

A QUALITATIVE STUDY: PERSPECTIVES FROM STUDENTS WITH AUTISM ON
CLASSROOM ENVIRONMENTAL ADAPTATIONS FOR THE ENHANCEMENT OF
ATTENTION AND ENGAGEMENT DURING LEARNING TASKS

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ABSTRACT

Title: Student Perspective on Classroom Environmental Adaptations

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This qualitative study explores the effects of environmental adaptations of a classroom on the attention of students with autism. The purpose of the study was to explore the effects of the changes as perceived by the four participants. The study is part of a larger study exploring the effects of environmental adaptation of a classroom on the attention/engagement of students with autism. The specific adaptations are the installment of sound absorbing walls and the installation of halogen lighting in a classroom with the Owens Corning Basement Finishing System™. The participants were four boys with a diagnosis of autistic spectrum disorder (ASD) who were between the ages of twelve and twenty-one years of age and had attended the school for more than one year. The study is a multiple single subject A-B- +(B+C) design. The study took place over a six week period with 3 phases of two weeks each. Phase (A) was baseline assessment of students in their assigned classroom, phase B followed the installation of sound absorbing walls using the Owens Corning Basement Finishing System™ and phase three was following the installation of halogen lighting.

Journaling was the qualitative, phenomenological method used in which all participants, in their own 'voice' could provide feedback on the baseline phase (pre-modifications) post- wall phase and post- lighting phase. The results of the journaling provided insight into individual student and cross-student themes, chief among them: post-modifications 3 of 4 participants provided comments on improved ability to perform on learning tasks, the same 3 participants provided positive emotional responses following modifications. One clinical implication is the importance of obtaining a first-person perspective from ASD students for both researches as well as in the classroom.

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DEDICATION

I wish to dedicate this project to both my wife, Natasha, and to my daughter, Sofia, for allowing me the time needed to focus on this paper.

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CHAPTER 1 – Introduction

One in 150 people in the United States are diagnosed as ‘autistic’ (Rice, Baio, Van Naarden Braun, Doernberg, & Kirby, 2007). Autism Spectrum Disorders (ASD) are a group of complex neurological developmental disabilities that are characterized by impaired social interaction, problems with non-verbal and verbal communication, and unusual or severely limited activities, interests, or behaviors. Autistic Disorder, Pervasive Developmental Disorder, Asperger’s Disorder, Childhood Disintegrative Disorder, and Rett’s Disorder are all classified under Autistic Spectrum Disorder (Rice et al., 2007)

Commonly occurring difficulties include unusual responses to everyday sensations such as sound, touch, and visual stimuli which are often accompanied by marked difficulty in learning how to regulate and control behavioral responses (Autism Society of Canada, 2010). There are numerous combinations of how the core deficits manifest themselves and there is no one single characteristic or behavior that is common to all autism spectrum disorders. There is no medical test to diagnose a child as autistic, but rather the diagnosis is based upon developmental and behavioral features. Diagnosis is based on observations within the following domains: social interaction, communication, restricted repetitive and stereotyped patterns of behavior, interests, and activities. A total of six (or more) items from the three domains, with at least two affecting social interactions and one each affecting communication and

stereotypical behaviors are required for diagnosis. (DSM – Diagnostic and Statistical Manual of Mental Disorders, 2000).

The American Psychiatric Association (2009) anticipates the DSM-5 to be finalized and introduced in 2013. The proposed changes include a new definition for autism spectrum disorders. The proposed changes to the definition include four criteria that include; persistent deficits in social communication and social interaction across contexts, restricted, repetitive patterns of behavior, interests, or activities, symptoms must be present in early childhood, and symptoms together limit and impair everyday functioning. Of particular interest for this master's thesis is the criteria of restricted, repetitive patterns of behavior, interests, or activities. One of the four possible manifestations includes the following: Hyper – or hypo reactivity to sensory input or unusual interest in sensory aspects of environment, (such as apparent indifference to pain/heat/cold, adverse response to specific sounds or textures, excessive smelling or touching of objects, fascination with lights or spinning objects). (American Psychiatric Association, 2010 – revised January, 2011)

Ganz (2000) reported that autism affects 1,500,000 Americans, and that it costs over three million dollars to take care of a person with autism over his or her lifetime. Thus, caring for these Americans with autism may cost the United States roughly \$45 billion dollars (Harvard University, 2006). Ganz' estimate is an untested calculation. Parents of children with autism may seek alternative therapies, diets, and newer techniques which can possibly lead them into debt due to the increased associated costs.

The cost for educating students with autism is considerable. It is important to determine effective interventions that can be used to increase attention and engagement of students with ASD in the school environment. Due to characteristics of the condition, there needs to be special focus on sensory sensitivities, environmental adaptations, and taking into account the student's perspective regarding what environmental and learning adaptations/interventions are being used with them and what is most effective from their perspective (Simpson, R.L., 2005). When a student with autism is not able to communicate his perspective verbally, then the use of augmentative and alternative communication training is needed to provide students with a voice regarding their preferences.

There is also a cost to families in human terms. The family dynamic is altered when there is a child in the family with autism. Parents may observe that their child is behind in reaching developmental milestones, not responding appropriately to stimuli and, therefore, attempt to figure out why their child is having difficulties – all prior to the diagnosis of autism. Parents may feel disbelief, anger, resentment, shock, guilt, surprise, devastation, and helplessness and hopefully, later, relief at having an explanation for their child's atypical behavior (Phelps, Hodgson, McCammon, Lamson, 2009). The authors further note that children with Autism tend to have extensive needs and one parent may have to work longer hours in order to help with the costs associated with the education and treatments or a parent may have to not work in order to take care

of the child. In order to help reduce stress, the family often needs to seek respite care from other family members, friends, or agencies.

Since the 1990's there has been an emphasis on evidence-based practice. It began in the medical profession and has expanded into education and all the health professions (National Institutes of Health, 2004). Evidence-Based Practice refers to the use of interventions that have research or scientific studies as a basis for determining their effective practices. The purpose of using this approach is to provide transparency and to assure the public that techniques and procedures will provide the best possible interventions and outcomes. Evidence-Based Practices aim to eliminate subjective professional judgment when developing appropriate plans of action (Glasby, J., Beresfor, P., 2006).

There has been federal and state legislation since 1975 that addresses the educational needs of special education students. The Individuals with Disabilities Education Act (IDEA) was enacted in 1990 and reauthorized in 1997. The 1997 reauthorization provided for the free and appropriate public education (FAPE) of all special education students. Other highlights included the requirement of post-secondary transition planning to begin by the age of 14, to prepare the student for life following graduation and encouraging the use of mediation to resolve parent – district differences, strengthening the role of parents and ensuring access for all students to the general education curriculum. The next major reauthorization of the law was in 2004 (IDEIA, 2004). This reauthorization put more emphasis on student outcomes than on compliance with special education processes. In addition, the reauthorization aligned special

education law with the No Child Left Behind Act of 2001. Initial evaluation procedures were also addressed with regard to specific learning disabilities. When determining if a child has a specific learning disability, a local educational agency shall not be required to determine if a severe discrepancy exists between achievement and ability. Instead, the Local Educational Agency (LEA) may use a process to determine if the child responds to scientific, research-based interventions. This process is commonly referred to as Response to Intervention (RTI) (Pennsylvania Training and Technical Assistance, 2004). RTI in Pennsylvania carries a dual meaning. It refers to the initial evaluation process for students suspected of having a specific learning disability as well as the general education initiative of using a comprehensive, three-tiered framework for supporting all students with either academic or behavior difficulties.

