007).

Related Literature

History of Alternative Schools

With the dawning of the Civil Rights era, public education could no longer ignore the socioeconomic, racial, ethnic, or disability-status inequalities present in public

schools (Decker, 2012). The U.S. Supreme court ruled that all students must receive access to equal levels of opportunity in education regardless of race (Brown v. BOE Topeka, KS., 1954) or disability status (Public Law 94-142 – the Education for All Handicapped Children Act of 1975), and later the Americans with Disabilities Act (1994), and the Individuals with Disabilities in Education act (1990), the No Child Left Behind Act (NCLB, 2002) and, most recently, the Individuals with Disabilities Education Improvement Act (IDEIA, 2004).

The common theme amongst all the legislation is found in the justification for a demand that education be provided equally to all students, regardless of race or disability status. The NCLB mandates that schools provide at-risk students with programs that allow equal access and equal opportunity regardless of race, disability status, language proficiency in English, or socioeconomic status (2002). Despite this mandate, a recent report from the Office for Civil Rights (U.S. Department of Education, Office for Civil Rights, 2012) indicates that many programs are in fact unequal and substandard.

The end of the 1960's and beginning of the next decade saw an increase in the number of alternative schools designed to meet the needs of at-risk youth (Wilkerson et al., 2016; Lange & Sletten, 2002). Franklin (1992) distinguished this period as the inception of an alternative movement that would further focus on providing sufficient educational opportunity for at-risk students. Public school systems began to provide alternatives to traditional education, beginning with open schools. Open schools were designed to embrace the learner and to guide the students at their own pace, attending to the individuals learning style and focusing on the student-centered education (Miller,

2009; Young, 1990). Other programs were formed within the schools and the first alternative schools for at-risk students were formed (Wilkerson, Afacan, Yan, Justin, & Datar, 2016).

As a result of the legislative action over the past several decades, professional educators are currently being challenged to educate all students, regardless of disability status, in a manner that allows the students to make Adequate Yearly Progress (AYP) (Zhang, Katsitannis, & Kortering, 2007). A sense of urgency has existed due in large part to goals set by and related to the above-referenced legislative actions. With only a few exceptions, the standard for measuring progress has been to analyze the results of standardized testing. Educators are often evaluated based on student test scores and the scores of students with disabilities are counted in the same manner as non-disabled students. With such standards in place, significant intervention is often needed to assist students with disabilities in achieving the goal.

Burnett (2010) states that alternative schools are expected to provide environments that allow students to reach the standards set by legislation both behaviorally, academically, and emotionally. Despite the best efforts of legislative action and the public schools themselves over the course of several decades, the needs of students with significant emotional and behavior needs remained largely unmet (Wilkerson et al. 2016; Watson, 2011). The efforts made by LEAs at the local and state level, while responsive to mandates, have had little to no success in producing statistically meaningful change for at-risk students (Foley & Pang, 1997; Watson, 2011).

Characteristics of Students in Alternative Schools

Students enrolled in alternative schools often have a history of chronic behavioral or conduct problems in public school (Powers, Bierman, & Coffman, 2016). Many of these students come from at-risk backgrounds with low socioeconomic status, poor family stability, and high levels of exposure to aggression and violence (Reid, Gonzalez, Nordness, Trout, & Epstein, 2014). Early behavioral problems often are the precursor for teacher-student conflict and rejection by peers which, in turn, lead to a recurring cycle of negative interaction with school administrators (Dodge, Greenberg, Malon, & Conduct Problems Prevention Research Group, 2008; Lane, Barton-Arwood, Nelson, & Wehby, 2008). These behavioral issues are often the primary reason for school suspensions and expulsions (Jull, 2008).

The high levels of school failure and dropout experienced by students with emotional or behavioral disorders is indicative of the difficulty that schools have in serving these students effectively (Wagner & Cameto, 2004). As the public schools are often unsuccessful in meeting the needs of at-risk students, the students are often referred to alternative settings in hopes that the alternative setting and services will result in success (Lindsay, 2007).

Characteristics of Alternative Schools

Alternative schools are needed to address the many risk factors associated with at-risk students. Drop-out, school failure, abuse, neglect, and other negative factors have been on the rise and the need for alternative schools has grown in the past two decades (Burnett, 2010; Lehr & Lang, 2003). Alternative schools embrace the fundamental belief

that all students are capable of learning, regardless of disability or risk factors, and alternative schools offer just this opportunity (Katsiyannis & Williams, 1998).

Increases in zero tolerance policies as well as in the rate of student failure have contributed to the increase in the number of alternative schools in the United States (Tobin & Sprague, 2000). Alternative schools are also increasing due to a higher level of supports and programs being offered for at-risk youth and the implementation of programs for younger and younger children. (Tobin & Sprague, 2000).

The goal of alternative schools is to provide an environment that is highly structured, has specially trained teachers, has a small student to teacher ratio, allows for student centered instruction, and that has well implemented behavioral interventions in place (Fuchs & Fuchs, 1995; Jull, 2008). Students with early onset conduct or behavioral problems who are placed in alternative schools experience a higher level of support and show an increase in positive behavioral outcomes (Rafferty, Piscitelli, & Boettcher, 2003) and are less likely to drop out of school in comparison to public school peers (Mykleburst, 2006; Wagner & Cameto, 2004).

Alternative schools often provide students with a range of options that will lead to behavioral success at elementary, middle, and high school levels. (Simonsen & Sugai, 2013). Smaller class sizes in alternative schools allow for a stronger sense of community amongst students (DeBlois & Place, 2007) and a consistent focus on the applicability of lessons to students' broader lives and environments are frequently found in these schools. As the goal of most alternative schools for students with emotional and behavioral difficulties is for the students to successfully return to the public school, the alternative

schools must maintain a positive and healthy relationship with the local educational agencies (LEA).

Raywid (1999) made three separate observations in defining alternative schools. Alternative schools that excluded at-risk students were no longer being tolerated, alternative schools were primarily responsible for working with students who were not successful in the regular school environment, and alternative schools recognized the need to differentiate instruction for students. Raywid (1999) further identified three categories of alternative schools as follows: Type 1 school: including magnet schools and schools of choice; Type 2 schools: schools that are designed for students considered disruptive to the public school and who have a focus on behavioral modification and intervention, and Type 3: schools with a rehabilitative or remediation approach to education. The goal for Type 2 and Type 3 schools is for the student(s) to successfully return to a more comprehensive, public education (Foley & Pang, 2007). The applicability of Raywid's 1999 model is still relevant in modern education (Wilkerson et al., 2016).

Similar to Raywid, Tern (2003) described alternative schools as being designed around the needs of the students, both academically and behaviorally. Typical programs in alternative schools are highly structured, provide significant academic support, and have multiple levels of behavioral support – these are all key to meeting the social and emotional learning needs of students (Behland, 2007). Additional studies further researched the benefits of alternative schools for students in special education, finding that students with disabilities in alternative schools often demonstrate significant benefit from smaller class sizes, flexible and differentiated instruction, greater levels of individual attention when compared to public schools, and more creative curricula

(Bullock, 2007; Foley & Pang, 2007; Katsiyannis & Williams, 1998; Lehr & Lang, 2003; Tobin & Sprague, 2000).

A significant responsibility falls on the alternative school to ensure that the education and services provided to alternative students are not of lower quality than found in public school. Provision of less than equal services will decrease educational opportunities and increase achievement gaps between alternative schools and public schools. When a Local Education Agency (LEA) indicates that a student is to be educated separately from the public school, it is the responsibility of the LEA to make sure that the placement results in the desired outcome for the student. This responsibility is even greater when the subset of students referred for placement in alternative schools is comprised disproportionately of students from poverty-stricken backgrounds and minority students. (Kleiner, Porch, & Farris, 2002).

Successful alternative school programs for at-risk youth include a variety of support services to meet the needs of their students (Kim & Taylor, 2008). One service is the ability to accurately assess the needs of the students. The assessments need to be associated with the behavioral, emotional, and social needs of the students. Services that result should include both individual and group counseling, academic intervention, mentoring, provision of drug and alcohol prevention, and curricular focus on life skills (Kubik, Lytle & Fulkerson, 2004; Kallio & Sanders, 1999; Kim & Taylor, 2008). Maintaining services and an environment that is conducive to learning for at-risk students is critical as well.

Three specific themes for effective alternative schools were introduced by Kallio and Sanders (1999). The first theme reveals that no school can be truly effective if it is

simply considered a dumping ground for problem students. Secondly, maintaining a focus on small class size and student-centered instruction are critical components for success. Finally, ensuring that all students are given the same level of dignity and respect is required. The role of teachers in alternative schools cannot be understated as without the buy-in and support of the teachers, the program is set up for failure (Barr, Colston, & Parrett, 1977).

