REGRESSION AMONG STUDENTS WITH AUTISM SPECTRUM DISORDERS: AN EXAMINATION OF EXTENDED SCHOOL YEAR PROGRAMMING

A Dissertation
Submitted
to the Temple University Graduate Board

In Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy

By
Emily R. Cross
August, 2013

Examining Committee Members:

Dr. Erin Rotheram-Fuller, Advisory Chair, School Psychology
Dr. Catherine Fiorello, School Psychology
Dr. Joseph DuCette, Educational Psychology
Dr. Frank Farley, Educational Psychology
Dr. Kenneth Thurman, Curriculum, Technology, and Technology in Education

ABSTRACT

The effects of long school breaks, such as summer vacation, on students' achievement has been an area of interest among educators and researchers for many years (e.g. Austin, Rogers & Walbesser, 1972; Ballinger, 1987, 1988; Borman, Benson & Overman, 2005; White, 1906). Research specific to children and youth with disabilities and the level of regression over summer months, however, is sparse. On the whole, both researchers and special educators have agreed that students with more severe disabilities tend to regress more than students with mild disabilities (Cornelius & Semmel, 1982; Edgar, Spence & Kenowitz, 1977; Shaw, 1982). These challenges can make extended breaks from school particularly detrimental for these children. A group of students that may be especially affected by a long break in schooling are children with autism spectrum disorders (ASD). These children often have slower rates of skill acquisition and more difficulties with maintenance/generalization of skills across time (Arnold- Saritepe, 2009). The current study explored the extent to which students with ASD maintained cognitive, behavioral and social skills over the summer vacation months with differing levels of summer programming. Additionally, this study examined whether students of varying functioning levels differed in their maintenance of skills during the summer. A pre-post quasi-experimental design was utilized in which the May assessments were treated as baseline data and September assessments for the following academic year were treated as outcome data. Participants included 139 students aged 5-9 years with an ASD diagnosis given by their school district. Three different groups of Extended School Year support were compared, including students who received no ESY support, students who received standard ESY support from their school district, and students who received ESY

support along with individualized programming. Overall, students maintained skills from pre- to post-test in most key areas. When group comparisons were made between children who attended ESY (ESY group and ESY with individualized support group) and those who did not receive ESY programming few differences were found. While students who received the most intensive level of ESY support were found to decrease significantly in the presentation of hyperactivity and noncompliance, ESY was generally effective in maintaining skills over the summer break.

ACKNOWLEDGMENTS

I would like to acknowledge Dr. David Mandell and the Philly AIMS research team for allowing me to pursue my research interests and goals. Without your guidance and support this dissertation would not have been written. I have been truly honored to work on the research project and would not be the researcher or clinician I am today without this experience. I would like to thank Erica Reisinger and Jill Locke for always offering their support and help whenever I needed it.

I would like to thank my advisor, Dr. Erin Rotheram Fuller for her support, encouragement, and commitment throughout the dissertation process. Thank you for always having high expectations of me and for always providing the support I needed. I also greatly appreciate the assistance of Dr. Catherine Fiorello and Dr. Joseph DuCette, members of my committee.

I would also like to thank Dr. James Connell for his guidance and mentorship. I greatly appreciate the consultation he provided to me throughout my graduate training and his efforts to create the best educational experiences and opportunites for me. Thank you for always believing in me and encouraging me to pursue all my professional goals.

I also must acknowledge all my friends I made while at Temple University, especially my cohort, Melanie, Sarah, Amber, Celeste and Greg, who gave me daily support, encouragement and motivation. I have learned so much from each of you.

I am very greatful and want to thank my family, Mum, Dad, Ben, Sophie and Mikey. No matter what support I needed over these past four years they were always able to provide it, and truly helped me achieve this goal. Thank you for always believing in me. Also, thank you to the Bernabes and for all your encouragement.

Finally, I would like thank my best friend and future-husband, Mike. Thank you for your calmness, encouragement, and dedication to me. You truly are my rock, and without you I would not be the person I am today. Thank you for the sacrifices you

made, for all your emotional support and for always believing in me when I doubted myself.

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CHAPTER 1

INTRODUCTION

Autism spectrum disorders (ASDs) are a group of developmental disabilities characterized by atypical development in socialization, communication, and behavior. Since the early 1990s, the number of persons receiving services for ASDs has increased substantially. Currently, it is estimated that between 1 in every 110 children is classified as having an Autism Spectrum Disorder (ASD; Rice, 2009). During the period of 1992 to 2001, the number of children with ASD served in Pennsylvania under the Individuals with Disabilities Education Act (IDEA) increased 855% (Rice, 2009). Given the increasing classification rates for children with ASD, it is important to determine best practices in education for this population of children. Students with ASD require significant resources in the form of special education classes, and also use other special education services (Chambers et al., 2003). An example of a specific special education service that children with ASD may often require is Extended School Year (ESY) services. Educational services provided during ESY may be essential to students with ASD as it is often reported that children with ASD do not readily maintain skills (Arnold-Saritepe, Phillips, Mudford, De Rozario & Taylor, 2009). However, there is a dearth of research examining the prevalence of academic skill regression among students with ASD over summer vacation months, and whether ESY programs help to remediate this concern.

The current study expanded upon research demonstrating the effects of summer vacations on students with disabilities, by specifically examining how much regression took place among students with ASD. In addition, this study assessed whether differing

levels of academic, behavioral and social supports during the summer improved the maintenance of academic and social classroom behaviors among children with ASD.

The effects of long school breaks, such as summer vacation, on students' achievement has been an area of interest among educators and researchers for many years (e.g. Austin, Rogers & Walbesser, 1972; Ballinger, 1987, 1988; Borman, Benson & Overman, 2005; White, 1906). The three-month break in schooling during the summer was originally created in an attempt to standardize school calendars across the nation at the turn of the 20th century. Historically, a longer summer break was an economic necessity, as many agricultural communities needed young students to help with agriculture and farming. However, although 85% of the population worked in agriculture at that time, less than 3% do today (Cooper, Nye, Charlton, Lindsay & Greathouse, 1996). Although research examining the effects of summer vacation on loss of skills or regression over the summer dates back over a hundred years, the literature base remains limited. Research specific to children and youth with disabilities and the level of regression over summer months is particularly dearth, which is surprising considering the various learning problems and adverse educational effects experienced by students with disabilities. These challenges can make extended breaks from school particularly detrimental for these children and youth with disabilities. A group of students, which may be especially affected by a long break in schooling, are children with autism spectrum disorder (ASD), who often have slower rates of skill acquisition and maintenance/generalization of skills across time (Arnold- Saritepe et al., 2009). Further, court cases such as *Armstrong vs. Kline* (1979) and *Battle vs. Commonwealth of Pennsylvania* (1980) set the precedent that breaks in schooling can have negative effects

on some students with "severe" disabilities, such as students with ASD. Although the courts have recognized that children with ASD may experience detrimental regression in their academic, social and behavioral success, there are currently no research studies explicitly examining the effects of summer vacation on regression of skills among children with ASD within the public school setting. The current study explored the extent to which students with ASD lost cognitive, behavioral and social skills over the summer vacation months.

Studies examining the effects of summer vacation on student regression have provided a range of results dependent on the academic content area being assessed, the age of the students, and differences with regression and a student's socio-economic status. In order to assess overall findings of summer skill regression for general education students, Cooper et al. (1996) conducted a meta-analysis of 39 studies examining summer regression between 1975 and 1996. Overall, their findings demonstrated that "at-best" students showed no academic growth on repeated measures of standardized testing. Further, at worst the students in the study lost about one-tenth of a standard deviation, or one-month grade equivalent, of reading skills. Cooper et al. (1996) also found that summer loss was more pronounced in mathematics than for reading. Other studies, however, have demonstrated that reading skills did not diminish over the summer break (Helf, Konrad & Algozzine, 2008). Overall, when examining regression of skills over summer vacation within the general education population, researchers have established varying results.

Several studies have aimed to determine whether students with disabilities showed academic regression during the summer months. Overall, students with

disabilities were found to regress in both reading and math (Allinder & Fuchs, 1994; Cornelius & Semmel, 1982; Shaw, 1982). On the whole, both researchers and special educators have agreed that students with more severe disabilities tend to regress more than students with mild disabilities (Cornelius & Semmel, 1982; Edgar, Spence & Kenowitz, 1977; Shaw, 1982). Further, research studies have established that summer programming is often necessary to help diminish regression of skills over summer vacations, specifically for children with severe disabilities.

A specific disability group that may require unique summer programming and services are children with autism spectrum disorders. The current study aimed to examine the effects of summer break and extended school year programming on the cognitive, behavioral and social progress of students with ASD. Unfortunately, no articles were found that explicitly examined the effects of extended school year services in schools for this population. Due to limited research evidence available, the extent to which students with ASD lose skills over summer vacation or how long recoupment takes during the subsequent school year is unclear. Since the research base is limited many of the issues surrounding regression of skills among students with ASD have been determined by case law.

Armstrong v. Kline (1979) was a significant court case that set precedent for Extended School Year programming for students with disabilities, including children with ASD. In the case, the court determined that the mandated 180-day school year violated a child's right to a free appropriate public education (FAPE), specifically in reference to children with severe and profound impairments or severe emotional disturbances. Due to Armstrong v. Kline, and the related lawsuits that followed, the

Individuals with Disabilities Improvement Act (IDEIA) currently mandates the consideration of ESY services for all students with disabilities. According to section 300.106 of IDEA each public agency must ensure that extended school year services are available as necessary to provide students with a free and appropriate education. Extended school year services must be provided if a child's Individualized Education Plan (IEP) team determines, on an individual basis, that the services are necessary for the provision of FAPE to the child. This determination must be based on evidence that the child will regress if ESY services are not provided.

Schools may deem ESY services necessary for any student identified as having a disability. However, the IEP team must determine on an annual basis whether ESY services are appropriate for the child. Eligibility for ESY services is not concrete, and often is dependent on state or district mandates. Two major factors impacting a student's potential need for ESY include regression, as defined by a significant loss of skills overtime, and secondly the recoupment of skills, or the time it takes to regain those skills.

Although ESY services are emphasized both in federal (e.g. IDIEA) and state laws, it is unclear whether ESY services are effective in reducing regression and recoupment of students' skills. Federal case law has attempted to examine many of the issues surrounding the effectiveness of ESY programming, by determining whether ESY programs are appropriate for different populations. Unfortunately, there is a lack of literature within this area and more research is warranted to better understand what is likely to be needed for each child based on their individual academic and social needs, and how that intensity could be adjusted for children with ASD, specifically.

This current study explored whether children with ASD lost skills or regressed over the summer vacation months. Varying levels of Extended School Year (ESY) services were examined to explore whether services over the summer helped students with ASD maintain or improve academic levels. Specifically, the research questions that were addressed were:

1) Do different levels of summer support help students with ASD maintain skills after long breaks in schooling
    a. Do changes in cognitive abilities, behavioral and social outcomes differ according to the level of summer support (ESY with individualized student programming; ESY alone; no ESY).
2) Is maintenance of skills among students with autism spectrum disorder different depending on the skill area?
    a. Is there a difference between the maintenance of cognitive abilities, behavioral outcomes, and social skills?
3) Are there differences in maintenance of skills based on the student's level of functioning?

CHAPTER 2

REVIEW OF LITERATURE

The possible regression of skills over summer vacation has been an area of concern among educators and researchers for over 100 years, with published studies on the effects of summer break on student achievement appearing from as early as 1906 (White, 1906). More recent studies examining the effects of summer break on student achievement have focused on comparing differences between different content areas, different aged students, as well as examining the relationship between regression and a student's socio-economic status. In a study by Aliinder, Fuchs, Fuchs and Hamlett (1992) the effects of school breaks on students' math and spelling performance were examined using aggregated curriculum based measure scores. Students in grade 2 and 3 did not regress in math, but did in spelling; however, this finding was reversed for students in grades 4 and 5. The authors hypothesized that the lack of regression in math skills among younger students may be due to the nature of the math content. In the lower grades, math problems included addition, subtraction and multiplication, all problems that occur naturally in contexts outside of school. However, students in the older grades may not have had as many opportunities to practice skills over the summer. Cooper, Nye, Charlton, Lindsay and Greathouse (1996) conducted a meta-analysis of 39 studies examining the effects of summer vacation on achievement test scores. Of the 39 studies the researchers selected, 26 were over 20 years old and did not contain the necessary information the authors needed for their meta-analysis. The results of the meta-analysis revealed that the overall effect of summer vacation on standardized test scores at best was

to demonstrate no academic gains over the summer. At worst, students appeared to lose one-month of grade level skills. More specifically, the average student score in the fall was about one-tenth of a standard deviation below the spring average. In regards to content or subject area, the meta-analysis indicated that that summer loss was more pronounced for math subjects than for reading or language. Students' regression of skills was most dramatic for math computation and spelling.

A more recent study (Helf, Konrad & Algozzine, 2008) examined the differences between student reading achievement from the end and beginning of the school year (e.g. spring to fall) using curriculum based measures of reading fluency, as opposed to norm referenced tests. The researchers found no evidence of setbacks across a 10-week summer vacation for this sample of children, most of whom were struggling readers. In fact, their reading performance improved in four different areas of early reading skills. Further, Helf, Konrad and Algozzine (2008) found that young students from disadvantaged environments did not appear to show a drop in early reading skills and other academic domains over the summer break.

Overall, researchers have demonstrated mixed results when examining students' regression of skills over summer vacations. One consistent pattern, however, is that there seems to be more loss of math than reading skills over the summer. This may be due to the likelihood that students continue to read books over the summer, whereas, they are less likely to engage in math work.

When examining regression and loss of skills over summer vacation researchers have identified several factors that influence student regression. These included socio-economic status, and whether the students had a disability. Several studies have

compared the effects of summer regression among students from low-income families. In their longitudinal study, looking at the reading losses among children from middle and low-income families, Alexander, Entwisle, and Olson (2001) found that family income had a significant effect on summer regression. More specifically, Alexander et al. (2001) reported that summer losses among students from low-income families accounted for "three grade levels" of difference between income groups by grade six. In a similar study, Borman, Benson, and Overman (2005) examined the effects of a summer school program for early elementary school students from high-poverty schools in the city of Baltimore. The researchers were interested in exploring how parents or communities contribute to, or overcome achievement losses. As found by Alexander et al. (2001), Borman et al. (2005) found significant reading achievement losses over the summer break among early elementary school students from high poverty schools. A voluntary summer school program, specifically created to alleviate summer achievement loss, had positive effects on students' summer learning. Further, Borman and colleagues (2005) found that when parents made summer school a priority, and made sure that students were attending summer school programs, summer losses were further alleviated. These results are also consistent with a study conducted by Edmonds, O'Donoghue, Spano and Algozzine (2009). In their study examining the effects of a summer intervention program among a sample of disadvantaged pre-school aged students, Edmonds and colleagues (2009) found that providing summer programming resulted in more favorable increases in early literacy skills. Although both students in the intervention program and in the control group made gains over the summer, students in the intervention program made more gains in early reading skills, indicating that summer programming for preschool aged

children reinforces prior learning, accelerates learning, and promotes a positive trajectory of learning (Edmonds et al., 2009).

Summer Programming for Students With Disabilities

Although student regression over the summer break has been studied for many years, there are few studies examining the effects of summer breaks or extended school year services for students with disabilities. While regression and recoupment among students with disabilities have historically been an area of concern among educators and researchers (Cornelius & Semmel, 1982; Shaw, 1982), many of the issues surrounding regression of skills among students with disabilities have been determined in case law (see section below on determining ESY services).

Several studies, however, have examined the effects of summer vacation on the regression of students with disabilities. For example, Shaw (1982*)* examined the effects of summer vacation on regular education students and special education students from 28 different schools. Shaw found that students in the special education group had lower scores in the Fall than Spring in both math and reading. Further, Shaw reported that students with more severe learning disabilities regressed more than students with mild disabilities. Cornelius and Semmel (1982) confirmed this finding in their study examining the effects of summer instruction in reading on regression among students with learning disabilities. Their study compared three groups of students: students who attended the first five-week summer reading program; students who attended the second five-week summer reading program; and students who did not receive any formal reading instruction during the summer. The researchers found that students with learning disabilities regressed in their reading skills when they experienced extended breaks in

their educational programs. A five-week summer reading program during either the first or last half of the summer minimized the regression. Thus, if students attended a summer reading program, at any point in the summer (either beginning of end of the summer), they were less likely to experience regression of reading skills. Interestingly, Cornelius and Semmel (1982) found that the greatest regression among students with disabilities occurred during the first part of summer break as opposed to the second half. As a result of their study, Cornelius and Semmel (1982) recommended that the criteria for identifying students with disabilities for extended school year programming should be based on empirical evidence collected by the school. Further, they explained that eligibility for summer services involves three key variables; the amount of regression over the summer break, the amount of time required to recoup lost skills, and the effectiveness of summer programs in preventing regression. Cornelius and Semmel (1982) indicated that there is a need for research to empirically examine these variables as related to specific skills and various classifications of students with disabilities.

Research studies examining students' loss of skills over the summer have indicated that students with disabilities do in fact regress and lose skills. This finding is an area of concern for many special education teachers. For example, in their study, Edgar, Spence and Kenowitz (1977) reported that special education teachers allegedly believe that students with more significant disabilities exhibit more regression during the summer break than those with milder disabilities. However, the authors reported that minimal data exist in the literature to document this claim. Further, Edgar et al. (1977) added that negligible data exist on how much students actually regress, or how much catch-up time is actually needed at the beginning of each school year. Thus, in their

study, Edgar et al. (1977) surveyed 18 different schools regarding the primary focus of their summer programming. Their results revealed that eight of the eighteen school reported that maintenance of skills was the primary focus. However, the authors did not report that regression was reduced as a result of summer intervention programs. Seven out of eighteen reported that increasing student skills was the primary focus, while two reported that their summer programming primarily consisted of recreational activities. A major issue identified by Edgar and colleagues (1977) was the measurement procedures used to determine the effectiveness of extended school year programming. The authors expressed concerns surrounding using standardized measures as tools to measure change in student achievement from the end of the school year, to the beginning of the next. More appropriate measures must be sensitive enough to determine changes in student achievement.

Allinder and Fuchs (1994) addressed this measurement issue by examining alternative ways of analyzing the effects of breaks in schooling for students with and without disabilities. The authors indicated that student growth should be monitored using more sensitive measures such as criterion-referenced or curriculum-related (CBMs; Curriculum Based Measures) and suggested examining the effects of school breaks on students by comparing the rate at which students learn before and after the break, as indicated by a trend line. A decrease in the trend after the break may indicate that the student has been affected negatively. Their study explored the effects of this type of analysis on results by contrasting two different indices, which included the level of performance before and after the break. Allinder and Fuchs (1994) monitored math computation skills among students with and without disabilities over a *short* break;

reading was not addressed in this study. The first type of analysis examined the effect of the break on students' performance in math. Using this analysis, neither students with or without disabilities regressed; students without disabilities scored significantly better after the short break, when compared to students with disabilities. The second analysis examined the effect of the break on students' progress using trend lines, and found that students with and students without disabilities performed in similar ways, but more poorly after the break. Specifically, the authors found that students who were making gains before the break were affected adversely by the 3-week break in schooling. The authors concluded that students were affected differentially by a break in schooling, but that both students with and without disabilities performance were affected by a break. This study questioned whether performance or progress were of primary concern when considering how to best index the effects of school breaks. Specifically, is it more important to assess student performance on tests, such as CBMs before and after break, or to examine students' progress with a trend line, before and after a long break from school?