Congress enacted the No Child Left Behind Act in 2001. This Law declared that evidenced-based practices must be used to develop programs, curriculum and teacher preparation courses to ensure that all students are provided opportunities to excel by using methods and practices proven to be effective. With this law, there no longer could be a separate curriculum for general education students and one for special education students. All students are to be taught from the same curriculum and to meet state determined levels of competency (Jalani, V., 2011).

Specific to Pennsylvania, the Gaskins Settlement Agreement (2005) addresses inclusive educational practices for students with disabilities and required the establishment of an advisory group to the Pennsylvania

Department of Education to address these inclusive issues. This agreement mandates training and technical assistance, as well as compliance regulations requiring local schools and school districts to offer a full continuum of support services allowing children with disabilities to be educated in regular education classrooms. This agreement forces every IEP team to carefully consider if the proposed educational program for a student can be delivered in the least restrictive educational setting possible. This act also reinforces the belief that special education is not a classroom but, rather a service that can be provided in a number of educational settings.

When compared to children with non-ASD developmental delays, children with autism have significantly more tactile sensitivity, auditory anomalies and taste/smell sensitivity (Lopez –Duran, 2009). Having sensory abnormalities is not a DSM-IV diagnostic symptom of autism. However, parents, clinicians and researchers often report that children with autism have hypersensitivity to sensory stimuli, such as sensitivity to bright lights, loud noises, specific fabrics, or unique flavors or food textures (Baranek, Boyd, Poe, Fabian, Watson, 2007).

Students with autism often demonstrate limited attention and engagement to tasks, unless they have a special motivation to learn a task and have an environment that does not distract them from learning (Murray, Lesser, & Lawson, 2005). In order for a child to learn, he or she must be able to focus on the lesson and engage in various tasks associated in the lesson. Occupational therapists often make environmental adaptations in order to help individuals participate. This thesis addresses the question, “Can the classroom environment

be adapted to address the special needs of the autistic student?" Specifically, it explores the effect of sound- absorbing walls and change in lighting in a classroom and the attention and engagement of students with autism.

When evaluating the effectiveness of a program, method, and/ or technique, considerations should include outcome, risks, and evaluation process as well as the importance of personal perspective (Weinkauf, Zeng, & Anderson, 2011). Many children, who do not have autism could also benefit from improvement in their sensory environment. As a result of this universal design, students in general may have increased attention spans for classroom learning activities and other academic tasks due to the sound-absorbing walls and lighting changes reducing sensory distractions resulting in overall educational improvement.

Purpose and Significance

The purpose of this study is to explore the effects of classroom adaptations as perceived and experienced by the students with autism through their personal written accounts in response to an established set of questions. This qualitative, phenomenological study is part of a larger study exploring the effects of environmental adaptation of a classroom on the attention/engagement of students with autism. The specific adaptation is the installment of sound absorbing walls and the installation of halogen lighting in a classroom with the Owens Corning Basement Finishing System™. These modifications are hypothesized to enable student with sensory sensitivities to sound and light to improve their attention and engagement in learning activities by creating a less sensory noxious environment. The implications of this study are twofold. First,

the opinion and lived experience of the person for whom the environmental adaptation is created, is an essential outcome to measure when establishing research based or evidence based intervention. This provides additional reliability to the larger study that examined and quantified behavioral outcomes. A second implication is that this OCBFS adaptation may be an effective universal design that could enable students and workers with sensory sensitivities to participate in their education/work environment in a comfortable and productive way.

Definitions

Autism / Autism Spectrum Disorder – Autism is one of the pervasive developmental disorders included in the DSM-IV-TR criteria. It refers to the presence of markedly abnormal or impaired development in social interaction and communication and a markedly restricted repertoire of activities and interest. Autism Spectrum Disorders include autism and related disorders such as Asperger Syndrome, Rett Syndrome, childhood disintegrative disorder- not otherwise specified (American Psychiatric Association, 2000).

Sensory Modulation– The ability to effectively detect, register, and process relevant sensory information to maintain attention to task is a function of neuro-modulation (Bundy, Lane & Murray, 2002; Hanff, Miller & Lane, 2000).

Universal Design (UD) - Universal Design is a concept or philosophy for designing and delivering products and services that are usable by people to the

widest possible range of function capabilities, which include products and services that are directly accessible (without requiring assistive technologies) and products and services that are interoperable with assistive technologies (section 3 of the Assistive Technology Act of 1998).

Universal Design for Learning (UDL) - UDL was based on the principles established for Universal Design. UDL is the use of technology designed for educational purposes with the widest range of student use possible. The design allows access to the curriculum and assessment, and there must be ease of use. The ultimate goal is to 'level the playing field' for students with disabilities (CAST, 2001).

Journaling – the practice of recording one's personal experiences, events, and emotions (McAllister & Cutcher, 2010).

Augmentative and Alternative Communication - These terms are sometimes used interchangeably. They refer to alternative ways to enable communication for people with disorders in either expressive or receptive language. Gestures, communication boards, pictures, symbols or drawings are common methods (The ASHA Leader, 2002).

CHAPTER 2 – Literature Review

The databases of PowerQuest, Ebscohost, Psychinfo were used to identify peer-reviewed journal articles that were published since 1995. Terms searched included: Autism Spectrum Disorder, Sensory Sensitivities, Sensory Modulation Dysfunction, Sensory Processing, Universal Design / Universal Design for Learning, Augmentative Communication, Alternative Communication, Student Perspective, Acoustics, Environmental Adaptations, Journaling, Diaries, Qualitative Study, Classroom Attention, Individuals with Disabilities Education Improvement Act of 2004 (IDEIA), Individual Educational Program (IEP), Free and Appropriate Education (FAPE), No Child Left Behind Act of 2001, Gaskins Settlement Agreement.

It should be noted that the topic of ‘journaling’ was the most difficult to research due to the lack of pertinent articles. However, when expanding the search to include augmentative and alternative communication, the search was more successful.

Sensory Sensitivities

The literature reviewed included topics of sensory sensitivities and students with autism. Some students with autism have extreme sensitivity to hearing, vision, touch, smell or taste. Not all students with ASD have auditory processing difficulties and not all students who have auditory processing disorder (APD) also are diagnosed with ASD. When a student with autism does experience difficulty with spoken language, it is the higher-order, global deficit of autism that is considered the cause of the student’s difficulties (ASHA, position paper –not dated). The final articles reviewed focus on Auditory Modulation Disorder (AMD). AMD is a category

of Sensory Processing Disorder. When a child has Auditory Modulation Disorder he is having difficulty regulating his responses to auditory sensations. When a child has poor modulation, his responses may be over-reactive, under-reactive, sensory-seeking, or fluctuate between these responses (Kranowitz, 2005).

Using the Sensory Profile that they developed, Tomcheck & Dunn (2007) investigated differences in sensory processing among age-matched children (ages 3 to 6) with ASD and those who are typically developing. Ninety-Five percent of the children with ASD demonstrated some degree of sensory processing dysfunction. The areas of greatest difference between the two groups were reported for Under-Responsive/Seeks Sensation, Auditory Filtering, and Tactile Sensitivity (Tomcheck & Dunn, 2007).

