

Running Head: CHILDREN WITH AUTISM AND FASDT

Children with Autism and Fire Alarm Sound Desensitization Training (FASDT)

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____

Abstract

Many children with autism have a difficult time during a fire drill in the school. The purpose of this quasi-experimental research project was to test the hypothesis that Fire Alarm Sound Desensitization Training (FASDT) helps children with autism respond correctly during fire alarm activations.

Parents and teachers of children with autism were surveyed for their experiences with children with autism and how they respond to fire alarms. Based on data collected from the surveys and previous research, the most significant concern for children with autism and fire alarms is the loud noise. Many children with autism suffer from a condition known as hyperacusis, which is an abnormal reaction to otherwise normal or soft sounds.

A series of three fire drills from 15 preschool and kindergarten classes were video recorded, and student behavior assessments conducted, to determine the effectiveness of the FASDT. Based on Teacher surveys and data collected, there appears to be an improvement in behavior of students who participated in the FASDT. Data did not support the null hypothesis that, after receiving FASDT, there will be no difference in the response of a child with an ASD to the sound of a fire alarm and those who have not received the training.

The Mountain Brook Fire Department will become more aware of the needs in our schools during fire drills, identify and work to resolve behaviors that pose a threat to students and faculty during fire drills, and encourage implementation of a FASDT program for all kindergarten and preschool students in the Mountain Brook Schools. Further research needs to be conducted to determine if FASDT works for other developmental disabilities, whether refresher type training is necessary to maintain long-term desensitization, and does the desensitization carry over into other arenas such as assemblies or sporting events.

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Introduction

It was the first week of school, and time for the first fire drill of the school year. The teachers and staff were ready to respond to whatever issues arose. This however, is not a typical school. This is an early learning center for children with autism.

The fire alarm activated and everything seemed to be going according to plan. Children covered their ears but were cooperative and exited the building in an orderly manner, except for Danny, who was completely oblivious to the alarm. He was led out of the building but then immediately fell to the ground. The teacher picked him up and walked him out to the staging area. This behavior continued throughout the drill until he was back in the classroom and was distracted by the teacher who gave him a task to complete.

Billy was doing great until it came time to return to the classroom. As he approached the building, he became more agitated where he began to cry and fight. He did not want to go back into the classroom, where “that” sound had been.

Charlie’s behavior, on the other hand, progressed from calm to uncontrollable. Charlie covered his ears until he exited the building. He became agitated, crying loudly. Returning to the building, Charlie was completely unmanageable. He was crying, screaming, kicking and fighting. He was screaming, “I don’t want to,” “No, No, No, I can’t do it,” and “Help me.” Charlie remained this way the remainder of the day.

Children with autism do not respond in a typical fashion to fire alarms. Previous research indicates many children become physically aggressive, run blindly into dangerous situations, or injure themselves or others (Cohen, 2012). For many, this behavior is the result of sensitivity to the noise of the fire alarm. Research indicates that children with autism can respond correctly to

fire alarm activations after undergoing an educational process involving desensitization to the fire alarm as well as other educational methodologies (Cohen, 2012).

The problem is the hypothesis that fire alarm sound desensitization training causes children with an autism spectrum disorder (ASD) to respond correctly during a fire alarm activation has not been tested. The purpose of this quasi-experimental applied research project is to test the hypothesis that Fire Alarm Sound Desensitization Training (FASDT) helps children with autism to respond correctly during fire alarm activations.

The hypothesis of this research is that a child with an ASD, after receiving fire alarm sound desensitization training (FASDT), will respond in the same manner as a typical child during a fire alarm activation. The null hypothesis is that after receiving FASDT, there will be no difference in the response of a child with an ASD to the sound of a fire alarm and those who have not received the training.

The evaluative research method will be used to answer the following research questions: (1) What is the proper response for children during a fire alarm in school; (2) How do typical children respond to fire alarms in school; (3) How do children with autism spectrum disorder respond to fire alarms in school; (4) How do children with autism spectrum disorder respond to fire alarms after receiving FASDT; and, (5) What are the limitations to FASDT?

The research method used to collect data will be nonrandomized control group pretest-posttest design. In addition, interviews will be conducted, surveys obtained, and behavioral assessments will be made from videos of preschool and kindergarten children during fire drills.

Background and Significance

The number of children with autism is increasing. Ten years ago, according to the Centers for Disease Control and Prevention (CDC), 1 in 150 children were identified with an

autism spectrum disorder. Just last year, the CDC predicted that 1 in 110 children born each year would be diagnosed with autism. Today, the CDC “Data and Statistics” report has increased that number to 1 in 88 children, or 11.3 per 1,000 (2012).

In the State of Alabama, the overall prevalence of ASD was estimated to be significantly lower (4.8 per 1,000) than any other state participating in the Autism and Developmental Disabilities Monitoring Network (CDC, 2012). The Autism and Developmental Disabilities Monitoring Network (ADDM) is a surveillance system, funded by the CDC, to estimate the prevalence of ASDs, and operates in 14 communities that comprise over eight percent of the U.S. population of eight-year-olds (CDC, 2012). The latest data collected by the Alabama State Department of Education (ALSDE) indicates there were 4,391 students, or 0.59%, out of a total enrollment of 749,084, who were classified as having autism (2011).

On a local level, the statistics collected by the ALSDE for Jefferson County indicate that of the 35,860 students enrolled, 0.53%, or 189 students were classified as having autism (2011). The City of Mountain Brook reported 49 students, or 1.09%, receiving special education assistance for autism. Mountain Brook Schools, according to ALSDE data, has over 25% of the statewide student population receiving special education assistance for autism (2011).

It is anticipated that many students who receive special education assistance for autism will be going to college (B. Hager, Personal Communication, 11/29/12). According to Hager, there is little data collected regarding the number of students with autism enrolling in college. Those students who were diagnosed in the late 1990’s, when the autism rate was 1 in 250, are just now 18 years old and beginning to enter college. However, she went on to say that all colleges have student services departments that serve ASD students (Personal Communication, 11/29/12). The University of Alabama has a transition program that started with 1 student in

2006 and now has 12 students, and is forecasted to have many more students in the coming years (University of Alabama, 2012).

A person who has an Autism Spectrum Disorder (ASD) is frequently termed “on the spectrum.” In *Facts about ASDs*,” autism spectrum disorder is a collection of developmental disabilities involving impairments in social skills, communication and behavior (CDC, 2009). Coplan (2010) identifies four primary categories of symptoms: difficulty relating to others, abnormal language development, repetitious behavior, and atypical sensory and motor processing. Symptoms of ASD are as varied as the number of people with autism, and those symptoms can improve or worsen over time (Sears, 2010). Even though a child has the same diagnosis as another child, they will not always have the same problems to the same extent (Greenspan & Wieder, 2006).

Although the symptoms of a person with autism is as varied as the number of people with autism, according to the American Speech-Language-Hearing Association (ASHA), as many as 40 percent of the children with autism suffer from hypersensitive hearing (2011). Individuals with hypersensitive hearing, or hyperacusis, have normal hearing, however suffer extreme pain or discomfort from, or are distracted by ordinary sounds (ASHA, 2011). This pain or discomfort, many times, causes children with autism to exhibit serious behavioral issues when they are exposed to loud noises, such as fire alarms (D. Finn, Personal Communication, July 11, 2012).

Fire alarms and fire drills pose unique difficulties for children with autism. They may have sensitivity to the high-pitched sound of the fire alarm (Adams, Edelson, Grandin & Rimland, 2004). Fire drills may also disrupt the routine that the child with autism thrives on, increasing anxiety, and according to Collins, can even be painful (n.d.).

Children with autism may exhibit behaviors that endanger themselves or others and may not understand the consequences of their activities (Autism Society of America, n.d.). Special education teachers surveyed indicate that children with autism react to fire drills in a variety of ways. Mild agitation and excitement were the most common responses, however several teachers wrote that they had seen aggressive behavior and students attacking others around them during a fire drill (Cohen, 2012). Fire drills can even cause behavioral issues well after the drill, making it difficult to stay on task or follow instructions (S. Naramore, Personal Communication, July 11, 2012).

Because of the problems children with autism have during a fire drill, they have been excluded from participation in school fire drills (Cohen, 2012). They have been given accommodations by removing them from the classroom prior to the fire alarm, or they have been given hearing protection to lessen the sound. They have not been educated to know the proper response when a fire alarm activates (Cohen, 2012).

The focus in the literature is to make accommodations rather than try to resolve the issues related to fire drills and fire alarms. Special sounding fire alarms such as chimes (California State Fire Marshal, 2007), or playing Stars and Stripes Forever (Newcastle Limited Press Room, 2006), or a woman's voice makes for an autism friendly environment (Jackson, 2011). Accommodation works well when that accommodation is available throughout society. Books on tape for the blind or handicap ramps for the wheelchair-bound are available everywhere, but special fire alarms are not (Rudy, 2008). Fire alarms are everywhere: churches, theaters, hotels and dormitories, malls and grocery stores (National Fire Protection Association, 2012). If a child is going to be self-sufficient when they are out on their own, they need to be included in the fire drill.

According to Ed Paulk, Alabama State Fire Marshal, there are no exceptions allowed for fire drills in schools. Everyone leaves the building. (Personal Communication, March 7, 2012). Code of Alabama Section 36-19-10 provides for the regulation of fire drills in schools, and states, “The Fire Marshal, his deputies and assistants shall require officials and teachers of public and private schools and educational institutions to have at least one fire drill each month” (1975). Fire drills in Alabama, according to Paulk, are a matter of law, not just code (Personal Communication, March 7, 2012). In addition, Appendix section A.4.7.2 of NFPA 101® is emphatic about all occupants participating and taking fire drills seriously because “there is a grave danger that, in an actual emergency, the evacuation and relocation will not be successful” (National Fire Protection Association, 2012, p. 101-324).

This research is significant to children with autism because many of them will grow up to become productive members of society and live independently. Life skills are important because many children with autism will go to college (Dutton, 2008). That number will be increasing in the coming years (B. Hagar, Personal Communication, 11/29/12). Life skills include helping children with autism respond appropriately during fire alarm activations. This research can provide children with autism the tools they need to deal with an event that seldom occurs – an actual fire with fire alarm activation. In an actual fire event, not having this one life skill can have devastating consequences.

This research is significant to the fire service in that we have a responsibility to protect life and property from the dangers of fire. Even more, the fire service has a responsibility to provide children with autism the tools they need to protect themselves in those first minutes before the fire department arrives.

The Mission Statement for the Mountain Brook Fire Department (MBFD) is:

The City of Mountain Brook Fire Department is a values-driven organization that provides a range of quality public services for the health, safety, and welfare of the Mountain Brook Community with professionals who are committed to shared values and who are provided opportunities for personal growth. (Mountain Brook Fire Department, 2012, p.101.01)

This research is significant because the MBFD has a responsibility to provide for the health, safety, and welfare of the “Mountain Brook Community” including all our residents who have been diagnosed with ASD.

Fire Chief Robert Ezekiel, during the hiring process of new firefighters, stresses that the residents of the City of Mountain Brook have an expectation of quality (Personal Communication, 11/15/12). “Commitment to Quality” and “Customer Service Orientation,” two of the Department’s Shared Values (Mountain Brook Fire Department, 2012, p.101.01), provide the foundation for meeting the community’s expectation of quality. The MBFD Philosophy of Operations requires that the Department, in order to achieve that customer service orientation, provide “proactive programs that maintain and improve fire safety education throughout our community” (Mountain Brook Fire Department, 2012, p.101.01).

Lastly, “Quality Service for a Quality City” is the motto the Department lives by (Mountain Brook Fire Department, 2012, p.101.01). The City of Mountain Brook has an expectation of quality. The Birmingham Business Journal (BBJ), in a December 9, 2011 article, reported the City of Mountain Brook, AL ranked 1st for quality of life in Alabama, 4th in the South and 13th in the nation, based on a study of economic health, traffic, cost of living, housing and education (Birmingham Business Journal, 2011). The Mountain Brook School System is also

a proponent of quality. Brookwood Forest Elementary and Crestline Elementary schools, the Mountain Brook Junior High School and the Mountain Brook High School are recipients of the Blue Ribbon School Award through the U.S. Department of Education Recognition Program. About 98% of the Mountain Brook School students go on to colleges and universities, including all five military academies. Many students received full academic scholarships. Mountain Brook High School has over 500 students who have been named National Merit Finalists, and has three graduates who are Rhodes Scholars (Mountain Brook Schools, n.d.). Because quality is so important to the citizens, it should likewise be important to the MBFD to meet or exceed the Community's expectations of quality.

This research is associated with Goal 1 of the United States Fire Administration (USFA) to “reduce risk at the local level through prevention and mitigation” (United States Fire Administration, 2009, pg. 14). In particular, this research relates to the Operational Initiative to “Expand initiatives in public fire and safety education through various avenues to reach all segments of the population, particularly high risk groups” (United States Fire Administration, 2009, pg. 18).

This research coincides with the course goals of the National Fire Academy Executive Analysis of Community Risk Reduction (R274) course to “empower the Executive Fire Officer (EFO) with the ability to lead community risk reduction in a strategic manner” (United States Fire Administration, 2011, p. SM 1-7). This research relates particularly with Unit 2, Assessing Community Risks, by assessing the vulnerability of children with autism in relation to fire alarms and fire drills. This research relates to Unit 3, Intervention, Program Design, and Evaluation by assessing a program that teaches appropriate behaviors for children with autism through an educational intervention to reduce the risk of dangerous behaviors during fire drills

and fire alarms. Developing an implementation and evaluation plan to collect and analyze data about the outcomes of the program is also related to Unit 3. This research is also associated with Unit 5, Organizational and Community Politics through gaining citizen support with personal presentations to school system administrators, special education coordinators, school principals, teachers and parents.