Summer Programming for Students With ASD

Summer programming for students with disabilities is often necessary to help diminish the regression of skills. A specific disability group that requires unique resources is children with autism spectrum disorders. Chambers and his colleagues (2003) reported that children with ASD require significant resources in the form of special education classes, and also use other special education services such as summer school services. Further, Dymond, Gilson and Myron (2007) reported that year round

schooling or summer school was identified as the seventh most important issue indicated by parents as a type of service needed for children with autism spectrum disorder.

The current study examined the effects of summer break and extended school year programming on the academic, behavioral, and social progress of students with ASD. This offers a unique look in the field, as no articles were found that explicitly examined the effects of extended school year services in schools for this population. Due to limited research evidence available, the extent to which students with ASD lose skills over summer vacation or how long recoupment takes during the subsequent school year is unclear. Several researchers have explored, the effects of various summer camps or programs for students with ASD, and these findings can be used to make some inferences about what we might expect from ESY programs. Some early work on the role of summer programs for children with ASD has provided promising findings. For example, Hung and Thelander (1978) evaluated the outcomes of a three-week intensive summer program at a residential center with 18 children with ASD. The intervention targeted four major areas of training, including self-help skills, language training, generalization of language from training to non-training settings, and reduction of undesirable behaviors. Results demonstrated that each child improved in at least one of the areas by 15% by the end of the intervention program. Since this early study, there has been a paucity of research examining the effects of summer camps or programs for children with ASD.

The social needs of children with ASD are a specific area of focus that should be addressed within summer programming. In a study conducted by Rynders and colleagues (1990), three children with ASD were included with eight children without disabilities in

a two-week summer camp program designed to increase social interactions through cooperative learning strategies and positive reinforcement. The authors concluded that both the children with ASD and the children without disabilities increased social interactions. Similarly, a study conducted by Brookman and colleagues (2003) evaluated the outcomes of eight children with ASD in an inclusive community summer camp program, which used applied behavior analysis and positive behavior support strategies to increase social skills. Social interaction was promoted using intervention strategies such as priming, self-management, and peer involvement. Results showed that the children with ASD improved in their ability to interact socially with their typically developing peers.

Social skills were also addressed in two studies conducted in a summer program by Lopata and colleagues (2006, 2008). In the first study, Lopata and colleagues (2006) evaluated a summer program implementing a cognitive-behavioral intervention to 30 children aged 6-13 years with Asperger's Disorder. The six-week summer program either included social skills training, behavioral treatment, or both. Results showed that the summer treatment program was successful in improving social behaviors based on parent and therapist reports. In a similar study, Lopata and colleagues (2008) replicated the findings of the 2006 study by evaluating a manualized summer social treatment program with 53 children aged 6-13 years with high-functioning ASD. The researchers used a program from *Skillstreaming,* which teaches social skills using teaching, modeling, role-playing, performance feedback and transfer of learning. Children attended the summer program for 6-hours a day, five-days a week. The social skills groups lasted for 20-minutes and were followed by 50-minute therapeutic cooperative activities

targeting social skills, face and emotion recognition, interpretation of non-literal language and interest expansion. Results showed that the summer treatment program was successful in improving social behaviors based on both parent and staff ratings, thus replicating the findings of Lopata and colleagues (2006).

Walker, Barry and Bader (2010) found similar results surrounding summer programs for promoting social skills in children with ASD. Their study examined whether both parents and therapists perceived changes in adaptive social behaviors among 12 children with ASD who attended a four-week summer camp designed to promote social skills and peer interaction in the context of sensory-motor and language-based play. The researchers developed a measure for the study (the Adaptive Social Skills Measure, ASSM), in order to examine changes in the children's' verbal communication, social interaction, attention to tasks, and transitions. Results revealed that therapists perceived significant improvement in all four areas measured by the ASSM. Parents perceived significant improvement in children's verbal communication and social interaction skills.

Although the research on summer programming for children with ASD is limited, several studies exploring the effects of summer camps or program on children's outcomes have provided promising findings. Research indicates that summer programs targeting the social needs of children with ASD have helped improve their social skills and abilities to interact socially (Brookman et al., 2003; Lopata et al., 2008; Rynders et al., 1990, 2006; Walker et al, 2010). However, the research on summer camp programs leaves gaps in the research base regarding questions of whether children with ASD will lose skills if no interventions or programs are in place over the summer.

Maintenance of Skills Among Children with ASD

In order to gain a better understanding of the extent to which students with ASD lose or maintain skills during a break in intervention or schooling, research studies exploring the maintenance of skills after intervention implementation were examined. Although these studies are not specifically linked to summer programming, each of the studies explored whether children with ASD maintained skills over time that they were initially taught and showed mastery. Maintenance of skills occurs when a student continues to perform a specific behavior, whether it is academic, communicative, or social, after the intervention responsible for the behavior has come to an end. For the purpose of the current study, maintenance will be considered to be the lack of loss of skills over time. Maintenance of skills is an area that has been found to be particularly difficult for children with ASD (Arnold-Saritepe et al., 2009). Studies investigating the maintenance of skills in children with ASD have especially focused on maintenance of academic, behavioral, social and communication skills. The importance of generalization and maintenance of skills for students with ASD is an educational outcome that has been emphasized by many clinicians and practitioners working with students with ASD (Arnold-Saritepe et al., 2009). Researchers (Cooper, Heron & Heward, 2007; Stokes and Baer, 1977) have suggested ways to promote generalization and maintenance of target skills for children with ASD. However, research studies specifically examining the generalization and maintenance of skills for students with ASD are scant and often involve measuring generalization and maintenance as an afterthought, instead of purposely planning for either at the outset of the study. For example, in a review of previous literature Arnold-Saritepe (2009) examined intervention articles published in the *Journal of Applied Behavior Analysis* from 2003 to 2009 {Vol. 36 – Vol. 41(2)} with

children with ASD as the participants. Within this review, forty-three articles were identified. Generalization and maintenance were not measured in 42% of the reviewed articles. Further, generalization was only taught to students in 26% of the studies, indicating that most researchers utilized a "train and hope" form of generalization (Stokes & Baer, 1977). It is unclear within the research literature whether children continue to generalize and maintain skills across a large amount of time, after the intervention or educational intervention has been terminated. Within the school or clinical setting, teachers and practitioners can purposefully plan for generalization and maintenance of target skills. However, during lapses in students' educational intervention, it is unclear whether children with ASD are able to maintain and generalize target skills. For example, although many students with ASD attend extended school year programming, these programs may be different from school placements, or may not specifically contain aspects designed to increase maintenance of target skills for children with ASD. Students may struggle to maintain skills between settings, teachers, and across extended periods of time, and this is especially critical over such a long period of time away from the classroom such as the summer break.

Although research examining the maintenance of skills is limited, several studies have sought to examine these effects of specific school-based interventions for children with ASD. For example, Machalicek, O'Reilly, Beretvas, Sigafoos, and Lancioni (2007) evaluated research on interventions targeting challenging behavior in school settings for students with ASD. Twenty-six studies were identified and only three of the 26 studies reported maintenance or follow-up data. Results indicated that a majority of the studies (85% of studies) reported a reduction in challenging behaviors. Maintenance or follow-up

assessments were conducted in a minority of studies, but the few studies that examined maintenance reported continued decreased challenging behavior (Buggey, 2005; Kuoch & Mirenda, 2003; Schmit et al., 2002)

In their review of a school based instructional intervention, Machaliecek and colleagues (2008) evaluated school based instructional interventions for students with ASD, and identified 45 studies published between 1995 and 2005. It was found that a majority of the studies did not address maintenance of skills, after the withdrawal of the intervention, with only 19 identified studies reporting the maintenance of skills (Machaliecek et al., 2008). The majority of these 19 studies (79%) reported positive findings. However, approximately 47% of the studies found that the skills taught during the intervention were likely to deteriorate without continued intervention. Based on their review of school based instructional interventions for students with ASD, the authors were unable to conclude which types of interventions led to better maintenance of targeted skills, since so few studies evaluated maintenance at all. Further, the variability between the different studies in regards to target behaviors, interventions, settings/conditions, and outcomes makes it difficult to make significant comparisons between the studies. Moreover, since the length of time between the intervention and follow-up data was variable in each study examined, it was unclear how long students maintained targeted skills.

When considering summer programming for students with ASD, it is important to consider the extent to which children with ASD maintain skills in several different areas, including academic, cognitive ability, communication and social skills. Academic programming is an important skill area targeted by school-based intervention programs

for children with ASD, which should be considered by extended school year programs. However, specific literature regarding the maintenance of academic skills among children with ASD is limited. In their meta-analysis, Machalicek et al. (2008) identified only three articles that examined maintenance of skills as a result of an academic, school-based intervention. For example, Akmanoglu and Batu (2004) focused on teaching functional academic skills to three individuals with ASD. The functional academic skill that was taught involved receptive identification of numbers, whereby the students were asked to point to different numerals. Results indicated that all three students acquired the skill of pointing to numerals. Maintenance data were collected one, two, and four weeks after completing teaching, and indicated that the participants maintained the skills taught up to four weeks after the intervention. In a similar study, Akmangolu-Uludag and Batu (2005) taught two five-year old males with ASD eight different relatives' names. Maintenance data were collected across materials, settings, and trainers. Results demonstrated that the participants were able to learn their relative names. Maintenance data were collected one, two and four weeks after the last intervention session and indicated that both participants maintained the skills taught during instruction. Johnson, McDonnell, Holzwarth and Hunter (2004) further examined the maintenance of academic skills in three children with developmental disorders after an academic intervention. Similar to Akmangolu-Uludag and Batu's studies (2004, 2005) the researchers found that academic skills maintained. Although maintenance data were collected in all the studies, the length of time was either not specified or was only four weeks after the end of the interventions. Furthermore, although the authors did not specify, they indicated that the sessions took place at the participants' schools, and it is unclear whether additional

programming targeting functional academics was in place during the maintenance phase of the intervention. In addition, the study only targeted one skill, specific to functional academics. The current study addressed these issues by examining maintenance of skills across a longer time period. Further, the current study addressed a broader scope of academics. Overall, there is limited research specifically targeting the maintenance of academic skills after a school-based intervention for children with ASD has been in place. However, the research reports that children with ASD do maintain skills after academic based interventions. Although the results are promising, within the studies examined, the length of time examined for maintenance was at most 4-weeks. Summer breaks for many children are much longer than this, especially if the child does not receive extended school year services. Further, since the interventions took place in a school setting, it is unclear whether other academic programs or interventions were in place for the targeted students, and whether these played a role in the maintenance of academic skills. The current study further explored these issues, by examining different levels of support during extended school year programs, and how academic skills were maintained across these different levels.

Students' with ASD cognitive abilities are another skill area that was addressed within the present study. Although several studies were identified that examined the maintenance of academic skills, no articles were found that specifically addressed the maintenance of students' cognitive abilities over an extended period of time. The current addressed this gap by examining academic as well as cognitive abilities.

Communication skills are another critical area to target in children with ASD, and maintenance of learned skills over extended breaks outside of school is essential to build

upon in the following academic year. However, research examining the maintenance of communication skills after a period of time is limited. In one study examining the maintenance of communication skills, Hetzroni and Shalem (2005), examined the use of a computer-based intervention for teaching orthographic symbols (i.e. words), used for expressive communication for students with ASD. The symbols taught were part of the participants' environment at home and at school, which may have affected the maintenance results, as students were able to use the words regularly within their natural environment. Six students with ASD, aged 10-13, who were non-verbal or used limited verbal speech, and used an augmentative communication device to communicate, were included in the study. Maintenance data were collected seven and 15 weeks after the end of intervention implementation. Results indicated that participants were able to learn to match photos of food package wrappings to printed words and maintained this knowledge over time. The results from this study indicated that children with ASD are able to maintain communication skills using picture symbols over an extended period of time. The children maintained the skill up to a fifteen-week follow-up, which is more than a summer break, indicating that communication skills my represent a solidified skill that is easily maintained across time. However, only one study was assessed, thus it is difficult to draw any final conclusions. The present study further examined the maintenance of communication skills in children with ASD across extended periods of time.

The maintenance of social skills among students with ASD has been the most studied skill area addressed in the research literature that specifically examines maintenance of skills. Research studies indicate that maintenance of social skills is variable with high maintenance effects reported when students received social skills interventions in their

typical classroom. The present study further explored the maintenance of social skills by examining the extent to which students with ASD maintained social skills across summer break.

The maintenance of social skills among students with ASD has been assessed in a review of the literature. For example, in their meta-analysis, Bellini, Peters, Benner and Hope (2007) examined the effectiveness of school based social-skills interventions for children and adolescents with ASD. Their meta-analysis included 55 single-subject designs, and measured intervention, maintenance and generalization effects. Maintenance effects were measured by calculating the percent of non-overlapping data points (PND) between the baseline and maintenance phase, and were reported in 25 of the 55 selected articles. Results of the meta-analysis indicated that social skills interventions produced low to questionable treatment and generalization effects and moderate maintenance effects for children with ASD. Moderate maintenance effects were observed for both individual and group social skill interventions. Further, Bellini and colleagues (2007) found that the social skills interventions that were delivered in the child's typical classroom produced better maintenance effects when compared to interventions delivered in a pull-out format.

Other studies examining the maintenance of social skills further demonstrated mixed results regarding the maintenance of social skills in children with ASD. For example, Baker, Koegel and Koegel (1998) examined whether obsessive behaviors could be used functionally as the theme of an appropriate social game, and whether the game, in turn, would increase social interactions between children with ASD and their typically developing peers. The participants included three children with ASD; two attended full-

time inclusion classrooms, and one of the participants attended a specialized classroom with part-time mainstreaming. Results demonstrated that during the intervention, maintenance, and follow-up phases, all three children showed increases in their social behavior. The maintenance phase was utilized to assess whether the children's appropriate social behavior would maintain in the absence of the adult who introduced the game. All three students continued to engage in social interactions and utilized the obsession theme game, without an adult present. The length of time between the intervention and maintenance phase of the intervention was not specified. On days where the participants did not engage in the obsession theme game, they engaged in non-obsession themed games with appropriate social interactions often occurring. The follow-up phase examined whether the participants continued to engage in social interactions after the removal of the intervention. All three participants continued to engage in social interactions during one and two month post-intervention follow-up assessments. Kohler, Anthony, Steighner and Hoyson (2001) found similar findings in their study examining the impact of a naturalistic teaching package on four children with ASD's social interactions during an un-structured play time, within an integrated preschool setting. Maintenance data was only collected for three of the four participants. Two of the participants were able to maintain high levels of social interaction during the maintenance phase. Similarly, Apple, Billingsley, and Schwartz (2005), demonstrated that the ability to respond to others with compliments was also maintained across time periods. However, the specific time period of the maintenance phase was either not specified by the authors or was short, thus it is unclear how long the skill would maintain.

Other studies reported mixed findings regarding the maintenance of social skills. For example, Charlop-Christy and Daneshvar (2003) explored perspective taking among students with ASD. Only two of the three participants maintained the skill of perspective taking, as measured on a post-test maintenance probe. Further, Garfinkle and Schwartz (2002) examined the effects of peer imitation on increasing social interaction. Participants included four preschool children (three with ASD, one with developmental delay), who each received the intervention within their integrated classroom during a regular small-group activity. Following the implementation of small group training, all participants exhibited an increase in peer imitation, but only one of the students maintained the skill into the follow-up period, and this was only for one day.

Overall, the extent to which students with autism spectrum disorders maintain academic, communication and social skills over the summer break is unclear. Research examining the maintenance of skills in each of these areas is limited. Although several studies report positive findings in regards to maintenance of skills, there are several unanswered questions. For example, the studies that actually did address maintenance of skills often failed to report the length of time in which maintenance effects were recorded, and did not indicate whether additional instruction or intervention programs were in place during the maintenance phase. Since many of the studies took place in a school setting, one can assume that the students were receiving programming that may have helped them maintain the targeted skills. Further, when the length of time for maintenance was reported, it was often short periods of time; thus it is difficult to compare these results to a typical summer break for students. The present study further explored the area of maintenance by examining whether extended school year programs

helped students maintain academic levels and classroom behaviors. Further, the study explored whether there was variability in the maintenance of different skills areas, across academic, cognitive, behavioral, and social skills

Determining ESY Services

Although there is a limited research base examining the effects of summer vacation on students' with ASD academic, behavioral and social skills, federal law mandates that students with disabilities are provided with Extended School Year (ESY) services in order to help prevent regression, or loss of skills over the summer months. There are currently several laws and mandates in place requiring the consideration of Extended School Year programming for students with disabilities. Thus, the current section will provide a background on federal laws and mandates for ESY including the criteria for determining ESY services and eligibility for ESY. Federal law requires schools to determine student eligibility for ESY services on an annual basis, in an attempt to prevent regression of skills over breaks in school. Schools are currently required to determine whether students with disabilities need extended school year services. More specifically, a student may require ESY services when data suggest that it may take them longer than a "typical" peer to recoup, or regain skills lost during the summer break. According to the Individuals with Disabilities Improvement Act (IDEIA), schools are required to ensure ESY services are available to provide a Free and Appropriate Education (FAPE), if a child's IEP team determines that these services are necessary. IDEA defines ESY as special education and related services that are provided to students with disabilities beyond the regular school year, in accordance with the child's IEP, at no

cost to the parents of the child. IDEA also imposed two limitations regarding ESY services. According to §300.106(a)(3) of IDEA, public agencies may not:

(i) Limit extended school year services to particular categories of disability; or

(ii) Unilaterally limit the type, amount, or duration of those services.

Under IDIEA, there are no current standards established for ESY eligibility. Instead, states are required to establish their own standards for ESY determination. Several standards to determine eligibility for ESY have been discussed by various federal courts throughout the country. The first standard in determining the need for ESY is that no single criterion can be used as a sole qualifying factor for students to be eligible. When determining eligibility for ESY services, school districts must ascertain needs for eligibility based on the following factors. First, school districts should consider regression and recoupment of student skills. Regression refers to a decline in knowledge and skills that can result from an interruption in education; recoupment is the amount of time it takes a student to regain the prior level of functioning from the previous school year. Schools must determine if the benefits obtained by the student during the regular school year will be lost if the student is not provided with an educational program during the summer months. Regression and recoupment should be considered by the student's IEP team and used in conjunction with other factors, such as student progress towards IEP goals during the regular school year, when determining ESY services.

Determination of ESY services should not only focus on regression and recoupment of skills. A student's "emerging skills" and "breakthrough opportunities" (Reusch v. Fountain, 1994) should also be incorporated into the eligibility analysis. If a student is in a critical stage of developing a specific skill, but the skill has yet to be

completely acquired or mastered, it is likely that the current level of acquisition will be lost due to interruption by the summer vacation (Reusch v. Fountain, 1994).