Ashburner, Angley, & Young (2008) compared sensory processing and classroom emotional, behavioral, and educational outcomes in children with and without autism spectrum disorders. A pattern of auditory filtering difficulties, under-responsiveness, and sensory-seeking was associated with academic underachievement. Children who have difficulty processing verbal instructions in noisy environments and who often focus on sensory-seeking behaviors appear more likely to underachieve academically. Similar results were found by Baker, Lane, Angley & Young (2008). Using caregiver questionnaires they found ASD student who demonstrated sensory processing difficulties in auditory filtering, under-responsiveness (along with a high degree of attention-seeking) displayed a high degree of maladaptive behavior and emotional /behavioral problems.

O'Brien et al (2009) conducted a study on how the adapted Short Sensory Profile was used to discriminate children with autism from children with learning disabilities. The study resulted in significant differences in sensory processing between the autism group compared to the learning disabled and control groups. The autism group showed auditory hypersensitivity and visual stimulus-seeking behavior far more often than either of the other two groups.

The literature presents two seemingly different reactions to auditory stimuli by ASD students. They are often distressed and anxious or they are fascinated by the sound presented. It is not unusual to find that when a study is done to determine how ASD students respond to auditory stimuli, that the results were diverse. The study examined the results of fourteen norm-referenced parent questionnaires and found that sensory differences between ASD and control groups was in under-responsivity, followed by over-responsivity and sensation seeking (Ken, Fluss, Cermak, et al, 2008).

While controlling for sensory processing, a study was completed that reviewed the role of executive functioning for students diagnosed with ASD and between the ages of 6-9. The students were assessed using the Wisconsin Card Sorting Test and the Behavior Rating Inventory of Executive Function and the School Function Assessment Questionnaire. Parents completed the Sensory Profile. The findings were that executive functions contributed to participation in school activities over and above the contribution of sensory processing in particular, the abilities to resist emotional responses, to stop a behavior at the appropriate time and to regulate emotional responses (Zingerevich & LaVesser, 2009).

One study sought to establish if there were significant relationships between dysfunction in sensory modulation, symptoms of affective disorders, and adaptive behaviors in children and adolescents (Pfeiffer, Kinnealey, Reed, & Herberg, 2005). One of the results was that there were significantly strong positive correlations between sensory defensiveness and anxiety in children and adolescents with Asperger's disorder. The primary author of this study cites researchers (Clark & Watson, 1991; Johnson, 1975; Neal et al., 2002) as suggesting that individuals with anxiety tend to over-respond to environmental stimuli (sensory hypersensitivity).

One of the classroom modifications occurred with the installation of the Owens Corning Basement Finishing System™. The installation of sound absorbing walls was first completed. The other classroom modification was the replacement of fluorescent lighting with halogen lighting. Many individuals with autism cannot tolerate fluorescent lights. They can see the 60- cycle flicker. This is especially a problem with older fluorescents (Grandin, T., 2009). Dr. Temple Grandin, herself an individual with autism, writes in a commentary that sensitivity to light or other visual stimuli is variable for people with autism. Grandin suggests that if sensitivity to fluorescent lights is going to be studied, subjects should be assigned to studies on the basis of their reactions to fluorescent lights. It is also important to document the type of fluorescent lights. The most offensive ones have a 50 - 60 cycle flicker rate and might create more problems for people with autism.

A study conducted by Winterbottom and Wilkins (2009) examined the effects of fluorescent lighting in a sample of UK schools in 90 classrooms across eleven secondary schools. They measured variables such as the amount of flicker,

luminance at desks, and luminance of whiteboards. Results showed that 80% of classrooms are lit with 100jz fluorescent lighting that can cause headaches and impair visual performance. The authors concluded that these findings might provide insights into small-scale reports linking pupils' attainment, behavior and learning to classroom lighting.

Attention

The attention capacity of children with autism has puzzled investigators and clinicians for many years. There are many times an ASD student appears unable to shift attention, on demand, to a particular stimulus, while some ASD students can engage in sustained, repetitive learning activity (Pascualvaca, Fantie, Papageorgiou, & Mirsky, 1998).

Pascualvaca, et. al. (1998) conducted a study of students with ASD and two control groups. All students completed an attention battery comprising three versions of the Continuous Performance Test (CPT), a digit cancellation task, the Wisconsin Card Sorting Test, and two novel computerized tests of shifting attention. Children with ASD were able to focus on particular stimulus and sustain this focus as indicated on the one digit cancellation task and the CPT. Their performance on the WCST suggested problems in some aspects of shifting attention (i.e., disengaging attention).

In order to provide a diagnosis for most disorders, more than one assessment tool must be used, along with interviews and observations (Mahan & Matson, 2011). One tool often used as part of the diagnosis process for autism is the Behavioral Assessment System for Children (BASC). A recent study (Mahan &

Matson, 2011) was completed comparing the results of the BASC-2 subscales and composite scores between students that have been diagnosed as having autism spectrum disorder with a control group of students who did not have this diagnosis. The results showed that the ASD group of students scored significantly higher than the control group on most areas measured. This includes difficulty with attention. On the other hand, the ASD group scored significantly lower on the adaptability composite and all of the subscales that made up that composite score.

Attentional processes in autism have been of interest for several decades. Despite the extended interest in the area of attentional processing in autism, there is little consensus on the nature of intact attentional abilities and deficits (Goldstein, Johnson & Minshew, 2001). Measures administered corresponded to Mirsky et al's (1991) factor analysis of tests of attention (Mirsky, A.F., Lochhead, S.J., Jones, B.P., Kugelmass, S., Walsh, D., Kendler, K.S., 1991). This comprehensive analysis of attention in individuals with high functioning autism found differences on measures in which the task placed demand on cognitive flexibility or psychomotor speed. Thus, reported attention deficits in autism may actually be primary deficits in complex decision-making or psychomotor abilities. These findings indicate that the well-established cognitive deficits and their associated abnormal behaviors associated with autism are not the result of failure to incorporate information, or to sustain concentration, or to resist distraction.

A study by Bonggat & Hall (2010) was prompted by the emphasis on evidence-based practices for both teachers and therapists. A special education pre-school teacher comparing the effects on student performance in a group of students

with ASD and with sensory problems as well as noticeable difficulties with sustaining attention to tasks conducted an evaluation. The teacher and her aide provided a sensory diet to the students at the beginning of the school day, which had been suggested by the occupational therapist. In addition, the students were given attention control activities during individual tasks. The data collected by the teacher showed no significant difference between the two approaches for enhancing on-task behavior.

Learning and paying attention is dependent upon the ability to integrate and organize information from our senses. When sensory systems are intact, learning is effortless and easy. Immature sensory systems make paying attention and, therefore, learning difficult and frustrating (Office of State of Washington Superintendent of Public Instruction, 1999)

Journaling

Journals can be an effective tool to enhance student learning and at the same time provide the teacher with insight into a student's mental processes. Simply asking students to maintain a journal may not be enough. Teachers from diverse disciplines have discussed the merits and techniques of using writing to obtain deeper learning at all levels of education. Writing can help students learn because it forces them to organize their thoughts, ideas, and facts. Writing helps students to think at a higher level because they are not being asked to simply repeat the facts or to make comparisons or find applications for the new concepts. Journaling is often done in general education classes from primary grades through college. However,

the practice of journaling is not found to be as prevalent a practice in many special education programs.