Literature Review

A literature review was conducted to provide a foundation for the research project and to identify any research performed relating to children with autism and fire drills. There were no peer-review journal articles related to fire drills and children with autism. Most of the literature about what to do for a child with autism during a fire drill is from Internet bulletin boards, discussion boards and blogs.

Autism, according to the Individuals with Disabilities Education Improvement Act (IDEIA), is defined as a developmental disability with significant verbal and nonverbal communication and social interaction deficits. According to IDEIA, the disability is usually evident before age three, and has an adverse impact on the child's educational performance (Child with a disability, 2007).

The Autism Society of America (ASA) defines Autism as a "complex developmental disability...that affects a person's ability to communicate and interact with others" (Autism Society of America, n.d. ¶ 1). They go on to say that there is no cure for autism, however it is treatable, and with early diagnosis and intervention, the outcome can be greatly improved.

The characteristics and symptoms of autism are as varied as the number of people with autism, and can range from mild to severe. According to Mintz (2009), there is not a single autism prototype or poster child for autism. Some people with autism are very high functioning,

such as Dr. Temple Grandin. She has designed almost one-half of the livestock handling facilities in the United States, she is a Professor of Animal Science at Colorado State University, and a much sought after lecturer on autism (Grandin, n.d.). On the other end of the spectrum are those who will never be able to function independently. No two people with autism are the same.

Hypersensitivity to sound, according to Stiegler and Davis (2010), is one of the most common challenges for a person with an ASD. Hypersensitivity to sound, also known as hyperacusis, is defined as “an abnormally strong reaction occurring within the auditory pathways resulting from the exposure to moderate, or even soft, sound levels” (Gold, Formby and Gray, 2000, p. 69). Klein, Armstrong, Greer and Brown (1990) more critically define hyperacusis as “consistently exaggerated or inappropriate responses to sounds that are neither threatening nor uncomfortably loud to a typical person” (p. 339). Rimland and Edelson (1995) have suggested that as many as 40% of children with autism show evidence of hyperacusis, while Baranek (2002) reports that number may be as high as 88%. There is no empirical evidence that suggests their hearing is any different than their typical peers (Steigler & Davis, 2010).

People suffering from hyperacusis find sounds, such as the buzzing of a fluorescent light or the whirring of a fan too loud, or even painful (D. Finn, Personal Communication, January 20, 2012). Some people say that rain on a roof sounds like gunfire while others say they can hear blood pumping through their veins (Grandin, 2006).

Although people with autism may have the same diagnosis, each is different. A sound that is pleasing to one person may be painful to another. Some will be fascinated by the flushing of a toilet while, according to Grandin (2006), “may be wet their pants in panic because the flushing sounds like the roar of Niagara Falls” (p. 63).

Many children with autism react in an adverse manner to loud noises. According to Cohen (2012), parents surveyed reported children covered their ears, yelled or screamed or tried to run away from the sound. When asked about how children with autism respond to loud noises, teachers said the children become anxious, cover their eyes or ears, and many would have tantrums or would panic (Cohen, 2012). Reactions may be so severe that aggressive or self-injurious behaviors may be displayed and the individual may not be able to function (Berkell, Malgeri and Streit, 1996). For this reason, children with autism are excluded from fire drills, or are given other accommodations such as earplugs or headphones (Cohen, 2012).

Although there were no national standards found regarding procedures for fire drills, there are common recommendations. Everyone participates in fire drills, according to the National Fire Protection Association, in their “School Safety Tips” information sheet (n.d.). NFPA goes on to say students should leave as quickly as possible, however, order is more important than speed.

Scholastic (n.d.) has a lesson plan for a program called “Following the Right Steps to Safety” that teachers can use to prepare students for a fire drill in the school as well as help them plan a fire escape plan for the home. This program explains that after hearing the alarm, the students should listen to the teacher for instructions then leave the classroom in single file to their predetermined place (Scholastic, n.d.).

A literature review was conducted to identify research relating to typical children and how they respond during fire drills. There was no literature found using keywords, and combination of keywords, such as fire drills, fire alarms, children, school fire drills or fire drill behavior.

Fire drills in the school should not be a traumatic event. Collins (n.d.) writes that children with an ASD respond to a fire alarm in a variety of ways. Matthew covers his ears and hides under the desk while James screams, runs to the door, and pushing and hurting people on his way out of the building. Cohen (2012) surveyed teachers about dangerous or self-destructive behaviors exhibited by children with autism during fire drills. The two most common responses were attack others/physical aggression and run blindly into dangerous situations.

Accommodation is a common thread on many of the parent chat groups and autism bulletin boards. When asked about how to help a student get through a fire drill, McGowan (2009) answered, “get them a pair of earplugs” (¶ 4). He recommends using a stim – a soothing or distracting item – to take with them in case of an emergency. Another recommendation, although McGowan (2009) says he is “on the fence” (¶4) about this is, advance warning. Teachers said the most common special fire drill procedure used in schools is advance warning (Cohen, 2012).

Many treatments designed to reduce sensory impairments, such as hyperacusis, have not been validated in controlled, reliable studies (Dawson & Watling, 2000). Many children wear headphones on a daily basis to reduce the sound, however, this can lead to an increased hypersensitization (Mraz & Folmer 2003; Stiegler & Davis, 2010). Jastreboff and Jastreboff (2000) recommend, in the absence of hazardous noise levels, not using ear protection at all.

The most common treatment identified for hyperacusis is desensitization, along with other supporting methodologies. Koegel, Openden and Koegel (2004) suggest in a study of three children diagnosed with autism that a “desensitization program may be helpful in eliminating apparent sound sensitivities in children with autism” (p. 133). Their program involved repeatedly exposing the children to their target sound, from a distance, and progressively moving

closer to the sound, until the sensitivity to that sound was reduced to a tolerable level (Koegel, Openden & Koegel, 2004).

Derek, a father of a child with autism, said regarding a fire drill, “We have always favored a desensitizing approach in dealing with them with near perfect results” (Collins, n.d., ¶ 5). The one catch is it takes time and consistency (Collins, n.d.). In a Frequently Asked Questions forum, Grandin (2010) says that children will tolerate sounds more easily if they can be in control of that sound, both intensity and duration. In the case of a smoke alarm, Grandin said to wrap the smoke alarm in a towel and let the child play with it. Over time, the child should be able to tolerate the alarm without the towels. She also said to record the sound of the alarm and allow the child to turn it on and off and control the volume.

Because of the differences in children with autism, no one educational methodology will work for all children. Social stories, role-playing, peer modeling and video modeling are the most common educational techniques used to teach children with autism about fire drills (Cohen, 2012). According to Olejnik (2004), “role playing, scenarios and detailed preparation are essential for autistics to function well in any environment” (p. 60).

Social stories are stories designed for a specific child with the goal of teaching that child appropriate social behaviors (Morris, n.d.). Gray (1994) developed the Social Stories educational method to build on the visual learning style of most children with autism. Social stories describe a social situation using words and pictures to help the child understand appropriate behaviors. By individualizing the social story the child will have a better understanding of specific settings (Sansosti, Powell-Smith, & Kincaid, 2004).

One example of a customizable social story is “I Know My Fire Safety Plan” available from the National Fire Protection Association (NFPA). This no-cost social story breaks down in

a step-by-step story the important points of what to do when a smoke alarm activates. The social story is designed for 6 to 9 year olds and can be downloaded from the National Fire Protection Association's website (n.d.).

Role-playing is an effective and pressure-free method of teaching a child how to behave in social situations. In role-playing, the parent or teacher will serve as the role model and act out typical scenarios that the child might encounter. Daily activities such as playing with others or answering questions are typical role-play scenarios. Patience is required in role-playing so the student can take the necessary time to formulate their responses. Because of the visual nature of many children with autism, video recording during role-play can reinforce acceptable behavior and help the child learn more effectively (Autism Spectrum Disorders Fact Sheet, n.d.).

Video modeling is also an effective teaching tool to help children with autism learn social skills and other skills needed for daily living. The student watches a video demonstration of a behavior and then the student imitates that behavior (Bellini & Akullian, 2007). Video modeling and peer modeling are similar in that a person demonstrates the appropriate behavior. In video modeling, a video recording is used to demonstrate that behavior. Video self-modeling is another method of video modeling where the child is in the video and can evaluate their own behavior from the video (ABA Therapists, 2010).

Children with autism want to go to college (Van Pelt, 2008). "With specifically tailored interventions, students with ASDs can fulfill those aspirations and can reach their potential to become independent contributing members of society" (VanBergeijk, Klin and Volkmar, 2008, p. 1368). To help fulfill those aspirations, many colleges and universities are beginning to see the need for student services programs for students with an ASD (B. Hagar, Personal Communication, November 29, 2012). College Autism Spectrum (n.d.) lists 18 colleges and

universities, including Rutgers University, that provide individualized and group support services for students with autism. There are many more colleges and universities not listed that provide services to students with autism.

Procedures

Research began with a review of the available references relating to Autism that were located in the Learning Resource Center (LRC) at the National Fire Academy. A search of the Applied Research Projects (ARP) revealed three projects with a focus on autism. Mims (2008) developed a program to train first responders to assess and provide care to individuals with an autism spectrum disorder (ASD) in the absence of a caregiver. Russell (2009) developed an educational program to teach fire prevention to families of children with autism. Cohen (2012) evaluated how children with an ASD responded to fire drills and fire alarms, along with educational interventions used in helping children with an ASD learn to respond appropriately to a fire alarm. The First Responder Dissertations and Thesis collection was reviewed using Autism, autistic or ASD as keywords. No records were found with those keywords.

Fire and emergency medical service journals, books and other publications were reviewed using the card catalog at the National Fire Academy LRC in May 2012. A literature review was conducted in the Lister Hill Library of Health Sciences and the Mervyn H. Sterne Library on the University of Alabama at Birmingham campus and the Samford University Library regularly from July to November 2012.

An Internet search was conducted on Google, Google Scholar and Bing using keywords including, but not limited to Autism, Autism Spectrum Disorder, ASD, autistic, Asperger, and fire drill or fire alarm. There were no peer-review journals or other publications found relating to ASDs and fire drills or fire alarms. There continues to be considerable discussion in blogs and

bulletin boards from parent support groups and web sites with recommendations on what to do for children with autism during fire drills and fire alarms.

Internet searches were also conducted utilizing academic search engines including Academic OneFile, LexisNexis Academic, EBSCOHost, PsychInfo, ERIC, Academic Search Complete, Proquest Research Library, WebMD, and MedLine. Additional keywords included autism and anxiety symptoms, sensory processing, sensory processing disorder, auditory hypersensitivity, sensory hypersensitivity, hyperacusis, and auditory overresponsivity. Treatment and educational methodologies were searched including social stories, video modeling, peer modeling and desensitization. Internet searches and literature reviews were continued throughout the research project.

Interviews were conducted with Amy Dern, Occupational Therapist, and Libby Pittman, Speech Language Pathologist at the Mountain Brook Schools, to determine the educational methodologies used in teaching children with autism about fire drills and fire alarms, as well as the steps included in a fire alarm sound desensitization training program (FASDT). Meetings were held with Sandy Naramore, Executive Director of Mitchell's Place, a therapeutic Autism learning center, Shannon Mundy, Director of Special Education at the Mountain Brook Schools and Richard Barlow, Superintendent of the Mountain Brook Schools to solicit their participation in the data gathering aspect of the FASDT research.

Dr. David Finn, Associate Professor and Director of Special Education at Samford University, was interviewed to determine the requirements to obtain approval from the Samford University Institutional Review Board. Finn was questioned about behavioral assessment methods for children with autism. Dr. Thomas Woolley, Professor of Statistics in the Brock

School of Business at Samford University was interviewed regarding data collection methods and procedures for statistical analysis of the data that was collected.

This ARP utilizes a nonrandomized control group pretest-posttest design to evaluate the behavior of preschool and kindergarten students before, during and after a fire drill. Because the study involves human subjects in the research, an application was submitted to the Institutional Review Board for Human Subjects (IRB) at Samford University. The IRB is responsible for reviewing and approving research to ensure the research participants are protected and that the research complies with federal regulations (Samford University, 2011). The researcher is not affiliated with any university, so based on the working relationship with faculty members at Samford University, the IRB application was submitted to Samford University for review and approval. The IRB application was submitted on July 30, 2012 and approval was received on August 16, 2012 (Appendix A).

Confidentiality is paramount when dealing with children, especially children who may have a diagnosis of a disability or developmental delay. The identity of each person, including teachers, parents and students, participating in the study and any data relating to them is confidential. All individual data was coded using a unique alphanumeric identifier. A list of 300 identifiers containing a series of four alphanumeric characters was generated on the website www.RANDOM.org. Teachers and students were assigned a unique identifier. Informed consent forms approved by the IRB were signed by a parent or guardian for each student participating in the project, and were stored in a locked file cabinet. Survey instrument results are identified by the unique alphanumeric identifier and are password protected in GoogleDrive®, a free, secure on-line data storage site. Participant names do not appear on any data collection tools including the parent surveys, teacher surveys and the fire drill analysis work sheets. Fire drills were video

recorded to facilitate accurate data collection. Video recordings are stored on two password protected external hard drives and kept in a locked file cabinet. No participant identification appears on the disc identification. The identity of individuals involved in the study will not be revealed. Specific individuals were selected to highlight unique behaviors, however, a pseudonym and minor demographic alterations are used to protect identities.