When a school is determining eligibility for ESY services, it is clear that the IEP team should consider a student's regression and recoupment of skills, and progress made during the school year (IDIEA). Decisions regarding a student's eligibility for ESY should be considered at each annual review meeting of the IEP (IDEA; 22 Pa. Code §14.132). The content and duration of ESY services should also be discussed with parents and used in the eligibility analysis (Reusch v. Foutain, 1994; 22 Pa. Code §14.132). Requirements specifying the content and duration of ESY services for students were discussed in the Reusch v. Foutain (1994) case, in which the court mandated "...individualized determinations of the number of weeks, days per week, and hours per day that each student receives ESY services." Reusch v. Foutain established that these individualized criteria be established during annual IEP meetings, along with the content of a child's ESY programming.

Although several standards to determine eligibility for ESY have been developed by various federal courts throughout the country, there is currently no standard practice for ESY eligibility. Thus, most states have state-wide eligibility criteria for determine whether a child is eligible for ESY services. For example, in Pennsylvania, the IEP team determines whether a child is eligible for ESY services by looking at information about the student's performance that has been gathered all year (PATTAN, 2008). The team must consider the following factors when determining whether a child is eligible:

(1) Will the student regress (revert to a lower level of functioning) in skills or behaviors as a result of an interruption in educational programming?

(2) Will the student take a long time to recoup (recover) the skills or behavior patterns that were lost during a break in educational programming?

(3) Will a pattern of difficulties with regression and recoupment make it unlikely that a student will maintain the skills and behaviors relevant to IEP goals and objectives?

(4) Will a lapse in services substantially reduce a student's chances of ever learning a critical life skill or behavior related to the IEP?

(5) Is the student at a crucial stage in mastering a life skill that is related to the IEP goals of self-sufficiency and independence from caregivers?

(6) Does the student have a severe disability such as autism/pervasive developmental disorder, a serious emotional disturbance, severe mental retardation, degenerative impairments with mental involvement or severe multiple disabilities.

Although ESY services are emphasized both in federal (e.g. IDIEA) and state laws, it is unclear whether ESY services are effective in reducing regression and recoupment of students' skills. Federal case law has examined many of the issues surrounding the effectiveness of ESY programming, by determining whether ESY programs are appropriate for different populations.

Case Law and ESY

Case law has influenced the provision of ESY services, and led to guaranteeing ESY services under the free and appropriate public education (FAPE) clause in IDEA. Other ESY issues, such as length of programming and using regression/recoupment to make eligibility decisions, are also derived from case law and other legal sources.

Armstrong v. Kline (1979) was a significant court case that set precedent for ESY programming for students with disabilities. In *Armstrong,* the court ruled that if an individual student demonstrated a need for services beyond the typical school calendar, the school district must provide those services. In the Armstrong v. Kline (1979) case, the court determined that the mandated 180-day school year violated a child's right to a free appropriate public education (FAPE), specifically in reference to children with severe and profound impairments or severe emotional disturbances. The court stated that, "By its terms, the Act (i.e. Education for All Handicapped Children Act) appears to demand that the state supply instruction designed to meet all of the handicapped child's 'unique needs' without limitation." The court also required state and local school districts "to provide an education to handicapped children in excess of 180 days," as determined by each child's individual educational needs. The Armstrong v. Kline case defined that a school district's goal for children with disabilities should be "self-sufficiency," which would necessitate the need to provide more than the same 180 days to children with disabilities that is provided to children without disabilities. The court concluded that "For some, but not all, Severely and Profoundly Impaired and Severely Emotionally Disturbed children, standing in the way of the attainment of some of these objectives (for self-sufficiency) is the effect of breaks in the educational program which are created, at least in part, by the 180 day rule." The court also noted that recoupment time for lost skills is "usually much greater" for children with disabilities. The *Armstrong* case also identified "target groups" of students with severe disabilities. Autism/pervasive developmental disorder was identified as a "target group" of high needs students who are eligible for extended school year services.

The *Lawyer v. Chesterfield* (1993) case similarly provided an impetus for school districts to evaluate whether they were providing students with the appropriate ESY services. In Lawyer (1993), a child with ASD was not provided with the necessary speech therapy services over the summer, and in turn regressed. The court stated "With respect to the issue of recoupment, the evidence in this case indicates that the services provided to Danny by the Chesterfield County Schools are insufficient to compensate for the significant amount of regression that Danny experiences during the summer months when he is not being provided speech language therapy. Danny's regression during the summer, coupled with nominal recoupment, severely limits the educational benefits he receives from instruction during the regular school year. His rate of progress is minimized by the interplay of continuous regression and recoupment." Further, the judge listed several factors that IEP teams should consider when deciding about the need for ESY services, including recoupment in the fall, the child's rate of progress, the child's behavioral or physical problems, availability of alternative resources, areas of the child's curriculum that need continuous attention, and the child's vocational needs.

Another important court case in ESY determination and programming was the *Reusch v. Fountain* (1994) case. In *Reusch v. Fountain* (1994) the courts found a Maryland school district to have misleading ESY policies for their students with disabilities. The courts found that the school district had (a) refused to notify parents of a child's eligibility for ESY services; (b) written misleading letters recommending a summer program requiring tuition from parents; (c) referred parents to central administration when they asked for ESY services; (d) intentionally did not inform parents of ESY services until it was too late to provide them; and (e) did not release information

to parents suggesting they had a right to request ESY services. The *Reusch v. Fountain* (1994) court case has shaped many of the details and information surrounding eligibility for ESY services. More specifically, the courts found in *Reusch v. Fountain* (1994), that "the practice of inadequate and untimely ESY notice must cease. Notice of ESY designed to fully explain such services must be provided to parents of disabled children in a timely fashion before annual review meetings. The notice must not disguise or downplay the true nature of ESY or attempt to confuse parents between free extended year services and tuition-charging summer enrichment programs." The court also outlined that additional criteria be considered when determining eligibility for ESY, focusing on regression of skills and recoupment time. "Emerging skills" and "breakthrough opportunities" should be in considered when making eligibility determinations. Further the court deemed a fixed-length program illegal, thus school districts were required to "make individual determinations of the number of weeks, days per week, and hours per day that each student receiving ESY should be provided."

Appropriate ESY Programs

Case law surrounding ESY has also addressed the appropriateness of ESY services and programming. Several cases concerning the number of ESY services and the length of services, concluded that ESY programs were deemed adequate if: (a) the program was based on assessment data, and (b) the program components were matched to the student's needs identified in the IEP. For example, in *Laurel School District* (2001), the school district proposed an ESY program for a seven-year old student with ASD. The proposed program was comprised of six-weeks in a community recreation program, with two hours per week of "autistic support" and two hours a week of speech/language services. The

student also received 15 hours a week of paraprofessional assistance. The six-week program was based on evaluation data from the previous summer's program, in which the student did not demonstrate significant regression. The courts ruled that the ESY program was appropriate in addressing the students' individual needs and educational goals. In contrast, several district's ESY programs did not address individual student needs established by their IEPs and were thus deemed inappropriate. For example, in *Allamakee community School District and AEA 1* (1996), the court found that the ESY program offered to a 5-year old boy with ASD did not meet his individual needs. The program did not include a social component, although the social needs of the student had been incorporated into the IEP. Thus, it is important for schools to address and consider all IEP goals into ESY programming. In another case, *Central Bucks School District v. Sara K.* (2000), the ESY program for a seven-year old student with pervasive developmental disabilities did not include physical therapy services, which was clearly outlined by the IEP. As a result the student regressed, and the parents were awarded compensatory education.

Although federal law mandates that students with disabilities receive extended school year services, there currently is a limited research base examining the effects of summer programming on students with disabilities' achievement and school success, as well as the level of ESY services needed to retain skills over the summer. These legal mandates have only provided guidelines to the process of selection of ESY services, and more information is needed to better identify the intensity of ESY services needed to produce the desired result for each child. In these previous cases, the determination of the intensity of summer programming appeared somewhat arbitrary, and was only deemed

appropriate or inappropriate after implementation. Thus, more information is needed to better understand what is likely to be needed by each child based on their academic and social profile, and how that intensity might need to be adjusted for children with ASD, specifically.

Specific Needs of Children with ASD

The core deficits of Autism Spectrum Disorders (ASD) include social impairment, communication impairment, and restricted repertoires of behaviors and interests (American Psychiatric Association, 2000, *Diagnostic and Statistical Manual of Mental Disorders*). Children with ASD often have difficulty interacting with other people, making it hard for them to make friends. Further, students with ASD struggle to communicate their ideas and feelings effectively. In some cases, individuals with ASD never develop vocal language, and must use sign language or assistive technology devices to help them communicate. Students with ASD may have trouble imagining what other people are thinking and show deficits in joint attention. Finally, many students with ASD display stereotypic and bizarre behaviors that may interfere with their learning, and daily functioning (National Research Council, 2001). The deficits in language development, non-verbal communication, cognitive abilities, and other areas seen among many students with ASD have specific effects on behavioral outcomes in ways that have important implications for the educational programming for these students. However, it has not yet been shown that specific educational programming is more effective depending on the student's specific diagnosis. When educating children with ASD, is important to recognize that autism spectrum disorders as a whole are a

broad disorder, which is characterized as deficits in communication, social and behavioral development and learning. Additionally, it is important to recognize the individual strengths and weaknesses of each child, and develop educational programming accordingly (National Research Council, 2001).

Research has shown that education is the primary form of treatment for autism spectrum disorders (National Research Council, 2001; Ruble & Akshoomoff, 2010). The primary goals in the educational programming for students with ASD are the same as those for typically developing children. According to the National Research Council (2001), these goals are personal independence and social responsibility. Education should provide opportunities for acquisition of skills and knowledge that support the ultimate goals of independence and social accountability. More specific goals include progress in social and cognitive abilities, verbal and non-verbal communication skills, adaptive behavior skills, reduction in interfering behaviors, and the generalization of abilities across multiple environmental settings (National Research Council, 2001). For children with ASD up to age eight, the National Research Council (2001) recommends the following be in place for appropriate educational planning for children with ASD: (a) early entry into an intervention program; (b) active engagement in intensive instructional programming for the equivalent of a full school day and a minimum of five days a week with a full-year of programming; (c) use of planned teaching opportunities; and (4) sufficient amounts of adult attention in one-to-one or very small group instruction to meet individualized goals. The National Research Council recommends that educational services should include a minimum of 25 hours a week of systematically planned, and individualized educational programming. Likewise, Iovannone, Dunlap, Huber and

Kincaid (2003) identified six essential themes or components to be included in an effective educational program for students with ASD. These include individualized supports and services for students and families, systematic instruction, comprehensible and/or structured environments, specialized curriculum content, a functional approach to problem behaviors and family involvement.

Many of the behavioral characteristics displayed by children with ASD have been addressed through strategies based on applied behavior analysis (ABA). Applied behavior analysis methods are used to support students with ASD in several ways, including the following: (a) systematic instruction and reinforcement procedure to teach new skills; (b) to reinforce and maintain previously acquired skills; (c) to generalize behavior from one situation to another; (d) to restrict and decrease conditions in which interfering behaviors occur; (e) to reduce interfering behaviors by withdrawing reinforcement (Steege, Mace, Perry & Longenecker, 2007). These methods are incorporated into most educational programs. Over the past four decades, several extensive intervention and treatment programs based on the principals of ABA have been developed to address the difficulties in social interactions, communication, and restrictive and repetitive behaviors that are displayed by children with ASD. Some of the most prominent of these teaching approaches for children with ASD, Discrete Trial Training (DTT), Pivotal Response Training (PRT), and Structured Teaching (ST)/Functional Routines, will be reviewed, as they are the core features of one of the levels of programming in ESY for participants in the current study.

Discrete Trial Training

Discrete Trial Training (DTT) emerged as a result of many years of research examining the effectiveness of interventions based on applied behavioral analysis. Beginning in the 1970s behavioral studies began applying the principals of operant conditioning to intervention programs designed to address interfering behaviors in children with ASD (Lovaas, 1987; Lovaas & Smith, 2003). These studies were generally conducted in highly structured settings, containing few distractions, with the children exposed to approximately 40 hours a week of intensive one-to-one intervention for up to three years. The interventions were delivered by trained therapists, but also included all significant people in the child's environment (e.g. parents). Further, the intervention studies focused on very young children with ASD (below the age of 4), as the researchers assumed that "younger children would be less likely to discriminate between environments, and therefore more likely to generalize and maintain their treatment gains" (Lovaas, 1987, p. 4). The traditional applied behavioral analysis approaches utilized during these early intervention studies demonstrated gains for children with ASD, and thus are currently the basis for many behavioral approaches (National Research Council, 2000). The UCLA Young Autism Project (YAP) was the most comprehensive and best controlled of these studies (Lovaas, 1987). In the Young Autism Project, Lovaas (1987), compared 40 hours a week of intensive 1:1 behavior analytic treatment for approximately three years to a minimal treatment control group, which received less than 10 hours a week of 1:1 instruction. Lovaas also compared both group to another group of children receiving non-behavioral services elsewhere. Discrete trial training was used with the group of children receiving 1:1 intensive behavioral treatment. Basic tenets of DTT include 1:1 intervention, short and clear instructions, carefully planned prompts and

fading of prompts and immediate reinforcement for correct responses (Lovaas, 1987; Lovaas & Smith, 2003). Further, DTT uses repetition along with sequenced instruction to develop and build fundamental skills in students with ASD (Lovaas, 1987). The sequenced instruction and intervention involves building on previously learned skills within five stages of instruction and the goals at each stage increasing in complexity and sophistication (Lovaas & Smith, 2003; Skokut, Robinson, Openden, & Jimerson, 2008; Smith, 2001). In stage 1, discrete trials are utilized to teach one-step instructions to help reduce problematic behavior. In stage 2, students continue to learn receptive language skills, with instruction focusing on imitation of motor actions, matching, identification of object, and discrimination between different commands. In stage 3, instruction focuses on expressive language and communication. These skills are expanded in stages 4 and 5 addressing expanding communication skills (Lovaas & Smith, 2003).

Support for DTT

Support for discrete trial teaching has been documented in many research studies, beginning with Lovaas's original study in 1987, which reported the results of the UCLA Young Autism Project. In this seminal study, Lovaas (1987) reported that 47% of children with ASD participating in the study who received 40 or more hours per week of one-to-one DTT for two or more years achieved normal intellectual and educational functioning in contrast to only 2% of the control group. In a follow-up study, McEachin, Smith and Lovaas (1993) reported that children participating in Lovaas's study (1987) maintained treatment gains at follow-up, whereby the average age of the students was 13-years of age. Replication studies have further reported positive outcomes for children (Anderson et al. 1987; Birnbrauer & Leech, 1993; Cohen, Amerine-Dickens, & Smith,

2006). For example, in a randomized control trial, and replication of Lovaas's (1987) original intervention study, Smith, Groewn and Wynn (2000) enhanced the experimental designed by including random group assignment, a uniform assessment battery, and objective accounting of the number of treatment hours. This study had fewer treatment hours for the experimental group (25 hours per week in first year; fewer in the next two years) and more treatment hours for the comparison group. The findings replicated Lovaas's (1987) original report of significant IQ gains for the treatment group in relation to the comparison group. However, at post-treatment, Smith, Groewn and Wynn's experimental group still had reported IQs in the range associated with mental retardation (MR). Sallows and Graupner (2005) conducted a replication of the original UCLA project in a clinic setting. Outcomes after four-years of treatment, including cognitive, language, adaptive, social and academic measures, was consistent with results found by Lovaas (1987) and McEachin, Smith and Lovaas (1993). Further, Cohen et al.'s (2006) replication of the UCLA model found that preschoolers with ASD who received intensive intervention (35-40 hours a week) had higher adaptive behaviors than control participants. However, these significant differences were not found between the groups for language comprehension or nonverbal skills

More recent studies examining the effectiveness of interventions based on the UCLA Young Autism Project, investigated the utility of intensive behavioral interventions with older students (aged 4-7 years old). Eikeseth et al. (2002) compared two treatment interventions for children with ASD, aged 4-7 years. Both interventions took place in a public elementary school, with both groups of students receiving similar amounts of treatment (M = 28.52 hours per week at the child's school). In the behavior

treatment group, students were exposed to a behavior treatment based on the methods used by Lovaas (1987). Students in the comparison group received eclectic treatment, which incorporated elements from a variety of different interventions. Results demonstrated that after a year of intensive treatment, children in the behavioral treatment group made significantly larger gains on standardized tests of intelligence, language, and adaptive behavior than did children in the comparison group. These results indicated that 4- to 7 year olds can make large gains with behavioral intervention in the school setting (Eikeseth et al., 2002). In a follow-up study of their original research, Eikeseth, Smith, Jahr and Eledvik (2007) extended their findings on the effects of the intensive behavioral intervention. All children in the behavioral intervention group continued to receive applied behavior analysis interventions, modeled by Lovaas (1987); all students in the comparison group received the same intervention model. In a follow-up of the same group of children at a mean age of 8 years, 2 months, the students in the intensive behavioral intervention group showed larger increases in scores with intervention than the students in the comparison group, as well as less severe aberrant behavior and fewer social problems (Eikeseth, Smith, Jahr & Eledvik, 2007). Thus, DTT has been rated as one of the most effective methods of teaching children with ASD, and is often incorporated into programs specifically addressing students' individual needs. Within the current study, DTT was used throughout the school year, as well as in the summer ESY programs, to enhance learning of the participating children with ASD.

Pivotal Response Training

Another program that was used throughout the school year and in the summer in combination with DTT was Pivotal Response Training (PRT). Although almost all

children in Lovaas's study (1987) made progress with intensive DTT, the teaching process involved focusing on individual behaviors one at a time, which could often be time-consuming, with children often making slow progress (in Koegel, Koegel & Carter, 1999). Lovaas reported (1977, p. 46 from Koegel, Koegel & Carter, 1999) that it could take up to 90,000 trials to teach a non-verbal child with ASD to verbally state the first correct label of an object. Further, researchers and clinicians were also concerned that children demonstrated a lack of generalization of learned behaviors, and that behaviors often failed to be exhibited in alternative settings, or in response to items that were not explicitly taught (Koegel, Koegel & Carter, 1999). Traditional applied behavioral analysis approaches to interventions, such as DTT tended to rely on the "train and hope" approach to generalization, whereby teachers and clinicians would teach students in a highly structured setting and then hope that the skill would generalize, or transfer to other critical settings, or tasks, without needing to be specifically taught (Stokes & Baer, 1977). An alternative intervention model to the train and hope approach often characterized in DTT is to systematically work towards generalization in the process of training, so the transfer of skills is more likely to occur.