In ASD programs, many students struggle with auditory processing and communication difficulties and their attention span is often short. Although it may not be a common classroom intervention, it could be used more often to access the perspective of the student regarding change. Quality of intervention effectiveness as well as quality of life in the classroom should include student perspectives.

A first-person narrative was an integral part of the study describing an intensive multi-therapy approach designed to address sensory and motor differences underlying communication both during its implementation as well as the outcome review (Shoener, Kinnealey, and Koenig, 2008). The main subject of the study explained how others made assumptions regarding his intellect based on his communication and movement challenges. This article points out the limitations of seeking empirical data to the exclusion of first person reporting.

A small group of high school students diagnosed with autism spectrum disorder, who attended inclusion classes, was used to gather student opinion in a study by Tobias (2009). The purpose of this interview process was to ask the students as well as their parents which of the current, commonly implemented interventions they felt were most helpful in the classrooms. The subjects were then asked what they thought should be considered for future practice (Tobias, 2009). The participants identified the following supports as being most helpful:

- Targeted support at key transition points.
- The provision of mentors for students.

- The availability of quiet, calmer spaces to reduce anxiety.
- Good communication between staff and parents.
- Staff having a good knowledge of ASD and of individual students.
- Individual, tailor-made support.
- Lower student staff ratio.

How do you sustain the attention and engagement of students with ASD during classroom activities” was the question posed by Humphrey and Lewis (2008).

The study took place in a secondary school in England and included 20 students with high-functioning autism, all of who were in mainstreamed classes. The authors of the study were interested in gaining insights by collecting data over a three-month period using both student diaries and semi-structured interviews.

When one of the students included drawings, the authors of the study decided to ask if all of the students would consider including drawings as well. Only 9 of the 20 students included drawings. The designers of the study felt that drawings, especially for this population of students, would aid in expressing feeling that might be difficult to express in words.

The results indicated that while these students were academically capable of dealing with the course requirements, most students expressed difficulty in social communication and peer interaction in general. As a result, these students were more likely to experience bullying and/or social isolation. Furthermore, the preference for routine, predictability and low sensory stimulation was at odds with the typical noisy, bustling and chaotic environment of a secondary mainstream school. The students often described themselves as having a bad

brain or as being retarded. They also felt that their teachers knew that they had a label and wanted to treat them differently but that they didn't seem to have an idea of how to effectively communicate or how to work with them. (Humphrey & Lewis, 2008).

Students with high functioning ASD are susceptible to symptoms of anxiety and stress (Bolton, Dearsley, Madronal-Luque, & Baron-Cohen, 2002).

Skepticism regarding the utility of self-reports for the ASD population is widely noted and questions generally involve the extent that these individuals are capable of identifying internal emotional stress (Atwood, 2004). Lopata (2008) compared the results of student self-reports (High Functioning ASD) to the results of saliva cortisol testing that indicates levels of stress in relationship to the effect of social familiarity. The results were consistent within each type of assessment. When placed in an unfamiliar social context, students' results indicated elevated levels of stress, while the student self-reports indicated no change in anxiety level when faced with the unfamiliar social interaction.

Although the results of the above study put into question the reliability of first-person responses, the need for obtaining first-person perspectives is still deemed an important premise. At the present time, obtaining first-person perspectives is not commonplace within the classroom. One premise of this thesis is that it is important to provide ASD students, on a regular basis, with a voice. In order to assist the teacher, therapist or caretaker with the student's perspective regarding changes made in natural settings (school/home), the use of a particular intervention or simply providing input on preferred activities and

items (for possible reinforcements), a means of communication needs to be developed. Journaling will need to be individualized for those ASD students who do not have the use of fluent spoken language. The following studies speak to three different augmentative and/or alternative approaches that focus on enhancing communication skills with ASD students.

One augmentative/alternative communication approach that is often used with students with autism who require augmentative or alternative communication skills is the Picture Exchange Communication System. In a study by Charlop-Christy, Carpenter, Le, LeBlanc and Keller (2002) demonstrated its utility for learning speech as well as social-communication and problem solving. The study consisted of three ASD students with a long history of verbal speech training that had been ineffective in teaching the children to communicate. All three subjects did not speak or rarely spoke. The results showed that all three subjects mastered the PECS in a relatively short amount of time and that all three maintained their progress when visited one year later. The students not only learned the system relatively quickly but their use of speech improved as well. PECS is presented in a structured, concrete format that the authors feel offered the predictability many ASD students do best with while learning new tasks. Initially, the use of a visual-visual training approach also aided learning by not combining auditory with visual tasks. The students' ability to increase their use of speech was aided by the reinforcement of an adult's auditory model of what and how to make requests.

Sign language is a form of unaided augmentative and alternative communication (AAC). Unaided communication does not require any equipment external to the body but involves the use of symbols such as manual signs, pantomimes, and gestures (Mirenda, 2003). It is important to note that signing does not impede the development of spoken language. There is evidence that children who learn sign language are able to learn spoken language at a faster rate (Edelson, 2005). In a PET scan study of children with autism it was shown that the same area of the brain is activated during speech and during sign (Edelson, 2005). This provides evidence that the development of sign language mimics the development of speech, and may even strengthen the connections in the brain that are needed for verbal communication.

Providing a contrarian opinion, Schwartz & Nye (2007) conducted a systematic review of the literature on the use of sign language for children with Autism. The authors concluded that although the effect size of sign language interventions is moderate, a recommendation for clinical application is tempered by the quality of research from which the data are drawn.

Communication technologies are another approach to support ASD students with their communication needs. There have been a number of different technologies currently available and some of these involve hardware while others focus on software. One study focused on a device called the Proloquo2Go . This study (Sennott & Bowker, 2009) examined the device in light of several best practices for students with ASD who require augmentative/alternative communication devices. This device runs on an iPhone™ and iPod touch™.

Because the device is both portable and lightweight, it was considered by the authors as ideal to use when a tabletop digital device is not practical. The authors conclude that Proloquo2Go appears to be especially appropriate for individuals with ASD who are ambulatory and have good visual processing skills. Another study focused on a software program, Team Up With Timo (Mulholland, Pete, & Popeson, 2008). The three researchers examined the impact of using the animated software program on the expressive and receptive language abilities of five children ages 5-9 in a self-contained Learning and Language Disabilities class. The students used the program three times a week for four months. The specific vocabulary was able to be individualized for each student. The results of the intervention showed three of five students demonstrated increased language ability, while four of the students showed increased time on task.

There are students with autism who have the ability to express their thoughts and opinions totally on their own. Other ASD students have varying degrees of communication difficulties that require supports and/or aids in order to express their thoughts. Augmentative/ Alternative communication approaches come in a number of different products and/or services. Journaling will necessarily look different due to the variability of communication needs for this population. This fact is illustrated by the journaling for the current study. Three of the four participants were able to use spoken communication in order to answer the questions posed, while one participant was non-verbal and needed to type out his responses.

Universal Design

The term Universal Design (UD) was coined to reflect a proactive approach that incorporated inclusive design features while minimizing the need for individual, retrofitted accommodation (Center for Universal Design, 1997). As noted by Welch (1995): The concept of UD goes beyond the mere provision of special features for various segments the population. Instead, it emphasizes a creative approach that is asks at the outset of the design process how a product, graphic communication, building, or public space can be made both aesthetically pleasing and functional for the greatest number of users.” (p.iii)

Universal Design attempts to level the playing field for students with disabilities. When the environment is modified or adapted, it is done so with the needs of the students who are going to be using that environment in mind.