One area of concern addressed by the IRB application is risk. This research project presents minimal risk to the participants. According to the International Fire Code® (2012), all students are required to participate in fire drills. Students may become distressed due to the disruption of routine, chaos resulting from the fire drill, fear of the noise associated with the fire alarm activation, or fear of the unknown relating to fire drills (Cohen 2012). There is minimal risk of injury to the student except for that risk associated with leaving the building during the fire drill. This risk included tripping, falling, bumping into walls, and other injuries common to exiting the building. Those students receiving the FASDT program, in addition to the required drills, will be exposed to the same risks found in the classroom environment, with the addition of the use of a fire alarm panel. These students may suffer distress due to the sound of the panel. These students were under the supervision of a Speech Language Pathologist, Occupational Therapist or other Special Education teacher when the fire alarm panel was in use.

Meetings were held with the principals of each school, prior to the start of school, to identify the classes that contained children with autism or other developmental delays. The classes that included special needs students and typical students were selected to participate in the research. Participants in the ARP consisted of students in eight kindergarten classes and seven preschool classes. Kindergarten and Preschool students were chosen for the research because they are the group most likely to have not been exposed to a fire drill in school. The

classes were divided into two groups: control and test, based on convenience. Four preschool classes were identified as the Preschool Test Group (n=42) while the remaining three preschool classes were identified as the Preschool Control Group (n=38). Four Kindergarten classes were identified as the Kindergarten Test Group (n=65). The remaining four Kindergarten classes were identified as the Kindergarten Control Group (n=66).

The Test Group consists of typical children and children with autism or other developmental delays in kindergarten and preschool. As part of the study, the students participated in three unannounced monthly fire drills. The first drill was conducted during the first week of school. Following the initial fire drill, the students participated in four sessions, one per week, of the FASDT program. Following the conclusion of the FASDT program, the students had the second fire drill. The students then went through a fifth session of the FASDT program. The final fire drill was held four weeks after the second fire drill. Each fire drill was video recorded for evaluation.

The Control Group consists of typical children and children with autism or other developmental delays in kindergarten and preschool. The students participated in three unannounced fire drills, four weeks apart. The Control Group did not undergo the FASDT program. The three fire drills were video recorded for evaluation.

Parents of prospective student participants were contacted during the school or preschool orientation programs. The parents were given an introductory letter (Appendix B) followed by a presentation about the research project including procedures used, confidentiality, risks associated with the study, and benefits of participating. At the conclusion of the presentation, parents were given an opportunity to ask questions. Parents were given an Informed Consent form (Appendix C) and a card with the student's randomly assigned alphanumeric identifier. The

alphanumeric identifier is to be used by the parent when completing the parent surveys. The parents were reminded several times that participation in the project was voluntary and their student could be withdrawn from the research project at any time without penalty. Signed Informed Consent forms were collected prior to any contact with the students.

The five research questions, along with interviews with Pittman, Dern, Finn and Naramore, provided the basis for the survey questions for the teachers and parents participating in the research project. Five surveys were assembled for the teachers and parents using Google Sheet®, a free spreadsheet program with capabilities for compiling and emailing survey forms and responses, available at www.docs.google.com. These surveys were used to gather teacher and parent responses concerning behavior of typical children and children with autism during fire drills. Teachers were given a USB drive containing the five teacher surveys and five parent surveys along with an introduction to each survey. They were asked to complete the Teacher Surveys and send the Parent Surveys, at predetermined times, to the parents through their teacher email distribution list. No personally identifiable information was solicited in the surveys, and the researcher did not have access to the parent email addresses.

The survey questions used a qualitative approach and consisted of several different question types. Structured questions including Likert scale questions, checklist items, and demographic questions. Unstructured questions were used to allow the respondent the opportunity to elaborate on previous questions or to provide additional comments (Gay, Mills, Airasian, 2009). Pittman and Finn reviewed survey questions and formats prior to submission in the IRB application.

The first Parent Survey, identified as the Parent Pre-Participation Survey (Appendix D) contains twelve questions divided into three categories: Sensory, Daily Life and Demographic.

The Sensory portion of the survey asks questions about whether their child is afraid of fire drills, what about fire alarms scares their child, and how the child responds to fire drills or fire alarms. The Social portion of the survey asks about places the parent and child frequent, whether a fire alarm has ever sounded in their presence, and if so, how did the child respond. Additionally, the survey asks if the child's school has any special procedures for fire drills. Demographic information is collected in the last section of the survey and includes the child's age, where they attend school and if they have a diagnosis of an ASD or other developmental delay. There is also an opportunity for the parent to include any additional comments they may have concerning the child and fire alarms or fire drills.

The second Parent Survey (Appendix E), third and fourth Parent Survey (Appendix F) asks if the child told the parent about the fire drill, what they said, did the fire drill have any adverse effects that carried over into the evening, and how afraid was the child of fire drills. The parents were also given an opportunity to leave any additional comments regarding the child and this fire drill. The third and fourth surveys had two additional questions to determine if the parent saw a difference between the previous fire drill and the current fire drill. There is also a space for any additional comments.

The fifth Parent Survey (Appendix G) is the Post-Participation Survey. This survey asks if there has been any change in the child's behavior regarding fire drills, and if so, what has changed. The parent could also provide any comments relating to the project.

The first Teacher Survey is the Teacher Pre-Participation Survey (Appendix H) and contains 13 questions. The survey asks about educational methodologies used to teach children with autism, and any particular methodologies used to teach about fire drills. It asks how they respond to loud noises, flashing lights, and how the children react during fire drills. The teacher

is questioned regarding any special procedures that may be used during fire drills. There are four questions relating to dangerous or self-destructive behaviors exhibited during fire drills or whether others are endangered because of their behaviors. Lastly, there are demographic questions regarding how long they have taught children with autism, and if they a special education teacher. There is also a question allowing additional comments.

The second Teacher Survey (Appendix I), third and fourth Teacher Survey (Appendix J) asks questions related to what impact the fire drill had on the students and how long that lasted. Teachers were given an opportunity to add any comments regarding the students and the fire drill. Survey three and four also asked if the teacher saw any difference between the current fire drill and the previous fire drill, and if so, what difference.

The fifth survey, the Teacher Post-Participation Survey (Appendix K), contains six questions relating to student behavior and any changes that may have occurred. It asks if the teacher saw any limitations to the FASDT program, and allows for any additional comments.

Fire Marshals were surveyed to determine the appropriate response for children during a fire alarm in the school. In collaboration with several local fire marshals, a list of expectations was compiled regarding the expected behavior of the students (Appendix L).

Fire drills were video recorded by Teacher Aides and Occupational Therapy students using iPads® and Flip Cameras®. The video recordings were downloaded to the researcher's computer, by date of drill and teacher, and then saved on two password-protected external hard drives. The fire drill videos were then deleted from the iPad® and Flip Camera®. The fire drill recordings were to be recorded according to the Video Recording Guidelines (Appendix M), beginning one minute prior to the fire alarm activation and continuing to one minute after students return to the classroom. The recording was to capture the student responses to the fire

alarm, record the entire class as much as possible, and focus in on any child having difficulty with the alarm.

The fire drills were broken down into seven individual segments: Pre-Fire Drill, Alarm to Exit, Exit to Staging, Waiting in Staging, Return to Building, Building to Classroom, and Post-Fire Drill. Each fire drill had a preliminary review to generate an assessment spreadsheet (Appendix N). The time stamp on the recording was used to break each segment into 30-second intervals on the assessment sheet.

Each fire drill was reviewed using a behavioral assessment rubric (Appendix O). The evaluators watched and listened to the fire drill videos and compiled a narrative assessment (Appendix P) for each child exhibiting any atypical behavior. This narrative included a physical description of the student, the behavior and the corresponding number from the rubric, the time the behavior occurred and the time the behavior ended. This data was then transferred into the appropriate time frame in the assessment spreadsheet. The spreadsheets completed by the researcher and the independent evaluator, were then compiled, based on physical description of the student, into one spreadsheet per class, per fire drill (Appendix Q). The teachers were consulted to identify the student. The student was matched to their student ID to allow data to be correlated from the Parent Surveys and the fire drills.

There were fifteen classes with three fire drills per class. The researcher and Dr. Constance Lawrence evaluated the first two fire drills. Lawrence served as an independent evaluator to ensure reliability of the assessment process. Inter-rater reliability refers to “the consistency of two or more independent scorers, raters, or observers” to have the same results (Gay, Mills & Airasian, 2009, p. 161). Each evaluator scored each fire drill independently. Students who exhibited behaviors identified in the behavioral assessment rubric were entered in

the assessment spreadsheet. The evaluator assessments were compared to determine the percentage of agreement. Only students who exhibited behaviors were entered on the assessment sheet. The percentage of agreement, or inter-rater reliability, was calculated by dividing the number of agreements (n=2,377) by the number of total assessment points (n=2,550) and multiplying by 100. Based on an inter-rater reliability factor of 93.2%, the third drill was evaluated only by the researcher.

Following the first fire drill, the experimental group participated in a FASDT program, designed by Dern and Pittman, to desensitize the student to the sound and flashing light of the fire alarm. This is accomplished with sensory integration therapy and social narratives (Dern & Pittman, 2012).

Peterson, Horner and Wonderlich defined treatment integrity as the degree to which the independent variable is applied as intended (1982). The independent variable in this project is the FASDT program. In order to ensure treatment integrity, the program was taught in a classroom environment by Dern, a Licensed Occupational Therapist (OTL) and another OTL who received training in the program. The FASDT program classes were also recorded to document individual behaviors.

According to Dern and Pittman, it is important to include students who are not adversely affected by fire alarms to serve as role models (2012). Sessions were taught one time per week and usually lasted approximately 20 minutes. The program used five sessions for the Kindergarten classes and four sessions for the Preschool classes. Each session had homework to be completed by the student and parent. Data sheets were also completed for any student who exhibited any sensitivities resulting from the fire alarm activation (Appendix R).

All five sessions for the Kindergarten classes begin with the same introductory material. They watch a fire drill social narrative video that depicts the proper way to respond during a fire drill. There are adverse behaviors in the video that the students are encouraged to identify. The students participate in a discussion about why fire drills are conducted and what the worst part of the drill is for each student. In the first Kindergarten session, the students then have an opportunity to look at and touch an operational fire alarm horn strobe (Appendix S), and then read a social narrative story about fire alarms. The students learn the “Stop” gesture (Appendix T) that will be used in later sessions to stop the fire alarm sound (Dern & Pittman, 2012).

The second Kindergarten session begins with the introductory material, after which the students can move across the room and wear hearing protection. The OTL turns on the horn strobe. After 2 seconds, an adult uses the “Stop” gesture and the alarm is immediately turned off. Positive reinforcement is used to help the students with any difficulties they may have due to the fire alarm. A social narrative is read and the students discuss how the alarm made them feel (Dern & Pittman, 2012).

During the third Kindergarten session, the students go through the introductory materials and then a volunteer from the class is asked to hold the alarm and turn it on. If any student shows the “Stop” gesture, the alarm is immediately turned off. Other students are allowed to hold and turn on the alarm if they want to. Following the activity with the alarm, the social narrative is read (Dern & Pittman, 2012).

In the fourth Kindergarten session, following the introductory material, all students are encouraged to hold the alarm and to turn it on. Students wearing hearing protection are asked to volunteer to remove it. Students sitting across the room are asked to volunteer to move closer to

the alarm. As always, if any student uses the “Stop” gesture, the alarm is immediately turned off. The social narrative is read after the students have had an opportunity to hold and turn on the alarm (Dern & Pittman, 2012).

The fifth session for the Kindergarten class is a review of the program. This review was conducted the week after the second fire drill. It consisted of the introductory material along with allowing as many of the students to turn on the alarm panel as wanted to (Dern, Personal Communication, November 19, 2012).

The Preschool students begin their first session with a discussion about loud sounds. The OTL plays loud and soft music and has the students tell if it is loud or soft. The students also can turn the volume up or down. They discuss the sound of a fire drill and whether it is loud or soft. The students finish the session by watching the fire drill social narrative video (Dern & Pittman, 2012).

In the second Preschool session, the students review loud and soft sounds and watch the fire drill social narrative video. They discuss the proper way to walk out with their class when they hear the fire alarm. The OTL will show the students the fire alarm horn strobe, and name the parts.

The third Preschool session begins with the students naming the different parts of the fire alarm horn strobe, and touching it if they want to. They discuss loud and soft sounds. They make a collage of loud and soft sounds from magazine pictures. The OTL teaches the students the “Stop” gesture (Appendix T), and asks them if they would like to hear the alarm. They finish the session by watching the fire drill social narrative video.

In the fourth Preschool session, the students review the fire alarm horn strobe and the stop gesture. The OTL has a towel to wrap around the fire alarm horn strobe if the students are

afraid. The alarm is turned on when all the students are ready. If a student is apprehensive, they may move to the hallway so the sound is not so loud.

According to Dern, each of the sessions can be taught on an individual basis for those students with learning disabilities that may require a one-on-one setting. Sessions can also be modified to meet the needs of individual students, based on the therapist's experience (Dern, Personal Communication October 17, 2012). However, Dern and Pittman (2012) stress that no student should be "exposed to the fire alarm if they are not ready" (p. 14).

Statistical analysis of the data was performed using Minitab®, release 16.2.2. The statistical analyses began with the compiling of all the data collected from the fire drill videos and sorting that data into various data sets for analysis. Data sets were assembled by classroom, by Test Group and Control Group, by individual fire drills and all three fire drills together. An Analysis of Variance (ANOVA) was used to test for a significant difference in behavior between the Test Group and the Control Group during each fire drill (Gay, Mills & Airasian, 2009).