Lagana-Riordan et al. (2011) further identified components of successful alternative schools in a study designed to gather perceptions of alternative school students. Key to success in these schools were the inclusion of positive relationships with staff of the program, strong behavior support, a focus on strengths of students, student ownership of school culture, and connections between lessons learned in school and the outside home and community environments. A student-centered approach was also found to be highly effective for at-risk youth in an alternative school by Watson (2011). The school in this study had a flexible schedule, multimodal methods of curriculum delivers (online, paper-based, lecture based) and students in this program reported feeling that the teachers in the program valued the students as individuals and learners.

In review of the literature on alternative schools, a recurring and major theme is the importance of the relationship between students and faculty/staff of the school. Fostering team-building, trust, and ensuring an open and non-judgmental environment are key factors reported in successful relationships between adults and students in alternative schools (D'Angelo & Zemanic, 2009). The relationships between teachers and students was also examined by Povrazlo et al. (2008). This study found that students who indicated having positive relationships and positive regard for teachers were more likely

to be successful both in school and after graduation. The importance of positive relationships in alternative schools also leads to the need for administrators who can lead staff of the school to foster a climate of respect and value as a major part of the school culture (Price, Martin, & Robertson, 2010).

While alternative schools were intended to meet the needs of all at-risk youth, these schools are more often being used to primarily serve students with significant behavioral problems (Wilkerson et al., 2016; Bullock, 2007; Foley & Pang, 2007). Identification as an at-risk student is often preceded by a history of academic and behavioral difficulties (Wilkerson et al., 2016). A student "at-risk" refers to students who are in danger of failing at school or are unlikely to make a successful transition from school to the workforce (Watson, 2011). Risk factors identified by Watson (2011) for students at-risk including poverty, ethnic status, language acquisition, type of school, community concerns such as crime and violence, and ethnicity. Additionally, many students in at-risk are also identified as students with disabilities (Bullock, 2007; Foley & Pang, 2007) who require significant intervention.

Interventions in Alternative Schools

In the 1990's and into the 2000's an increased focus was found on the use of School Wide Positive Behavior Support (SWPBS) in alternative schools (Farkas, Simonsen, Migdole, Clemens, & Cicchese; 2012; Reinke, Herman, & Stormont, 2013; Simonsen, Britton, & Young, 2010; Simonsen & Sugai, 2013). Characteristics of SWPBS include a focus on goal setting, data collection, and progress monitoring of students when the focus was on reinforcing positive behaviors across school population.

Farkas et al. (2012) determined that when teachers implemented SWPBS with high levels of fidelity, an overall increase in positive student behavior occurred.

In a study conducted by Simonsen, Britton, and Young (2010) the researchers found a significant decrease in negative behavioral incidents amongst students enrolled in an alternative school when SWPBS was implemented with fidelity. Additional research has revealed that the use of SWPBS has resulted in reducing problem behavior (Bradshaw, Mitchell, & Leaf, 2010; Bradshaw, Waasdorp, & Leaf, 2012), and increasing academic achievement (Bradshaw, Mitchell, & Leaf, 2010; Horner et al. 2009; McIntosh, Bennet, & Price, 2011; Nelson, Martella, & Marchand-Martella, 2002; Reinke, Herman, & Stormont, 2013).

Additional research on interventions in alternative schools reveals that many schools are implementing a behavioral system based on the tenets of Positive Behavior Intervention and Support (PBIS) (Horner & Sugai, 2015). The goal of PBIS is to teach the student to self-identify and self-monitor negative behaviors and to learn replacement behaviors that yield positive outcomes (Horner & Sugai, 2015; Simonsen & Sugai, 2013). A critical component of PBIS is implementing a continuum of evidence-based practices that follows a three-tiered approach as described by Simonsen& Sugai (2013). Tier I involves identifying the supports needed for all students in the environment, Tier II increases the supports and interventions for students who do not respond positively at Tier I, and Tier III further intensifies interventions for students who are not responsive to Tier I or II level supports (Scott & Cooper, 2013). This framework allows the focus to be on the school itself at Tier I and on the individual student at Tiers II and III (Putnam & Knoster, 2016). As this approach is individualized to the student him or herself, it allows

the student to respond to interventions that are designed to address their own behavior and readiness levels (Simonsen & Sugai, 2013).

Carswell, Hanlon, O'Grady, Watts, and Pothong (2009) studied the implementation of an after-school program in alternative schools to allow for additional support for students. These researchers noted the importance of buy-in from the students' families and further emphasize the success of PBIS being contingent on administrator buy-in. When a faculty knows that their approach to students will be supported by the school administrator, the chance of success is significant (McIntosh, Kelm, & Delabra, 2015).

In another study, Turton, Umbriet, and Mathur (2011) investigated the process of designing and implementing interventions for students with emotional and behavioral disabilities who were placed in an alternative educational setting. Key suggestions from this study include the use of a functional behavior assessment (FBA) to determine the reason, or function, for of student's misbehavior, creation of a behavior intervention plan while considering the results of the FBA, and frequent data monitoring to determine if the plan is working or not.

At-Risk Students

As previously noted, at-risk students are those who are considered likely to drop out of school due to lack of success (Kellmayer, 1995). Common characteristics of at-risk students include low academic achievement, poor attendance at school, having repeated one or more grades, higher levels of drug use, low socioeconomic status, violent tendencies, and chronic disruptive or antisocial behaviors. (Acker, 2007; Camak, 2007; Foley & Pang, 2006; McArdle, 2003).

While all ages and grades can have students considered at-risk, the majority of interventions have focused on adolescents at the middle and high school level. Adolescence by its very nature is a time where individuals are trying to determine where they fit in within the world around them. The desire to find one's place is complicated by pubertal growth, the influence of family, peer pressure and influence, and the environment in which the adolescent lives (Ianni, 1989).

While there is significant research identifying risk factors for and characteristics of at-risk youth, there is also significant research regarding interventions that are designed to meet the needs of these students. Alternative schools are one intervention that recognize the factors affecting at-risk students such as feeling defeated and discouraged, having low self-esteem and poor self-confidence, feeling helpless, and having a poor sense of self-worth (Conrath, 2001). Students often arrive in the alternative school setting having avoided significant education, with significant distrust of adults and educational systems, poor vision for the future, and lacking in basic educational skills (Conrath, 2001).

In addition to understanding the characteristics and risk factors involved with at-risk students, alternative school personnel must also have the ability to address the aggressive and violent behaviors in the population that they serve (Van Acker, 2007). Van Acker (2007) further discusses the value of alternative schools having significant supports in place for at-risk students including a focus on transition services that are geared toward helping students return to the public-school environment where the level of support that the students have been receiving in alternative schools is no longer available.

In comparison to public schools, alternative schools focus heavily on the provision of positive experiences in education and meaningful relationships between students and teachers (Simonsen & Sugai, 2013). A study by Sutherland (2011) sought to determine if there was a relationship between negative school experiences and illegal activity. Many of the participants in this study felt alienated from the school system and from pro-social peers, they felt that schooling was forced upon them rather than being their choice, and many felt that learning was difficult, particularly as they entered secondary grades. Further, all indicated being significantly truant from school and felt that school rules applied to others in the environment rather than themselves (Sutherland, 2011). However, the most overarching theme gleaned from Sutherland's 2011 study was a feeling from students of being treated unfairly by school personnel that led to feelings of not belonging in or being a part of the school culture.

Aggression in At-Risk Students

Aggression and behavioral problems have consistently been shown to occur at a higher rate among individuals with disabilities (Farmer & Aman, 2009). The negative consequences of aggression towards self and others are also well documented in literature (Barchia & Bussey, 2011). As discussed previously, exposure to aggression and violence are significant risk factors for at-risk students, many of whom are enrolled in alternative schools.

Grunbaum, Lowrt, and Kann (2001) studied the behaviors of students in alternative schools and compared them to the behaviors of students in public schools, find that the students in the alternative setting demonstrated higher levels of risky behavior in every category that was studied. Given this knowledge, personnel involved in the

education of alternative school students need to use interventions that will limit the risky behaviors and that will allow students a higher probability of success when leaving alternative schools for public schools.

As previously discussed, the majority of students enrolled in alternative schools are exposed to risk factors for aggression, the implementation of interventions to decrease aggressive behavior is a key aspect of these programs. Complicating the intervention approach is the grouping of multiple at-risk students in one environment. Warren, Schoppelrey, Moberg, and McDonald (2004) indicate that grouping peers who display aggressive behavior is particularly problematic for children, even very young children, who are themselves at-risk for aggressive behavior.

Kellam et al. (1998) studied first grade students who were exposed to aggressive classroom environments and found an interaction effect in which the most aggressive elementary students were more likely to exhibit increased aggression in middle school. Further, Snyder (1983) found a long-term effect in pre-school children who were exposed to aggressive peers, determining that students who were exposed were more likely to demonstrate aggressive behavior 3 months after the exposure.