In the special education literature, there is a difference between a modification and an adaptation (IDEA 2004). A modification indicates a major change while an adaptation implies a more modest change.

When an architect designs a classroom or an entire school that is user friendly for the disabled, he is trying to create consistency for the students, ease of use and, most importantly, make the environment fit the purpose(s) for which it was intended. However, it is rare for an entire school environment to be designed with the ASD student in mind (Mostafa, 2008). Mostafa designed an entire school with ASD students in mind as part of her master’s thesis in 2008. Mostafa took into account the location of each part of the building, being careful to avoid distracting noise in adjoining rooms. In each room, the layout was designed in order to provide

consistency and predictability for the ASD students. Such a design lessens student anxiety when they can predict what will be expected of them as they enter each section of the classroom. Mostafa included factors in the various environments that took into account sound sensitivity that is often experienced by ASD students. With an eye toward moving into inclusionary settings, she designed classrooms that allowed students to move into less sound proofing as they showed signs of improved self-regulation. While this special school design holds potential for contributing to the universal design of classrooms, it was not translated into an actual building. Most students diagnosed with ASD attend public schools. The majority of public schools are existing sites and would more likely require retrofitting.

While proactive schools nation-wide are revamping their special education curricula to support increasing numbers of children diagnosed with autism spectrum disorder, one area not being as successfully revamped is the facilities design to house these new programs (Vogel, 2008). In Vogel's master's thesis (2008) he proposed 8 design principles for creating a classroom design with the autistic learner in mind. This proposal was the result of Vogel interviewing parents, educators, therapists as well as college students and adults diagnosed with autism. The 8 principles include: flexible and adaptable, non-threatening, non-distracting... creating a room for learning that will decrease sensory overload, predictable, comfortable, sensory-motor attuned, safe, non-institutional. Vogel believes that good design for students with special needs is good design for all. Since these 8

design principles were proposed in Vogel's 2008 master's thesis, it is unknown how many, if any schools have used the as a guide.

In a Master's Thesis (Lash, 2009) the installation of sound absorbing wall, using the Owens Corning Basement Finishing System™, is an example of Universal Design because it is an attempt to make sound sensitivity a non-issue from the beginning. This is also the premise of this current study. By installing sound absorbing walls as well as the installation of halogen lights it is expected to eliminate reverberating noise and iridescent light, thus making the learning environment more conducive to attending and engagement with learning tasks.

Currently, a more common approach to negating sound sensitivity is to try and counter the effects that are ever-present in a typical classroom. In one study (Goodman & Williams, 2007) inclusion teachers were directed to classroom, field-tested evidence based practices. To support the ASD student's auditory engagement by employing auditory focus cues, such as ringing a bell or rhythmic clapping. This cues the entire group to become silent and gains student attention before instruction is delivered. Also, music has been found to help individuals with autism attain both behavioral and communication objectives.

The current study took place in an existing private, special education school building. One classroom was selected for the installation of the sound absorbing walls employing Owens Corning Basement Finishing System™ and halogen lighting. These classroom environmental adaptations were chosen based on the exhibited needs of a number of students who exhibited signs of being distracted during academic tasks due to sensory sensitivities, specifically, auditory sensitivities.

CHAPTER 3 - Methods

Setting

The quantitative study took place in a private school for academic grades of kindergarten through twelfth grade. All children who attend this school have a diagnosis of autism, pervasive developmental disorder, and/or a severe communication disorder. The language skills varied among the students involved in the study.

The private school is located in the suburbs of a city in the Mid-Atlantic region of the United States. Core curriculum was taught using the guidelines of the Association Method which is considered an intensive and systematic design to teach speech, reading, language, writing, and literacy. Educational professionals working in the educational program included a school teacher with a special education background, a teacher's aide, an occupational therapist, and a speech therapist. Occupational therapy services addressed sensory integration and sensory diets for the students in the classroom as well as individualized sessions. The DIR/Floortime model is utilized in addition to the school's intensive speech and language developmental program. This private school offers an eleven month school year to its students.

The study on sound absorbing walls and halogen (versus fluorescent) lighting as environmental modifications took place in a single classroom within the school. Environmental modifications were managed by the school director and were made after school hours in order to not disturb the curriculum and the students' schedule. These environmental modifications included sound absorbing walls

versus typical classroom walls and halogen lights versus fluorescent using the Owens Corning Basement Finishing System™.

Subjects

Students who were assigned to the classroom targeted for environmental modifications were included in the study. The participants were four boys with a diagnosis of Autistic Spectrum Disorder (ASD) who were between the ages of twelve and twenty-one years old and had attended the school for more than one year. These four students received educational services in the same classroom. There was a fifth boy in the class who was apraxic but not autistic and so he was not a research participant. Despite being diagnosed with Autism, the four male students did not have any other medical, physical, nor psychological impairment. These students, like many people with Autism, have sensory processing disorders.

Procedure

The study was reviewed by the Institutional Review Board and received an exempt status. The school director spoke to and sent information to the parents of the students describing the modification, the study of student behavior and requested notification if parents did not wish their child's data to be included in the study. Each student was asked if he were willing to be interviewed and for this study. Videotaping is an ongoing tool used at the school to inform academic and therapeutic improvement.

The study took place in the classroom over a six week time period that included a two week baseline, two week installation of sound-absorbing walls, and

then a two week time period of installation of halogen lighting that were made post school hours. Classroom lessons were not interrupted. Attention span of the boys was observed via videotaping. Subjects were assigned an identifying number to provide anonymity to the data. Three times in each phase the subjects were interviewed by the occupational therapist in an adjacent office to their classroom, utilizing a pre-determined, open-ended set of questions (see Appendix A) concerning their perceptions of classroom environmental changes. Answers were written down verbatim for three students while one non-verbal student was able to type his own responses.

Instrumentation

The *Sensory Profile*, completed by the parents, served as a tool to help identify sensory processing issues with each male student with Autism. It measures a person's responses to various 'sensory events' in their everyday life. The Sensory Profile consists of sensory processing, modulation, and behavioral and emotional responses. Subjects are to report how frequently they respond in the way described in each item. A five point Likert scale (nearly never, seldom, occasionally, frequently, almost always) is used to assess their responses.

Journaling was a qualitative method in which the four male students, in their own 'voice' could provide feedback on the baseline phase (classroom without environmental modifications), sound absorbing wall phase, and lighting phase (halogen versus fluorescent). Students were interviewed three times in each phase of the study. The occupational therapist met with each student individually in the occupational therapy room that was adjacent to the classroom and was familiar to

the students. The interview consisted of predetermined, open ended questions (see Appendix A) and follow up clarifying questions to elicit the students perception and feelings about the changes to their environment from their perspective. She recorded the responses as they were given. Three students were verbal. One student was non verbal and typed his responses to the questions.

A decibel meter with ranges of 50 to 126 dB SPL was used to assess classroom sound in each phase of the study. Five locations in the classroom were utilized to measure decibel readings during each condition. Vents for heat as well as air were kept open consistently for each phase and condition.

Research Design and Analysis

The current study is a qualitative phenomenological design that is part of a mixed-method multiple single subject A-B-+(B+C) design. The study took place over a six week period with 3 phases of two weeks each. Phase (A) was baseline assessment of students in their assigned classroom, phase B followed the installation of sound absorbing walls using the Owens Corning Basement Finishing System™ and phase three was following the installation of halogen lighting. Videotaped segments of each student's attending/non attending behaviors were analyzed and grafted to determine differences in attending/engagement under the three conditions.