Pivotal Response Training (PRT) is an intervention model based upon applied behavior analysis, which focuses on the child's natural environment in order to provide comprehensive services for children with ASD (Koegel & Koegel, 2006). PRT involves delivering the intervention in the child's naturalistic environment, in loosely structured intervention sessions. Intervention sessions are initiated and paced by the child, as opposed to teacher led, and also can take place in a variety of environments or locations, and employ an assortment of stimuli. Further, PRT utilizes natural and direct

reinforcement as opposed to DTT, which often uses reinforcers that are preferred by the student and often unrelated to the instructional task. In PRT, the desired object, selected by the child and used as the training stimulus, serves as a natural reinforcer, where a child's correct response results in access to the desired item (Koegel, Koegel & Carter, 1999).

Pivotal response training emphasizes targeting the core pivotal areas of the autism spectrum disorder during intervention, in order to promote generalized areas of functioning (Koegel, Koegel & Carter, 1999; Koegel, Openden, Fredeen & Koegel, 2006). More specifically, an important aspect of intervention should be to focus on pivotal areas by increasing a child's motivation to respond, so that children can self-initiate social, linguistic and academic interactions throughout the day. Pivotal areas that have been identified include motivation, self-initiations, responsivity to multiple cues, and self-management (Koegel, Koegel & Carter, 1999). Teaching pivotal behaviors can be described like traditional ABA intervention formats. Antecedent stimuli (teaching instructions or instructional cues) are delivered, and consequences are provided contingent upon the child's response. Within a pivotal response training format, the behavior under focus is that of the pivotal area, such as motivation (Koegel, Koegel, & Brookman, 2003).

Support for PRT

Pivotal Response Training teaching methods have been researched with children with ASD in a number of studies, using single subject designs. Empirical support for the use of each individual PRT component (e.g., motivation and self-initiations) has been broadly studied within the research literature (Koegel, Koegel & Brookman, 2003). In

addition, other studies have examined the efficacy in using a PRT model or package, whereby all the motivational components are utilized during teaching (e.g., Koegel, O'Dell & Koegel, 1987; Koegel, Koegel & Surratt, 1992; Stahmer, 1995; Koegel , Camarata, Koegel, Betall, & Smith, 1998; Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Koegel, Koegel, Shoshan & McNerny, 1999). Research has demonstrated that PRT is associated with improvements in several core deficits in ASD involving expressive communication, self-initiations (question asking and commenting), and joint attention behavior (Koegel et al, 1992; 2003). For example, Koegel et al. (1992) demonstrated that teaching using PRT teaching methods was related to greater gains in children's utterance length, number of words, word attempts, and word approximations when compared to a discrete trial format that focused on individual target behaviors. Similarly, Koegel, and colleagues (1998) examined the utility of using PRT to increase children's self-initiated questions. The researchers found that children consistently and spontaneously initiated "what's that?" which included generalization across settings. Likewise, a significant increase in the children's vocabulary (e.g., labels) was also observed after the intervention. Naturalistic behavioral programming, such as PRT has also been successfully used to increase symbolic and socio-dramatic play skills in children with ASD (McGee et al., 1994, 2000; Stahmer, 1995; Thorp, Stahmer, & Schreibman, 1995).

Structured Teaching/Functional Routines

Structured Teaching or Functional Routines were other teaching strategies that were used throughout the school year and in the summer in combination with DTT and PRT. Functional Routines were a component of the curriculum used with the

participating students during the regular school year. Functional Routines provide meaningful contexts for using, generalizing and maintaining receptive and expressive language skills, social interactions skills, and pre-academic concepts. They utilize the strategies found in the teaching strategy, Structured Teaching. For the purpose of the current study, functional routines and structured teaching will be used interchangeably. Structured teaching is a form of teaching employed by TEACCH (Treatment and Education of Autistic and related Communication handicapped Children), which emphasizes visual supports, and which aims to increase students' independence and reduce the frequent need for teacher correction (Schopler, Mesibov & Hearsey, 1995). Structured teaching is based on four main components, including physical organization and structure (the organization of the classroom), daily schedules (visual information representing where/when and what the daily activity will be), individual work systems (information provided to students depicting what to do while in a work or play area), and task structure (visually clear information on what the learning task is about; Schopler et al., 1995). Examples of how these four components would be utilized in the classroom setting include establishing clear visual and physical boundaries in rooms to minimize visual and auditory distractions, along with developing physically separate work areas in the classroom. Individual schedules can be used throughout the day to help increase student independence. Structured teaching also incorporates making the start and end of each individual task understandable and predictable for students by manipulating the spatial orientation of work materials. For example, students may start on work placed in a tray to the left of the child, and then place the finished task in a tray to the right of the child (Schopler, Mesibov, & Hearsey, 1995).

Support for Structured Teaching

Several studies have demonstrated the effectiveness of structured teaching methods for children with ASD. For example, in an early investigation of the TEACCH intervention model, Schopler and colleagues (1971) examined the benefits of structure with children with ASD. Within the study group, 5 children with ASD, ranging in age from 5 to 8 years of age were rotated through structured and unstructured work sessions. The results demonstrated that students in the structured sessions were rated as demonstrating increased relatedness, more appropriate affect, more meaningful engagement with activities, and less repetitive, self-stimulatory behavior. However, a large limitation of the study was that the raters were TEACCH program staff, and the researchers did not use a control group. Ozonoff and Cathcart (1998) also assessed the effectiveness of the TEACCH model in their study comparing the outcomes of a group of eleven young children with ASD placed in a home-based intervention group, based on the TEACCH model to a matched control group of children. The intervention consisted of eight to twelve sessions of an individualized home-based TEACCH program. The group of children in the TEACCH group had significantly higher gains on various subtests of the Psychoeducational Profile—Revised, (Schopler et al. 1990) including imitation, fine motor, gross motor, and cognitive-performance.

In another study, Schopler et al. (1982) examined the effectiveness of the TEACCH program based on questionnaires returned by 348 families who had received services between 1966 and 1977. The parent ratings demonstrated high overall satisfaction with the TEACCH program and improved child behaviors. Although

Schopler and his colleagues provided important information about parent's views of the TEACCH program, pre- and post- data was not collected on specific child outcomes during the study. In a similar study, Short (1984) assessed changes in child behavior during TEACCH treatment compared with changes during a waiting period, prior to the beginning of the TEACCH program. The researchers used behavioral observations of 15 children their parents, semi-structured interviews, and two rating scales to examine changes. Based on behavioral observations, the researchers indicated significant improvement in the level of child communication and appropriate engagement with materials. Further, parents rated the effectiveness of the program very positively.

Individual components of structured teaching, such as individual work systems, have also been investigated within research literature. For example, Hume and Odom (2007) utilized a single-subject withdrawal of treatment design across three participants to assess the on-task behavior and work completion skills of students with ASD as a result of a work systems intervention. The results demonstrated an increase in on-task behavior, as well as increases in the number of tasks completed or play materials utilized, and a decrease in the number of teacher prompts, as a result of the work systems intervention.

DTT, PRT and structured teaching/functional routines are three intervention programs that have been extensively supported and researched within the literature for the past four decades. Each intervention program is based on the principles of ABA and has been developed to address the difficulties in social interactions, communication, and restrictive and repetitive behaviors that are displayed by children with ASD. Within the

present study each was utilized in combination within in the Extended School Year individualized programming condition for participants with ASD.

Summary

As highlighted within this literature review, the effects of long breaks in schooling, such as summer vacations on student achievement and academic outcomes, has been an area of study among researchers for many years. Several studies have examined the effects of summer break on the general education population on reading and math achievement. Students with disabilities have also been studied in this area, but with most of the research conducted focusing on students with learning disabilities. Despite several studies examining the effects of summer breaks on student learning and achievement, the research base is limited in regards to the population of students studied, and the types of disabilities included. Children with ASD are such a population of students whereby the research examining the effects of extended breaks in school is narrow. Currently, no study exists that specifically examines the effects of long breaks in schooling or intervention programs on student with ASD's progress and achievement. This is particularly concerning considering the social, behavioral and communicative deficits found among many students with ASD. Moreover, breaks in interventions and schooling may be especially detrimental to students with ASD, as it is often reported that children with ASD do not readily maintain skills (Arnold-Saritepe, Phillips, Mudford, De Rozario & Taylor, 2009).

Since there is scant research specifically examining the extent to which students with ASD regress or lose skills over summer vacation, research examining students' with ASD maintenance of skills after intervention implementation was explored. Although

these studies did not specifically examine summer breaks, each of the studies investigated whether children with ASD maintained academic, behavioral, social and communication skills over time. Overall, the maintenance of social skills was the most studied area in regards to maintenance of skills. However, maintenance of social skills was variable, with high maintenance effects reported when students received social skills interventions in their typical classroom. Other areas of maintenance, including academics and communication have a limited research base, with studies in this area demonstrating variable findings.

Overall, research examining the maintenance of skills for children with ASD is limited. Although several studies report positive findings in regards to maintenance of skills, there remain several unanswered questions, with several gaps within the literature. For instance, the studies that addressed maintenance of skills often failed to report the length of time in which maintenance effects were recorded. Further, these studies did not indicate whether additional instruction or intervention programs were in place during the maintenance phase. Many of the studies took place in a school setting; thus, one can assume that the students were receiving programming that may have helped them maintain the targeted skills. Further, when the length of time for maintenance was reported, it was often limited to a short period of time. Thus, it is difficult to compare these results to a typical summer break for students.

The current study sought to fill these important gaps within the literature. The goal of the study was to explore differing levels of summer support in order to gain a better understanding of if and how students with ASD maintained skills. Further, the

present study explored whether specific skill areas, including academic, communication and social skills were better maintained than the others.

CHAPTER 3

METHODOLOGY

Participants and Setting

Participants were part of a larger existing research project, the Philadelphia Autism Instructional Methods Study (Philly AIMS) during the 2009-2010 and 2010-2011 school years, funded by the National Institute of Mental Health (NIMH) and the Institute of Education Sciences (IES). The participants in the current study were all eligible for receiving Extended School Year (ESY) kindergarten-through-second grade ASD support in the selected school district. The children enrolled in these classrooms were between five and eight years of age, based on school district regulation. The total number of participants enrolled in Philly AIMS for the 2009-2010 school year was 327. Any of those participants who took part in the Philly AIMS study and had a complete data set during the 2009-2012 and the 2010-2011 school years were included in this project. To be included in the project, children had to have a diagnosis of ASD through the selected school district. The participants must have been enrolled at least half time within a kindergarten-through-second grade autism support classroom, and must have been consented participants enrolled in Philly AIMS for both the 2009-2010 and 2010-2011 academic years. The total number of participants in the current study was 139. Of these participants approximately 84% were male (N = 117) and 16% were female (N = 22) (which is expected given the higher proportion of children with ASD who are male). Approximately 47% of the participants were African-American, approximately 13% were Caucasian, approximately 4% were Asian, approximately 8% were Hispanic, 4% were multiple ethnicities and 2% were other races or ethnicities. Approximately 37% were in

kindergarten, 28% were in first grade, 8% were in second grade and 1% were in 3rd grade. The mean age of the students in the present study was 6 years 5 months. Approximately 75% of the participants were eligible for free or reduced-price lunch.

Procedures

Participants in the current study were selected from an existing research project, the Philadelphia Autism Instructional Methods Study (Philly AIMS). Philly AIMS was a randomized-control-trial looking at improving the implementation of the STAR Autism Program curriculum in kindergarten-second grade, Autism Support Classrooms in a large urban school district.

The STAR Program

The STAR Program is a curriculum designed to teach children with ASD the critical skills identified by the 2001 National Research Council (National Research Council, 2001). The STAR program is broken down into three distinct levels of instruction (Levels 1, 2, and 3), and encompasses six instructional areas, which include receptive language, expressive language, spontaneous language, pre-academic skills, functional skills and play/social skills. Level 1 is intended to teach students a basic understanding of language concepts, start to verbalize requests, follow simple routines, and participate in independent constructive play. In Level 2, students learn how to follow two-step commands, use multiple words to make requests, use verbs, names, play interactively, identify numbers, letters and some words, and answer "wh" questions. In Level 3, students learn to expand their vocabulary, use prepositions and pronouns, write from dictation, identify and use money, tell time, etc.

The STAR Program consists of three instructional methods based on Applied Behavior Analysis (ABA) principles, including discrete trial training, pivotal response training and functional routines. In discrete trial training (DT), skills are taught in a logical sequence. Concepts are first identified and then broken down in specific elements for instruction, with each instructional session consisting of a series of discrete trials. Within the STAR Autism Program, discrete trials consisted of a four step sequence: 1) instructional cue; 2) child response; 3) consequence (generally a positive reinforcer); and 4) a pause. Data were collected during every instructional session in order to monitor each student's progress, and to determine whether mastery had been reached for a specific skill set. Mastery criteria were defined as three consecutive correct responses across two days of instruction. The STAR Program provided a detailed guide and program plan for teaching students using this method of instruction. More specifically, DT was used within the STAR Program to teach receptive language concepts, pre-academic concepts and some mid and advanced level expressive language concepts.

Pivotal Response Training (PRT) provides a guideline for teaching skills and has been most successful at improving language, play and social interaction skills in children with ASD. Within the STAR Program, PRT is also based on the 4-step instructional sequence of cue, response, consequence and pause. However, in PRT, reinforcement had a specific relationship to the desired behavior and thus, trials are incorporated into the environment in a functional context. During PRT the child chooses the activity or object and the reinforcer is the natural consequence of the behavior being reinforced. For example, if a child wanted a cookie, the teacher would prompt a request for the cookie, and then reinforce this behavior by providing the child access to the cookie. PRT was

primarily used in the STAR Program to teach and generalize expressive language and play and socialization skills.

Structured Teaching/Functional Routines are generally associated with a functional outcome for the child, with the outcome of a routine serving as the reinforcer. Within the STAR Program, Functional Routines provided meaningful contexts for using, generalizing and maintaining receptive and expressive language skills, social interactions skills, and pre-academic concepts.

Philly AIMS Recruitment

All Autism Support Classrooms in a large metropolitan urban district were approached by the lead investigator for participation in the Philly AIMS project. Within these classrooms, all students were offered the opportunity to participate in the Philly AIMS project. To recruit students and families for the study, packets were sent home to the families via the students' schools and teachers. The packet consisted of a letter describing the Philly AIMS study. Within this letter parents were informed that if their child participated in Philly AIMS their child would receive a comprehensive assessment. Further, parents were informed that they would have to complete surveys about their child, and that they would be compensated $50 for the completion of the surveys in the fall, and $100 for completing them in the spring. A consent form was also included in the packet sent home to parents. Parents were asked to send signed consent forms back to their student's classroom teacher. All returned consent forms were collected from classroom teacher from the Philly AIMS research team.

Assessment Procedures

To assess student progress across the school year after the implementation of the STAR Program, comprehensive assessments were conducted in the Fall and Spring of each school year. Participating students were administered several measures assessing the social, communication, cognitive, academic, and adaptive behaviors of each student, including the following, the Autism Diagnostic Observation Schedule (ADOS), the Differential Ability Scale (DAS), the Social Responsiveness Scale (SRS), the Aberrant Behavior Checklist (ABC), the PDD-BI, and the Adaptive Behavior Assessment System (ABAS). At the beginning of the school year, schools were contacted by the researchers via fax and phone to schedule days that assessment teams could come out to the school to assess the students participating in Philly AIMS. Assessment teams consisted of a trained DAS examiner and a Research Assistant. The assessment teams were sent out to the participating classrooms every day across three-four weeks. All students were assessed by the assessment team in their respective schools during the regular school day. Teachers were asked to complete several surveys, including the Social Responsiveness Scale (SRS) and the PDD-Behavior Inventory (PDD-BI). These were distributed and collected from teachers by the research team. Parents were also asked to complete several surveys and rating scales, including the Social Responsiveness Scale (SRS), the Aberrant Behavior Checklist (ABC), and the Adaptive Behavior Assessment System (ABAS) assessing their child's behavior in both the Fall and Spring. These surveys were sent home to parents and returned to the research team via the students' teachers.

Present Study

During the 2010 summer, 139 of the students from the Philly AIMS project were tracked to monitor progress from Spring 2010 to Fall 2010. For the purpose of this study, three differing levels of summer Extended School Year (ESY) were compared, in order to explore the effects of Extended School Year programming on the maintenance of cognitive, behavioral and social skills for children with ASD. The three differing levels of ESY support included: students who received no ESY programming; students receiving ESY support as provided by the school district; students receiving ESY support provided by the school district plus individualized programming support. This study used a quasi-experimental design using a pre-test and post-test measure for all participants. The participants were grouped by level of ESY support (no ESY, standard ESY and ESY with individualized support) and level of functioning. Level of functioning was determined using expressive language level measured by the Autism Diagnostic Observation Schedule. All students' cognitive, behavioral, and social skills were assessed in May and September 2010.

Extended School Year Programming

Fifty-two of the participants were in the ESY programming condition and were those students who participated in the Philly AIMS study and who attended a typical ESY program over the summer. Students in the ESY Programming condition were those students who showed up and attended ESY within their school district. Extended School Year services are specialized instruction and related services, such as therapies provided to a child with a disability when the school program is not normally in session, for instance, in the summer vacations. School-aged children with disabilities are eligible for

ESY services if the Individualized Education Plan (IEP) Team determines that the services are necessary to provide the child with a free and appropriate public education. In the selected school district, all children with ASD were eligible for ESY services. Appropriate services must be individualized to meet the needs of the child. Further, children identified as in need for extended school year programming are entitled to all the special education and related services on their ESY IEPs.

The selected district's ESY programs focused on academics during the first part of the morning and art, music, and other enrichment activities in latter part of the ESY school-day. The STAR curriculum was not implemented as a part of the selected district's ESY program. Approximately eight students were present in each Extended School Year (ESY) Autism Support Classroom. Students attended the program for three days a week for three-hours for seven-weeks. One day a week classrooms spent half of the ESY day out of their classrooms and in the community participating in community training in order to learn functional skills necessary for daily living. Students received breakfast and lunch each day. Teachers were assigned to the Autism Support ESY classrooms by the school district. Teachers were not required to have experience teaching students with ASD, and were not required to teach in an Autism Support classroom during the regular school year.

ESY with Individualized Programming

A total of 30 participants were in the ESY programming condition and were those students who participated in the Philly AIMS study and who attended an ESY program with individualized programming over the summer. The individualized programming condition was based upon the curriculum used throughout the school-year, the STAR

program. The STAR program is based on three instructional techniques including discrete trial, pivotal response training and functional routines/structured teaching. The individualized programming condition used these three strategies, which are known to be effective with children with ASD, along with using a motivational component. The individualized programming condition also contained optional consultation for teacher who wanted to learn about any of the three teaching areas (DT, PRT or functional routines/structured teaching.) Consultation support was provided by trained coaches on instructional and behavioral strategies shown to be effective for children with ASD. Coaches worked with the ESY teachers once a week for approximately two-three hours, and provided the teachers with strategies including modeling, behavior management, classroom routines, schedules, and daily activities.

No ESY

The final group of participants were those who participated in the Philly AIMS study, but did not attend any ESY program during the summer. All students in the current study were eligible for ESY programming, however students in this group were not recorded to have attended the school district's ESY programming. Forty-one of the participants were in the no ESY group.