In these situations, commonly found in alternative schools, effective interventions to prevent aggressive behavior are critical. Studies have shown that in less aggressive classrooms, students are less likely to feel threatened and to feel more respected by peers and teachers, both key factors for successful programs (Warren et al., 2004). If aggression is left unchecked, the resulting increase in aggressive behavior often results in a negative reinforcement of the behavior, as it provides temporary relief from the aggression shown by another. The ability to use aggression to ward off others aggressive

attacks becomes the negative reinforcer and increases children's willingness to use aggression as a response (Bandura, 1977, 1983; Reid, Patterson, & Snyder, 2002).

Theoretical Basis of Sensory Based Interventions

The body and mind work in conjunction with one another to learn, problem solve, and remember events. Realistically, the thinking and learning are codependent processes that are unable to occur without one another (Flanagan, Vetter, Johansson, & Wolpert, 2003; Hannaford; 1995; Katz & Stienmetz, 2002; Pert, 1997; Weiss, 2001). While the connection between the body and mind is not a new concept, the implementation of interventions in education that draw upon the importance of this relationship is a relatively new concept in education (Willis, 2007). The link between neuroscience and classroom instruction, often referred to as brain-based learning, is closer now than ever before.

Sensory Integration Theory

Jean Ayres is one of the founders of Sensory Integration Theory (SIT), a theory rooted in systematic process and methodical measurement (Ayres, 1972). Beginning with her research in the 1950's the growth of SIT has had a consistent upward trajectory due in large part to contributions from researchers building upon Ayers' original ideas (Roley, Bissell, & Clark; 2015; Mailloux & Miller-Kuhaneck, 2014). Ayres (1972) describes sensory processing as follows:

> Good sensory processing enables all the impulses to flow easily and reach their destination quickly. Sensory integrative dysfunction is a sort of 'traffic jam' in the brain. Some bits of sensory information get 'tied up in traffic,' and certain parts of the brain do not get the sensory information they need to do their jobs

(p. 51).

Along with the growth of SIT, concurrent growth has occurred in the use of research-based interventions. As Ayres was researching sensory integration in children, she was also focused on the effects of sensory intervention on academic performance of students. In her 1972(a)-article titled "Improving Academic Scores Through Sensory Integration" Ayres reported that the use of a daily sensory based occupational therapy approach over a 6-month time span significantly improved the achievement scores of the students receiving the intervention.

The use of SIT is often identified by the trademarked term Ayres Sensory Integration® (ASI; Fertel-Daly et al., 2001). ASI represents a well-developed theory grounded in basic and applied science (Berthoz, 2002; Berthoz & Petit, 2008; Stein, 2012). Sensory integration approaches to intervention have been used frequently to address behavioral concerns in individuals with Autism (Gabriels et al., 2012; Van Rie and Heflin; 2009), Attention Deficit Hyperactivity Disorder (Faramarzi, Rad, & Abedi, 2016), and in individuals with Autism or ADHD with a comorbid behavioral concern of aggressive behavior (Farahiyah, Karen, Liu, Bissett & Penkala,2015). SIT is designed to modulate arousal through sensory input through the use of vestibular, tactile and proprioceptive stimuli (Lang et al., 2012).

A common form of SIT is deep-pressure therapy (DPT). DPT involves the application of pressure to the individual's body through the use of hug-boxes, weighted blankets (Mullen, Champagne, Krishnamurty, Dickson, & Gao, 2008), or weighted vests (Roley, Bissell, & Clark 2015; Davis et al. 2011,). Use of this approach has been shown to modulate arousal and has been linked to increases in attention and decreases in arousal,

stereotypical, self-injurious, and disruptive behaviors (Losinski, Cook, Hirsch, & Sanders, 2017; Quigley, Peterson, Frieder, & Peterson, 2011; Doughty & Doughty, 2008; Fertel-Daly, Bedell, & Hinojosa, 2001). Gringras et al. (2014) found that levels of anxiety decrease and a sense of calm increases with the use of DPT.

Related Literature

Sensory Integration Theory in education

Ayres (1991) proposed that behavioral problems in children are linked to sensory processing dysfunction. Sensory processing is necessary for the central nervous system to produce appropriate behavioral responses to stimuli (Bundy, Lane, & Murray, 2002). Dysfunction in the area of sensory processing impedes a child's ability to correctly interpret sensory input with the correct intensity, impedes their ability to regulate behavioral responses to stimuli that further disrupt their ability to participate in school and social events (Miller et al., 2007). Instead of exhibiting appropriate responses, children may display avoidance or sensory seeking behaviors (Ben-Sasson, Carter, & Briggs-Gowan, 2009). These responses can then detrimentally effect development of skills, social relationships, and meeting basic biological needs (Jasmin et al, 2009; Lane et al., 2010, Parham & Mailloux, 2005).

For school-based practice, difficulties in sensory integration and praxis are predictive of academic achievement in elementary school children (Clark et al., 2015; Parham, 1998). Interventions are often delivered to students with sensory integration difficulties by certified or licensed occupational therapists in the school setting. Sensory integration methods that can be found in typical school classrooms include the use of equipment that naturally occurs in school and that is found in common areas such as the

playground or gymnasium. Interventions that involve swinging, climbing, or gentle pressure may be essential in setting children with sensory integration difficulties up for success and may well be written as goals and objectives in the Individual Education Plan (IEP) of students who are identified as students with disabilities (Dunn, 2001; Parham & Mailloux, 2010).

Choosing the most effective intervention is often dependent on the individual goals of the child receiving the treatment. The results of the use of SIT has been well researched over the past four decades (Ayres, 1979; Bundy, Lane, & Murray, 2002; Dunn, 2001; Parham & Mailloux, 2010; Smith Roley, Blanche, & Schaaf, 2001; Watling et al., 2011). By using baseline data, measurable goals, and ensuring fidelity in data collection, individuals using SIT are able to provide accountability for student progress with the intervention as it relates to achievement in school (Mallioux et al. 2007)

The focus of sensory based intervention within educational environments is centered on student participation (Foster & Cox, 2013). Educators use sensory based interventions to address the specific sensory needs of the student and the interventions are dependent on the student's individual threshold for sensory input (Dunn, 2013; Watling et al., 2011). The intervention is designed after considering the sensory needs of the students and may involve helping classroom level personnel consider modifying the classroom environment to most effectively meet the sensory needs of students (Kuypers, 2011; Williams & Shellenberger, 1994).

Previous research has identified sensory integration difficulties within the general population of between 5% and 16.5% (Ahn, Miller, Milberger, & McIntosh, 2004; Ben-Sasson, Carter, & Briggs-Gowan, 2009). In at-risk populations, the incidence of sensory

integration difficulty increases to 35%, with 45% of the population demonstrating extreme needs in either under or over-responsive behaviors (Reynolds, Shepard, & Lane, 2008). Much of the research on interventions involving SIT has focused on results of interventions for students with autism spectrum disorder (ASD). In a student of students with ASD, Tomchek & Dunn (2007) determined that approximately 95% of the sample exhibited some level of dysfunction in sensory processing. Hyatt, Stephenson, and Carter (2009) summed up this underlying assumption best when addressing unusual responses to sensory input with children diagnosed with autism spectrum disorders as follows:

> A fundamental assumption underlying sensory integration is that learning and other problems arise, at least in part, from difficulties in the neurological processing of vestibular, tactile and proprioceptive sensory information. Higher- level functions, such as those involved in traditional academic skills, are assumed to be dependent on lower-level processing of sensory information (p. 318).

Sensory Based Interventions in schools

A primary responsibility for many professions working with at-risk and/or disabled students is developing interventions for challenging behavior. The behaviors exhibited by students in alternative schools often cause difficulty in curricular planning, prohibit a return to less restrictive environment, and can cause additional difficulty to those in the environment, including the students themselves (Burnett, 2010). Given these reasons, it is essential to develop interventions that counteract the risk factors for students

and lead to success both in and out of school. While the most effective interventions to date have been based on behavioral approaches (Bachman, 1972; Marcus & Vollmer, 1996; Mason & Iwata, 1990; Vollmer et al., 1993; Borrero & Vollmer, 2006) many institutions believe in the value of sensory based interventions.

Sensory-Integration therapy, as previously described, is a commonly applied intervention in schools. Interventions within SIT are frequently used by therapists who work with children with developmental, learning, and behavioral problems (Watling et al., 1999; Case-Smith & Miller, 1999; Roley et al., 2001; Spitzer et al., 1996). For example, Watling et al. (1999) surveyed occupational therapists and determined that 82% of respondents indicated that they "always" used a sensory integrative approach when working with students with Autism Spectrum Disorders (ASD). Further, parents of children with ASD who were enrolled in applied behavior analysis (ABA) programs were surveyed by Smith and Antolovich (2000) and over half (56%) indicated that they had exposed their children to sensory integration techniques. Ayres (1979) indicated that SIT is able to help children change brain processes and organize sensation by providing sensory stimulation, allowing for positive growth to occur.