Triangulation refers to the use of more than data source when investigation of a research question in order to enhance confidence in the ensuing findings. This master's thesis employed the use of Triangulation by generating qualitative data from the student perspective to supplement the quantitative data generated and

reported elsewhere. A qualitative design was utilized as the goal was to capture the emic view and lived experiences of the participants within the three phases of environmental modification process (Luborsky & Lysack, 2006).

An interview format was used using journaling in which the participants responded to questions of their personal perception and responses to the environmental changes within the three phases thereby providing systematic data on a person's own perceptions and experiences as well as the meaning and implications of such. It focuses on learning people's values and experiences in the settings as well as their challenges and resources. It is a technique developed in anthropology and adopted by health professional including occupational therapists (Luborsky & Lysack, 2006).

The occupational therapist interviewed the participants in a familiar comfortable room in which they usually received occupational therapy. She facilitated the responses to the questions below. After asking the thematic question, the therapist followed up and explored anything the participant brought up. The participants were asked to describe their experiences thereby "thick descriptions" of their subjective experience.

To analyze the data, two independent reviewers read each student's journal entries and the themes for each student were identified independently and compared to determine reliability. The response of each student to each phase was depicted with supporting subject quotes. While saturation was not reached in these four subjects, the information provided the participants' perspective to supplement the quantitative measures and the parent and teacher questionnaires.

CHAPTER 4 – Results

The questionnaires used for all three phases of the study are located in Appendix A: Questionnaires. Charts summarizing the students' journaling can be found in Appendix B. Two independent occupational therapists familiar with qualitative research independently read the transcripts and corroborated on themes of subjects.

Individual Student Themes

Student 1

Baseline

During baseline the student expressed his distraction within the classroom (sounds and lights) that affected him. Comments included: "yes my ears give me pain...yes his singing," "unusual light sour very buzzy, they(lights) are intimidating without covers," "lights are not my favorite." Student 1 experienced anxious feelings during baseline. Comments included: "tangible agitation, happy nevrr" (never)

Post- Sound Absorbing Walls (OCBFS™)

Student 1's comments indicated that he noticed that the sound absorbing walls were installed. Comments: "new walls new closet, walls better habitat, new walls." Student 1 noticed that there were improvements in the sensory environment within the classroom as well. Comments: "better able to hear teachers, sounds identified easier," "sounds less threatening," "being in groups easier to listen, all sounds are nice to my ears" Student 1 expressed distraction from his learning by sounds from the lights. Comments: "lights buzz louder, sounds lights"

Post – Installation of Halogen Lights

Student 1 noticed the installation of the new lights. Comments: "Lights new can see better," "yes loud loud now muffled." Student 1 also noticed positive changes to the sensory environment within the classroom. Comments: "better focus and calmer," "less noise better freedom to think, have new mind clarity" Student 1 noticed that he was now better able to pay attention and to learn. Comments: "I can now better be focused with less sound distraction and pain now can freely listen", "yes must name lighting as most improved, have new mind clarity." Student 1 appeared to feel better about being in his classroom with the installation of both walls and lights. Comments: "I feel like nice minded my just very self is now able to meet my learning, lots of calm new (now) I now am might be an ordinary guy"

Individual Student Themes

Student 2

Baseline

Student 2 was distracted from his learning by sounds. Comments: when sounds make loud noises, when I hear other people talking louder in the classroom, sounds when people are talking, the sound of the room and the way it is set up. Student 2 has concerns about touch and disorganization. Comments: "When the desks are not close together" (I'm happier), (room) "kind of small very small in the classroom when you put the desks together almost like the other person is close and can touch you," "I feel less organized in class like I have my desk is more a mess now than before it was nice and neat"

Post -Sound Absorbing Walls (OCBFS™)

Over time, student 2 expressed improved feelings about being in the classroom with the installation of the sound-absorbing walls. Comments: “The noise level ahs really not as loud as it’s been, when we were over the other classroom it is loud”, “when I’m in my classroom it’s nice and quiet, I like it very much because it a lot more quieter not more noisy”

Post- Installation of Halogen Lights

Student 2 expressed his improved ability to focus in the classroom due to both adaptations now present. Comments: “changed for me definitely cause I can hear my teachers better I can focus it not as loud in my classroom,” “I’m really happy, very happy that I can finally come in a quiet room, fially (finally) I can concentrate,” “my work I can see my work better now than before,” “yes it is a lot more easier to see and I can work a lot more quicker than I used to I feel happy, I feel like a really has made a difference in the way I learn and the way I work”

Individual Student Themes

Student 3

Baseline

Student 3 made comments that centered on his concern with being touched. Comments: “When Nathan touches you,” “I don’t want the little girls and the little boys are not going to touch me,” “bothered and sad I am getting a boo boo when he’s touching me,” “I was bothered when Liam is touching me when I am bubbles and Eleanor.” Student 3’s attention to learning is compromised by thoughts outside of

the classroom. Comments: "I need to watch survivor gabon in Africa", "I hope Nathan, Liam and Gabe are not chasing me"

Post- Installation of Sound Absorbing Walls (OCBFS™)

Student 3 continues to be preoccupied with thoughts outside of the classroom. Comments: "Can I go see the movie the secret life of bees with Queen Latifah and Dakota Fanning and Jennifer Hudson", "We don't like Arthur's reading race does not gonna have a game plan" Student 3 states that he is happy in his classroom. Comments: "Yes, I feel happy "(Repeated 2 times).

Post Installation of Halogen Lights

Student 3 continues to be preoccupied with thoughts outside of the classroom. Comments:"Want to go Halloween," "I can go and get candy," "I hope you pay attention when there's barney and many adventures of Winnie the pooh in my head," "I don't want to be sad when Ms. Linda gets mad when there's Barney in my head not Christine," "I watch tv's, dvds and videos" By the third journal interview, the student noticed the two environmental adaptations. Comments: "we made walls we made lights", "I have a new lights"

Individual Student Themes

Student 4

Baseline

Student 4 mentioned that he had been upset but was now happy or calm. His comments about being upset had nothing to do with the sensory environment of the classroom. Comments:" I feel better," "I feel upset, because I'm really angry (angry)

and mad yelled (yelled) about me,” “I feel fine,” “I feel angry because I killed the bug and the bug is dead, I feel happy because the real bugs are dead”

Post -Installation of Sound Absorbing Walls (OCBFS™)

When the question - Are there things about the room that distract you or interfere with learning? - Student 4 consistently denied the presence of any distractions. Comments: “no there are no things in this classroom,” “no there are not, no”

Post – Installation of Halogen Lighting

Student 4 provided many responses that were unrelated to the questions asked. Comments:” hate pirates”,” there are no birds”, “it distracts like a bug and you killed a buzz bugs fly away”

Cross Student Themes

Baseline journaling did not result in any cross -subject themes

Following the wall installation 2 of the 4 students provided positive comments about the sound in the room.

Student 1: “better ability to hear teachers, sounds identified easier”

Student 2: “I noticed a lot more people a lot more quieter. Without the wall covering it was loud, plain old loud.”

Several students expressed feelings of anxiety. The anxiety might have been based on sensory stimuli, on thoughts that they couldn’t block out, or on fear of being touched.