Measures

The Differential Ability Scale (DAS-II)

The Differential Ability Scale is an individually administered battery of cognitive tests for children aged 2 years, 6 months to 18 years (Elliot, 2007). The DAS is divided into three levels, Lower Preschool (ages 2 years, 6 months through 3 years, 5 months),

Upper Preschool (aged 3 years, 6 months through 5 years, 11 months), and School-Age (6 years, 0 months through 17 years, 11 months). All participants in the current study were administered the Upper Preschool level. The Upper Preschool battery includes six core subtests and measures General Conceptual Ability, Verbal, Nonverbal and Visual-Spatial Ability; a Special Nonverbal score may also be obtained. The DAS was administered to all participants by trained examiners in September and October of the Fall semester, and April and May of the Spring semester. The DAS-II may be considered a more appropriate assessment tool for evaluating the cognitive abilities of children with ASD and other disabilities because it relies less on expressive language ability than other cognitive assessments and its primary purpose is as a tool for identifying and understanding the strengths and weaknesses in individuals rather than establishing a general IQ score. Although specific information regarding the utility of the DAS-II for children with ASD is not available, the measure has been reported to have strong psychometric properties with the general population (Elliot, 2007). Internal reliability for the sub-tests within the school age battery was high and ranged from .74 to .96. Similarly, test-retest reliability was also high and ranged from .78 to .83. Lastly, the DAS-II has been shown to be highly correlated with other measures for cognitive ability, with correlations with the WISC-IV generally found to be in the .70's and correlations with the Bayley-III ranging from .56 to .67 (Elliot, 2007). The DAS-II was used to evaluate differences in treatment outcome after ESY programming based on cognitive levels.

Social Responsiveness Scale (SRS)

The SRS was administered via parent and teacher survey at the beginning and end of the school year by the Philly AIMS Team. The Social Responsiveness Scale is a rating scale that measures the severity of autism spectrum disorders as they occur in natural social settings (Constantino, 2004). Both parent and teacher versions were utilized in the current study. The SRS assesses social awareness, social information processing, capacity for reciprocal social communication, social anxiety/avoidance, and autistic preoccupations and traits. It can be used with children from four to 18 years of age. The SRS is particularly useful for this study as it measures impairment on a quantitative scale across a wide range of severity, and therefore provides information regarding the social functioning of children with varying degrees of autism severity. Internal consistency is high for normative parent ratings, normative teacher ratings, and clinical ratings, ranging from .93 to .97 for all groups. Further, test-retest stability ranges from .77 to .85 for parent ratings; mother-father, mother-teacher, and father-teacher interrater reliabilities were .91, .82, and .75, respectively (Constantino, 2004). Validity was examined for the SRS in terms of discriminant validity, concurrent validity, structural validation, and factor analytic studies. Measures of validation for the SRS against other diagnostic measures for autism revealed a strong association between the SRS and the Autism Diagnostic Interview-Revised, which is largely considered the gold standard for autism diagnostic interviews (Constantino, 2004). Results of the teacher and parent SRS were used to evaluate students level of social functioning before and after ESY programming.

Aberrant Behaviors Checklist (ABC)

The ABC was administered via parent survey at the beginning and end of the school year by the Philly AIMS Team. The ABC evaluates the presence of problem behaviors in individuals with developmental delays (Aman, Singh, Stewart, & Field, 1985). The ABC takes 10-15 minutes to complete and can be used on individuals ages 5 to 54 years old. The ABC includes 58 items and produces scores across five subscales, including irritability, agitation, lethargy/social withdrawal, stereotypic behavior, hyperactivity/noncompliance and inappropriate speech. Psychometric studies of the ABC have shown high internal consistency (subscale range of 0.86-0.95), moderate inter-rater reliability (0.63) and very high test retest reliability (0.96-0.99). Criterion validity is also high (Aman, Singh, Stewart, & Field, 1985). Results of the ABC were used to identify levels of inappropriate behaviors in the children and evaluate the presence of these behaviors before and after ESY programming.

PDD Behavior Inventory (PDD-BI)

The PDD-BI was administered via teacher survey at the beginning and end of each academic year by the Philly AIMS team. The PDD-BI is a rating scale that assesses problem behaviors, social skills, and language skills, in children who have been diagnosed with Pervasive Developmental Disorders (PDD) (Cohen & Sudhalter, 2008). It can be used with children between the ages of 1.6 and 12.5 years. The teacher rating form used in this study consists of 124 items and is administered in approximately 20 to 30 minutes. The PDD-BI has high reliability and validity, test-retest reliability for the teacher ratings ranged from .65-.99 over an average 2-week interval and inter-rater reliability among teachers ranged from .85 to .92. Construct validity was also high and

ranged from .63 to .73 for Factor 1 and .58 to .89 for Factor 2. The PDD-BI is highly correlated with the Childhood Autism Rating Scale (CARS) and the Vineland Adaptive Behavior Scales (Cohen & Sudhalter, 2008). Results of the PDD-BI were used to identify levels of problem behaviors, social skills and expressive language skills in children and evaluate the presence of these behaviors before and after ESY programming.

Adaptive Behavior Assessment System (ABAS-II)

The parent survey version of the ABAS-II was administered to all participants in Philly AIMS at the beginning and end of each academic year to assess daily living skills. The ABAS-II uses a behavior-rating format to assess adaptive behavior and related skills for individuals birth through 89 years of age. The scores derived from the ABAS-II describe an individual's general adaptive behavior as well as his or her functioning in ten related adaptive skill areas: communication, community use, functional academics, school/home living, health and safety, leisure, self-care, self-direction, social, and work (for older adolescents and adults). These skill areas encompass the practical, everyday skills required to function and meet environmental demands, including those needed to effectively and independently care for oneself and to interact with others. Reliability estimates for the ABAS-II are high; estimates of internal consistency and test-retest reliability are above .90. Average reliability coefficients for the 10 skill areas across all ages range from .85 to .97. Inter-rater reliability and cross-form consistency also are high. Factor analytic, concurrent validity and clinical studies provide strong support for its validity. Results of the ABAS-II were used to identify the presence of adaptive behavior skills in children with ASD before and after ESY programming.

Autism Diagnostic Observation Schedule (ADOS)

In the current study the ADOS was used to group students according to level of functioning based on their expressive language level. The Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2000) provides a context for a semi-structured standardized assessment of social interaction, communication (verbal and nonverbal), play or imaginative use of materials, and repetitive/restricted behaviors associated with a diagnosis of Autism Spectrum Disorder (ASD). There are four different modules of the ADOS, administered depending on the language level of the individual being assessed. Only children assessed using Modules 1, 2 and 3 were included in the current study. Module 1 is for children who are non-verbal or use primarily single words and occasional phrase speech. Module 2 is for children with phrase speech, and Module 3 is for children with fluent speech. The Autism Diagnosis Observation Schedule (ADOS) was administered to all participants in September and October of the Fall semester, and April and May in the Spring semester. Interrater reliability for Module 1 items is 91.5% agreement across items. Interrater reliability for Module 2 items is 89% agreement. Interrater reliability for Module 3 is 88.2% agreement across items, with 16 items receiving kappas of .60 or better. Intterater reliability in diagnostic classification of autism versus non-spectrum comparisons based on the ADOS algorithm is 100% for Modules 1 and 3 and 91% for Module 2. Test-retest reliability is .78 for Social Interaction Domain; .73 for Communication Domain; .82 for the Communication-Social Interaction Total Domain and .59 for Stereotyped Behaviors and Restricted Interests. All ADOSs were administered and coded by individuals who had achieved research-reliability status, as defined by at least three consecutive instances of 80% or higher agreement for the ADOS. Cronbach's alphas are consistently highest for

the Social Interaction Domain (,86 to .91 for each module), slightly lower for the Communication Domain (.74 to .84), and lower for Stereotyped Behaviors and Restricted Interests (.63 to .65 for Modules 2 and 1 and .56 for Module 3).

CHAPTER 4

RESULTS

The main focus in this study was summer regression, or the change in cognitive, behavioral, and social abilities from June to September among children with autism spectrum disorders. Thus, pre-test to post-test scores were the main focus of the analysis. Additional variables analyzed included the participants' ADOS Module, and level of functioning.

The distribution of the sample was examined prior to conducting analyses to determine if the sample met with statistical assumptions. Distribution of frequencies were examined for overall cognitive abilities, and social and behavioral outcomes, including the DAS-II General Ability Scale (GCA), The Social Responsiveness Scale Total Parent and Teacher SRS score, the PDD-Behavior Inventory Autism Composite Score, the ABAS-II General Adaptive Composite (GAC), and all scales from the ABC. All of the identified variables were evenly distributed across the target sample.

Before conducting any analyses comparing the independent variable (levels of ESY support) pre-test scores were initially compared by group. Table 1 lists pre-test scores for overall cognitive abilities for the different groups. A one-way ANOVA comparing the pre-test General Conceptual Ability scores of participants in different levels of ESY programming was conducted. A significant difference was found among the different groups ($F(2, 121) = 7.95$, $p < .001$). Tukey's HSD was used to determine the

nature of the differences between ESY Group and GCA. This analysis revealed that students' overall cognitive abilities in the No ESY group (*m* = 72.33, *sd* = 22.2) were significantly higher than the students in the Standard ESY group (*m* = 56.22, *sd* = 18.34). However, the No ESY group did not significantly differ in overall cognitive abilities when compared to students in the ESY with individualized support group. The two groups of students who attended ESY (standard ESY and ESY with individualized support) did not significantly differ in overall cognitive abilities.

Table 1. GCA Pre-test Means by ESY Group

ESY Group	Pre-test Mean (sd)	Sig	ES
No ESY (n = 42)	72.33 (22.2)		
ESY (n = 52)	56.22 (18.34)	.001	.116
ESY with Support (n = 28)	62.62 (17.9)		

Since the three groups differed at pre-test on their overall cognitive abilities, pre-test GCA was used as a covariate in all subsequent analyses examining between-group differences. Although the groups differed in other areas at pre-test, overall cognitive ability was used as the covariate as it is a core ability that underlies other skills and abilities measured. For each outcome domain, the pre-test variable was used as a covariate when conducting analyses examining the effects of ESY programs in order to covary out the effects of pre-test differences.

Since each research question in the current study involved the examination of different domains (including cognitive, social and behavioral outcomes), the following sections will answer each research question by addressing each outcome domain separately. Cognitive abilities were assessed using the DAS-II overall General Abilities Scale (GCA), Verbal Scale, Non-Verbal Scale and Spatial Scale. Social outcomes were

assessed using the parent and teacher Social Responsiveness Scale treatment scales. Behavioral outcomes were assessed using the PDD-BI, the ABC and the ABAS-II Composites. Table 2 provides additional information on each of these scales.

Table 2. Dependent Variables in the Cognitive, Social and Behavioral Domains

Domain	Assessments	Subscales
Cognitive	DAS-II	GCA
		Verbal
		Non-verbal
		Spatial
Social	Parent SRS	Social Awareness
		Social Cognition
		Social Communication
	Teacher SRS	Social Motivation
		Autistic Mannersims
Behavioral	PDD-BI	Sensory and Perceptual
		Ritualism/Resistance to Change
		Social Pragmatic Problems
		Semantic Pragmatic Problems
		Expressive Language
		Autism Composite
	ABC	Hyperactivity/Noncompliance
		Irritability
		Lethargy/Social Withdrawal
		Stereotypic Behavior
		Inappropriate Speech
	ABAS-II	GAC
		Conceptual
		Social
		Practical

Research Question 1

The first research question that this study aimed to answer was whether students with ASD maintain cognitive abilities and classroom behaviors over the summer break from school. Specifically, this study sought to determine whether changes in cognitive abilities, social, and behavioral outcomes differed according to the level of summer support participants received (no ESY, ESY alone, or ESY with individualized student support). Initial analyses were conducted on the entire sample to determine whether the overall population of students with ASD maintained abilities. A repeated-measures analysis of variance (ANOVA-RM) was computed to compare pre-test to post-test scores on cognitive, social, and behavioral outcomes. Results of these analyses can be found in Appendix A.

To answer the first research question, separate analyses were conducted for each outcome area, including cognitive, social and behavioral abilities. One-way analyses of covariance (ANCOVA) were conducted for each variable within each domain, with post-test scores as the dependent variable and the pre-test score for each variable as the covariate. General Cognitive Ability (GCA) was also used as a covariate in each ANCOVA analysis. Individual one-way ANCOVAs were conducted for each individual variable to covary out the effect of pre-test differences on each variable. In addition, Multivariate Analysis of Variance (MANOVA) was not used due to missing data points for several key variables, resulting in a small sample size. Thus, a .01 alpha level was used for all analyses comparing group differences in order to increase power and reduce Type I error.

Cognitive Abilities

Separate analyses were conducted for each of the cognitive abilities variables, including GCA, Verbal, Non-Verbal, and Spatial scores. A one-way between subjects ANCOVA was conducted to examine the effects of ESY programs (no ESY, ESY, and ESY with individualized support) on post-test overall cognitive scores (GCA) using pre-test GCA as a covariate. The main effect for ESY group was not significant ($F(2, 114) = .453$, $p > .05$), with no differences between ESY groups from pre-test to post-test on GCA after covarying out pre-test differences. A one-way between subjects ANCOVA was also conducted to examine the effects of ESY program on Verbal post-test scores using GCA and pre-test verbal scores as covariates. The main effect for ESY group was not significant ($F(2, 112) = 1.59$, $p > .05$) indicating that there were no differences between ESY groups at post-test. Likewise there were no significant effects for ESY group for Non-verbal ($F(2, 106) = .405$, $p > .05$) and Spatial ($F(2, 117) = .377$, $p > .05$) with no differences between ESY groups from pre-test to post-test score on the Non-verbal and Spatial scales after covarying out pre-test differences. Overall, there were minimal differences between ESY groups on post-test cognitive abilities scores after controlling for pre-test differences on GCA and each individual variable's pre-test scores. Pre-test and post-test means for each cognitive outcome measure can be found in Appendix B.

Social Outcomes

Social outcomes were assessed by examining post-test scores on the Parent and Teacher Social Responsiveness Scale. A one-way between subjects ANCOVA was

conducted for each variable to examine the effects of ESY programs (no ESY, ESY, and ESY with individualized support) on post-test scores using GCA and each variable's pre-test score as a covariate. For example, a one-way between subjects ANCOVA was calculated to examine the effect of ESY group on the post-test parent-SRS Total scores, using GCA and pre-test parent SRS Total scores as covariates. The main effect for ESY group was not significant ($F(2, 30) = .739$, $p > .05$), indicating that there were no difference from pre-test to post-test between ESY groups. Likewise, a one-way between subjects ANCOVA was calculated to examine the effect of ESY group on the post-test teacher SRS Total scores, using GCA and pre-test teacher SRS Total scores as covariates. The main effect for ESY group was not significant ($F(2, 103) = .061$, $p > .05$), demonstrating that there were no differences between ESY groups on post-test SRS Total scores as rated by the participants' teachers. Pre-test to post-test differences are displayed in Appendix B for each of the social abilities variables including social awareness, social cognition, social communication, social motivation and autistic mannerisms.

Behavioral Outcomes

Behavioral outcomes were assessed by examining post-test scores on the PDD Behavior Inventory (PDD-BI) Teacher version, the Aberrant Behavior Checklist (ABC)-Parent version, and the Adaptive Behavior Assessment System (ABAS-II) Parent Version. Each target behavioral outcome variable is shown in Table 3. A one-way between subjects ANCOVA was conducted for each variable to examine the effects of ESY programs (no ESY, ESY, and ESY with individualized support) on post-test scores using GCA and each variable's pre-test score as a covariate.

For the PDD-BI, the main effect for ESY group was not significant for Sensory/Perceptual Approach Behaviors ($F(2, 69) = .160$, $p > .05$); Ritualism/Resistance to Change ($F(2, 70) = .356$, $p > .05$); Social Pragmatic Problems ($F(2, 70) = .080$, $p > .05$); Semantic Pragmatic Problems ($F(2, 51) = .291$, $p > .05$) Social Approach Behaviors ($F(2, 70) = .353$, $p > .05$); and the Autism Composite Score ($F(2, 66) = .479$, $p > .05$). As described in Appendix A, in the overall sample, students' expressive language abilities as measured on the PDD-BI Expressive Language Scale improved significantly from pre-test to post-test. Group differences were examined by conducting a one-way between subjects ANCOVA to examine the effects of ESY Programs on expressive language post-test scores using GCA and pre-test Expressive Language scores as covariates. The main effect for ESY group was not significant ($F(2, 52) = .172$, $p > .05$) with no differences between ESY groups from pre-test to post-test score on the Expressive Language after co-varying out pre-test differences. Pre-test to post-test change are depicted in Table 8 for each scale on the PDD-BI.

For the ABC, there was no significant main effect for ESY group for Irritability ($F(2, 44) = 2.33$, $p > .05$); Lethargy and Social Withdrawal ($F(2, 45) = .349$, $p > .05$); Inappropriate Speech ($F(2, 48) = .374$, $p > .05$); and Stereotypic Speech ($F(2, 46) = .230$, $p > .05$); with no differences between ESY groups from pre-test to post-test score on each cale after covarying out pre-test differences.

A one-way between subjects ANCOVA was calculated to examine the effect of ESY group on post-test Hyperactivity and Noncompliance using pre-test Hyperactivity and Noncompliance scores and GCA as covariates. There was a significant difference between ESY groups for post-test Hyperactivity scores ($F(2, 43) = 3.402$, $p < .05$). A

Tukey's post-hoc test was conducted to determine the nature of the differences between the groups. This analysis revealed that students' hyperactivity in the No ESY group increased significantly ($p<.01$) more than students in the ESY with Individualized support group. There were no differences between students in the No ESY group and ESY group. Figure 1 displays mean differences for the ABC Hyperactivity Scale by ESY group.