Cook (1990) infers that some researchers subscribe to the notion that children with autism are hyper or hyposensitive to sensory input. Many symptoms associated with ASD are hypothesized to be the result of sensory integration issues. Chu and Green (1996) established that aberrant and maladaptive behaviors, when reinterpreted in an SIT framework, are thought to be the result of sensory dysfunction.

According to SIT, problems with sensory integration may manifest within the vestibular system, proprioceptive system, and tactile system. The vestibular system is

involved with providing input to the brain regarding the body's movement in space. Deficiencies in vestibular processing may manifest as poor posture and difficulty with motor activities. The proprioceptive system is involved with sensory input for muscles and joints and impairment in this area may involve stereotypical body moves such as repeated hand flapping. The tactile system involves the sense of touch, impairments in this area are characterized by lack of sensitivity or oversensitivity to sensory stimuli. The goal of SIT is to enhance each of these systems and to restore effective neurological processing.

As dysfunction in sensory processing may lead to behavioral problems that interfere with school participation, as well as social and daily activities, sensory based interventions (SBI) are designed to remediate these behavioral problems and thus improve one's function. Sensory based interventions are commonly used to assist in the regulation of behavioral problems caused by dysfunction in sensory processing (Ayres 1991; Case- Smith & Arbesman, 2008). By intervening to produce appropriate sensory response, SBI are designed to assist children in engaging appropriate in learning (Tomchek & Case-Smith, 2009; Watling et al., 2011). This approach typically includes one or all of the following: Tactile stimulation – using a touch sensation including pressure or temperature provided by an object or environment (i.e. weighted vest or blanket, hot/cold compress); Proprioceptive stimulation: a sensation stimulated when muscles and joints are activated by movement (i.e. pedaling a bicycle); and Vestibular stimulation: when an individual moves or is moved in a certain speed or direction (i.e. swinging).

The use of SBI for students with behavioral problems has resulted in inconclusive

results as to its effectiveness, and has at times produced contrasting results. Gabriels et al. (2012) studied a sample of 42 children with autism spectrum disorder and reported that sensory interventions were effective in managing a wide range of difficult behaviors. Other studies report three primary benefits to sensory interventions: enhanced ability to focus (Wilbarger & Wilbarger, 1991); reduction in the rate of aberrant behaviors (Bright et al., 1981), and generalized improvements in the functioning of the nervous system, resulting in higher academic gains (Ayres, 1979; Mangrun et al., 1981). Wells and Smith (1983) specifically studied the occurrence of self-injury in students with autism and determined that the frequency of self-injury decreased when the students received sensory integration.

In contrast to the aforementioned studies, there have been many others that have determined that SBI were not effective in decreasing behavioral issues in students. Farahiyah, Karen, Liu,Bissett and Penkala (2015) reported that four systematic reviews analyzed the effectiveness of SBI for children with general sensory processing problems Case-Smith et al. 2015; May-Benson and Koomar, 2010; Polatajko and Cantin 2010). The most recent of these, Case-Smith et al. (2015), confirmed mixed results for the effectiveness of SBI on children with ASD. Limitations of these studies included a focus on general behavior, rather than specific behavior, and small sample sizes, preventing generalization of results. Resultingly, it is difficult to draw a clear conclusion as to the effectiveness of SBI on managing students' behavior.

Lang et al. (2012) reported that after reviewing 25 separate studies, including 17 that used SBI for students with ASD, results were again mixed. Limitations noted in this review included lack of fidelity to intervention, incomplete description of interventions used, and lack of randomization of the sample used. May-Benson and Koomar (2010)

investigated the effects of sensory based intervention with students who were identified with difficulties in sensory processing and reported positive changes in the areas of sensorimotor skills, socialization, behavior, and play. However, this study was limited in sample size, heterogeneity of the sample, and the intervention used was not specifically designed for students with behavior problems.

The final review reported in Farahiyah et al., (2015) summarizes the work of Polatajko and Cantin (2010). Polatajko and Cantin (2010) summarized 21 studies of occupational therapy interventions with students who had sensory processing delays. Again, the results of the review indicated that the effects of SBI were inconclusive.

While significant research indicates inconclusive results for the use of SBI, few compare the results of SBI to more traditional behavioral intervention approaches. Devlin, Healey, Leader, and Hughes (2011) conducted a study that specifically looked at the effects of SBI on self-injurious behaviors on students with a propensity for self-injury and compared the results to the effects on the same students when the students were exposed to more traditional behavioral interventions. Results of this particular study demonstrated that the behavioral intervention was more effective than the sensory integration therapy in the treatment of challenging behavior.

Use of Weighted Vests as a Sensory Based Intervention

A popular intervention to address repetitive and stereotypic behaviors is the use of weighted vests. Weighted vests are garments that add even distribution of up to 10% of an individual's body weight to that person (Stephenson & Carter, 2009). Professionals who use weighted vests for intervention espouse the benefits as providing deep pressure, increasing serotonin and dopamine levels in the brain, and reducing repetitive and

purposeless movements (Kane, Luiselli, Dearborn, & Young, 2005; Morrison, 2007; Olson & Moulton, 2004, Stephenson & Carter, 2009). Proponents of weighted vest use believe that the pressure provided by the vests creates calming effects by providing neurological input to the thalamus, reticular formation, and parietal lobe (VandenBerg, 2001).

In a study by Olson and Moulton (2004), occupational therapists were surveyed and 82% of respondents indicated using weighted vests to address the sensory needs of their clients. These respondents also reported the presence of calming effects on students, reduced stereotypical behavior in students with ASD, and an increase in students' attention to tasks. While the overall opinions on the use of weighted vests were positive, the respondents did acknowledge having concerns over the lack of research determining the effectiveness of the practice.

Morrison (2007) reviewed research on the use of weighted vests on children with ASD. Like other reviews of sensory based interventions, the results of the review were inconclusive in determining the overall effect of the use of the vests. One of the reviewed studies, by Fertel-Daly, Bedell, and Hinojosa (2001) reported positive effects in attention to detail and a decrease in distractive behaviors when participants wore weighted vests. Another study, by Kane et al. (2005), reported no improvements in any behavioral area and even reported that 3 of the 4 participants in the study exhibited negative outcomes. The final study reviewed, by Myles et al. (2004) and conducted on three students, indicated positive responses for two subjects and negative response for one subject.

Stephenson and Carter (2009) built upon Morrison's 2007 work and further examined seven studies that used weighted vests to improve the behavior of students with ASD and other disabilities. The authors found significant methodological flaws in many of the studies including inadequate descriptions of participants, questionable experimental designs, and insufficient reliability data. Similar to other studies, the researchers found insufficient evidence to support the use of weighted vests to improve the behavior of students with ASD.

Additionally, a 2011 study by Davis et al. found little to no effect on the level of aggressive and self-injurious behavior in a single subject with ASD.

Although research has shown limited and inconsistent results, the use of weighted vests by occupational therapists and special educators remains prevalent. The American Occupational Therapy Association (2017) currently recommends the use of sensory integration strategies and, specifically, the use of weighted vests. The AOTA also published a comprehensive review of sensory based interventions, finding moderate evidence to support the use of Ayre's Sensory Integration, and mixed results for sensory based methods overall (Watling & Hauer, 2015).

Summary

The increasing number of alternative schools in the United States is due to many factors. Legislative action that has resulted in multiple key laws being passed has caused educational professionals to seek out interventions that are effective in supporting the most at-risk students. Through a focus on small class sizes, effective relationship building, and a student-centered approach, alternative schools are one intervention that is being used to meet these needs.

Social learning theory is a guiding factor in the administration of alternative schools. By focusing on the needs of the student and applying lessons to real-life knowledge and experiences, alternative schools are addressing the needs of their student at the student's level of understanding. By encouraging positive and meaningful relationships between students and educators, the alternative school environment becomes less threatening and more rewarding for students.

Constructivist theory allows for the alternative school to approach teaching through a methodical and specific building approach. By engaging students through social and reality-based knowledge, and by tapping into previously acquired knowledge, the alternative school staff can set the student up for success. Rather than treating learning as a rote process, the constructivist view allows for deviation from traditional forms of education and taps into the varying styles of learning exhibited by students.

With significant needs of at-risk students being present, multiple interventions are required in alternative schools. A primary factor for students being referred to alternative schools is the prevalence of significant emotional and behavioral issues in the student while enrolled in public school. School-wide approaches such as School Wide Positive Behavior Support and Positive Behavior Intervention and Supports are interventions that have met with success in the alternative school environment.