Student 1:” My individual sensory bothers”

Student 2: "Like if somebody trying to get close to the desk that kind of distracts me"

Student 3: "I need to pay attention. I don't want when there's Barney in my head"

Following the light installation three of four students mentioned positive improvements, one of whom also mentioned light sounds.

Student 1: "new lights made calmer days"

Student 2: "Much more calmer than when the big lights are on."

Student 3: "Yes, I really like the lights."

A theme of positive emotional response to the environment following the installations was noted in 3 of 4 students.

Student 1: "I love to hear now."

Student 2: "I'm really happy that I have finally got the change into a nice quiet classroom."

Student 3: "yes, I really like the lights"

Some of the students made statements indicating that they were distracted in the classroom if they were experiencing multiple stimuli at the same time (sensory modulation).

Student 1: "sounds can from people and lights buzzing"

Student 1: "Necessary movements, sounds, lights" (post wall comment)

Student 2: "When we had the big light it was a lot more noisier and you couldn't as well as you can see now"

Student 3: "lights sounds setup smells feel of the room" (Student might have simply repeated the options offered rather than producing an original thought.)

Although sensory sensitivity to touch was outside the parameters of this study, several students did appear as if they sought to avoid tactile input.

Student 1: "my desk is too close gives me bothersome neighbors"

Student 2: "Like if somebody trying to get close to the desk that kind of distracts me" (post wall comment)

Student 3: "I don't like the first day of school when he's touching me"

Following the installation of both the sound absorbing walls and the halogen lights the theme of being able to perform was identified by three of the students.

Student 1: "free to think"

Student 1: "less noise better freedom to think"

Student 1: "I feel like nice minded my just very self is now able to meet my learning"

Student 2: "I can see and I can listen better and I can do a lot of stuff now."

Student 2: "I'm really happy, very happy that I can finally come in a quiet room, finally I can concentrate."

Student 3: "Yes it is a lot more easier to see and I can work a lot more quicker than I used to"

CHAPTER 5 – Discussion

This qualitative study is part of a larger study exploring the effects of environmental adaptations of a classroom on the attention/engagement of students with autism. The specific focus of this study was to explore the effects of the changes as perceived by the students with ASD, through their personal dictated/typed accounts in response to questions. Based on the review of the 4 student journals, the following cross-student themes prevailed: 2 out of 4 students made positive comments about the sound in the room with the installation of sound absorbing walls, 3 out of 4 students commented about improvement of hearing or vision with the halogen lights installed, 3 out of 4 students noted improvement in performance of learning tasks after both adaptations were made, 3 out of 4 students provided positive emotional responses to the environment after either the installation of walls or of the lights, 3/4 students expressed feelings of anxiety. Three of the four students mentioned that they were distracted in the classroom if they were experiencing multiple stimuli at the same time. These comments were made throughout the 3 conditions.

Three students indicated through their journaling that they noticed when both the wall covering and the light had been installed, indicated positive emotional response after the two adaptations were installed, and described improved ability to perform learning tasks.

Two of the four students did not provide comments on the positive sensory change in the classroom due to both adaptations (Student 3 & Student 4). Both Student 3 and Student 4 have motor planning difficulties and have difficulty making

connections between their ideas to verbalize or type a response. This information, provided by the occupational therapist that acted as the interviewer, helps to explain, in particular, Student 4's journal responses. Student 4's responses to the questionnaire appeared, at first glance, not to relate to the prompts. It would be incorrect to assume that Student 4 possessed below average cognition skills. In fact, both Student 3 and Student 4 achieved average non-verbal IQ scores. Understanding that Student 4 has difficulty making the connections between ideas and responses indicates that the student requires additional support in order to formulate and communicate his ideas. That might mean that Student 4 would have provided more conventional responses with either the occupational therapist providing facilitated communication or the use of another augmentative/alternative communication approach (AAC) that the student already has familiarity. This was a definite possibility since the occupational therapist assisted Student 1 with the use of facilitated communication.

One of the implications of this study is the importance of obtaining a first-person perspective in effectiveness research in terms of the perceived change. Including first-person perspectives in research can support and triangulate research results provide additional reliability of results. First-person perspectives provide ASD students with a voice. Most literature has not given this population a voice and, at best, only gave their caregivers a voice.

Clinical implication from this study indicate that collecting first-person perspectives will need to accommodate students who possess spoken language skills as well as those who do not. The expression 'One size does not fit all'

(Tomlinson, 1993) applies to ASD students and journaling efforts. There are many ASD students who require an augmentative and/or alternative communication approach in order to express their opinions. One method will not work with all students. Depending on each ASD student's receptive as well as expressive abilities, and their ability to write or to type, journaling efforts may be a longer process for some individuals.

Literature has established that there are many students with autism who have sensory sensitivities. These sensory sensitivities cause distractions within the classroom. These distractions cause ASD students to attend and engage in learning tasks at diminished levels of capacity. The purpose of using OCBFS as a Universal Design was to eliminate the current environmental distractions to help the ASD students increase their ability to attend and, therefore, to engage in learning tasks. The OCBFS™ has built-in acoustic insulation with a .95 noise reduction coefficient.

The Person-Environment-Occupation Model of occupational performance enables occupational therapists to view a therapeutic situation in terms of interacting components to improve the student's occupational preference. (Law,1996). The environmental changes were made within the classroom environment in an attempt to reduce sensory distractions and, thereby, increase attention toward learning tasks (occupational performance). This study person or student factors, by obtaining journal responses to the environmental adaptations put into place and how they reported it affected their performance. The system was able to be installed after school hours to greatly limit distraction to the students and

staff. If the school decides to upgrade wiring at a future time, wall panels can be removed for easy access whenever necessary.

Limitations to the Study

This study was a qualitative phenomenological design. This qualitative study was part of a larger quantitative study completed by Miller (2009). Miller's study was a multiple single subject design in which the subject functions as their own control. This was appropriate given the small number of subjects and the great variability among students with ASD. The subjects are exposed to a non-treatment and 2 treatment phases Performance is measured across all phases (Gay, Airasian, 2003). A stronger research design is the true experimental design. One type of true experimental design is 'Post-test Only, Control Group.' In this model the subjects are randomly assigned to one of two groups. Given sufficient numbers of subjects, randomization helps to assure that the two groups (or conditions) are comparable or equivalent in terms of characteristics which could affect any observed differences in posttest results (Gribbons, & Heman, 1997).

The reason that true experimental research design could not have been used for this particular study was the limited number of subjects who participated. This study was a qualitative research study. This type of study is often referred to as an exploratory investigation characterized by semi-structured questions asked of a small, often conveniently-selected sample of respondents, the results of which are indicative but not conclusive without a subsequent quantitative study (Rossiter, J.R., 2009). Used in this exploratory manner, qualitative research is not sufficient on its own to contribute to knowledge. This exploratory version of qualitative research

should really be called pre-quantitative research. The results of the current qualitative study need to be considered in conjunction with results from a quantitative study on the same thesis topic.

Recommendations for future research

Consideration should be given to expanding the scope of the study, involving more students with autism and/ or non-exceptional students with sensory sensitivities. Future studies involving students with ASD should routinely incorporate student subjective perspectives.