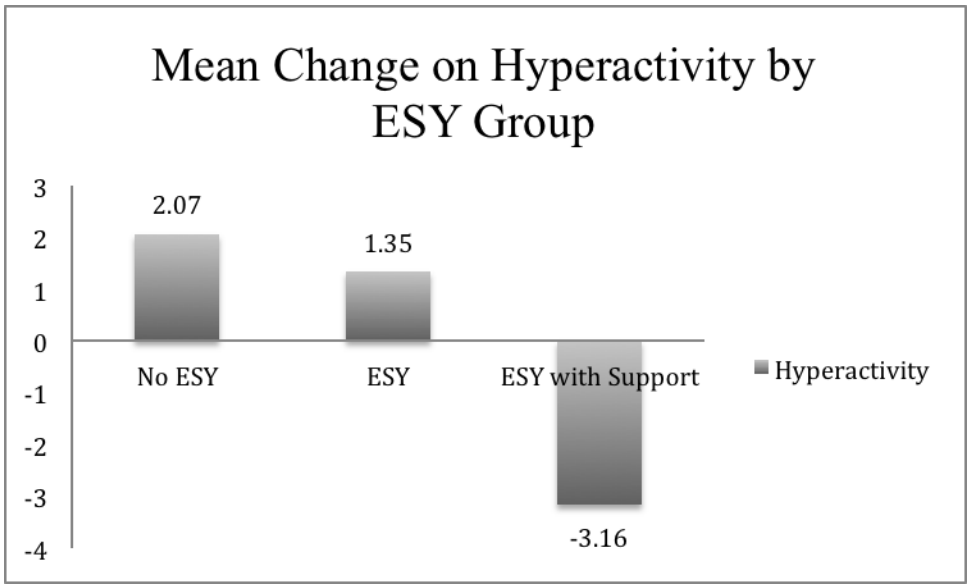

Figure 1. Mean Differences in Hyperactivity by ESY group

Individual one-way between subjects ANCOVAs were calculated for each of the variables on the ABAS-II including GAC, Conceptual, Social and Practical Composites using GCA and each individual variable's pre-test scores as covariates. For the ABAS-II the main effect for ESY group was not significant for GAC ($F(2, 49) = 1.68$, $p < .05$); Conceptual Composite ($F(2, 49) = 2.35$, $p < .05$); Social Composite ($F(2, 49) = 1.41$, $p < .05$); and the Practical Composite ($F(2, 49) = 1.05$, $p < .05$), indicating that there were no group differences at post-test on adaptive behavior abilities, when controlling for GCA

and adaptive behavior pre-test differences. As indicated in Table 8 group-pre test and post-test means for No ESY versus standard ESY and ESY with Individualized Support demonstrated that scores on adaptive behavior measures for students who did not attend ESY decreased more than those of their peers who attended ESY over the summer. Although the results were not significant, students who did not attend ESY decreased in their overall adaptive behavior as well as in their conceptual, social and practical adaptive behavior skills.

Overall, as shown in Table 3 there were minimal differences between ESY groups on post-test behavioral outcomes scores after controlling for the effect of pre-test differences on GCA and each individual variables pre-test scores.

Table 3. Descriptive Statistics Regarding Pre- and Post-test Behavioral measures by ESY Group

Measure	No ESY		ESY		ESY with Support		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
PDD-Behavior Inventory-Teacher PDD-BI								
Sensory	48.20 (13.1)	47.96 (11.4)	54.56 (13.8)	50.56 (15.6)	48.35 (12.1)	50.82 (15.3)	.852	.005
Ritual	49.12 (10.2)	52.50 (12.6)	52.28 (11.6)	53.31 (13.9)	54.41 (11.0)	53.47 (12.9)	.701	.010
SOCPP	54.92 (10.5)	57.12 (12.8)	59.63 (9.4)	55.81 (11.8)	52.47 (11.6)	56.00 (13.7)	.924	.002
SEMPP	50.83 (9.9)	54.74 (8.90)	58.61 (8.9)	55.61 (11.6)	53.20 (6.2)	55.70 (12.7)	.749	.011
SOCAPP	58.27 (13.1)	58.88 (11.6)	57.06 (9.8)	59.84 (13.9)	60.18 (9.2)	59.35 (13.7)	.704	.010
Expressive Language	56.22 (8.9)	58.43 (8.5)	52.58 (6.2)	58.50 (10.9)	58.10 (6.2)	56.90 (11.7)	.842	.007
Autism Composite	46.75 (13.4)	46.75 (11.6)	53.37 (11.7)	49.10 (15.5)	47.35 (11.6)	48.41 (16.1)	.622	.014

Aberrant Behavior Checklist (ABC)								
	No ESY		ESY		ESY with Support		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
Hyperactivity	23.08 (13.8)	25.15 (13.6)	15.78 (10.2)	17.13 (11.4)	13.83 (8.8)	10.67 (7.4)	.043	.137
Irritability	15.13 (10.2)	16.53 (12.9)	12.60 (8.9)	13.25 (8.1)	11.07 (9.3)	8.86 (6.1)	.109	.096
Lethargy	7.80 (6.6)	8.40 (8.1)	7.68 (8.2)	9.36 (8.7)	6.38 (5.7)	6.46 (6.7)	.708	.015
Stereotypy	5.50 (4.2)	6.56 (5.8)	4.14 (4.6)	5.59 (5.2)	3.46 (4.9)	4.23 (3.8)	.795	.010
Inappropriate Speech	4.37 (3.1)	4.63 (3.2)	2.48 (2.9)	2.70 (2.9)	3.14 (2.8)	3.00 (2.3)	.690	.015

Table 3. (continued)

Adaptive Behavior Assessment System (ABAS-II)								
	No ESY		ESY		ESY with Support		Sig	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
GAC	74.00 (16.6)	67.50 (16.5)	58.74 (16.7)	56.35 (12.85)	71.07 (20.8)	69.60 (17.9)	.197	.064
Conceptual	77.81 (14.3)	70.75 (13.4)	63.43 (15.2)	62.09 (11.5)	74.47 (17.5)	72.87 (17.9)	.106	.087
Social	78.81 (14.5)	74.37 (13.0)	66.70 (11.1)	66.04 (8.8)	77.07 (18.2)	77.13 (15.7)	.253	.055
Practical	75.88 (17.8)	69.13 (19.9)	60.64 (20.1)	58.17 (16.9)	72.33 (22.2)	71.67 (19.3)	.357	.040

Research Question 2

The second research question sought to examine whether maintenance of skills among students with autism spectrum disorder differed depending on the skill area. Specifically, if there was a difference between the maintenance of cognitive abilities, behavioral, or social skills? In order to answer this research question, the analyses used in research question 1 (Appendix A) were examined. Repeated Measure ANOVAs were conducted in each outcome area including cognitive, social and behavioral. Overall, the sample maintained cognitive abilities scores from pre-test in June to the post-test in September and demonstrated little regression, as shown in Appendix A. Likewise, the ANOVA-RM's indicated that overall, the sample maintained social ability scores from pre-test in June to the post-test in September and demonstrated little regression. Behavioral outcomes were assessed using different behavior rating scales. On the PDD-BI, participants maintained behaviors from pre-test in June to the post-test in September,

with the ANOVA-RM's indicating no significant effects for sensory/perceptual approach behaviors, ritualism/resistance to change behaviors, social pragmatic problems, semantic pragmatic problems, social approach behaviors, or on the overall autism composite. Similarly, no significant effects were found when an ANOVA-RM was conducted for the ABC hyperactivity, lethargy and social withdrawal, hyperactivity, and inappropriate speech scales. Figure 2 displays mean pre-test and post-test scores for the different outcome areas. Change score means are depicted in Figure 3 for each outcome area.

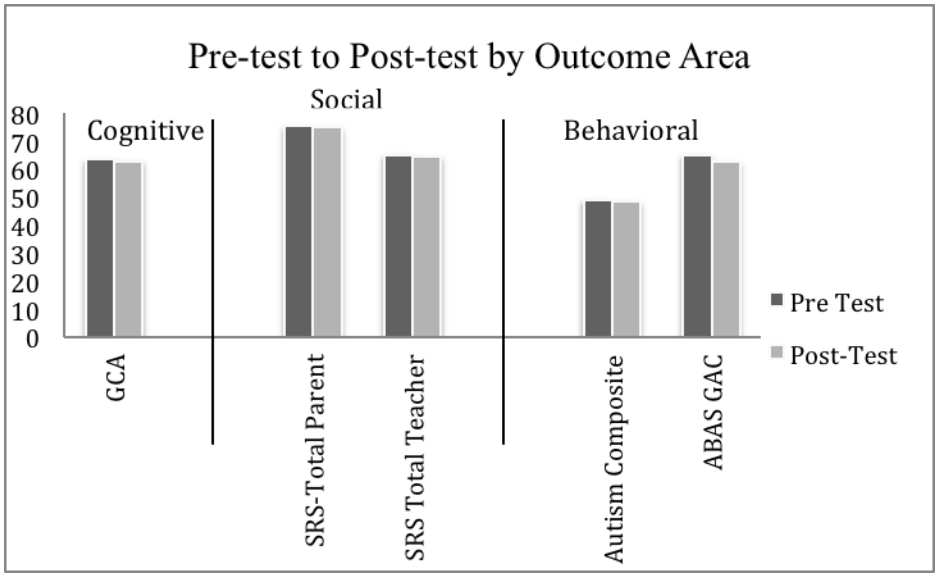

Figure 2. Pre-test to post-test by outcome area

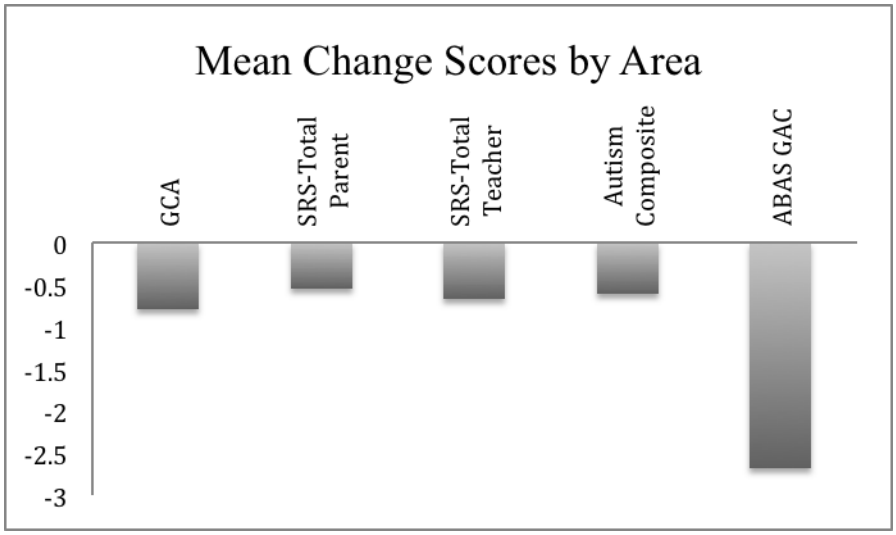

Figure 3. Mean Change Scores by Outcome Area

Significant effects were found for several behavioral areas. A repeated-measures ANOVA was calculated examining pre-test and post-test scores on expressive language. A significant effect was found for Expressive Language ($F(1, 62) = 6.46$, $p < .05$). Post-test scores (m =58.62, sd = 10.05), increased significantly from pre-test (m = 54.73, sd = 7.44), indicating that the participant's expressive language abilities improved significantly pre-test to post-test. An ANOVA RM examined pre-test and post-test differences for the ABC Stereotypic Behavior scale and found a significant effect for Stereotypic Behavior ($F(1, 57) = 7.10$, $p < .05$). Post-test scores (m =5.79, sd = 5.43) increased significantly from pre-test (m = 4.57, sd = 4.79), indicating that the participant's stereotypic behavior increased significantly from pre-test to post-test. Finally, an ANOVA-RM found a significant effect for the ABAS General Adaptive Composite ($F(1, 60) = 5.23$, $p < .05$). Post-test scores (m =62.39, sd = 15.93) decreased significantly from pre-test (m = 65.07, sd = 18.68), indicating that the participant's overall adaptive behavior decreased significantly from June to September. A significant

effect was also found for the Conceptual Composite. Post-test scores (m =66.95, sd = 14.20) decreased significantly from pre-test (m = 69.31, sd = 16.55). Figure 4 displays pre-test and post-test scores for each of these outcome areas.

An additional analysis was conducted to determine whether maintenance of skills differed depending on the skill area. Using the repeated-measures ANOVA previously described, effect sizes were computed for the variables in each of the three domain areas. Within the cognitive domain, only the Verbal, Non-verbal and Spatial abilities scales were used; GCA was not used, as it incorporates the three other cognitive variables. Table 4 provides the mean effect sizes for each domain, including cognitive, social and behavioral. A one-way ANOVA comparing the effect sizes for each different domain area was conducted. The analysis was not significant ($F(2, 29) = .983$, $p > .05$), indicating that the three domain areas effect sizes did not differ. Specifically, children with ASD did not differ in the maintenance of cognitive, social, or behavioral outcome areas.

Table 4. Mean Effect Sizes for Cognitive, Social and Behavioral Domains

Outcome Area	Mean Effect Size (sd)	Sig	ES
Cognitive Variables (n = 3)	.034 (.055)		
Social Variables (n = 12)	.015 (.016)	.383	.063
Behavioral Variables (n = 16)	.032 (.037)		

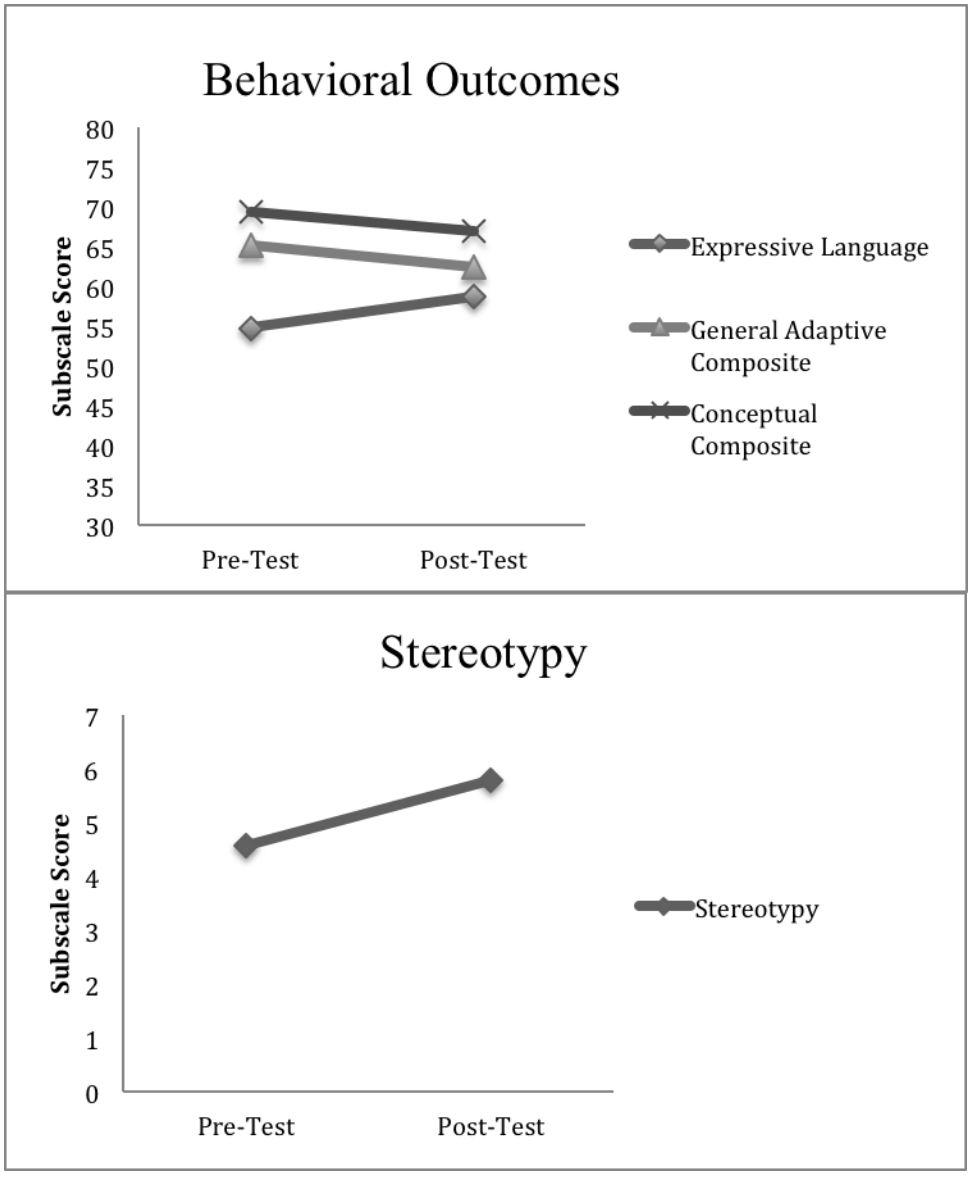

Figure 4. Pre-test and Post-test Scores for Behavioral Outcomes

Question 3: Differences in Student Level of Functioning and Maintenance of Skills

The third research question examined whether differing levels of functioning among children with autism was related to increased or decreased regression of skills over the summer vacation months. In order to answer this research question, Pearson

Correlations were computed examining students' initial level of functioning as measured on the pre-test ADOS Module and three main groups of variables, including changes in cognitive abilities, changes in social skills, and changes in behavior. Using the ADOS, students were grouped into one of three Modules, depending on their expressive language and vocal communication abilities. Students in Module 1 had little or no phrase speech, students in Module 2 had phrase speech, and students in Module 3 were verbally fluent. These correlations are presented in Table 5. In the cognitive outcome area there was a significant positive correlation between the students' level of functioning as measured by the ADOS Module and DAS Verbal change score ($r = 0.199$, $n = 124$, $p = .027$). There were no significant correlations between student level of functioning and mean changes on social outcomes. In the behavioral outcome area there was a significant positive correlation between students' level of functioning as measured by ADOS Module and the PDD-BI Autism Composite change ($r = 0.311$, $n = 77$, $p = .006$); PDD-BI Sensory change ($r = 0.288$, $n = 81$, $p = .009$); and PDD-BI Social Pragmatic Problems ($r = 0.225$, $n = 82$, $p = .042$). There was also a significant negative correlation between ADOS Module and ABAS-Practical Composite change ($r = -0.295$, $n = 61$, $p = .020$).