Of particular concern in alternative schools is the tendency for students to have a history of aggressive behavior. Research reviewed for the present study indicates that grouping students with aggressive pasts together often leads toward an increase in aggressive behaviors, which can be negatively reinforcing to the student, in a school setting. The challenge for alternative school personnel then becomes designing

interventions that accommodate for the population of students enrolled in the alternative school, all of whom are at-risk. One particular approach has been to consider the use of sensory based interventions.

Sensory integration theory espouses that behavioral difficulties are rooted in the dysfunction of the sensory system. Interventions in the realm of sensory integration theory have focused on providing sensory experiences for students that engage in maladaptive behaviors. While much of the research on sensory integration intervention has been focuses on students who have Autism Spectrum Disorder, the applicability of the techniques to students without autism but who also display maladaptive behaviors cannot be overlooked.

Significant research on the value of sensory based intervention has resulted in inconsistent findings. While there appears to be an overall positive regard for the expected benefit of sensory based treatments, research has been unable to confirm or deny the applicability of the approach to students exhibiting maladaptive behavior. Specific to the current study, the use of weighted vests as an intervention for students with aggressive and self-injurious behavior was reviewed. Again, research has been inconsistent with several studies pointing to a benefit in using weighted vests, and several more indicating no effect of even negative effects on student behavior.

The review of literature in this chapter leads to several key understandings

1. Alternative schools are increasing in numbers
2. A constructivist approach with incorporation of social learning theory is seen as the most effective approach to alternative school education.

3. Standards for success, both academically and behaviorally, have led to the inception of multiple intervention programs for students in alternative schools
4. Sensory based approaches are believed by many to be appropriate and result in positive outcomes by reducing maladaptive behavior in students
5. Research has not been able to consistently support or refute the benefit(s) of sensory based instruction
6. Most research on sensory approaches has pointed to cases where the students were students with autism. The applicability of these methods to other disabled students in an area in need of further investigation, which is what the current study proposes to do.

CHAPTER THREE: METHODS

Overview

This study examined the effect of a sensory integration intervention, the wearing of a weighted vest, on the level of student aggression for elementary students enrolled in a private alternative school. This chapter provides information about the study's design, instrumentation, participants, setting, data collection procedures, and analysis.

Design

This study used a quasi- experimental time series A-A-B-B design (Gall, Gall, & Borg, 2007, p. 433). Time-series analysis is a design for analyzing data from repeated observations on a single unit or more than one individual at regular intervals over many observations. Using this particular design was critical as in the current study there could be multiple confounding variables within the sample that cannot be effectively controlled. Furthermore, this design is well suited for research on behavior modification (Gall, Gall, & Borg, 2007). The purpose of the study was to measure and analyze how the use of a sensory integration impacts a student's frequency and type of aggressive behavior. The independent variable in this study was the use of the sensory based intervention and the dependent variable was the number of instances of verbal aggression, physical aggression, aggression towards property, and aggression toward self was displayed by students when receiving the intervention as compared to the same factors when the students are not receiving the intervention**.**

The sensory integration intervention for this design was the use of a weighted vest with 2 lbs. of weight applied. The students were observed while receiving the intervention and without receiving the intervention each for 8 consecutive school days. A

weighted vest is a specifically created vest that provides deep touch and proprioceptive input that help to calm and organize the body (funandfunction.com). The level of aggression for the students was measured with an in-house rating scale during the same school period on eight days without the intervention and on eight days with the intervention. Participants in this study were be enrolled in the private alternative school before the start of the research, thereby eliminating the opportunity for random selection (Gay & Mills, 2012).

Research Question

The following research question was used for this study:

RQ1: Is there a difference in in the frequency of aggressive behaviors of alternative school elementary students with disabilities who undergo sensory integration intervention when compared to the same students not receiving a sensory integration intervention?

Null Hypotheses

The null hypotheses for this study are:

$H_0$1: There is no significant difference between the mean levels of *verbal aggression* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention and while not undergoing sensory integration intervention.

$H_0$2: There is no significant difference between the mean levels of *aggression towards property* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention and while not undergoing sensory integration intervention.

$H_0$3: There is no significant difference between the mean levels of *aggression towards self* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention and while not undergoing sensory integration intervention.

$H_0$4: There is no significant difference between the mean levels of *physical aggression toward others* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention and while not undergoing sensory integration intervention.

Participants and Setting

Population

The population for this study consisted of students enrolled in a private alternative school for students with disabilities located in a low-to-middle class neighborhood in a central Virginia. The school enrolls students in grades K-12 from 14 different school divisions and has students from urban, suburban, and rural backgrounds . The total enrollment for the school is 78 students. The students in this study were elementary students in special education with the following disabilities: Emotionally Disabled (ED) and Autism Spectrum Disorder (ASD). The private alternative school is set up much like a public school with classrooms containing computers, interactive white boards, tablets, and LCD projectors. Each classroom is staffed by a teacher licensed by the State of Virginia Department of Education in Special Education and an instructional assistant. The alternative school is also staffed by three full time qualified mental health practitioners for children, three full-time behavior specialists, a full time reading specialist, and two administrators.

Sample

Convenience sampling was used for this study. The sample consisted of 20 elementary students in grades K-5 enrolled in the private alternative school who participated in 16 separate data collection events (20 x 8 = 160). According to Gall, Gall, and Borg (2007), 32 entries is the required minimum for a medium effect size with statistical power of .7 at the .05 alpha level for a time-series repeated measure design. The sample consisted of students from four separate classrooms within a private alternative school. The sample included 18 male and 2 female students. The ethnic background of the sample is as follows: 6 Caucasian, 13 African-American, 1 Hispanic. All participants were students with disabilities with active IEPs in the following categories: 18 Emotionally Disabled (ED); 2 Autism Spectrum Disorder. The setting for the study was in the specific classrooms in which the sample students are enrolled, and the study occurred during the same time of day and during the same subject being instructed on every measured day to avoid any effects of time or subject on the results.

Instrumentation

The instrument used in this study was an in-house rating of student aggression chart, entitled The Aggressive Behavior Rating Form (See Appendix C). This instrument appears to be based on the Modified Overt Aggression Scale (MOAS) and has been in use for over 5 years at the school and in surrounding school divisions to measure frequency of aggressive behavior. The original Overt Aggression Scale was created by Yudofsky (1986). The Modified Overt Aggression Scale (MOAS) was developed by Kay et al.(1988). The MOAS has been used repeatedly in research on aggressive behavior of

children, adolescents, and adults (Lanza, 2016; Chaplin et al. 2015; Chen, 2014; Krakowski, 2014; Magari et al., 2014; Stafford, 2012;Yeh, 2009; Oliver, 2007).

The MOAS is considered to be both valid and reliable and is supported in literature as follows: Inter-rater reliability as measured by Intra-class correlation was established on the various subscales between 0.90-1.0 with an overall rating of 0.94 $p > .001$ (Huang, 2009) in one study and 0.96 in another (Endicott, 2012). Several investigators have modified the MOAS so it can be used to provide more global assessments of aggression frequency rather than on an incident by incident basis. These modifications vary with the individual needs of the investigator but all have resulted in acceptable levels of reliability and validity (Alderman et al. 2002; Kay et al. 1988; Knoedler 1989; Sorgi et al. 1991). Validity was established in a study by Coccaro (1991) and again by Suris et al. (2005) who compared the use of the MOAS to several other identified measures of aggression (Aggression Questionnaire, Barrett Impulsiveness Scale -11).

Permission to use the instrument was obtained from school administration. The purpose of the student aggression chart is to indicate the frequency of aggressive behaviors on a scale from zero behaviors to five or more behaviors and to assign a level to the total number of observed behaviors. The student aggression chart has been in use at the private alternative school for over 5 years and all in-classroom staff receive initial and refresher training on the use of the chart. At least 10 local school divisions in the Central Virginia area have requested and used data and results from this instrument to be used for educational and behavioral planning over the past 5 school years. The data provided by the student aggression chart is frequently used to develop functional behavior assessments (FBA) and behavior intervention plans (BIP) for individual

students as well as to compare behavioral levels and types of aggression upon enrollment in the alternative school, during enrollment, and when a return to public school is being considered. The local education agency (LEA) responsible for referring the student to the private alternative school completes these assessments and the data for these assessments is provided by the private alternative school. Each level of the scale is assigned a point value as follows:

0	No occurrence
1	1 occurrence
2	2 occurrences
3	3 occurrences
4	4 occurrences
5	5 or more occurrences

Individuals are rated in four separate areas; Verbal Aggression, Aggression toward Property, Aggression toward Self, and Physical Aggression towards others. A score of 0 is the lowest possible score, indicating that the student displayed no aggressive behaviors in any sub-area during the observation. A score of 5 points is the highest possible score, indicating that the student exhibited 5 or more aggressive behaviors in each sub-area during the observation. The researcher collected the rating, less identifying information, from the observer and scored the instrument.

