7-2011

THE EFFECT OF OUTDOOR ENVIRONMENT ON ATTENTION AND SELF-REGULATION BEHAVIORS ON A CHILD WITH AUTISM

Mollie R.M. von Kampen

University of Nebraska-Lincoln, mvonkampen2@unl.edu

Follow this and additional works at: http://digitalcommons.unl.edu/cehsdiss

Part of the Education Commons

http://digitalcommons.unl.edu/cehsdiss/117

This Article is brought to you for free and open access by the Education and Human Sciences, College of (CEHS) at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Public Access Theses and Dissertations from the College of Education and Human Sciences by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
THE EFFECT OF OUTDOOR ENVIRONMENT ON ATTENTION AND SELF-REGULATION BEHAVIORS ON A CHILD WITH AUTISM

by

Mollie R.M von Kampen

A THESIS

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Master of Science

Major: Child, Youth & Family Studies

Under the Supervision of Professor Julia Torquati

Lincoln, Nebraska

July 2011
THE EFFECT OF OUTDOOR ENVIRONMENT ON ATTENTION AND SELF-REGULATION BEHAVIORS ON A CHILD WITH AUTISM

Mollie R.M von Kampen, M.S.
University of Nebraska, 2011

Advisor: Julia Torquati

The benefits of spending time outdoors are becoming more apparent for children and adults, as more research is showing that nature can help improve academic performance, reduce stress, and provide physical benefits. Specific groups such as children with attention deficit disorder have shown gains in attention by being outdoors in natural settings, but little research has examined potential benefits of nature for children with other disabilities such as Autism Spectrum Disorder (ASD). With one in every 110 children being diagnosed with ASD, effective practice with children with ASD is needed. However, no study to date has directly compared behavior of children with ASD in natural settings to behavior in a built environment. This study aims to address this gap in research by comparing social behaviors, attention/engagement, and self-regulation of a child with ASD while engaging in identical activities indoors and outdoors. The focal child participated in four structured play activities indoors and outdoors, for a total of eight research sessions. The activities included: (1) play dough; (2) water; (3) sand; and (4) play dough. The dependent variables examined were social behaviors, attention behaviors and self-regulation. Results indicated that when examining these variables outside and inside, one setting was not favored over the other. Future research should focus on including children with varying levels of ASD and
sensory integration issues to see if nature could hold a calming effect for these children.

In addition, future practice should focus on incorporating time outdoors into already established interventions to see if this may provide added benefits and functionality to the intervention.
ACKNOWLEDGEMENTS

I would like to thank my advisor, Julia Torquati, for all of her knowledge, continuous patience, and encouragement with this project. I would also like to thank my other committee members, Michelle Rupiper and John Maag, for their help and participation. Thanks also to the staff at Ruth Staples Child Development Lab for their flexibility and contribution. Finally, I would like to thank my husband, David, for his patience and encouragement throughout this process.
# TABLE OF CONTENTS

Abstract .................................................................................................................. ii

Acknowledgements ............................................................................................... iv

Chapter 1 .................................................................................................................. 1

Chapter 2 .................................................................................................................. 4

Chapter 3 .................................................................................................................. 12

Chapter 4 .................................................................................................................. 23

Chapter 5 .................................................................................................................. 30

References ............................................................................................................... 36

Appendix A ............................................................................................................... 38

Appendix B ............................................................................................................... 42
Chapter I
Introduction

“The movement to reconnect children to the natural world has arisen quickly, spontaneously, and across the usual social, political, and economic dividing lines.” (Louv, 2007) It is true that the movement to reconnect children to nature is gaining recognition across many fields of studies and interests. In recent years, organizations such as the Children and Nature Network have started to track important research in the field across many interests such as children’s health, education and child development (www.childrenandnature.org). Many of these studies have found that time spent in nature provides benefits such as reduced stress, attention restoration and physical benefits (Hartig, Mang & Evans, 1991; Gulwadi, 2006; National Environmental Education Foundation, 2010). Studies conducted by Hartig, Mang and Evans (1991) showed that after walking in a park college students were able to recover quicker after performing tasks that were designed to generate mental fatigue compared to college students who were assigned to walk through an urban downtown area. It has also been found that nature reduces amounts of stress in specific groups such as those employed as teachers (Gulwadi, 2006). Research on the physical benefits of nature indicates that time spent outdoors can help fight childhood obesity, vitamin D deficiency and attention defect disorder (National Environmental Education Foundation, 2010; Faber & Kuo, 2009). With the benefits that nature provides covering so many populations, research has begun to examine specific groups and what special role nature can play for these groups.