Table 5. Pearson Correlations between ADOS Module and Change Scores

Mean Changes for Cognitive Outcomes		ADOS Module
GCA Change Score	Pearson Correlation	.017
	Sig. (2-tailed)	.851
	N	124
DAS Verbal Change Score	Pearson Correlation	.199*
	Sig. (2-tailed)	.027
	N	123
DAS Non-Verbal Change Score	Pearson Correlation	-.061
	Sig. (2-tailed)	.516
	N	116
DAS Spatial Change Score	Pearson Correlation	-.002
	Sig. (2-tailed)	.985
	N	125
Mean Changes for Social Outcomes		
SRS Total Change Parent	Pearson Correlation	.020
	Sig. (2-tailed)	.904
	N	47
SRS Total Change Teacher	Pearson Correlation	.018
	Sig. (2-tailed)	.842
	N	123
Mean Changes for Behavioral Outcomes		
PDDBI Autism Composite Score Change	Pearson Correlation	.311**
	Sig. (2-tailed)	.006
	N	77
PDDBI Sensory Change	Pearson Correlation	.288**
	Sig. (2-tailed)	.009
	N	81
PDDBI Ritualistic Change	Pearson Correlation	.175
	Sig. (2-tailed)	.115
	N	82
PDDBI SOCPP Change	Pearson Correlation	.225*
	Sig. (2-tailed)	.042
	N	82
PDDBI SEMPP Change	Pearson Correlation	.236
	Sig. (2-tailed)	.062
	N	63

Table 5 (Continued)

PDDBI SOCAPP Change	Pearson Correlation	-.184
	Sig. (2-tailed)	.099
	N	82
PDDBI EXPRESSIVE Change	Pearson Correlation	-.192
	Sig. (2-tailed)	.149
	N	58
ABC Irritability Change	Pearson Correlation	-.160
	Sig. (2-tailed)	.240
	N	56
ABC Lethargy Change	Pearson Correlation	-.019
	Sig. (2-tailed)	.861
	N	57
ABC Stereotypy Change	Pearson Correlation	-.161
	Sig. (2-tailed)	.227
	N	58
ABC Hyperactivity Change	Pearson Correlation	.015
	Sig. (2-tailed)	.911
	N	55
ABC Inappropriate Speech Change	Pearson Correlation	.053
	Sig. (2-tailed)	.690
	N	60
ABAS GAC Change	Pearson Correlation	-.236
	Sig. (2-tailed)	.067
	N	61
ABAS Conceptual Change	Pearson Correlation	-.238
	Sig. (2-tailed)	.065
	N	61
ABAS Social Change	Pearson Correlation	-.202
	Sig. (2-tailed)	.119
	N	61
ABAS Practical Change	Pearson Correlation	-.295*
	Sig. (2-tailed)	.020
	N	

In order to further explore the relationship between students' level of functioning and changes from pre-test to post-test on cognitive and behavioral outcomes, analyses of covariance (ANCOVAs) were conducted. Before examining the differences between groups on pre and post-test cognitive and behavioral outcomes, initial analyses

comparing pre-test group differences were conducted. A one-way ANOVA comparing the pre-test General Conceptual Ability scores of participants who had different levels of functioning as measured by the ADOS showed a significant difference between the different levels of functioning ($F(2, 121) = 64.9$, $p < .001$). Tukey's HSD was used to determine the nature of the differences between ADOS Module and GCA. This analysis revealed that that students in the Module 3 group (verbally fluent) had a significantly higher GCA ($m = 84.61$, $sd = 14.5$) than students in the Module 1 and 2 groups. Students in Module 2 (phrase speech) had a significantly higher GCA that student in the Module 1 group (little or no phrase speech). Since the three groups were significantly different on GCA at pre-test, a one-way between subjects ANCOVA was conducted for all subsequent analyses in order to covary out the effect of pre-test overall cognitive abilities (GCA).

In the cognitive domain, a one-way between subjects ANCOVA was calculated to examine the effects of Module (1, 2 or 3) on post-test Verbal scores, using GCA as a covariate. A significant main effect was found for module ($F(2, 116) = 114.3$, $p < .001$). Descriptive statistics regarding pre-test and post-test verbal abilities by ADOS module can be found in Table 6. Tukey's HSD was used to further examine the differences between modules, and revealed that Module 1 students decreased significantly in their verbal ability when compared to Module 2 and 3. Modules 2 and 3 both increased in their verbal abilities from pre-test to post-test.

Table 6. Descriptive Statistics Regarding Pre-test and Post-test Cognitive Abilities by ADOS Module

	Module 1		Module 2		Module 3		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
Verbal	41.83 (12.3)	39.86 (12.1)	69.19 (16.0)	70.44 (15.2)	84.73 (12.2)	86.95 (11.9)	.000	.151
Verbal Mean Change	-1.85		1.25		2.23			

Within the behavioral domain, one-way between subjects ANCOVAs were conducted for each variable to examine the effects of Module (Module 1, 2 and 3) on post-test scores using GCA and each variable's pre-test score as a covariate. For the PDD-BI, the main effect for module was not significant for Sensory/Perceptual Approach Behaviors ($F(2, 69) = .200$, $p > .05$); Ritualism/Resistance to Change ($F(2, 70) = .445$, $p > .05$); Social Pragmatic Problems ($F(2, 70) = .528$, $p > .05$); Semantic Pragmatic Problems ($F(2, 51) = 1.68$, $p > .05$)Social Approach Behaviors ($F(2, 70) = .081$, $p > .05$); Expressive Language ($F(2, 52) = 1.80$, $p > .05$) and the Autism Composite Score ($F(2, 66) = .147$, $p > .05$). In addition, within the behavioral domain, a one-way between subjects ANCOVA was calculated to examine the effects of Module on the post-test Practical Adaptive Behavior Composite. The main effect for module was not significant ($F(2, 50) = 1.57$, $p > .05$) after covarying out pre-test overall cognitive abilities. Although significant main effects for module were not observed for each of the behavioral variables, as seen in Table 7, and Figure 5, the behaviors for children in Module 3 increased more than those in Module 1 and 2. In addition, expressive language and social approach behaviors for students in Module 1 increased more than students in Module 2 and 3.

Table 7. Descriptive Statistics Regarding Pre- and Post-test by ADOS Module

Measure	Module 1		Module 2		Module 3		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
PDD-Behavior Inventory-Teacher PDD-BI								
Sensory	57.79 (12.7)	49.55 (13.3)	48.73 (13.1)	50.42 (16.1)	40.75 (4.7)	48.33 (10.4)	.820	.006
Ritual	52.10 (9.1)	50.57 (11.2)	51.82 (12.9)	53.58 (14.2)	50.17 (11.1)	57.92 (13.8)	.445	.023
SOCPP	58.87 (8.4)	55.20 (12.8)	56.27 (11.9)	56.52 (12.7)	50.42 (10.1)	58.50 (11.4)	.592	.015
SEMPP	56.88 (7.7)	54.29 (11.2)	55.79 (10.5)	53.54 (10.6)	47.27 (5.5)	61.18 (8.1)	.197	.062
SOCAPP	52.33 (10.4)	58.37 (15.2)	61.88 (7.9)	59.18 (12.0)	62.67 (13.1)	62.58 (9.2)	.922	.002
Expressive Language	50.50 (6.0)	58.89 (11.6)	56.25 (5.8)	56.11 (9.8)	59.27 (10.7)	62.36 (6.2)	.175	.065
Autism Composite	55.85 (9.8)	46.15 (14.9)	48.27 (13.8)	46.09 (15.2)	40.25 (5.7)	49.92 (10.1)	.864	.004
ABAS-II								
Practical Composite	57.38 (20.9	58.46 (19.4)	76.04 (16.9)	70.26 (17.2)	78.50 (20.9)	69.75 (19.9)	.218	.-59

Table 8. Descriptive Statistics Regarding Change Scores by ADOS Module

Measure	Module 1 Mean Change	Module 2 Mean Change	Module 3 Mean Change	Sig.	ES
PDD-Behavior Inventory-Teacher					
Sensory	-8.24	1.79	7.58	.593	
Ritual	-1.53	1.76	7.75	.374	
SOCPP	-3.67	-0.25	8.08	.285	
SEMPP	-2.59	-2.25	13.91	.031	
SOCAPP	6.04	-2.70	-0.09	.410	
Expressive Language	8.39	-0.14	3.09	.243	
Autism Composite	-9.71	-2.18	9.67	.505	

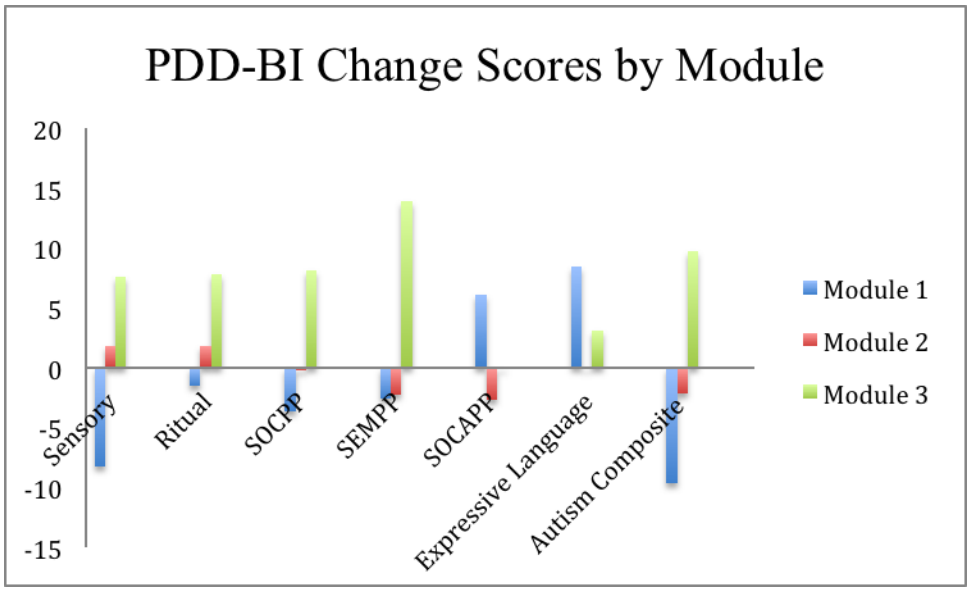

Figure 5: PDD-BI Change Scores by ADOS Module

CHAPTER 5

DISCUSSION

Overview

The goal of the present study was to expand upon research demonstrating the effect of summer breaks on students with disabilities, by specifically examining how much regression takes place among students with ASD in several domains. Specific aims included a) investigating whether changes in cognitive, behavioral and social abilities differed according to the level of support provided in ESY programming, b) exploring if different areas were maintained better than others, and c) the investigation of child characteristics related to regression of skills from the Spring to the Fall.

The following sections will discuss the results of the current study as they pertain to each of the research questions and relate with previous research on regression. Further, limitations of the current study will be examined along with implications for future research, and relevance to the field of school psychology.

Research Question 1: ESY Programming

This study sought to examine whether students with ASD maintained cognitive abilities and classroom behaviors over the summer break from school. Specifically, the study sought to determine whether changes in cognitive abilities, social and behavioral outcomes differed according to the level of summer support the child with ASD received (no ESY, ESY alone, or ESY with individualized support). Previous research has produced mixed conclusions regarding regression of skills among children with disabilities during the summer months. As a whole, many of the studies found that

students with mild disabilities lost skills during the long break in schooling (Allinder & Fuchs, 1994; Cornelius & Semmel, 1982; Shaw, 1982). Given what prior research has demonstrated regarding the regression of skills among children with disabilities, it was hypothesized that students with ASD in the current study would regress in cognitive, social and behavioral outcome areas, and that students in the no ESY group would experience the most regression from pre- to post-test. However, overall the current study found little regression in those three areas. As shown in Appendix A areas of regression among the whole sample included students' visual-spatial abilities, behavioral stereotypy, adaptive behavior and social motivation. Increases in student's abilities were found in their expressive language abilities, social cognition and autistic mannerisms. To date, no previous research has fully examined the impact of summer breaks for children with ASD, so these results are somewhat difficult to contextualize. However, it is promising that there is little overall regression in students' skills, and suggests the need for a direct comparison of those who received ESY services to those who did not.

Despite changes in some areas when examining the sample all together, there were no differences across the three groups of ESY programming. Specifically, students in the no ESY, ESY and ESY with individualized support groups did not differ in their maintenance of visual-spatial skills, adaptive behavior, presentation of stereotypy, expressive language, or social behaviors. When comparing other outcomes, there was only one significant difference in behaviors, with no differences in cognitive abilities or social skills. Specifically, students in the ESY with individualized support group were found to decrease significantly in the presentation of hyperactivity and noncompliance as

measured on the ABC when compared to both the regular ESY and No ESY groups. No differences occurred between the no ESY and ESY group, with students in both groups demonstrating an increase in the presentation of problem behaviors related to hyperactivity and non-compliance. In addition, although significant differences were not found, it is important to note the observed differences between the groups in the area of adaptive behavior. Students attending ESY showed little changes between pre- and post-test on adaptive behavior scales. However, although the differences were not significant, adaptive behaviors skills for students who did not attend ESY decreased from pre- to post-test in each of the adaptive behavior domains. The findings related to adaptive functioning are not especially surprising considering the activities conducted during ESY. Both students in the ESY and ESY with individualized support group received community training in order to learn functional skills necessary for daily living. Thus, adaptive behavior skills were targeted in ESY for the students who attended. It is possible that with a larger sample size, significant differences would be found between the ESY and no ESY groups.

Other research has examined the effectiveness of summer programming and camps for children with ASD and found overall positive results on the improvement of social skills. Namely, previous research indicates that summer programs aimed to promote social needs of children with ASD have helped improve their social skills and abilities to interact socially. These findings are inconsistent with the present study, whereby social abilities remained the same, but did not improve. However, the ESY programming for participants in the current study did not explicitly target social skills. Although some areas of improvement were seen according to teacher reports, no group

differences were found, indicating that, overall, children who attended ESY did not show improvements in their social skills when compared to children who did not receive ESY programming. Thus, it can be assumed that without specific interventions targeting social interactions over the summer, it is unlikely that improvements in social abilities occur.

Overall, results of the current study demonstrated few group differences between children who attended ESY (ESY group and ESY with individualized support group) and those who did not receive ESY programming, indicating that children with ASD generally maintained their skills over the summer. However, since few group differences were found between those that attended ESY and those students who did not, ESY appears generally ineffective in preventing regression of skills over not attending ESY services. Federal law mandates that students with disabilities be provided ESY services in order to help prevent the loss of skills over the summer. Although few significant improvements were observed, students in all three groups maintained skills. Interestingly, within the current study, students who did not attend ESY were significantly higher functioning as measured by the overall cognitive abilities. Although this difference was controlled for in all group comparisons, it may have influenced the lack of significant findings between the three groups.

Question 2

A second research question sought to determine whether differences occurred between the maintenance of cognitive, behavioral and social skills in children with ASD. Children with ASD were found to maintain cognitive, social and behavior abilities over the break in summer schooling. However, varying results were found in the behavioral

domain. In most areas assessing the presence of problem behaviors, students showed little changes in the occurrence of certain behaviors from the beginning of the study. However, the presence of stereotypy increased significantly after the break in schooling. This increase may be accounted for by the lower demands placed upon children during the summer months, as compared to the regular school year. Moreover, students' general adaptive behavior and conceptual adaptive behavior decreased significantly, indicating that adaptive behavioral functioning for children with ASD is not as easily maintained compared to other areas of cognitive or social functioning.

One surprising change over the summer, was the significant increase in expressive language abilities. According to teacher report on the PDD-BI, students improved significantly in expressive language from pre- to post-test. When interpreting this finding, it is important to consider the nature in which expressive language was measured, and the inconsistency with the verbal cluster measured on the DAS-II. Specifically, improvements in expressive language abilities were not observed on a standardized measure assessing the child's ability to expressively label certain pictures. Instead, an increase in abilities was observed on a rating scale used for children with ASD, measuring expressive language abilities of the child relative to the average child with autism. Thus, relative to other children with autism, children in the current sample improved significantly in their expressive language abilities.

Still, this significant improvement in expressive language is encouraging, as there is no existing research has explicitly examined these skills over time. Several studies conducted with children with learning disabilities found that more regression occurs in math skills, than in reading (Allinder & Fuchs, 1994; Cooper, Nye, Charlton, Lindsay &

Greathouse, 1996; Helf, Konrad & Algozzine, 2008). The authors of these studies indicated that differences in regression may have been accounted for by environment factors within summer settings. Specifically, children are more likely to read over the summer than engage in math problems. Similar hypotheses can be drawn within the current study. Specifically, changes in expressive language abilities may be accounted for by environmental factors surrounding students with ASD over the summer. Using expressive language skills is a skill that is not exclusive to the school setting, and is used in the home and community.

Question 3

The final research questions examined whether differences in initial functioning levels of the child with autism was related to their degree of maintenance of skills over the summer months. Students' level of functioning, as assessed by the ADOS module, was compared to pre- to post-test change scores. Several areas were significantly related to level of functioning. Specifically, in the cognitive domain, students who were higher functioning demonstrated increases in verbal abilities over the summer, while lower functioning students significantly decreased in their verbal abilities. However, in other domains, higher functioning students lost more skills than lower functioning students. Specifically, it was observed that students who were higher functioning demonstrated increases in their presentation of problem behavior, along with decreases in adaptive behavior over the summer.

The results of the current study related to students' level of functioning are partially consistent with previous research, but offer important information for ESY programming. Overall, extant research has established that students with more severe disabilities tend to regress more than students with mild disabilities (Cornelius &

Semmel, 192; Edgar, Spence & Kenowitz, 1977; Shaw, 1982). In regards to students' verbal abilities (as measured by the DAS-II), it is evident that lower functioning students with ASD appear to regress more than higher functioning students over the summer months. The verbal scale on the DAS assesses student ability to follow complex directions and expressively label pictures of objects. Thus, for lower functioning students it is especially important to consider ESY programming related to expressive and receptive language.

Overall, the current study suggests that some students with more severe disabilities appear to regress more than students with mild disabilities, which is consistent with previous research (Cornelius & Semmel, 192; Edgar, Spence & Kenowitz, 1977; Shaw, 1982). This is important to consider when developing ESY programs for students with ASD.

Limitations

One limitation of the current study was that it did not measure recoupment of skills once the participants returned to school after the summer break. Schools must decide whether ESY is necessary for any student identified as having a disability. Eligibility for ESY is determined using two major factors, including regression of skills and recoupment, or the time it takes to regain skills. Although the current study examined regression of skills in children with ASD, it did not assess the recoupment of skills, or how long it took students to regain skills from the previous school year. If a student is able to quickly recoup and regain any skills lost, then ESY services may not be considered necessary. Previous research has shown that although students with mild disabilities regress in reading and math, upon returning to school for six weeks, the

students not only recouped previously lost skills, they also demonstrated improvement compared to previous scores (Allinder & Fuchs, 1994). To date, no prior research has compared ESY and recoupment for children with ASD. Thus, it is unclear how quickly students with ASD recoup or regain skills after regression, and what additional interventions may be necessary to increase recoupment. Future studies should seek to extend the current research examining regression of skills among children with autism by examining recoupment of skills after schooling is reinstated after long breaks during the summer.

Although the current study did not examine the recoupment of skills among children with ASD, recoupment may have also been a possible confound of the present findings. Due to the timing of the assessment procedures, the September assessments were not conducted directly when the students returned to school, but rather 2-3 weeks into the school year. For some students, two weeks in full-day schooling and programming may be enough for recoupment to occur. Thus, the assessments conducted in the Fall may have failed to represent true regression of skills from long breaks in schooling.

The current study was conducted in a large urban school district, with approximately 75% of the participants eligible for free or reduced-price lunch. While this may reflect experiences of students in a similar large urban school district, it may not represent all students from different areas or socio-economic groups. Previous research has demonstrated that students from low-income families are more likely to experience summer loss (Alexander et al., 2001; Borman et al., 2005). Although these studies examined academic losses in reading and math for the general education population, it

can be assumed that similar losses would occur among children with disabilities. Thus, it is important to consider how environmental factors, such as socio-economic status influence students' regression of skills over the summer months.