Training for use of rating scale

The teaching assistants in each of the classes are trained on how to use the student

aggression chart during orientation after initial employment. Refresher training is provided during pre-school planning week prior to the start of each Fall semester. Individuals are provided training from school administration on behavioral observations including how to document frequency and type of behaviors. Each individual is required to watch a video of a student in a classroom who exhibits a variety of behavioral problems. While watching the video, the individual is asked to document the student's behaviors on a behavior sheet. A second video is then viewed that shows a student exhibiting different types of aggressive behavior. The observer is asked to document the type and frequency of each behavior exhibited by the example student. The observer's sheet is then collected and compared to an existing observation sheet completed by a well-trained observer on the same child. Differences in recording are identified and compared with the goal being to have observers exhibit consistency in behavioral documentation. For this study, one observer was selected to complete all observations to avoid any inter-rater bias or reliability issues.

Verbal Aggression

Behaviors that will be recorded on the Verbal Aggression sub-scale include; verbal threats, name-calling, cursing/profanity, verbal bullying, and verbal challenges to authority.

Aggression towards property

For the aggression toward property sub-scale the observer looks for instances of any of the following; breaking or attempting to break pencils or other writing instruments, pushing desks or classroom furniture, knocking items from desks/table, turning over desks/chairs, kicking or punching furniture or walls, throwing of any item.

Aggression toward self

Behaviors recorded on the aggression toward self subscale include; hitting self, head banging, skin picking, choking self, wrapping clothing or other items around neck, throwing self into objects or walls.

Physical aggression toward others

Behaviors that qualify as physical aggression toward others include: posturing or "bucking up"; hitting, kicking, biting, or pinching others; spitting at others; throwing an item with the intent to hit another person; intentional tripping or pushing of others; and throwing or directing any bodily fluid at another person.

Procedures

Institutional Review Board approval was requested and obtained. See appendix A for IRB approval letter. The researcher will use caution to minimize any risks to participants.

Consent forms with an opt out option for participation in the study were sent home to the parent/guardian of each student identified as a possible sample group participant. See Appendix B for the consent letter. Parental consent letters were mailed home two weeks prior to the start of data collection. As was explained by the consent form, the parents/guardians were given the opportunity to opt their student out of the study. Of 25 letters sent home to 25 students, 2 parent/guardians responded to opt their student out of the study.

The time-series design requires a baseline measurement followed by the introduction of the experimental variable. The observation schedule for the time series consisted of two consecutive eight day periods as follows with C = control day (no

intervention) and T = treatment day (with intervention):

Table 1

Schedule of Data Collection

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14
T/C/WE	C	C	C	C	WE	WE	WE	C	C	C	C	WE	WE	WE
Day	15	16	17	18	19	20	21	22	23	24	25	26	27	28
T/C/WE	T	T	T	T	WE	WE	WE	T	T	T	T	WE	WE	WE

T = Treatment
C = Control
WE - Weekend

Observations were conducted in four, thirty minute periods on each study day by a trained observer. Each classroom group was observed during the same thirty minute period each day to avoid any chance of the time of day or subject being taught having any effect on results. The observer was an instructional assistant in the school who was unfamiliar with the specific sample participants (the observer worked only with high school students during the previous school year and was recruited specifically for this study on elementary students to avoid any possibility of prejudice/bias). As a current employee, the observer was previously trained in behavioral data collection and in the use of the observation instrument. To ensure effective training in behavior data collection and in the use of the selected instrument, refresher training was provided to the observer two weeks in advance of the scheduled observations and three practice observations, under the supervision of the researcher, occurring during that period.

For this study, the observations occurred during reading instruction time period. Reading instruction time is defined as instruction dedicated to teaching reading skills,

strategies and concepts (Denton, n.d.). Reading skills can include activities that allow students to learn how to associate letters with sounds. Strategies are routines or actions that help a student know what to do when faced with a word that they don't know, a word that they cannot spell, or a passage that they don't fully understand. Concepts relate to the background knowledge required for reading and related to the subject that is being read about.

On treatment days (T), the instructional assistant read the following instructions to the students:

Hello students, we will be wearing our vest today. I will handout the vest now. Now that you have your vest, please put the vest on. Does everybody now have their vest on? Now let's start our lesson for today.

Vests were obtained from Fun and Function (www.funandfunction.com - Item # WR1831) and each vest contained 2 lbs. of weight. Vests were worn for the entire 30-minute observation period. After thirty minutes the following instruction was read:

Thank you all for your participation, you may now remove your vests. Please hang your vests on the back of your chair.

On control days (C), no instructions were provided to students participating in the study, no vests were handed out or worn. The observer documented aggressive behaviors shown by each study participant during the observation periods. Observed behaviors were recorded as they occur by the observer utilizing the provided instrument. One sheet of the instrument was used each day for each student participating in the study.

Data sets were organized by variable using Microsoft's Excel spreadsheet program, and inferential statistics were calculated using Intellectus Statistics ®[Online

computer software] (2018).

Data Analysis

Prior to receiving the individual observation sheets, each sample participant's identifying information was removed from the observation sheets by the school's administrative assistant. Each study participant was assigned a unique identification number to ensure anonymity. The researcher organized data by sub-scores for analysis and reporting purposes, as reported with both the research question and null hypotheses. Means by domains were calculated and compared to determine the existence of any area of statistical significance. Paired samples *t*-tests were utilized to test the four null hypotheses to describe differences between two groups (treatment group and control group). Paired samples *t*-tests compare the means of separate groups of scores that are reported by making repeated measurements on the same sample whose behavior is measured in separate trial, before and after an intervention, or under two treatment conditions. (Warner, 2013). In a within-S or repeated measures design, the researcher measures each participant's aggressive behavior on all four areas (verbal, property, self, and physical). To protect the validity of these results, any student with missing data points were removed entirely from the study. Missing data points occurred during this study due to student refusal to participate (2).

As with any study involving the use of *t*-tests, there are several assumptions and tests for the assumptions. For the paired samples *t*-test the assumptions are as follows:

- Assumption 1: The dependent variable is measured on a continuous scale.
- Assumption 2: The independent variable consists of two related groups, meaning the same subjects are present in both groups (Warner, 2013).

- Assumption #3: There should be no significant outliers in the differences between the two related groups. A box and whiskers plot will be produced to identify any possible extreme outliers (Gall, Gall, & Borg, 2013;Warner, 2013)..
- Assumption #4: The distribution of the differences in the dependent variable between the two related groups should be approximately normally distributed**.** In the current study, the assumption of normality will be tested with a Shaprio-Wilk test (Warner, 2013). The Shapiro-Wilk will be used as the sample size will be less than 50.

To protect against a possible Type 1 error with four null hypotheses, a Bonferroni correction was applied to the alpha level (Warner, 2013; Gall et al., 2007). To test the null hypotheses, a paired samples *t*-test was employed with a significance level set at alpha = .01 (Bonferroni correction .05/5). Effect size was reported using the eta squared statistic to determine the strength of the effect (dependent variable) attributable to intervention (independent variable) (Warner, 2013; Howell, 2011).

CHAPTER FOUR: FINDINGS

Overview

The purpose of this quasi-experimental time series designed study is to determine the effect of a sensory based intervention on the number and type of aggressive behaviors exhibited by students with disabilities who are enrolled in a private, alternative school. In Chapter Four, the descriptive statistics will be discussed, as well as the data screening procedures and the assumptions. The results for each of the null hypotheses will be presented.

Research Question

The research question for this study was:

RQ1: Is there a difference in in the frequency of aggressive behaviors of alternative school elementary students with disabilities who undergo sensory integration intervention when compared to the same students not receiving a sensory integration intervention?

Null Hypotheses

The null hypotheses for this study were:

$H_0$1: There is no significant difference between the mean levels of *verbal aggression* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention and while not undergoing sensory integration intervention.

$H_0$2: There is no significant difference between the mean levels of *aggression towards property* observed in alternative school elementary students with disabilities

while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

$H_0$3: There is no significant difference between the mean levels of *aggression towards self* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

$H_0$4: There is no significant difference between the mean levels of *physical aggression toward others* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

Descriptive Statistics

Descriptive statistics where obtained for the dependent variables, verbal aggression, property destruction, self-aggression, and physical aggressing towards others. The mean level of participant's levels of occurrences of verbal aggression in the control group (M = 1.60, SD = 1.93) was slightly greater than in the treatment group (M = 0.60, SD = 1.05). The mean level of participants' observed occurrences of property destruction in the control group (M = 0.65 SD = 1.14) was slightly greater than in the treatment group (M = 0.45, SD = 0.83). The average of participants observed occurrences of self-aggression in the control group (M = 0.15, SD = 0.49) was slightly lower than in the treatment group (M = 0.20, SD = 0.70). Finally, the average of participants' observed occurrences of physical aggression toward others in the control group was slightly higher in the control group (M = 0.40, SD = 0.75) than in the treatment group (M = 0.20, SD = 0.70).