Research Question 1 asks, "What is the proper response for children during a fire alarm in the school?" The purpose of this question is to determine what behaviors are expected during fire drills. This question is answered primarily by the responses of Fire Marshal surveys but also from the observations of students during the actual fire drills.

Research Question 2 looks at, "How do typical children respond to fire alarms in the school?" The purpose of this question is to determine if typical children respond in a manner appropriate for safe and orderly evacuation during a fire drill. Data collected through the fire drill video assessments will be used to answer this question. Typical is a term used not so much to describe a characteristic of disability but rather to describe what it is not: "typical" refers to a person who has not been diagnosed with an ASD or other developmental delay (Rudy, 2010).

Research Question 3 provides the foundational data for the research by asking, “How do children with ASD respond to fire alarms in the school?” Data will be collected from the fire drill video assessments, as well as responses to Question 2 of the Teacher Fire Drill 1 survey, to answer this question. Previous research will also provide insight into the response of children with an ASD and fire drills.

Research Question 4 focuses on, “How children with an ASD respond to fire alarms after receiving FASDT?” The fire drill video assessments and responses to Teacher Fire Drill 2 and 3 survey questions 5 and 6 will be used to answer this question.

Research Question 5 asks, “What are the limitations to the FASDT?” This question will be answered using interviews with the Occupational Therapists who taught the FASDT program. Responses to Teacher Post-Participation survey Question 5 will also be used to identify the limitations of the FASDT program.

Several limitations were noted during the research process. The Parent Survey return rate declined significantly over the five surveys. The first survey had a return rate of 63.9% (n=135) while the fifth survey return rate was 26.5% (n=56). In many survey returns, the parent failed to put the student ID on the survey, or answer all the questions on the survey. This made matching the parent responses to the student throughout the study impossible. Additionally, due to the manner of survey distribution, and the confidential nature of the survey, contacting the respondent to ask follow-up questions or clarify responses was not possible. For confidentiality reasons, the Teacher surveys did not ask the teacher to identify specific students who were having difficulties with the fire drill.

Teachers, because of HIPAA and IDEIA confidentiality requirements, were unable to discuss students who had an IEP and the nature of the student’s educational needs. The Parent

Survey asked if they child had a diagnosis of an ASD or other developmental delay. Unless the parent responded to this question, the student was not identified as such. This resulted in incomplete data on students with an ASD or other developmental delay.

The researcher had no control over the video recording process. The fire drills were recorded using iPads® or Flip Cameras® from the schools. Several classes were not recorded completely, either due to insufficient memory on the camera, operator error, or other factors. This allowed some behaviors to go undocumented.

Fire drill procedures are not the same at each school. Different principals allow the fire alarm to sound until all students have exited the building. Others turn the alarm off after they students start to exit. In some schools, the students exit directly to the outside while in other schools, the students have to travel a significant distance through the hallways to the outside. Some schools travel a long distance to arrive at the staging area while other schools have a short distance to go.

Every school has a different sounding fire alarm. There are specific code requirements for the alarms, but the codes have evolved over time, so the alarms are different. Fire alarm sound levels, as measured by a Radio Shack® Digital Sound Level Meter, Model 33-2055, are varied based on the locations, type of horn, and the ambient sound levels, and range from 88 dBA to 97 dBA. The horn strobe used in the FASDT program had a sound level of 78 dBA.

Due to the number of students leaving the classrooms, hallway crowding, and the intermingling of classes during the fire drills, it was difficult for the videographer to focus on their assigned class. Students would stretch out for long distances making it difficult to include the entire class in the videos. While focusing in on specific students, other student behavior

issues may have been missed. Some students who were identified as having difficulties during the fire drill were not in the classes participating in the study.

In the Parent Post-Participation Survey, Question 2 was not worded correctly. The question was phrased “Is your child more or less afraid of fire drills?” and the choices were “Yes,” “No,” “Don’t know” or “About the same.” The responses should have been “More,” “Less,” “Don’t know” or “About the same.” The same applies to the Teacher Post-Participation Survey Question 2.

Results

The purpose of this quasi-experimental research project is to test the hypothesis that the Fire Alarm Sound Desensitization Training (FASDT) program causes children with an ASD to respond in the same manner as a typical child during fire alarm activations. The hypothesis is that a child with an ASD, after receiving FASDT, will respond in the same manner as a typical child during a fire alarm activation. The null hypothesis is that after receiving FASDT, there will be no difference in the response of a child with ASD to the sound of a fire alarm and those who have not had the training. Utilizing interviews, eleven survey instruments, and a non-randomized control group pretest-posttest design method was used to collect data.

Demographic data was collected in the Parent and Teacher surveys to provide basic information about those participating in the study. The Parent Pre-Participation survey asked for the child’s diagnosis, their age and whether they attend a private or public school. The Teacher Pre-Participation survey asks if they are a special education teacher, if they have taught children with autism, and if so, how long. The return rate for the Teacher Pre-Participation survey was 93.3%.

Of the 63.9% of parents (n=135) responding to the Parent Pre-Participation survey, 111 did not have a diagnosis. Twelve students were diagnosed with Autism, 2 with Asperger, 2 with PDD-NOS, and 6 with some other developmental disability. Two respondents did not answer this question. Table 1 shows the breakdown by Test and Control Groups.

Table 1. Child's Diagnosis

Has your child been diagnosed with Autism Spectrum Disorder or other developmental disability?		
Diagnosis	Test	Control
Autism	11	1
Asperger	2	0
PDD-NOS	2	0
Other DD	3	3
No	45	66

Question 10 of the Parent Pre-Participation survey asks for the child's age. Table 2 indicates the ages of the children by Test and Control group. Seventeen parents did not answer this question.

Table 2. Age of Children

How old is your child?		
Age	Test	Control
3	4	2
4	8	17
5	24	41
6	14	8

Table 3 shows the number of children who attend public or private school, and is separated by Test and Control Group. The private school is a non-profit school providing a variety of programs and therapies for children with autism (Mitchell's Place, 2010). The public schools are elementary schools in the Mountain Brook City School System. Five parents did not answer this question.

Table 3. Public or Private School
Where does your child attend school?

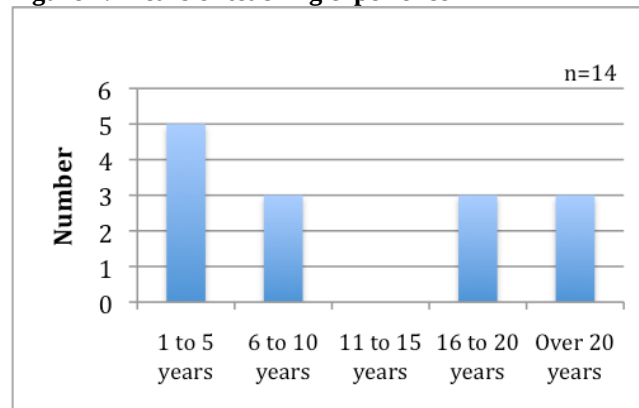
Type school	Test	Control
Public	43	68
Private	19	0

Parents were asked in Question 9 if their child's school had any special procedures for fire drills. Over 70% of both groups said their school had no special procedures. In this researcher's experience, the most common accommodation is advance warning. Teachers were asked the same question and with 11 citing advance warning as the most frequent special procedure for fire drills. Table 4 shows the parent and teacher responses.

Table 4. Special Fire Drill Procedures

Special Fire Drill Procedure	Test	Control	Teacher
Advance Warning	4	6	11
Headphones	2	0	7
Not Participate	0	0	1
Special Alarm	1	4	0
1:1 with Aide	0	0	1
Reward	0	0	1
None	37	50	50
Don't know	7	7	7

Fourteen out of 15 teachers responded to the Teacher Pre-Participation survey received (93.3%). Question 1 was asked to determine how many of the teachers were special education teachers. Half of the respondents said they are special education teachers while the other half are not. Teacher Pre-Participation survey Question 2 asks if the teacher has taught or is presently teaching children with autism. Of the 14 respondents, 13 said they teach or have taught children with autism. Figure 1 shows that over half of the teachers have taught for 10 years or less while 6 of the teachers have over 16 years teaching experience.

Figure 1. Years of teaching experience

Sensory information was obtained from the parents relating to how their child responds to fire alarms. Parent Pre-Participation survey Questions 2 asks if their child is afraid of fire drills. Figure 2 shows that of the parents responding, 38.2% of the Control Group and 49.2% of the Test Group parents did not know if their child was scared of fire drills. Only 13.2% of the Control Group and 16.4% of the Test Group parents said their child was not afraid of fire drills. As shown in Figure 3, 73.7% of the Control Group and 95.5% of the Test Group indicated that the sound of the fire alarm is what bothered their child. Question 4 asks, on a scale of 1 to 5, with 1 being the least and 5 being the most, how afraid is the child of fire drills. The results are found in Figure 4.

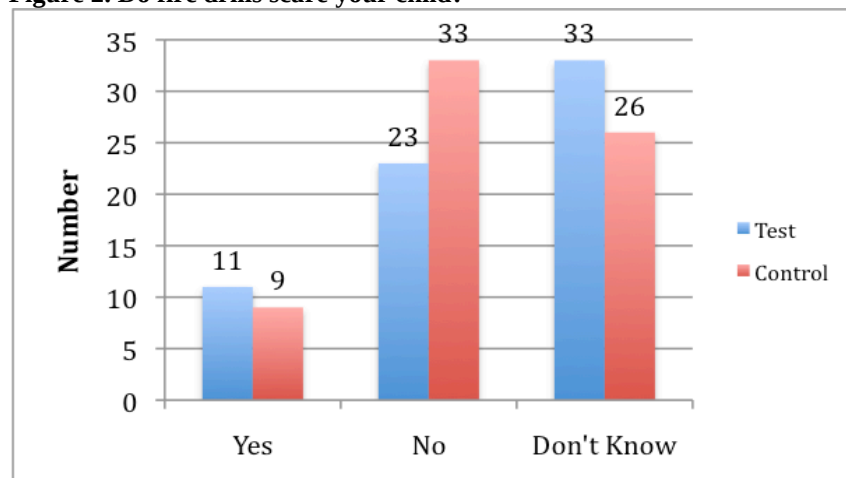
Figure 2. Do fire drills scare your child?

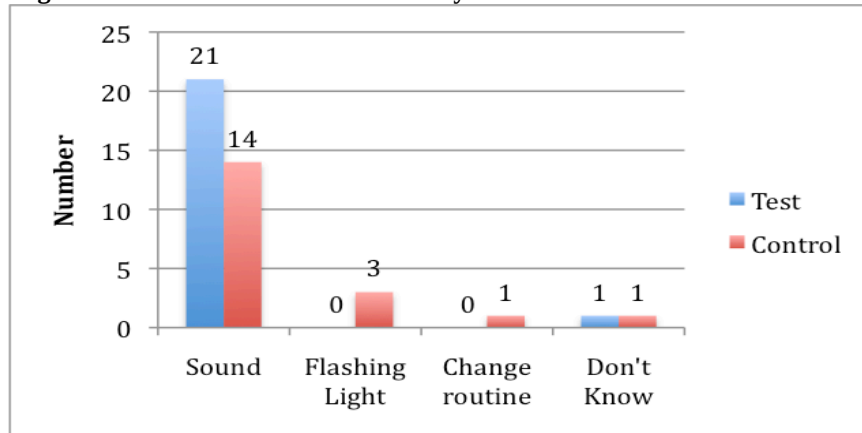
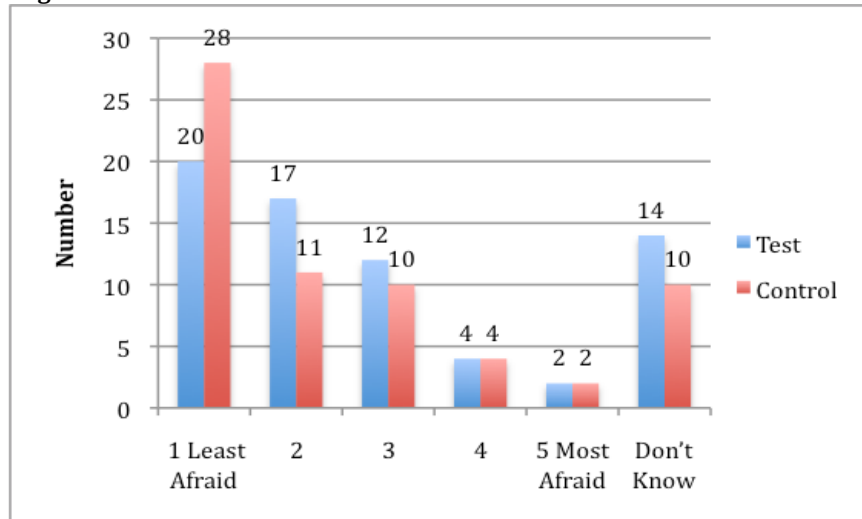
Figure 3. What about fire drills scares your child?**Figure 4. How afraid is child of fire drills?**

Table 5 lists the parent responses to Question 5 regarding how their child reacts when a fire alarm activates. The most common response by the child, according to the parent, is the child covers their ears.