Another limitation of the current study surrounds the assessment tools used to measure changes in cognitive, behavioral and social skills. Edgar, Spence & Kenowitz (1977) have suggested that a major issue with previous research on Extended School Year services was the measurement procedures used to assess effectiveness of ESY programs. They expressed concern with the use of measures that were not sensitive enough to determine changes in student achievement. The current study primarily used standardized measures as tools to assess the differences in regression depending on ESY programming among children with ASD. Characteristics of these measures likely contributed to the lack of significant regression when comparing students' pre- and post-test scores on cognitive, behavioral and social measures. A measure of significant concern was the use of the Differential Abilities Scale, Second Edition (DAS-II) to assess changes in cognitive abilities. Although cognitive assessments have been used as outcome measures in previous studies assessing effectiveness of interventions for children with ASD (Lovaas, 1987; McEachin, Smith & Lovaas, 1993), the length in time from pre- to post-test was significantly longer when compared to the time period within the current study. Future research should aim to use more sensitive measures to assess regression of skills and the effectiveness of ESY programming. Allinder and Fuchs (1994) utilized curriculum based measures, in addition to assessing students' progress, with the use of trend lines. Goals for future studies to support the current findings should

focus on applying the procedures used by Allinder and Fuchs (1994) to examine the effectiveness of ESY programs on children with ASD.

Another limitation of the current study was the missing data associated with several of the key social and behavioral outcome measures. There was a significant amount of missing data among the parent surveys utilized within the current study (i.e. SRS-Parent Version and ABAS-II) yielding small sample sizes. This was particularly evident during group comparisons. However, all parent surveys were supplemented with teacher rating scales. Specifically, the teacher SRS had high return rates and yielded sample sizes similar to other measures (i.e. DAS-II). Further, the ABAS-II was also compared with other behavioral outcomes measures including the teacher version of the PDD-BI and ABC.

Finally, another limitation in the present study was the lack of randomization between groups, which introduces validity threats into the study. Randomization did not occur in order to determine group placement in the no ESY, ESY and ESY with individualized support groups. Students provided with the most ESY support were delivered individualized intervention due to their placement in a specific ESY site. All students in the ESY group were placed at sites by the school district. However, students in the no ESY group were placed in this group due to unknown factors. Namely, it is unclear whether students did not go to ESY because they did not attend as recommended or if they attended other summer programming, such as a camp. Moreover, it is unknown what services students in the no ESY group received over the summer months. Specifically, students in this group may have attended summer camps specifically designed for children with ASD, which increases the threats to internal validity within the

current study. However, the present study does add to the current knowledge base regarding ESY interventions and supports for children with ASD and provides specific detail on regression of skills in certain outcome areas.

Implications and Future Research

Overall, the results of the current study offer important information regarding the regression of skills among children with ASD and on determining the effectiveness of ESY programming for this group of children. Children with ASD were found to generally maintain skills from the end of the school year to the beginning of the following academic year. Moreover, ESY services were found to be ineffective, in that students who attended ESY maintained skills in similar ways to those who did not attend ESY. Although Federal mandates indicate that the purpose of ESY is to prevent regression of skills, progression and improvement towards IEP goals should also be considered during ESY programming.

Individual differences in students' level of regression are extremely important when determining ESY programming for students. As outlined in the *Reusch v. Fountain* (1994) case, ESY programming should be individualized and specific for each student in order for the child to meet IEP goals. Specifically, the court ruled that fixed-length programs were illegal and school districts were required to "make individual determinations of the number or weeks, days per week, and hours per day that each student receiving ESY should be provided." This case is particularly interesting when considering the ESY programs of the current study. Although programming was individualized for a sub-group of students, all ESY programs were restricted to specific

time periods of the day (and number of days during the summer). It is important to consider this when interpreting the results of the study and the few differences found between students in the ESY with individualized support group and the standard ESY group. Specifically, differences may have been observed if individualized programming was offered to students including more intensive ESY programming that included longer hours per day or days per week.

Given the study's limitations, further study and follow-up research is recommended. First, future research should focus on not only confirming results of the current study, but also expanding them by examining the recoupment of skills among children with ASD at the beginning of the school year. By assessing how quickly students with ASD regain skills after a break in schooling, school psychologists and educators will be better able to develop appropriate ESY programs for students with ASD. In addition, future research should focus on utilizing more sensitive assessment tools in order to monitor changes in abilities over the summer breaks. Specifically, future research should focus on identifying academic assessment tools and strategies for monitoring regression of skills from one school year to the next. Using curriculum-based assessments specifically designed for children with ASD, future research should focus on furthering the present results by determining how much regression takes place in academic skills, as well as those measured in this project.

Finally, it is also important to consider how to monitor and track student's regression and recoupment using data-based decision making and accountability. According to the National Association of School Psychologists (2008), school psychologists should be adept and well versed in data-based decision making and

accountability. The purpose of assessment should be to define problems and needs, to estimate the student's current status, to link results to the development of appropriate interventions, and to evaluate the effectiveness of interventions to inform future practices. School psychologists' should use this data-based decision making strategy in developing ESY programming as well, in order to prevent regression from occurring for children with ASD. Further, school psychologists can use their expertise in evaluating programs for groups of students in order to ensure that ESY programs are appropriately targeting each student's individual need.

Summary

The goal of the current study was to explore different levels of summer support in order to gain a better understanding of whether students with ASD maintained skills after long breaks in schooling. In addition, the present study sought to examine if certain child characteristics influenced regression, and whether different skills areas, including cognitive, social and behavioral skills were better maintained than others. Previous research examining the effectiveness of summer programming on Extended School Year (ESY) services for children with disabilities is limited, with most research conducted with children with learning disabilities. The current study's examination of different ESY programs for children with ASD adds not only to research and knowledge surrounding ESY and specialized services for children with disabilities, but also provides a unique contribution to the research on autism spectrum disorders and developmental disabilities.

Overall, students maintained skills from pre- to post-test in most key areas. However, regression did occur in visual-spatial skills and adaptive behavioral functioning

as a result of the summer break. The presence of stereotypy also increased, however similar behaviors, such as repetitive behaviors and highly restricted interests significantly decreased. When group comparisons were made between children who attended ESY (ESY group and ESY with individualized support group) and those who did not receive ESY programming, few differences were found. While students who received the most intensive level of ESY support were found to decrease significantly in the presentation of hyperactivity and noncompliance, ESY was generally ineffective in preventing regression of skills over not attending ESY services.

Despite the limitations presented, the current study adds to previous research and case law surrounding eligibility and programming needs for Extended School Year services for children with disabilities. Although students with ASD in the current study generally maintained skills across the cognitive, social and behavioral domains, future research should assess regression and maintenance using more sensitive measures in addition to examining the recoupment of skills. Further, school psychologists should aim to use their expertise in data-based decision making and accountability in order to ensure that ESY services are appropriately monitored, and evaluated for all children with disabilities.

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APPENDIX A

Comparison of Pre-test and Post-test Scores

Repeated-measures analyses of variance (ANOVA-RM) were computed with the entire sample to compare pre-test to post-test scores on cognitive, social, and behavioral outcomes. The following provides the results of these analyses for each outcome area.

Cognitive Abilities

Separate ANOVA-RM's were conducted for each of the cognitive abilities variables including GCA, Verbal, Non-Verbal, and Spatial scores. Overall, the sample maintained cognitive abilities scores from pre-test in June to the post-test in September and demonstrated little regression, as shown in Table 9. For GCA ($F(1, 123) = 1.20$, $p > .05$), Verbal ($F(1, 122) = .047$, $p > .05$) and Non-verbal abilities ($F(1, 115) = .593$, $p > .05$) no significant effect was found. The ANOVA-RM comparing participants pre-test and post-test Spatial scores did reveal a significant effect ($F(1, 124) = 13.30$, $p < .001$). Post-test Spatial scores ($m = 68.54$, $sd = 24.3$) decreased significantly from pre-test ($m = 72.29$, $sd = 24.1$).

Table 9. Descriptive Statistics Regarding Pre-test and Post-test Cognitive Abilities Measures

	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
DAS-II GCA	63.53 (20.60)	62.75 (21.21)	-.78	7.88	.272	.010
DAS-II Verbal	60.99 (21.60)	61.16 (22.70)	.17	8.75	.892	.000

Table 9 (Continued)

DAS-II Non-Verbal	72.69 (18.74)	72.59 (19.08)	.91	12.65	.443	.005
DAS-II Spatial	72.29 (24.17)	68.54 (24.27)	-3.75*	11.50	.000	.097

Note: * p <.05; ** p <.001

Social Outcomes

Separate repeated measures ANOVA's were conducted for each of the social ability variables to examine whether the sample participants maintained or regressed in social outcomes. Each target social outcome variable is shown in Table 10. The ANOVA-RM's indicated that overall, the sample maintained social ability scores from pre-test in June to the post-test in September and demonstrated little regression. Specifically, no significant effects were found for any of the social abilities variables, for parent ratings on the SRS Total Scale (F(1, 38) = .148, p > .05); Social Awareness (F(1, 46) = .061, p > .05); Social Cognition (F(1, 44) = .110, p > .05); Social Communication (F(1, 42) = .231, p > .05); Social Motivation (F(1, 45) = .000, p > .05); or Autistic Mannerisms (F(1, 45) = .097, p > .05). As Table 10 indicates, no significant difference exists among pre-test and post-test means. ANOVA-RM's were also conducted for each of the teacher SRS scales to examine the effects of summer on pre-test and post-test social abilities. A significant main effect was found for Social Cognition (F(1, 123) = 4.75, p < .05); Social Motivation (F(1, 123) = 5.06, p < .05); and Autistic Mannerisms (F(1, 121) = 4.26, p < .05). As demonstrated in Table 10 ratings on the SRS cognitive and autistic mannerisms scale decreased significantly, indicating an improvement in

social functioning in each of these areas. Students' scores on the motivation sub-scale also increased from pre- to post-time points. No significant effects were found for the following social abilities variables, as rated by teachers on the SRS, including the Total Scale ($F(1, 122) = 3.428$, $p > .05$); Social Awareness ($F(1, 123) = 3.72$, $p > .05$); and Social Communication ($F(1, 123) = .475$, $p > .05$; see Table 10).

Table 10. Descriptive Statistics Regarding Pre-test and Post-test Social Abilities Measures

Social Responsiveness Scale (SRS) Parent Version						
	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
SRS Total	75.33 (13.10)	74.79 (13.53)	-.54	8.73	.703	.004
Awareness	65.85 (10.84)	65.51 (11.67)	-.34	9.47	.806	.001
Cognitive	74.62 (12.27)	74.16 (11.78)	-.47	9.42	.741	.002
Communication	72.65 (12.47)	71.81 (13.13)	-.84	11.41	.633	.005
Motivation	69.07 (12.20)	69.04 (13.13)	-.02	9.11	.987	.000
Autistic Mannerisms	73.41 (16.31)	73.98 (17.0)	.57	12.30	.757	.002
Social Responsiveness Scale (SRS) Teacher Version						
	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
SRS Total	65.09 (12.14)	64.42 (11.81)	-.67	3.99	.067	.027
Awareness	64.06 (12.42)	63.52 (12.60)	-.54	3.33	.073	.026
Cognitive	66.23 (11.74)	65.67 (11.50)	-.56	2.84	.031	.037
Communication	70.22 (10.23)	70.55 (9.63)	.33	5.34	.492	.004
Motivation	58.90 (11.53)	58.52 (11.36)	.39	1.91	.026	.040
Autistic Mannerisms	66.53 (14.78)	65.39 (13.57)	-1.14	6.10	.041	.034

Behavioral Outcomes

Behavioral outcomes were assessed by examining pre- and post-test scores on the PDD Behavior Inventory (PDD-BI) Teacher version, the Aberrant Behavior Checklist (ABC)-Parent version, and the Adaptive Behavior Assessment System (ABAS-II) Teacher Version. Separate repeated measures ANOVA's were conducted for each of the behavioral variables to examine whether the sample participants maintained or regressed in behavioral outcomes. On the PDD-BI no significant effect was found for Sensory/Perceptual Approach Behaviors ($F(1, 80) = .005$, $p > .05$); Ritualism/Resistance to Change ($F(1, 81) = 1.14$, $p > .05$); Social Pragmatic Problems ($F(1, 81) = .108$, $p > .05$); Semantic Pragmatic Problems ($F(1, 62) = 1.17$, $p > .05$); Social Approach Behaviors ($F(1, 81) = .801$, $p > .05$) and the overall Autism Composite ($F(1, 76) = .063$, $p > .05$; see Table 5). The repeated-measures ANOVA showed a significant effect for Expressive Language ($F(1, 62) = 6.46$, $p < .05$). Post-test scores (m =58.62, sd = 10.05) increased significantly from pre-test (m = 54.73, sd = 7.44), indicating that the participant's expressive language abilities improved significantly from June to September.

On the ABC, no significant effect was found for Hyperactivity and Noncompliance ($F(1, 54) = .250$, $p > .05$); Irritability ($F(1, 55) = .016$, $p > .05$); Lethargy and Social Withdrawal ($F(1, 56) = 1.31$, $p > .05$); and Inappropriate Speech ($F(1, 59) = 1.16$, $p > .05$). As Table 11 indicates, no significant difference exists among pre-test and post-test means. A significant effect was found for Stereotypic Behavior ($F(1, 57) =$

7.10, $p < .05$). Post-test scores (m =5.79, sd = 5.43) increased significantly from pre-test (m = 4.57, sd = 4.79), indicating that the participant's stereotypic behavior worsened significantly from June to September.

On the ABAS-II no significant effect was found for the Social Composite ($F(1, 60) = .034$, $p > .05$) and Practical Composite ($F(1, 61) = .024$, $p > .05$). As Table 5 indicates, no significant difference exists among pre-test and post-test means. The ANOVA-RM's found a significant effect for the ABAS General Adaptive Composite ($F(1, 60) = 5.23$, $p < .05$). Post-test scores (m =62.39, sd = 15.93), decreased significantly from pre-test (m = 65.07, sd = 18.68), indicating that the participant's overall adaptive behavior decreased significantly from June to September. Similarly, a significant main effect was found for the Conceptual Composite ($F(1, 60) = 5.29$, $p < .05$). Post-test scores (m =66.95, sd = 14.20) decreased significantly from pre-test (m = 69.31, sd = 16.55).

Table 11. Descriptive Statistics Regarding Pre-test and Post-test Behavioral Measures

PDD-Behavior Inventory (PDD-BI) Parent Version						
	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
Sensory	50.56 (13.29)	50.40 (14.19)	-0.16	19.7	.942	.000
Ritualism	51.16 (11.23)	53.34 (13.50)	2.18	18.5	.289	.014
SOCPP	55.88 (10.67)	56.49 (12.65)	0.16	16.8	.743	.001
SEMPP	53.57 (9.54)	55.67 (10.76)	2.10	15.4	.284	.019
SOCAPP	58.00 (10.72)	59.70 (12.98)	1.7	17.2	.373	.010
Expressive Language	54.73 (7.44)	58.62 (10.05)	3.89*	12.1	.014	.094
Autism Composite	48.99 (12.46)	48.39 (14.84)	-.60	20.8	.802	.001
Aberrant Behavior Checklist Parent Form						
	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
Hyperactivity	17.89 (11.99)	18.51 (12.90)	.62	9.16	.619	.005
Irritability	12.89 (9.51)	13.02 (10.01)	.13	7.37	.900	.000
Lethargy	8.25 (7.83)	9.30 (9.19)	1.05	6.96	.258	.023
Stereotypy	4.57 (4.79)	5.79 (5.43)	1.22**	3.5	.010	.111
Inappropriate Speech	3.13 (2.95)	3.48 (3.14)	.35	2.52	.286	.019
Adaptive Behavior Assessment System – Second Edition (ABAS-II) Parent Form						
	Pre-Test Mean	Post Test Mean	Mean Change	SD	Significance	ES
GAC	65.07 (18.68)	62.39 (15.93)	-2.67*	9.12	.026	.080
Conceptual	69.31 (16.55)	66.95 (14.20)	-2.36*	8.02	.025	.081

Table 11 (continued)

Social	72.05 (14.99)	70.41 (12.86)	-1.64	8.85	.153	.034
Practical	66.47 (20.60)	64.32 (18.65)	-2.15	13.76	.224	.024

APPENDIX B

Descriptive Statistics Regarding Pre-test and Post-test Scores

Table 12. Descriptive Statistics Regarding Pre-test and Post-test Cognitive Abilities by ESY Group

Measure	No ESY		ESY		ESY with Support		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
GCA	72.80 (22.7)	72.35 (23.4)	56.92 (18.3)	55.76 (18.3)	62.70 (18.3)	62.22 (18.6)	.637	.008
Verbal	70.81 (22.5)	72.68 (22.9)	54.52 (19.9)	54.33 (20.9)	61.07 (20.3)	59.59 (20.5)	.221	.027
Non-Verbal	81.84 (17.4)	81.79 (20.6)	65.56 (19.0)	66.77 (16.6)	72.40 (16.2)	74.64 (17.1)	.668	.008
Spatial	81.03 (25.1)	77.50 (24.6)	66.53 (23.9)	61.86 (23.9)	73.12 (20.9)	70.19 (20.45)	.687	.007

Table 13. Descriptive Statistics Regarding Pre-test and Post-test Social Abilities by ESY Group

Measure	No ESY		ESY		ESY with Support		Sig.	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
SRS Total-P	81.55 (11.1)	79.00 (16.6)	74.77 (16.0)	75.54 (12.5)	72.36 (11.1)	68.91 (12.0)	.486	.047
Social Awareness- P	65.17 (11.7)	68.58 (10.9)	65.19 (9.7)	64.81 (14.2)	66.00 (12.8)	62.23 (8.7)	.161	.096
Social Cognition- P	80.00 (11.5)	78.67 (13.6)	73.31 (11.8)	72.90 (9.0)	70.83 (12.6)	69.83 (13.1)	.602	.029
Social Comm- P	75.18 (11.3)	74.27 (16.0)	75.00 (15.8)	73.79 (12.4)	70.00 (10.5)	66.85 (12.3)	.441	.048
Social Motivation- P	74.25 (10.5)	69.75 (14.6)	68.07 (14.9)	67.80 (12.7)	65.54 (10.7)	67.69 (14.2)	.405	.050
Autistic Mannerisms- P	86.25 (13.9)	83.42 (19.1)	70.25 (17.8)	72.56 (18.5)	70.17 (11.8)	67.67 (11.7)	.668	.023
Social Responsiveness Scale-Teacher								
Measure	No ESY		ESY		ESY with Support		Sig	ES
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test		
SRS Total-T	62.12 (10.6)	61.53 (10.7)	68.57 (13.1)	67.65 (11.9)	61.20 (10.5)	60.56 (11.4)	.941	.001
Social Awareness- T	60.47 (11.0)	60.09 (11.0)	67.22 (12.5)	66.55 (12.1)	59.64 (11.3)	59.08 (12.0)	.970	.001
Social Cognition- T	63.91 (10.9)	63.29 (10.8)	69.45 (12.0)	68.76 (11.3)	63.48 (10.2)	63.00 (10.8)	.975	.000
Social Comm- T	67.97 (12.2)	69.17 (12.2)	72.20 (8.9)	71.31 (8.3)	66.60 (10.7)	68.00 (9.7)	.289	.024
Social Motivation- T	57.14 (9.8)	56.74 (9.8)	61.61 (12.6)	61.12 (12.0)	56.52 (10.9)	56.12 (11.5)	.955	.000
Autistic Mannerisms- T	63.94 (11.5)	63.21 (11.6)	71.14 (16.7)	69.55 (14.4)	60.25 (9.4)	59.17 (9.8)	.604	.010