Data Analysis Results

Null Hypothesis One - Verbal Aggression

A paired samples *t*-test was conducted to examine the first null hypothesis. The first null hypothesis aimed to determine the difference between the total occurrences of *verbal aggression* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

Prior to analysis, the assumptions of normality and homogeneity of variance were assessed. A Shapiro-Wilk test was conducted to test the assumption of normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test was not significant ($p > .05$) for both control and treatment groups. These results suggest that the assumption of normality for both the control and treatment groups were met. Levine's test was used to assess whether the homogeneity of variance assumption was met (Levine, 1960). The result of Levine's test was significant ($p = .022$), however, after examination, the researcher determined that the violation of the assumption of homogeneity of variance was not severe and continued with a paired samples *t* test.

Due to the number of hypotheses being tested, a Bonferroni correction was applied for each analysis to determine significance using the formula ($PC_a = EW_a/k$) or $PC_a = .05/4$ resulting in a comparison alpha at .0125 (Warner, 2013, p. 98-99). The result of the paired samples *t*-test was not significant at the new alpha level where $t(19) = 2.76$, $p = .013$. The control group had a mean of 1.60 and standard deviation of 1.93 and the treatment group had a mean of 0.60 and a standard deviation of 1.05. The control group

showed a higher of verbal aggression when compared to the treatment group, however the difference was not significant.

Null Hypothesis Two – Aggression Towards Property

A paired samples *t*-test was conducted to examine the second null hypothesis. The second null hypothesis aimed to determine the difference between the total occurrences of *aggression towards property* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

Prior to analysis, the assumptions of normality and homogeneity of variance were assessed. A Shapiro-Wilk test was conducted to test the assumption of normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test was significant ($p < .05$) for both control and treatment groups These results suggest that the assumption of normality for both the control and treatment groups were not met. However, the researcher determined that the *t* test was robust enough to handle the violation of normality and continued with the analysis. Levine's test was used to assess whether the homogeneity of variance assumption was met (Levene, 1960). The result of Levene's test was not significant ($p = .528$), the researcher determined that the assumption of homogeneity of variance was met and continued with a paired samples *t* test.

Due to the number of hypotheses being tested, a Bonferroni correction was applied for each analysis to determine significance using the formula ($PC_a = EW_a/k$) or $PC_a = .05/4$ resulting in a comparison alpha at .0125 (Warner, 2013, p. 98-99). The result of the paired samples *t*-test was not significant at the new alpha level where $t(19) = 0.85$,

p = .408. The control group had a mean of 0.65 and standard deviation of 1.14 and the treatment group had a mean of 0.45 and a standard deviation of 0.83. The control group showed a higher of aggression toward property when compared to the treatment group, however the difference was not significant.

Null Hypothesis Three – Aggression Towards Self

A paired samples *t*-test was conducted to examine the third null hypothesis. The third null hypothesis aimed to determine the difference between the total occurrences of *aggression towards self* that was observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

Prior to analysis, the assumptions of normality and homogeneity of variance were assessed. A Shapiro-Wilk test was conducted to test the assumption of normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test was significant (p < .001) for both control and treatment groups These results suggest that the assumption of normality for both the control and treatment groups were not met. However, the researcher determined that the *t* test was robust enough to handle the violation of normality and continued with the analysis. Levine's test was used to assess whether the homogeneity of variance assumption was met (Levine, 1960). The result of Levene's test was not significant (p = .794), the researcher determined that the assumption of homogeneity of variance was met and continued with a paired samples *t* test.

Due to the number of hypotheses being tested, a Bonferroni correction was applied for each analysis to determine significance using the formula ($PC_a = EW_a/k$) or $PC_a = .05/4$ resulting in a comparison alpha at .0125 (Warner, 2013, p. 98-99). The result

of the paired samples *t*-test was not significant at the new alpha level where t(19) = -0.57, $p = .577$. The control group had a mean of 0.15 and standard deviation of 0.49 and the treatment group had a mean of 0.20 and a standard deviation of 0.70. The control group showed a lower level of aggression toward self when compared to the treatment group, however the difference was not significant.

Null Hypothesis Four – Physical Aggression Toward Others

A paired samples *t*-test was conducted to examine the fourth null hypothesis. The fourth null hypothesis aimed to determine the difference between the total occurrences of *physical aggression towards others* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment) and while not undergoing sensory integration intervention (control).

Prior to analysis, the assumptions of normality and homogeneity of variance were assessed. A Shapiro-Wilk test was conducted to test the assumption of normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test was significant ($p < .001$) for both control and treatment groups. These results suggest that the assumption of normality for both the control and treatment groups were not met. However, the researcher determined that the *t* test was robust enough to handle the violation of normality and continued with the analysis. Levene's test was used to assess whether the homogeneity of variance assumption was met (Levene, 1960). The result of Levene's test was not significant ($p = .389$), the researcher determined that the assumption of homogeneity of variance was met and continued with a paired samples *t* test.

Due to the number of hypotheses being tested, a Bonferroni correction was applied for each analysis to determine significance using the formula ($PC_a = EW_a/k$) or $PC_a = .05/4$ resulting in a comparison alpha at .0125 (Warner, 2013, p. 98-99). The result of the paired samples *t*-test was not significant at the new alpha level where $t(19) = 0.85$, $p = .408$. The control group had a mean of 0.40 and standard deviation of 0.75 and the treatment group had a mean of 0.20 and a standard deviation of 0.70. The control group showed a higher of physical aggression toward others when compared to the treatment group, however the difference was not significant.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Overview

The purpose of this quasi-experimental time series designed study was to determine the effect of a sensory integration intervention on aggressive behavior of students enrolled in an alternative elementary school for students with disabilities. Twenty students participated in the study. Data was collected through behavioral observations over the course of 16 consecutive school days with the individual student's frequency of aggressive behaviors in four domains being recorded on eight days with a weighted vest on and eight days without a weighted vest on. The four observed and recorded domains were verbal aggression, aggression toward property, aggression toward self, and physical aggression toward others. A series of paired samples *t*-tests were used to analyze the data. Chapter Five includes a summary and discussion of the findings, implications for current practices and future research, and limitations experienced throughout the research process.

Discussion

The purpose of this quasi-experimental time series designed study was to determine the effect of a sensory integration intervention on aggressive behavior of students enrolled in an alternative elementary school for students with disabilities. The following research question guided this study:

RQ1: Is there a difference in in the frequency of aggressive behaviors of alternative school elementary students with disabilities who undergo sensory integration intervention when compared to the same students not receiving a sensory integration intervention?

When examining the results of this quasi-experimental designed study four separate hypothesis were tested. Each null hypothesis proffered that the frequency of aggression demonstrated by observed students would not be significantly different when students were subjected to a sensory based intervention (wearing a weighted vest) and when not subject to the intervention.

The first null hypothesis aimed to determine the difference between the total occurrences of *verbal aggression* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment group) and while not undergoing sensory integration intervention (control group). Review of the data indicates that the control group showed higher verbal aggression when compared to the treatment group; however, the difference was not statistically significant. As a result, this null hypothesis was not rejected.

While some previous research indicated that the use of deep pressure therapy is linked to increases in attention and decreases in arousal, stereotypical, self-injurious, and disruptive behaviors (Doughty & Doughty, 2008; Fertel-Daly, Bedell, & Hinojosa, 2001; Losinski, Cook, Hirsch, & Sanders, 2017; Quigley, Peterson, Frieder, & Peterson, 2011), the results of the current study, while somewhat supportive, were not statistically significant. Therefore, it is not possible to state that the use of the weighted vests was significantly effective in decreasing the frequency of verbal aggression in students.

While additional previous research did not focus specifically on the target population of this study, the results were similarly inconclusive with SBI being effective for some, but not all, subjects and benefits not occurring at a statistically significant level (Case-Smith et al., 2015; Farahiyah, Karen, Liu'Bissett & Penkala, 2015; May-Benson

& Koomar, 2010; Polatajko and Cantin, 2010). In the majority of these prior studies, the effects of sensory based interventions are confounded by lack of statistical significance and violations of normality due to small population size.

The second null hypothesis aimed to determine the difference between the total occurrences of *aggression towards property* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment group) and while not undergoing sensory integration intervention (control group). Review of the data indicates that the control group showed higher *aggression towards property* when compared to the treatment group; however, the difference was not statistically significant. As a result, this null hypothesis was not rejected.