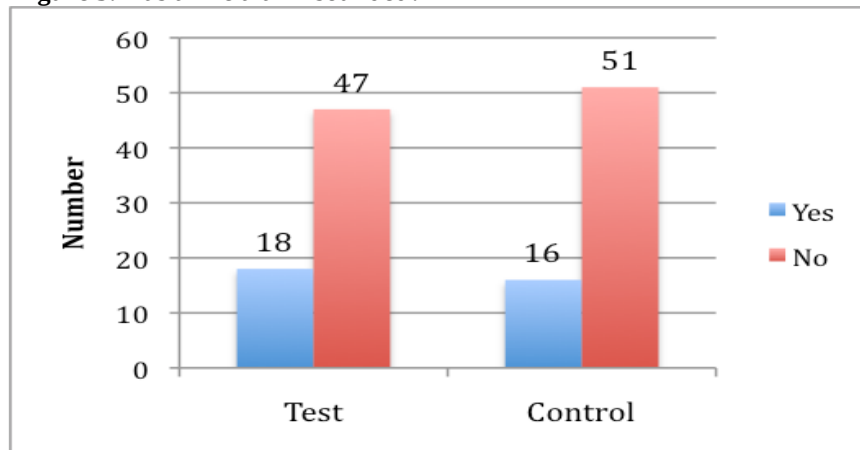
Table 5. Reaction to fire drills

Reaction	Test	Control
Cover ears	10	7
Close eyes	1	0
Panic	1	0
Nervous/anxious	5	3
Cry/scream	4	4
Freeze/withdraw	2	2
Seek out adult	5	1
Ask questions	1	1
Pretend to wear earphones	1	0
Bite hand	1	0
Follows instructions	2	0
No problem	0	1
Don't Know	12	7

Because fire alarms are located everywhere in society, parents were asked in Question 6 about the places they frequent with their child, and whether a fire alarm has ever sounded when they were in the area with their child. Question 8 asked for how the child responded when the alarm sounded. Table 6 identifies the places frequented by the parent and child. Figure 5 shows that only 34 of 98 responses say a fire alarm has sounded while they were out. The most common response identified in Table 7 was “nervous/excited/scared” in both the Test and Control Group.

Table 6. Public Places Commonly Frequented

Places Commonly Frequented	# Responses
Mall/Shopping Center	118
Restaurant	113
Sporting Event	60
Theaters	80
Hotels/Motels	63
Libraries/Museums	101
Place of Worship	101
Airport	33

Figure 5. Has a fire alarm sounded?**Table 7. Child's Reaction to Fire Alarm**

How Responded	Test	Control
Looked around	3	3
Said "It's loud"	1	0
Covered ears	3	2
Nervous/Excited/Scared	5	4
Ran away	1	2
Annoyed	1	0
Seek out adult	2	1
Cry	0	1
No Problem	5	3

Teachers were asked to identify in Question 3, the methods or techniques used in educating children with autism. The most common response was peer modeling, which is also a significant tool used in the FASDT program. Table 8 lists the teacher responses.

Table 8. Educational Techniques

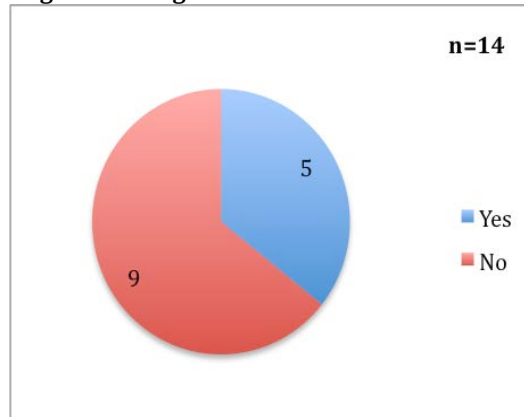
Educational Techniques Used	General Education	Fire Drills
Peer Modeling	14	6
Social Story	13	11
Role Play	11	4
Video Modeling	6	2
Pre-teach expected behavior	0	2
None	0	2
Don't Know	0	1

Questions 4 and 7 of the Teacher Pre-Participation survey asks, based on the teacher's experience, how children with autism respond to external stimuli, such as loud noises, as well as to fire drills. Table 9 lists the children's responses.

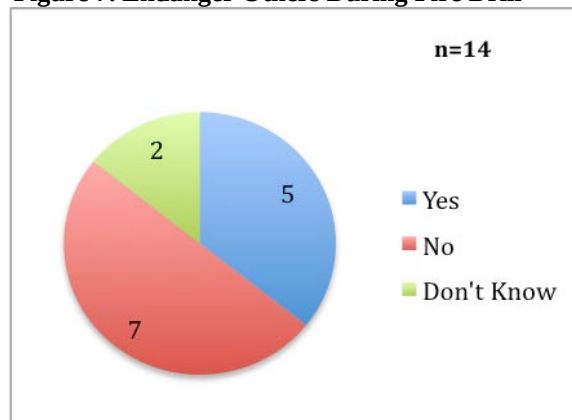
Table 9. Response to External Stimuli and Fire Drills

Response	External Stimuli	Fire Drill
Scream	7	8
Hold/cover ears	7	7
Anxious, stress, agitated, upset	9	3
Perseverate/stim	4	2
Disruptive	1	
Aggressive, push others	1	1
Overstimulated	4	2
Cry	5	4
Fall out on floor/ refuse to leave/ failure to follow instructions	1	4
Run away	2	1
Cover eyes	2	
Oblivious	1	1
No difference	0	1
None	1	0

Teacher Pre-Participation survey Questions 8 through 12 deals with children with autism and dangerous, self-destructive behaviors or behaviors that may endanger others during fire drills. Figure 6 shows that over 64% of the teachers do not believe the children exhibit dangerous behaviors. Table 10 lists those dangerous behaviors the remaining 36% identified. Figure 7 shows that half of the teachers do not believe the children endanger others during fire drills. Table 11 lists the identified behaviors that endanger others during fire drills.

Figure 6. Dangerous Self-Destructive Behaviors**Table 10. Dangerous Self-Destructive Behaviors Exhibited**

Dangerous Behavior	# Responses
Run away	1
Bang hands on ears	1
Throw chairs	1
Hit self	1
Difficulty removing child	1
Fall to ground	1

Figure 7. Endanger Others During Fire Drill**Table 11. Behaviors Dangerous to Others**

Dangerous Behavior	# Responses
Scare other students	3
Push	3
Others stop to help	3
Hit	2

What is the proper response for children during a fire alarm in the school?

Local fire marshals were surveyed to identify the appropriate response for children during a fire alarm in the school. A list of expected behaviors were identified and compiled. Table 12 shows the behaviors the fire marshals expected during a fire drill.

Table 12. Expected student behaviors during a fire drill

Step	Procedure / Activity
1	Alarm sounds
2	Student stops what they are doing
3	Student stops talking
4	Student listens for instructions from teacher
5	Student walks to classroom door in orderly manner
6	Student lines up in single file by door
7	Student waits for teacher to say when to leave
8	Student walks quickly and quietly behind leader
9	Student stops at designated safe place outside building
10	Student waits quietly in line for further instructions

This researcher observed several teachers giving an orientation to their kindergarten students about what was expected during a fire drill. There was very little deviation from the expectations of the fire marshals. Three teachers also commented in the Pre-Participation survey that it is very important to prepare the students prior to the first fire drill.

How do typical children respond to fire alarms in the school?

Typical children seem to respond much the same as children with autism and other developmental delays to fire alarms in the school. Of the total typical children in both the Test Group and the Control Group, nearly half (48.5%) had some difficulty with the drills. This ranged from mild hands over ears (Rubric Scale 2) to holding hands over ears and clinging to the

teacher (Rubric Scale 3). Table 13 shows the distribution of typical students in both the Test Group and Control Group.

Table 13. Typical Student Response to Fire Alarms

Rubric Scale	Test Group Typical Student	Control Group Typical Student
1	24	45
2	31	24
3	8	2
4	0	0
5	0	0
0	0	0

How do children with ASD respond to fire alarms in the school?

Children with an ASD respond much the same way as the typical students with the exception of the severity of the response. Table 14 shows that of the students reported to have a diagnosis of an ASD, 22.2% (n=6) responded appropriately during all three fire drills. There were no students identified in the Control Group that were diagnosed with an ASD.

Table 14. ASD Student Response to Fire Alarm

Rubric Scale	Test Group ASD Student	Control Group ASD Student
1	6	0
2	11	0
3	7	0
4	2	0
5	1	0
0	0	0

Those students with a behavior assessment of “2” resolved to a “1” once they exited the building.

Teacher Fire Drill #1 Survey Question 2 asks what effect the fire drill had on their students. This question does not differentiate between those students with an ASD and other students. Teachers and aides were focusing on getting the students out of the building in an

orderly manner and were not looking at specific students. Table 15 identifies the effects the first fire drill had on the students.

Table 15. Effects of the Fire Alarm on Students

Effect	Test Group	Control Group
Anxious	6	5
Frightened	5	1
Overstimulation	4	1
Disruptive	3	0
Difficulty focusing	3	1
Cry/Irritable	3	0
Agitated	3	0
Hide/withdraw	2	0
None	1	0
Uncooperative	0	2

Question 3 of the Teacher Fire Drill #1 survey asks, on a scale of 1 to 5, with 1 being least and 5 being most, how afraid their students were during the first fire drill. Figure 8 shows the responses from the Test Group and Control Group teachers. Table 16 shows how long the effects of the fire drill lasted. Two students in the Test Group had effects that lasted the remainder of the day.

Figure 8. How afraid is the child during fire drills

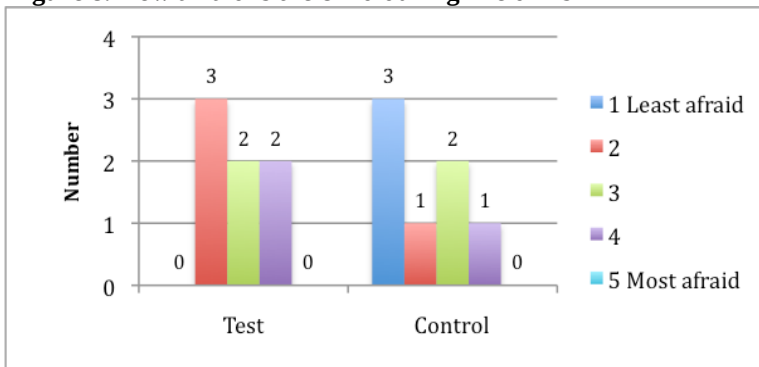


Table 16. How long did the fire drill effects last?

	Test Group	Control Group
Less than 1 hour	5	7
1 to 2 hours	0	0
2 to 3 hours	0	0
3 to 4 hours	0	0
Remainder of day	2	0

In the comments section of the survey, several teachers said their students were frightened and put their hands over their ears. One said the student's anxiety level was increased after the drill and they were bothered by the sound. Two other teachers stated they had done fine since they had practiced the fire drill the week before.

Parent Fire Drill survey responses were not utilized. The return rate was not sufficient to be reliable. Table 17 shows the return rate for the Parent Fire Drill surveys and the Parent Post-Participation survey. Another reason parent survey responses were not used was because most parents did not know what effect the fire drills had on their child. Several parents even noted in the comments section to "Ask the teacher. They would know better than I do."

Table 17. Parent Survey Response Rate

Survey	Responses	Percentage
Pre-Participation	135	63.90%
Fire Drill 1	89	42.20%
Fire Drill 2	48	22.70%
Fire Drill 3	53	25.10%
Post-Participation	56	26.50%

How do children with ASD respond to fire alarms after receiving FASDT program?

Teacher Fire Drill #2 and #3 surveys ask the same questions as Fire Drill #1 survey with the exception of asking if there were differences from the previous drills. Table 18 shows a

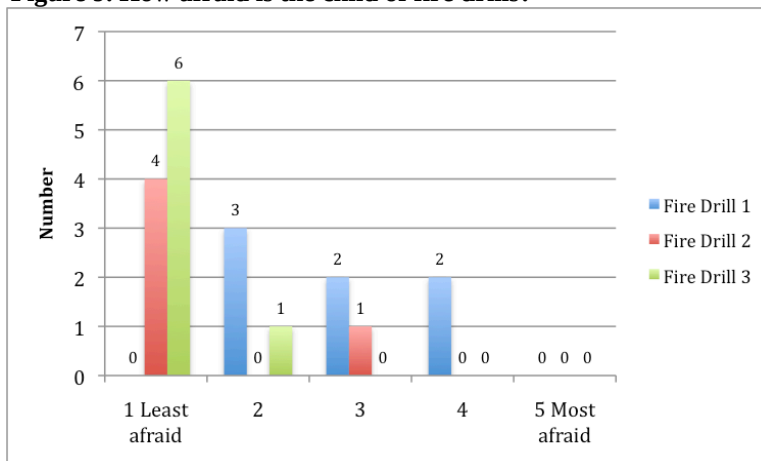
compilation of Question 2 from all three Teacher Fire Drill surveys. The second fire drill was conducted after the Test Group students participated in the FASDT program. Reported adverse behaviors declined significantly from 29 in the first fire drill to 8 in the second, and 4 in the third.

Table 18. What effect did fire drill have on students?