There is no one factor that determines an acoustical or decibel level (or range) for every classroom across the nation. To achieve appropriate acoustical conditions in an educational setting, the American Speech-Language-Hearing Association (ASHA, 2005) recommends the following: Unoccupied classroom noise levels must not exceed 35 dBA, the signal-to-noise ratio (SNR) should be at least +15 dB at the child's ears, unoccupied classrooms reverberation times must not surpass 0.6 seconds in smaller classrooms (< 10,000 ft³) or 0.7 in larger rooms (> 10,000 ft³ and < 20,000 ft³). It is important to note that these acoustical criteria from ASHA are essentially identical to the recently approved American National Standards Institute (ANSI) Standard on classroom acoustics. ANSI is part of the Acoustical Society of America. Although three of the four students in this master's thesis perceived that there were benefits to the learning environment from the addition of environmental adaptations, the study would have been strengthened with a more sensitive decibel level meter that addressed sounds below 50 db.

As this study illustrates, journal results are not easy to obtain with many students who have been diagnosed with ASD. Future studies with this population should consider how journal responses could be obtained through the use of alternative or augmentative communication approaches.

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APPENDIX A

Questionnaire

Baseline Condition:

We are interested in the sensory environment of your classroom and what about it helps you to learn and what distracts you or interferes with your ability to attend to the teachers and learn.

What helps you?

What distracts or interferes with your ability to learn in the classroom? (Classroom set up, lights, sounds, smells, feel of the room?)

How do you feel in the classroom? (calm, organized, bothered, upset, happy, sad?)

Post-Wall Condition:

A change was made in your classroom over the weekend. Did you notice what was changed?

We installed a new wall covering in your classroom.

Did you notice any differences in the sensory environment of the classroom after it was installed?

Were there things about it that helped you pay attention and learn?

Are there things about it that distract you or interfere with you learning? (classroom set up, lights, sounds, smells, feel of the room?)

How do you feel in your classroom? (calm, organized, bothered, upset, happy, sad?)

Post- Lighting Condition:

We made another change to your classroom. Did you notice what it was?

We installed new lighting into your classroom.

Did you notice any differences in the sensory environment of the classroom after it was installed?

Were there things about it that helped you pay attention and learn?

Are there things about it that distract you or interfere with you learning? (classroom set up, lights, sounds, smells, feel of the room?)

How do you feel in your classroom? (calm, organized, bothered, upset, happy, sad?)

APPENDIX B

Journaling charts for baseline, post-wall conditions, post-lighting conditions

E	Emotion
S	Sound
VL	Visual & Lighting
T	Touch
O	Occupational performance as a student

Table 1

	Subject 1	Subject 2	Subject 3	Subject 4
Baseline 1	S=3 bothered,singing, lights buzzing " Unusual light sour very buzzy"	S=2 sounds bother me "when somebody makes loud noises, a lot of people talk at once"	E=2 (happy,bothered) " I feel happy"	E=5 (better,upset,angry,better,better) " I feel better" " I feel much better"
	VL=1 lights, blind, ceilings "High ceiling too far away"	E=2 bored, happy "Bored, that it - that the only thing, just bored"	T=3 "I don't wan the little girls and the little boys are not going to touch me"	
	E "I feel outdone."			
Baseline 2	VL=1 complains, anxious "They (lights) are intimidating without covers"	S=2 Finds loud sounds distracting " When I hear other people talking louder in the classroom"	T=2 "bothered and sad I am getting a boo boo when he's touching me"	E= 2 " I feel fine" " I feel happy"
		T=2 Wants personal space "When the desks are not close together"	E=3 "I feel happy"	
		E=3 " very very happy"		
Baseline 3	VL=1 "lights are not my favorite"	VL=2 " sometimes the light can be hard for me to write my sounds"	T=1 "I was bothered when liam is touching me when I am bubble and Eleanor" " I	O "We do classwork"

	S=1 "my ears are not able to make a beautiful sound numbs"	S=2 "When I see when somebody walks into the door sometimes that distracts me"	E=4 (happy) " I feel happy"	E " I feel fine" "Yes I'm proud"
	E=3 " happy never"	O=1 (disorganized desk frustrates him) " some of the time when I get frustrated it makes me really sad when my desk disorganized and when other people's desks is nice and neat"		
		E=5 (happy 2x,sad,upset,frustrated) " I feel happy" "definitely upset and sometimes really happy"		

Table 2

	Subject 1	Subject 2	Subject 3	Subject 4
Post Wall 1	S=5 "better ability to hear teachers"	S=5 "When other people are talking, when other people are making noises that is when it gets really loud"	0 "I want to pay attention"	E= tired " I feel tired" " I'm just really tired. And I'm proud."
	E "happy far from me, targeted but elusive"	E=2 happy "Really really happy"		
		O= handwriting improved. "...much more focused in my work."		
Post Wall 2	S=3 "sounds less threatening"	S=6 "I noticed a lot more people a lot more"	0 "I want to pay attention"	0 " I help and pay"

		quieter without the wall covering it was loud”	yes”	attention and learn”
	0 “very alert about learning”		E= 2 happy “I feel happy”	E = 5 “ I feel better” “I feel fine. I’m just fine.” “I just alright”
Post Wall 3	S=2 “sounds lights my own need to move”	S=2 “it was a lot more quieter than before. Before it was a lot more noisier. And it much more quieter and I can focus”	E=3, 2 happy/1 sad “I don’t want to be sad”	0 “yes I help and a pay attention”
	E=2 “ a bit happier”	E=2 happy. “Very happy because it makes me really organized when I’m in the room”	T=1 “Because I don’t like he’s touching his shoulder” “I bang when he’s touching me”	E “ I just feel alright” “ no feelings”
		Dislikes lights 2x “The light is not as bright as it was before, a lot more dimmer”	Aware of a new wall covering. “ I have my new wall”	

Table 3

	Subject 1	Subject 2	Subject 3	Subject 4
Post Lights 1	V&L=4 “lights new can see better”	V-L-5x “Much more calmer than when the big lights shine, when the big lights are on.”	S “ Not like the first day of school I got very sad when he’s touching me, I got banged”	E “ I just alright and I’m proud and I’m not unhappy”
	S=4 “ now less sound bothers me”	E=3 “yesterday I was not really happy being in my classroom” “because the lighting was kind of hard for me to see what I was doing and that why I was not too happy”	E= 2x “ I feel happy “ “I feel happy today”	

	L,S,E "better focus and calmer"			
	E= calm 2x, love, joy "can enjoy voices without fears of pain in my head"			
Post Lights 2	S=4 sound buzzing of lights "sounds can(distract) from people and lights buzzing"	VL=8 "When we had the big light it was a lot more noisier and you couldn't as well as you can see now"	V&L=3	E " I think I'm not upset anymore" I am proud I don't like it and I hate it. Hate pirates"
	O " can now better be focused with less sound distraction and pain now can freely listen "	S=1 "My work I can see my work better now than before"	E=4 "I feel happy in my classroom"	
		O=3 "I can see and I can listen better and I can do a lot of stuff now"		
		E=3 calmer, happy 4x "I am really happy very happy that I can finally come in a quiet room, finally I can concentrate"		
Post Lights 3	S= 4 " Yes loud loud now muffled"	V= 4	E=2x	E=4 17 " I'm just bothered" "I feel mcy better and much happier"
	VL=1		T= 2x	
	O=2 " I feel like nice minded my just very self is now able to meet my learning"	E= Happy " I like it all"	O	
	E=2 "lots of calm new I now am might be an ordinary guy"		.	