Previous research has indicated that sensory integration approaches to intervention have been used frequently to address behavioral concerns in individuals with autism (Gabriels et al., 2012; Van Rie & Heflin; 2009), Attention Deficit Hyperactivity Disorder (Faramarzi, Rad, & Abedi, 2016), and in individuals with Autism or ADHD with a comorbid behavioral concern of aggressive behavior (Farahiyah, Karen, Liu, Bissett, & Penkala, 2015). These approaches are designed to modulate arousal through sensory input through the use of vestibular, tactile, and proprioceptive stimuli (Lang et al., 2012). A common form of SIT is deep-pressure therapy (DPT). DPT involves the application of pressure to the individual's body through the use of hug-boxes, weighted blankets (Mullen, Champagne, Krishnamurty, Dickson, & Gao, 2008), or weighted vests (Roley, Bissell, & Clark 2015; Davis et al. 2011).

Although many previous studies have investigated the effects of sensory based interventions such as the use of deep pressure therapy with a weighted vest, few have

resulted in any data indicating a statistically significant improvement in positive behavior or any statistically significant decrease in negative behaviors. While the results of the current study indicate that the control group showed a higher level of *aggression towards property* when compared to the treatment group, the difference was not statistically significant and any interpretation of these results should be viewed with caution.

The third null hypothesis aimed to determine the difference between the total occurrences of *aggression towards self* that was observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment group) and while not undergoing sensory integration intervention (control group). Review of the data indicates that the control group showed a lower level of aggression toward self when compared to the treatment group; however, the difference was not significant and the null hypothesis was not rejected. This is consistent with the inconclusive results previously found in multiple studies (Case-Smith et al., 2015; Farahiyah, Karen, Liu'Bissett, & Penkala, 2015; May-Benson & Koomar, 2010; Polatajko & Cantin, 2010). Limitations noted in these reviews included lack of fidelity to intervention, incomplete description of interventions used, and lack of randomization of the sample used. Furthermore, the current results are supported in part by a previous study. Devlin, Healey, Leader, and Hughes (2011) conducted a study that specifically looked at the effects of SBI on self-injurious behaviors on students with a propensity for self-injury and compared the results to the effects on the same students when the students were exposed to more traditional behavioral interventions. Results of the Devlin et al. (2011) study demonstrated that the behavioral intervention was more effective than the sensory integration therapy in the treatment of challenging behavior.

In the case of this third variable, aggression toward self, the mean of the control group was lower than the mean of the treatment group, indicating that the intervention was not only ineffective, but also produced an increase in negative behavior. Careful review of individual student profiles for this sub-area of study reveal that one particular student was very bothered by wearing a weighted vest and, while the student willingly wore the vest on the requested days, the student showed an individual increase in self-harming behaviors. The increase in aggression towards self in one student was significant enough to skew the mean of the overall variable, leading to the result of a higher mean for the treatment group than control group. Despite the effect of one student on the overall mean, the means of the two groups were not statistically significant.

The fourth null hypothesis aimed to determine the difference between the total occurrences of *physical aggression toward others* observed in alternative school elementary students with disabilities while undergoing sensory integration intervention (treatment groups) and while not undergoing sensory integration intervention (control group). The control group showed a higher level of physical aggression when compared to the treatment group; however, the difference was not significant. As a result, this null hypothesis was not rejected.

Similar to previous research, the results of this analysis are indicative of some positive effect of the use of sensory based interventions on the frequency of physical aggression in students; however, the effect is not statistically significant and therefore is not able to be generalized. May-Benson and Koomar (2010) investigated the effects of sensory based intervention with students who were identified with difficulties in sensory processing and reported positive changes in the areas of sensorimotor skills, socialization,

behavior, and play. However, the May-Benson and Koomer (2010) study was limited in sample size, heterogeneity of the sample, and the intervention used was not specifically designed for students with behavior problems.

Implications

Alternative schools often enroll students with significant emotional and behavioral disabilities. While research has indicated some positive effect for the use of sensory based interventions in students with Autism Spectrum Disorder and in students with concerns in the area of hyperactivity/inattention, the present study investigated the effect on students with disabilities who exhibited aggressive behaviors.

In review of the current study results there are multiple implications for use and interpretation. While the statistical results did not indicate a level of significance for any measured variable, based on the descriptive statistics the overall means in three of the four measured areas lean toward a positive implication for the use of a weighted vest for students with emotional and behavioral concerns in the areas of verbal aggression, property destruction, and aggression toward others. While a fourth variable, aggression toward self, showed a slightly higher mean due to the treatment, removal of one individual student's data from the sample results in a generally positive effect using the vest, though not statistically significant.

For schools working with students with aggressive behaviors toward others, property destruction, and verbal aggression, the implementation of a sensory based intervention with a weighted vest may well achieve a desired result of decreasing the negative behaviors. When negative behaviors in the classroom decreases, the student's ability to benefit from instruction is increased. The positive effect will carry over to other

students in the environment and may well increase the overall academic and behavioral gains for all students in the room. Caution should be used when implementing the use of a weighted vest as an intervention to decrease self-injury in students as both the current study and previous research indicate a potential negative effect with this behavior. Careful observation of the student's reaction to this method must occur as the present study indicated, in at least one student's case, that the negative behavior of self-harm could increase with the use of a weighted vest.

Limitations

A limitation of the current study is the small sample size (n = 20). Stevens (2009) indicates that with a sufficiently large sample size (n > 50), deviations from normality will have little effect on the results. Further analysis of the effect size, as measured by Cohen's d, indicate that a sufficiently larger sample size alleviates this limitation with increasing amounts of statistical power. was not determined.

Another limitation was when working with children with emotional and behavioral disabilities, the disabilities themselves can be a limitation. In the present study, additional students were recruited to participate but refused to do so on the needed days. Thus subject mortality in the present study is a limitation to be considered.

Recommendations for Future Research

As there are few studies determining the effect of sensory integration interventions on populations that do not consist solely of individuals with Autism Spectrum Disorder or Attention Deficit Hyperactivity Disorder, further study on the applicability of these interventions to other populations is warranted. Sensory integration theory posits that sensory intervention can have a positive effect on multiple negative

behaviors, not just those commonly associated with the aforementioned diagnoses. Additional studies that focuses on the results of sensory interventions for individuals with anxiety, aggression, depression, and other mental health diagnoses is needed.

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APPENDIX A: IRB Approval

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

June 22, 2018

Joshua Lutz
IRB Approval 3302.062218: Effect of a Sensory Integration Intervention on Aggressive Behavior in Alternative School Elementary Students

Dear Joshua Lutz,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project. Sincerely,

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UNIVERSITY.

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APPENDIX B: Permission Form

Consent Form

Dear Parent(s)/Guardian(s) of _____,

As you may be aware, I am currently pursuing my doctoral degree from Liberty University. One requirement of this objective is to complete my dissertation on the topic of the use of sensory integration interventions and the effect on student aggression. This ten day study will be conducted across the Elementary School in order to gather information at each grade level. I am asking parents and students for permission to gather data from class pre and post intervention with the use of a weighted vest (weighing no more than 2 pounds). Students will be asked to put the vest on for a 30 minute period on 5 different days and continue with their normal classroom activities.

The data I gather will have no undue effect on your student, our school, or class instructional time. The identity of our school and students will be protected and all information will be

anonymous in the final research report, or additional presentations in the future.

Only data from students who are present for the entire length of the study and who, along with their parents, give consent will be eligible for evaluation. There will be no negative consequences for students whose parents choose not to allow them to participate. Furthermore, students may opt out of the study at any time without negative consequences. Please discuss this with your student and check the appropriate line below. Please sign and date the bottom of the form. Thank you for your consideration of this matter.

Sincerely, Joshua Lutz

APPENDIX C: Instrument

Aggressive Behavior Rating Form (for use with FBA)

Student Name:_____

Grade:_____ Teacher:_____

Date:_____Observer:_____

Verbal aggression

_____ **0** No occurrence
_____ **1** 1 occurrence
_____ **2** 2-3 occurrences
_____ **3** **3-4 occurrences**
_____ **4** **5 or more**

_____ **VERBAL AGGRESSION SCORE**

Property Aggression/Destruction

_____ **0** No occurrence
_____ **1** 1 occurrence
_____ **2** 2-3 occurrences
_____ **3** **3-4 occurrences**
_____ **4** **5 or more**

_____ **PROPERTY AGGRESSION/DESTRUCTION SCORE**

Aggression toward self

_____ **0** No occurrence
_____ **1** 1 occurrence
_____ **2** 2-3 occurrences
_____ **3** **3-4 occurrences**
_____ **4** **5 or more**

_____ **AGGRESSION TOWARD SELF SCORE**

Physical Aggression

_____ **0** No occurrence
_____ **1** 1 occurrence
_____ **2** 2-3 occurrences
_____ **3** **3-4 occurrences**
_____ **4** **5 or more**

_____ **SUM PHYSICAL AGGRESSION SCORE**

CATEGORY	SUM SCORE
Verbal Aggression	
Aggression against Property	
Autoaggression	
Physical Aggression	
Total Score	