Effect	Test Group Drill 1	Test Group Drill 2	Test Group Drill 3
Anxious	6	1	0
Frightened	5	2	3
Disruptive	3	0	0
Difficulty focusing	3	2	0
Overstimulation	4	0	1
Cry/Irritable	3	0	0
Agitated	3	0	0
Hide/withdraw	2	0	0
Uncooperative	0	1	0
Hands over ears	0	2	0
None	1	3	2

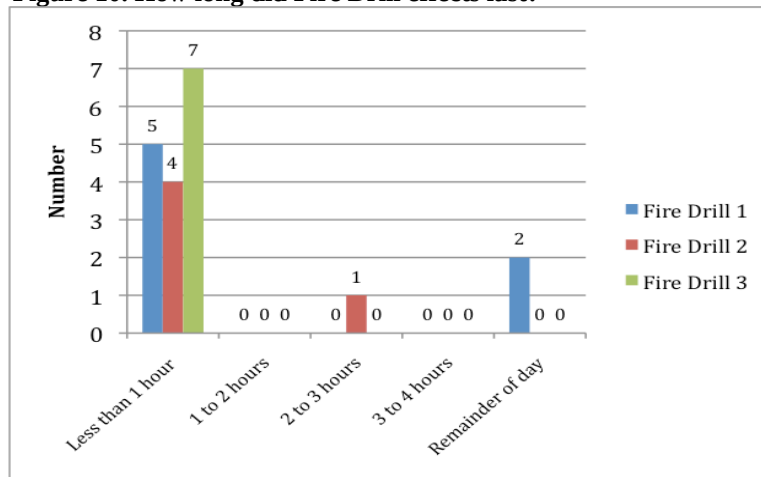
Question 3 of the Teacher Fire Drill surveys asks the teachers to quantify how afraid the students were on a scale of 1 to 5. Figure 9 shows a comparison of the three fire drills. Again, the teachers reported a significant decrease in the fear level from the first to the third fire drill.

Figure 9. How afraid is the child of fire drills?



Teacher Fire Drill question 4 asks how long the effects lasted from the fire drill. Figure 10 shows a decrease in how long the effects lasted as a result of the fire drill, from the first to the third fire drill. Only one student had a problem lasting 2 to 3 hours after the second fire drill.

Figure 10. How long did Fire Drill effects last?



The last two questions of the second and third fire drill survey ask if the students behaved differently after this drill than the previous drill, and if they did act differently, what was different. Five teachers reported behaviors changed from the first to the second fire drill while only one teacher reported a change from the second to the third fire drill. Teachers from the Test Group reported the students were more calm and cooperative. One teacher said the students were less disruptive and agitated and that no one was afraid to come back into the building.

A data set was assembled from the fire drill video assessments using only those students who received an atypical behavioral assessment on any of the three fire drills. The mean and standard deviation was calculated for both the Control and Test Groups. Table 19 shows that the Control Group assessments remained basically the same across the three fire drills. The mean

assessment for the Test Group declined steadily, although the decline was not statistically significant (T.W. Woolley, Personal Communication, November 13, 2012).

Table 19. Mean Ratings of Fire Drills

Variable	Group	Fire Drill 1		Fire Drill 2		Fire Drill 3	
		Mean	StDev	Mean	StDev	Mean	StDev
Assessment	Control	1.553	0.686	1.625	0.6279	1.463	0.745
	Test	1.8	0.7331	1.77231	0.6497	1.5846	0.6822

In Table 20, an analysis of variance showed that those students who participated in the FASDT program had an improvement in their behavioral assessment scores. Rounding to two decimal places, there is a statistically significant difference ($p = 0.05$) in mean assessment scores between the Control and Test Groups (T.W. Woolley, Personal Communication, November 13, 2012).

Table 20. ANOVA

Source	DF	Seq SS	ADJ SS	Adj MS	F	P
Regression	5	3.886	3.886	0.77722	1.63776	0.149689
Drill	2	1.811	1.516	0.75794	1.59713	0.204149
Group1	1	1.761	1.787	1.78696	3.76550	0.053233
Drill*Group1	2	0.314	0.314	0.15676	0.33034	0.718936
Error	308	146.165	146.165	0.47456		
Total	313	150.051				

Lastly, a two-way repeated measures ANOVA, shown in Table 21 confirms that, averaged over all three fire drills, there is a difference between Control and Test Mean Rating. This provides further evidence that, as the Control Means remain level across the three fire drills, the Test Means drop enough so that the overall means is statistically different ($p < 0.05$) between Control and Test groups (T.W. Woolley, Personal Communication, November 16, 2012).

Table 21. Analysis of Variance for Rating, using Adjusted SS for Tests

Source	DF	Seq SS	ADJ SS	Adj MS	F	P
ID Number (Group)	104	52.4334	52.5402	0.5052	1.10	0.28
Group	1	2.1176	2.0833	2.0833	4.13	0.045 x
Drill	2	1.6397	1.3321	0.6661	1.45	0.237
Group*Drill	2	0.2357	0.2357	0.1178	0.26	0.774
Error	204	93.6247	93.6247	0.4589		
Total	313	150.051				

x Not an exact F-test.

S = 0.677454

R-Sq = 37.60%

R-Sq (adj) = 4.27%

What are the limitations to the FASDT program?

The teachers were asked in Question 5 of the Teacher Post-Participation survey if they saw any limitations to the FASDT program. In the comments section, one teacher said the program took too much time out of the classroom. According to Dern (Personal Communication, December 3, 2012), the program only takes about 20 minutes per class period, once a week for 4 weeks.

The FASDT program was designed for smaller groups of about 5 to 7 students. The program was taught in classrooms ranging from 10 to 20 students. Having this many students did not give each student an opportunity to be in charge of the alarm box.

Based on a review of the data sheets used during the FASDT program, some students require more than 4 sessions. Other students may need more individualized sessions or one-on-one lessons because of their learning disabilities. The program as designed, does not provide for the opportunity for more lessons, however, the OT or SLP does have the flexibility to modify the program as needed.

Discussion

This Applied Research Project came about because there is no research found regarding children with autism and their response to fire alarms and fire drills. There was also no research found about how to help these young children learn to respond in a typical manner when a fire alarm does activate. This ARP set out to evaluate whether a fire alarm sound desensitization program would help children with autism respond appropriately to fire alarm activations.

There were no national standards or recommendations found for the proper response of children during a fire alarm or fire drill in the schools. Both Scholastic (n.d.) and the National Fire Protection Association (n.d.) identified generalized steps for the fire drills whereas the data collected from the local fire marshals was much more specific. Teachers also provided similar instruction to their students about what they should expect and how they should act during fire drills.

Typical children respond to fire drills and fire alarms in a variety of ways. This research indicates that of the 134 typical students in Test Group and Control Groups, 51.5% of the students (n=69) have no behavioral difficulties with fire drills. Adding in those who only covered and uncovered their ears, but otherwise responded in accordance with the procedures outlined by the fire marshals, that number increased to 92.5% (n=124). Eight students in the Test Group and 2 in the Control Group exhibited behaviors classified as “3” in the Behavior Assessment Rubric (Appendix O).

There is very little information available regarding how children with autism respond to fire alarms or fire drills. Cohen has found that every child with autism reacts differently to the sound of a fire alarm (2012). This research confirms the literature review. Some children with an

ASD respond in the same way as typical children. Some have no reaction at all, while others become anxious, frightened disruptive or uncooperative.

In this research, six of the 27 students diagnosed with an ASD, or 22.2%, responded in the manner described by the fire marshals. They stopped what they were doing, quietly lined up and walked quickly out the building to their staging area. They had no adverse behaviors from the fire drill.

Data collected from the first fire drill indicated that 11 of the 27 students diagnosed with an ASD (40.7%) suffered mild behavioral issues during the fire drill. These included covering and uncovering their ears until they were out of the building, repetitive behaviors or whimpering. These behaviors resolved once they were away from the sound of the fire alarm or they left the building.

Seven of the students diagnosed with an ASD exhibited behaviors that were moderate in nature. Many covered their ears and held them covered even after exiting the building, while others clung to the teacher, whined or cried out. For most, the behavior resolved after leaving the building however some behaviors lasted longer.

Three of the students exhibited severe behaviors. One was completely withdrawn from the fire drill. He had to be carried out of the building. Once outside, he fell to the ground where he became completely uncooperative. This behavior lasted until he re-entered the classroom where the teacher aide helped him focus on a simple task. The second student was very withdrawn during the time he was exiting the building but became agitated and combative when it was time to re-enter the building. He struggled and cried, fighting to get away from his teacher. After over an hour he had finally calmed down enough to participate in class activities. The third

student was intolerant of the fire drill. His behavior became progressively worse to the point of being completely unmanageable. His behavior lasted the remainder of the day.

Hyperacusis appears to be the most significant problem for children with autism (Cohen, 2012; Collins, n.d.; McGowan, 2009). Grandin (2010) recommends using a desensitization program to help desensitize the children to the sound of the fire alarm. One father also considers desensitization to be the most appropriate method of helping a child deal with the sound of a fire alarm (Collins, n.d.).

Teacher survey responses after the second and third fire drill indicate that the students had significantly less behavioral issues after undergoing the FASDT program. Teachers reported their students were much more calm and cooperative during and after the second and third fire drills. Teachers, when asked how afraid their students were, reported a significant decrease in the fear level from the first fire drill to the third fire drill.

The parent of one student who had participated in the FASDT program came in to the office for an Individualized Education Plan (IEP) meeting. The mother said her son was sitting at the kitchen table while she was cooking. The smoke alarm activated and her son, who would normally have sensory issues with the smoke alarm, looked around, got up from the table and went to the back door. As he was going to the door, he said “Everyone line up” (S. Naramore, Personal Communication, October 18, 2012).

Statistical analysis of the data collected from the fire drill behavioral assessments showed the mean assessment for the Test Group declined steadily from the first to the third fire drill, although this decline was not statistically significant. There is however, a when compared to the Control Group, the Test Group Means drop enough so that the overall means is statistically different ($p < 0.05$) between the Control and Test groups.

Teachers did not identify any limitations to the FASDT program. There were however several limitations identified by the researcher and occupational therapists conducting the FASDT program in the classroom. The FASDT program was designed for small groups ranging in size from five to seven students. The program was taught in a full classroom, which did not allow the therapist the opportunity to provide individualized attention to those having problems during the class. Other limitations are that some students require more time to become comfortable with the fire alarm. Some students learn better with a more individualized educational process and may require a one-on-one learning environment.

Based on the Teacher surveys and the data collected from the fire drill behavior assessments, there appears to be a correlation between an improvement in the behavior of children with autism and the FASDT program. Data collected did not support the null hypothesis.

Recommendations

This applied research project was conducted because children with autism grow up to become functional members of society. The purpose of this research was to evaluate the effectiveness of an educational program that was designed to help children with autism respond correctly during fire alarm activations through a fire alarm sound desensitization program. Several recommendations have resulted from this research project that can be implemented by the Mountain Brook Fire Department and the Mountain Brook Schools to better assist not only children with autism, but typical children as well, learn to respond appropriately during a fire alarm activation.

1. Become aware of the students in the schools who have special needs concerning fire drills and fire alarms. Become proactive in working with the school, the special education teachers, and general education teachers and parents to meet the needs of those students.
2. Become more active in the schools and day cares to help identify other behaviors that may pose a threat to students or faculty and staff relating to fire drills, fire alarms and other safety matters.
3. Use the FASDT program for all preschool and kindergarten students. The research indicated the problems with fire drills were not limited to those students who had developmental delays but also included many typical students. By introducing a pre-teaching program, as many teachers use, along with a FASDT program, the students would be better educated in the proper behaviors during fire drills and fire alarm activations.
4. Develop an abbreviated program that will allow the OT or SLP to identify those who, after the second or third lesson, who continue to have sensory issues with the FASDT program. Once those are identified, they can be moved into smaller groups for more individualized attention.

Further research should be conducted with a larger sample size to confirm the results that were obtained in this research project. Is there a difference in the effectiveness of the FASDT program between the various types of ASD? Does the program work for other developmental disabilities besides ASDs? Does the program provide a long-term desensitization or does there need to be “refresher” type training? Does the difference in the dB levels of the alarm panel compared to the real fire alarm make any difference? Does the desensitization carry over into other arenas such as assemblies, sporting events, etc?

Cary Boswell, Commissioner of the Alabama Department of Rehabilitation Services (ADRS) wrote in his 2010 Annual Report that the mission of the ADRS is “to enable Alabama’s children and adults with disabilities to achieve their maximum potential” (p. 2). With the number of children diagnosed with autism rapidly increasing, we have a responsibility to help those children “achieve their maximum potential” (ADRS, p. 2) to become functional and contributing members of society, who know how to respond when a fire alarm activates, and have the ability to respond to that alarm.

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Appendix A

Institutional Review Board Approval

	
Approval Form Identification and Certification of Research Projects involving Human Subjects	

The Institutional Review Board (IRB) must complete this form for all applications for research and training grants, program projects and center grants, demonstration grants, fellowships, traineeships, awards, and other proposals which might involve the use of human research subjects independent of source of funding.

This form does not apply to applications for grants limited to the support of construction, alterations and renovations, or research resources.

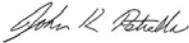
PRINCIPAL INVESTIGATOR: Dr. David Finn

PROJECT TITLE: Fire Alarm Desensitization: Does it work for children with autism?

- ☐ 1. This is a training grant. Each research project involving human subjects proposed by trainees must be reviewed separately by the Institutional Review Board (IRB).
- ☒ 2. This application includes research involving human subjects.
The IRB has reviewed and approved this application in accordance with Samford University's assurance approved by the United States Public Health Service. The project will be subject to annual continuing review as provided in that assurance.
- ☒ This project received expedited review.
☐ This project received full board review.
- ☐ 3. This application may include research involving human subjects. Review is pending by the IRB as provided by Samford's assurance. Completion of review will be certified by issuance of another APPROVAL FORM as soon as possible.
- ☐ 4. Exemption from subject informed consent based on number(s) _____

The Samford University IRB (IORG# IRB00008759) has approved this application. Any modifications in the study methodology or protocol must be submitted for review and approval to the Samford IRB prior to implementation.

8/16/2012
Date



IRB Chair

EXPD-E-12-SUM-10
IRB Application Number

Appendix B

Parent Introduction Letters

MOUNTAIN BROOK FIRE DEPARTMENT

David A. Cohen, Fire Marshal
#8 Office Park Circle, Suite 200, Mountain Brook, AL 35223
(205) 802-3832 FAX: (205) 879-5919

CONTROL GROUP PARENTS

Study Title: Fire Alarm Desensitization: Does it work for children with autism?

Dear Parent and Student:

My name is David Cohen. I am the Fire Marshal for the Mountain Brook Fire Department and am enrolled in the National Fire Academy's Executive Fire Officer Program (EFOP). The EFOP is a four-year program consisting of four Graduate-level courses – Executive Development, Community Risk Reduction, Fire Service Operations and Executive Leadership. Following each course, the participant is required to complete an Applied Research Project (ARP) relating to a problem in their department and the course completed. The EFOP is the premiere professional development program for fire service leaders from around the world.

I would like to invite you to participate in my research project. I am studying the response of children and children with autism to fire drills. The purpose of the research is to test the effectiveness of a program to teach children and children with autism to respond appropriately during fire drills. In order to collect meaningful data, it is important for all children in the class to participate.

If you decide to allow your child to participate, you will be asked to complete five brief surveys: a survey about your child, three surveys relating to your child's response to the fire drills and a post study survey. Your child will participate in three fire drills over approximately an 8-week period. In addition, the fire drills will be video recorded for data analysis.

Participation is completely voluntary. Participation is confidential. You do not have to answer any survey questions that you do not wish to. Personally identifiable information will not be utilized in any manner. The results of the study may be published or presented at professional meetings, but your identity and your child's identity will not be revealed. Attached is an Informed Consent form that has more information about your child's participation.

I will be happy to answer any questions you have about the study, or discuss the results of the study, upon completion. If you have any questions, you may contact me at 205-802-3832 or by e-mail at cohendava@mtnbrook.org.

Thank you for your consideration. If you would like to participate, complete and sign the Informed Consent form and turn these in to your child's teacher before leaving today. The surveys will be completed through an email.

With kind regards,

David A. Cohen

MOUNTAIN BROOK FIRE DEPARTMENT

David A. Cohen, Fire Marshal
#8 Office Park Circle, Suite 200, Mountain Brook, AL 35223
(205) 802-3832 FAX: (205) 879-5919

TEST GROUP PARENTS

Study Title: Fire Alarm Desensitization: Does it work for children with autism?

Dear Parent and Student:

My name is David Cohen. I am the Fire Marshal for the Mountain Brook Fire Department and am enrolled in the National Fire Academy's Executive Fire Officer Program (EFOP). The EFOP is a four-year program consisting of four Graduate-level courses – Executive Development, Community Risk Reduction, Fire Service Operations and Executive Leadership. Following each course, the participant is required to complete an Applied Research Project (ARP) relating to a problem in their department and the course completed. The EFOP is the premiere professional development program for fire service leaders from around the world.

I would like to invite you to participate in my research project. I am studying the response of children and children with autism to fire drills. The purpose of the research is to test the effectiveness of a program to teach children and children with autism to respond appropriately during fire drills. In order to collect meaningful data, it is important for all children in the class to participate.

If you decide to allow your child to participate, you will be asked to complete five brief surveys: a survey about your child, three surveys relating to your child's response to the fire drills and a post study survey. Your child will participate in three fire drills over an 8-week period. Your child will participate in a fire alarm program called *Fearless Fire Drills*. In addition, the program and the fire drills will be video recorded for data analysis.

Participation is completely voluntary. Participation is confidential. You do not have to answer any survey questions that you do not wish to. Personally identifiable information will not be utilized in any manner. The results of the study may be published or presented at professional meetings, but your identity and your child's identity will not be revealed. Attached is an Informed Consent form that has more information about participation.

I will be happy to answer any questions you have about the study, or discuss the results of the study, upon completion. If you have any questions, you may contact me at 205-802-3832 or by e-mail at cohendava@mtnbrook.org.

Thank you for your consideration. If you would like to participate, complete and sign the Informed Consent form and turn it in to your child's teacher before leaving today. The surveys will be completed through an email.

With kind regards,

David A. Cohen

Appendix C

Informed Consent Form



**Samford University Institutional Review Board
Informed Consent for Participation of a Minor in a Research Study**

Principal Investigator(s): Dr. David Finn, David Cohen
Study Title: Fire Alarm Desensitization: Does it work for children with autism?
Date:

Name of participant: _____ **Age:** _____

The following information is provided to inform you about the research project and your child's participation in it. Please read this form carefully and feel free to ask any questions you may have about this study and the information given below. Also, you will be given a copy of this consent form.

Your child's participation in this research study is **voluntary**. You are **free to withdraw** your child from this study at any time. Your child is also **free to withdraw** from this study with no penalty. In the event new information becomes available that may affect the risks or benefits associated with this research study or your willingness to allow your child to participate in it, you will be notified so that you can make an informed decision whether or not to continue allowing your child to participate in this study.

1. Purpose of the study:

The purpose of the study is to test the hypothesis that the Fire Alarm Sound Desensitization Training (FASDT) teaches children with autism to respond correctly during fire alarm activations.

Your child is being asked to participate in this research study to identify behaviors of pre-school and kindergarten students as they relate to fire drills and fire alarm sounds. Preschool and kindergarten students have been selected because they most likely have not been exposed to fire drills and fire alarms.

2. Procedures to be followed and approximate duration of the study:

Students will participate in three unannounced monthly fire drills. The first drill will be conducted during the first week of school. The second and third fire drills will be conducted approximately four weeks after each preceding fire drill. Student participation in the study will be terminated at the end of the third fire drill.

The test group will consist of typical children and children with autism or other developmental disability in Kindergarten and Preschool. As part of the study, the students will participate in three unannounced monthly fire drills. The first drill will be conducted during the first week of school. Following the initial fire drill, the test group will receive the Fire Alarm Sound Desensitization Training as outlined in the Program Manual. This training will be conducted one time weekly for four weeks, until the second fire drill. Approximately four weeks after the initial fire drill, a second drill will be conducted. Following the second fire drill, the test group will receive the Fire Alarm Sound Desensitization Training weekly for another four weeks. The test group will then have the third fire drill. Student participation in the study will be terminated at the end of the third fire drill.

An occupational therapist, speech language therapist, behavioral therapist or special education teacher, who is also a certified teacher, will administer the training program for preschool students. As part of the training, the students will discuss loud and soft sounds and view a fire drill modeling video. They will discuss procedures for walking out of the classroom when they hear the fire alarm. The students will be introduced to a fire alarm box that models a fire alarm in the building. They will be able to touch it and discuss the parts. They will be taught a "STOP" gesture to use when the fire alarm is sounded. When the "STOP" gesture is used by anyone, the sound will be immediately turned off. The alarm can be covered with a towel to deaden

Parent/Guardian's initials: _____

IRB approval number: EXPD-E-SUM-12-10
Approval date: 8/16/2012

the sound. If a child is not ready, they may be taken out into the hall to experience the sound from a distance. NO CHILD WILL BE FORCED TO MOVE BEYOND A LEVEL THEY ARE COMFORTABLE WITH.

An occupational therapist, speech language therapist, behavioral therapist or special education teacher, who is also a certified teacher, will administer the training program for kindergarten students. The students will progress through five sessions. They will watch the fire drill social narrative movie and discuss the reasons we have fire drills. They will discuss the worst part of the drill. Students will look at and touch the fire alarm box. They will learn the "STOP" gesture to use when the fire alarm is sounded. The students will put on sound reducing earphones and sit across the room. The alarm will be set off and an adult will use the "STOP" gesture after 2 seconds, then immediately turned off. Volunteers will be asked to be "in charge of the fire alarm" and may turn on the alarm. Volunteers will be asked to take off their sound reducing earphones. NO CHILD WILL BE FORCED TO MOVE BEYOND A LEVEL THEY ARE COMFORTABLE WITH.

The occupational therapist, speech language therapist, behavioral therapist or special education teacher responsible for the class will handle adverse reactions in an appropriate manner. Throughout the program, positive reinforcement will be encouraged. A child can be removed from the program at any time without consequence by the parent, teacher, or Principal Investigator if they believe that the risks to your child outweigh the benefits of participation. NO CHILD WILL BE FORCED TO MOVE BEYOND A LEVEL THEY ARE COMFORTABLE WITH.

3. **Expected costs to you:** There are no costs for participation in this study.
4. **Description of the discomforts, inconveniences, and/or risks that can be reasonably expected as a result of your child's participation in this study:**

All students will be required to participate in fire drills. They may become distressed due to disruption of routine, chaos resulting from the fire drill, fear of the noise associated with the fire alarm activation, or fear of the unknown relating to fire drills. Those students receiving the Fire Alarm Sound Desensitization Training will be required to participate in fire drills, and will also use a fire alarm horn and strobe under the supervision of the child's teacher, which may result in distress due the sound of the panel.

5. **Foreseeable or anticipated risks from your child's participation in this study:**

The study will present minimal risk to the students. Students will be required to participate in fire drills. They may become distressed due to disruption of routine, chaos resulting from the fire drill, fear of the noise associated with the fire alarm activation, or fear of the unknown relating to fire drills. There is minimal risk of injury to the student except for that risk associated with exiting the building during the fire drill. This risk includes tripping, falls, bumping into other students, bumping into walls, and other injuries common to exiting the building.

Those children receiving the Fire Alarm Sound Desensitization Training, in addition to the required fire drills, will be exposed to the same risks found in the classroom environment, with the addition of the use of a fire alarm panel. Students may suffer distress due to the sound of the panel. The student will be under the supervision of a Speech Language Pathologist, Occupational Therapist or other Special Education Teacher when the fire alarm panel is in use.

6. **Compensation in case of study-related injury:** There is no provision for compensation in case of study-related injury.
7. **Good effects or benefits that might result from this study:**

a) The benefits to science and humankind that might result from this study.

The possibility of benefits to society can be significant. Children with autism have been excluded from participation in fire drills because of behavioral issues during and after the fire drill. Validation of the FASDT

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will allow the program to be introduced as a viable treatment option to teach children with autism how to respond appropriately to fire alarm activations.

b) The benefits your child might get from being in this study.

Individual participants in the study should benefit directly from participation in the study. Through the educational process, they should learn the appropriate response to fire alarms and be able to exit the building in the correct manner during fire alarm activations.

8. **Alternative treatments available:** There are no alternative treatments available.
9. **Compensation for participation:** There are no monetary incentives or compensation for participation in this study.
10. **Circumstances under which the Principal Investigator may withdraw your child from study participation:**

Your child may be withdrawn from participating in the study if the Principal Investigator and/or your child's teacher believe that the risks to your child outweigh the benefits of participation.

11. What happens if you withdraw consent or your child chooses to withdraw from study participation:

Your child's participation in this research study is voluntary. You are free to withdraw your child from this study at any time, for any reason, with no penalty.

12. Confidentiality:

All efforts, within reason, will be made to keep your child's personal information in his/her research record confidential.

The identity of persons participating in the study and their related data are to remain confidential. All individual data will be coded using a unique alphanumeric identification. Informed consent forms will be stored separately in a locked file cabinet in the researcher's office. Survey instruments will be stored separately in a locked file cabinet in the researcher's office. No participant names will appear on any of the data collection tools. All computerized data will be kept in a password-protected computer in the researcher's office, with access only by the researcher. All data will be kept a minimum of three years before being destroyed. Electronic media will be securely overwritten and hard copy data will be shredded and recycled.

Fire drills and FASDT classes will be video recorded to facilitate accurate data collection. Video recordings will be stored on DVD discs in a locked file cabinet in the Researcher's office. Discs will be identified using the date, time and school where the fire drill was conducted. No participant information will appear on the disc identification. Discs will be kept a minimum of three years before being destroyed. Discs will be shredded.

The results of the study may be published or presented at professional meetings, but the identity of individuals involved in the study will not be revealed. Specific individuals may be selected to highlight unique behaviors. These individuals will have their identity protected through use of a pseudonym as well as minor demographic and case detail alterations.

13. Privacy:

Your child's information may be shared with the Samford University Institutional Review Board or the Office for Human Research Protections (Federal Government). His/her information will only be used for monitoring purposes.

Parent/Guardian's initials: _____

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14. Contact Information.

If you should have any questions about this research study, please feel free to contact David Cohen at 205-802-3832 or cohendava@mtnbrook.org or, Faculty Advisor for this study, Dr. David Finn at dmmfinn@samford.edu.

For additional information about giving consent or your child's rights as a participant in this study, to discuss problems, concerns, and questions, please feel free to contact the Samford University Institutional Review Board Chair **Dr. John Petrella** at [jkpetrel@samford.edu](mailto:jkpettel@samford.edu).

Statement by Person Consenting to Allow the Minor's Participation in this Study

I have read this informed consent document and the material contained in it has been explained to me verbally. All my questions have been answered, and I freely and voluntarily choose to consent to my child's participation in this study. I have received a copy of this consent form.

Signature of Parent/Guardian

Date

Consent obtained by:

Date

Signature

Printed Name and Title

Parent/Guardian's initials: _____

IRB approval number: EXPD-E-SUM-12-10
Approval date: 8/16/2012

Appendix D

Parent Pre-Participation Survey

Dear Parent:

Thank you for agreeing to participate in this research project. Please complete this survey to the best of your ability. You do not have to answer any questions that you do not wish to. Personally identifiable information will not be collected or utilized in any manner. Please be sure to use your child's Research ID number that you received at orientation. Again, thank you for your participation.

Student Research ID Number

1. Has your child been diagnosed with Autism Spectrum Disorder or other developmental disability?

No
Autism
Asperger
PDD-NOS
Other developmental disability

2. Do fire drills scare your child?

Yes
No
Don't know

3. What about fire drills scares your child?

Choose all that apply.

Sound
Flashing lights
Other:

4. On a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid is your child of fire drills?

1	2	3	4	5
Least				Most

5. How does your child react when fire drills scare them?

6. What places do you and your child frequent?

Choose all that apply.

Mall / Department Store /
Supermarket

Restaurant
Sporting event / Bowling Lanes
Movie Theaters
Hotels / Motels
Libraries / Museums / Zoos
Place of Worship
Airport
Other:

7. Has a fire alarm ever sounded when your child was in the area?

Yes.
No

8. If yes in Question 7, how did your child respond to the fire alarm?

9. Does your child's school / preschool have any special procedures for fire drills for your child?

Choose all that apply.

No
Advance Warning
Headphones / earplugs
Special fire alarm
Other:

10. How old is your child?

4
5
6
7
Other:

11. Where does your child attend school?

Public School
Private School
Other:

12. Please list any additional comments you may have concerning your child and fire alarms or fire drills.

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Appendix E

Parent Fire Drill #1 Survey

Dear Parent:

Your child's school had a fire drill today. This is the first of three fire drills held as part of the research project. Please complete the survey about your child's response to the fire drill. Be sure to use your child's Research ID Number you received at the orientation. Please be as complete and accurate as possible regarding effects the fire drill had on your child's behavior. Feel free to include any additional comments regarding your child and fire drills.

Thank you for your participation in this research project.

Student Research ID Number

1. Did your child tell you about the fire drill in school today?

Yes. Please describe what they told you in Question 2.

No

2. If "Yes" in Question 1, what did your child tell you about the fire drill?

3. When your child got home, what effects did the fire drill have on your child?

Please check all that apply

Anxious
 Uncooperative
 Hide / Withdraw
 Overstimulation
 Agitated
 Crying / Irritable
 Frightened
 Disruptive
 Repetitive Behavior (Stim)
 Difficulty focusing on task
 None
 Other:

4. How long did the effects of the fire drill last?

Not Applicable
 Less than 1 hour
 1 to 2 hours
 2 to 3 hours
 3 to 4 hours
 All evening

5. Based on your child's reaction to the fire drill today, on a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid is your child of fire drills?

	1	2	3	4	5	
Least						Most
afraid						afraid

6. Please list any additional comments you may have regarding your child and this fire drill.

Appendix F

Parent Fire Drill #2 & 3 Survey

Dear Parent:

Your child's school had a fire drill today. This is the second of three drills held as part of the research project. Please complete this survey about your child's response to this fire drill. Be sure to use your child's Research ID Number you received at the orientation. Please be as complete and accurate as possible regarding effects the fire drill had on your child's behavior. Feel free to include any additional comments regarding your child and fire drills.

Thank you for your participation in this research project.

Student Research ID Number

1. Did your child tell you about the fire drill in school today?

Yes. Please describe what they told you in Question 2.

No

2. If "Yes" in Question 1, what did your child tell you about the fire drill?

3. When your child got home, what effects did the fire drill have on your child?

Please check all that apply

Anxious

Uncooperative
Hide / Withdraw
Overstimulation
Agitated
Crying / Irritable

Frightened

Disruptive
Repetitive Behavior (Stim)
Difficulty focusing on task
None
Other:

4. How long did the effects of the fire drill last?

Not Applicable
Less than 1 hour
1 to 2 hours
2 to 3 hours
3 to 4 hours
All evening

5. Did your child behave differently after this fire drill than after previous fire drills?

Yes. Please describe in Question 6.

No

6. How did your child's behavior differ from previous fire drills?

7. Based on your child's reaction to the fire drill today, on a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid is your child of fire drills?

1	2	3	4	5
Least afraid				Most afraid

8. Please list any additional comments you may have regarding your child and this fire drill.

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Appendix G

Parent Post-Participation Survey

Thank you for your participation in this research study. Please be as accurate as possible regarding the changes in your student's behavior between the first fire drill and the last fire drill. Feel free to include any additional comments on the survey.

Student Research ID Number

1. After participating in the study, has your child's behavior changed concerning fire drills?

Yes
No
Don't know

2. Is your child more or less afraid of fire drills?

Yes
No
Don't know
About the same

3. On a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid is your child of fire drills?

	1	2	3	4	5	
Least afraid						Most afraid

4. What has changed about your child's behavior concerning fire drills?

5. Please list any additional comments you may have about this project?

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Appendix H

Teacher Pre-Participation Survey

Please complete this survey to the best of your ability. You do not have to answer any questions that you do not wish to. Personally identifiable information will not be collected or utilized in any manner. When you have completed the survey, please click on the "Submit" button. Again, thank you for your participation in this project.

Teacher ID Number

1. Are you a special education teacher?

Yes
No

2. Do you teach children with autism or have you taught children with autism?

Yes
No

3. What techniques are used in educating children with autism? Choose all that apply.

Role-playing
Social Story
Video modeling
Peer modeling
Don't know
None
Other:

4. How do children with autism respond to external stimuli, such as loud noises, flashing lights, etc.?

5. What special procedures are used for children with autism when fire drills are performed?

Check all that apply

None
Advance Warning
Ear plugs or Headphones
Special alarm
Child does not participate in fire drills
Other:

6. What techniques are used in educating children with autism regarding fire drills? Choose all that apply.

Role-playing
Social Story
Video modeling
Peer modeling
Don't know
None
Other:

7. In your experience, how do children with autism react during fire drills?

8. In your experience, do children with autism display dangerous or self-destructive behavior during fire drills?

Yes. Please describe behavior in Question 9
No
Don't know

9. In what way do children with autism display dangerous or self-destructive behavior during fire drills?

10. Do children with autism endanger others during fire drills?

Yes. Please describe behavior in Question 11.
No
Don't know

11. In what way do children with autism endanger others during fire drills?

12. Please list any additional comments you may have regarding children with autism and fire drills.

13. How long have you taught children with autism?

1 to 5 years
6 to 10 years
11 to 15 years
16 to 20 years
Over 20 years

Appendix I

Teacher Fire Drill #1 Survey

Please complete this survey to the best of your ability. You do not have to answer any questions that you do not wish to. Personally identifiable information will not be collected or utilized in any manner.

Please base your answers on the responses your students had during the fire drill

Teacher ID Number

1. Approximately what time was the fire drill conducted?

2. What effects did the fire drill have on your students?

Choose all that apply.

Anxious
 Uncooperative
 Hide / Withdraw
 Overstimulation
 Agitated
 Crying / Irritable
 Frightened
 Disruptive
 Repetitive Behavior (Stim)
 Difficulty focusing on task
 None
 Other:

3. On a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid were your students during this fire drill?

	1	2	3	4	5
Not Afraid					Very Afraid

4. How long did the effects last after the fire drill?

Less than 1 hour
 1 to 2 hours
 2 to 3 hours
 3 to 4 hours
 Remainder of the day

5. Please list any additional comments you have regarding your students response to this fire drill.

Appendix J

Teacher Fire Drill #2 & 3 Survey

Please complete this survey to the best of your ability. You do not have to answer any questions that you do not wish to. Personally identifiable information will not be collected or utilized in any manner.

Please base your answers on the responses your students had during the fire drill

Teacher ID Number

1. Approximately what time was the fire drill conducted?

2. What effects did the fire drill have on your students?

Choose all that apply.

Anxious

Uncooperative
Hide / Withdraw
Overstimulation
Agitated
Crying / Irritable

Frightened

Disruptive
Repetitive Behavior (Stim)
Difficulty focusing on task
None
Other:

3. On a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid were your students during this fire drill?

	1	2	3	4	5
Not Afraid					Very Afraid

4. How long did the effects last after the fire drill?

Less than 1 hour
1 to 2 hours
2 to 3 hours
3 to 4 hours
Remainder of the day

5. Did your students behave differently after this fire drill than after previous fire drills?

Yes. Please describe the difference in Question 5.
No

6. In what way did your students behave differently after this fire drill than after previous fire drills?

7. Please list any additional comments you have regarding your students response to this fire drill.

Appendix K

Teacher Post-Participation Survey

Thank you for your participation in this research study. Please be as accurate as possible regarding the changes in your student's behavior between the first fire drill and the last fire drill. Feel free to include any additional comments on the survey.

Teacher ID Number

1. After participating in the study, has your student's behavior changed concerning fire drills?

Yes
No
Don't know

2. Are your students more or less afraid of fire drills?

Yes
No
Don't know
About the same

3. On a scale of 1 to 5 with 1 being the least and 5 being the most, how afraid are your students of fire drills?

	1	2	3	4	5	
Least						Most
afraid						afraid

4. What has changed about your student's behavior concerning fire drills?

5. Do you see any limitations to the FASDT program?

6. Please list any additional comments you may have about this project?

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Appendix L**Fire Drill Procedures**

Fire Drill Procedures

Step	Procedure / Activity	Response
1	Alarm sounds	
2	Student stops what they are doing	
3	Student stops talking	
4	Student listens for instructions from teacher	
5	Student walks to classroom door in orderly manner	
6	Student lines up in single file by door	
7	Student waits for teacher to say when to leave	
8	Student walks quickly and quietly behind leader	
9	Student stops at safe place outside building	
10	Student waits quietly in line for further instructions	

Appendix M

Video Guidelines

Video continuously from start to finish. Do not stop recording for any reason.

Begin recording 1 to 2 minutes before the fire alarm activation.

Video the student's response to the fire drill.

Video the teacher giving directions.

Video the class walking out of the classroom.

Walk behind the class and attempt to record the entire class.

Video the class walking out of the building, lining up outside and waiting to return to class

Video any child that is having difficulty with the drill.

Video the class walking back into the building and into the classroom, seated at their desk/table

Continue recording the classroom for approximately 1 minute after they are seated.

If a student is having difficulty, continue recording them 2 to 3 minutes after everyone is seated.

Appendix N

Assessment Spreadsheet

School:
Class:
Grade:
Date of Drill:

[illegible]

Appendix O

Behavioral Assessment Rubric

Behavioral Assessment Rubric

Interval data collection system in continuous 30-second intervals used to rate behavior

Fire Drill Behavior Assessment Criteria

Each 30-second interval

- No affect – 0 – absence of response to stimuli; zones out; disassociated
- Tolerant – 1 – appropriate response; no signs of stress, anxiety or agitation; comfortable
- Mild agitation – 2 – whimpering; irritated; covers and uncovers ears; stim
- Moderate agitation – 3 – moves away from sound; covers and holds ears; whining; scared, quivering; clinging to teacher
- Severe agitation – 4 – Cry uncontrollably; cowering; lash out at others; forcefully cover ears
- Intolerant – 5 – painful; running away; screaming uncontrollably; violent; self-abusive

Appendix P

Narrative Assessment Form

Date: August 30, 2012

Time: 10:00

Fire Alarm dB reading: 95 dBA

Recording consisted of one video: 16 minutes 47 seconds. Children sitting on floor interacting with teacher.

Details:

Pre-Fire Drill

0:34 – 1:34

0:34 – Assessment begins

No atypical behaviors noted prior to fire alarm activation (1)

Alarm to Exit

1:34 – 2:25

1:35 – Fire alarm sounds

1:40 – Male #1 – blue marble shirt, khaki shorts – almost covered right ear – hands moved to ears but did not cover them. (2)

1:42 – Male #2 – blue/white stripe shirt, blue shorts – fingers in both ears (2)

1:47 – Female #1 – white top/pink design – hand to left ear (2)

1:53 – Fire alarm stops

All three had ears uncovered upon leaving classroom and alarm stopping.

No further atypical behaviors noted.

Exit to Staging

2:25 – 4:52

No atypical behaviors noted (1)

Waiting in Staging

4:52 – 8:38

No atypical behaviors noted (1)

Return to Building

8:38 – 12:58

No atypical behaviors noted (1)

Building to Classroom

12:58 – 13:50

No atypical behaviors noted (1)

Post-Fire Drill

13:50 – 14:50

No atypical behaviors noted (1)

14:50 – Assessment ends

Appendix Q

Sample Compiled Assessment Spreadsheet

School: _____ Elem

Class:

Grade: Preschool

Date of Drill: 9/4/12

[illegible]

Appendix R**FASDT Data Sheet****Fire Alarm Data**

Name _____ Date _____

Current response to the fire alarm: _____

Was the student forewarned about alarm: _____

Did student require assistance in leaving the building? _____

If so, how much: _____

Session 1: _____ Date: _____

Session 1 Notes: _____

Response to Session 1: _____

Plan: _____

Session 2: _____ Date: _____

Session 2 Notes: _____

Response to Session 2: _____

Plan: _____

Session 3: _____ Date: _____

Session 3 Notes: _____

Response to Session 3: _____

Plan: _____

Session 4: _____ Date: _____

Session 4 Notes: _____

Response to Session 4: _____

Plan: _____

Session 5: _____ Date: _____

Session 5 Notes: _____

Response to Session 5: _____

Plan: _____

Fire Alarm Data Chart

Date	Alarm w/earphones	Turn on alarm	Alarm w/o earphones	Alarm in class

Data information:

of seconds alarm was on

G- Student used gesture to turn off

*- Alarm was turned on by teacher (student knew but was not agreeable)

(Adapted from "Fire Alarm Data Chart," by A. Dern and E. Pittman, 2012, *Fearless Fire Drills*, P. 23-24)

Appendix S

Alarm Box



Appendix T

“Stop” Gesture



(Adapted from “Fire Alarm Data Chart,” by A. Dern and E. Pittman, 2012, *Fearless Fire Drills*, P. 6)