One of these specific groups is children with attention deficit disorder or attention deficit/hyperactivity disorder (ADD/ADHD). Evidence indicates that nature can provide
a host of physical and cognitive benefits for these children (Faber & Kuo, 2009). Children with ADD/ADHD were able to perform better on cognitive tasks after a walk in a “green” area in comparison to a walk in an urban or residential area, providing evidence of the restorative potential of nature (Faber & Kuo, 2009). Researchers have also reported that academic performance can increase and children experience shorter periods of recovery from stress when given time outdoors (Wells, 2009).

Autism Spectrum Disorder is a pervasive developmental disorder (PDD), which is characterized by impairments in communication skills, social interactions and repetitive behaviors (National Institute of Mental Health). Although there is no cure for ASD, early intervention for children with autism is recommended by the Center for Disease Control and National Institute of Mental Health to help children with ASD in their development (CDC, 2011; NIMH, 2011). Currently, research on how to best develop attention behaviors such as joint attention and social skills is being conducted. When specific training on joint attention was provided with children with autism, researchers found that attention increased and children were also able to apply these skills in other setting (Gulsrud, Kasari, Freeman & Paparella, 2007). Research on increasing social interactions is also being conducted. Researchers have found that when using peer models to aid in social skills training with children with autism that the children with ASD increased their social interactions and decreased their repetitive behaviors (Lee, Odom, & Loftin, 2007). Studies like these are important in the development of effective practices with children with ASD.

However, research has not examined potential benefits children with autism could receive from time outdoors. This study aims to address this gap in the research on the
benefits of time spent in nature by accomplishing the following specific objectives: (1) compare social behaviors of children with ASD indoors and outdoors; (2) compare attention and engagement of children with ASD indoors and outdoors; and (3) compare self-regulatory behaviors of children with ASD indoors and outdoors. Accomplishing these objectives will permit testing the hypothesis that children with ASD will demonstrate more competent social behavior, be more engaged and attentive, and be more calm when engaging in activities outdoors compared to indoors. Children’s behavior will be observed and compared in identical activities but in different settings (indoors/outdoors). By observing children with autism participating in activities both indoors and outdoors, this study will provide evidence of how social behaviors, attention, and self-regulation may differ in the two settings. This study can inform practitioners whether the outdoor environment could serve as a support for autistic children. If providing activities and programming outdoors aids in attention behaviors and self-regulation, this could be a simple but powerful way to support children with ASD as they learn and develop.
Chapter II  
Literature Review

Considering the numerous benefits of time spent in nature that research has documented, ranging from increased attention to improved physical health, it is important to examine whether the same benefits accrue to children with autism, a population that has not been specifically studied with respect to benefits of nature experience. It is currently estimated at one in every 110 children will receive some type of autism diagnosis (National Institute of Mental Health). The number of children being diagnosed with autism and the growing number of benefits nature is providing to numerous populations, shows the need to make a connection between these two fields. If such a connection could be made, it could yield potential tools for children with autism. In the following sections, research on nature and benefits it provides will be reviewed, followed by research on children with autism and behaviors associated with the disorder. Finally the potential connections between the two fields will be discussed.

Benefits of Nature

Experiences with the natural world are diminishing for children across America, and more research is focusing on how nature may benefit children’s development and why it is important for children to have contact with nature. According to a study that examined visits to National Parks, researchers found that numbers are declining while access to electronic media is on the rise (Pergams & Zeradic, 2007). Trends toward electronic and sedentary activities are alarming institutions that provide experiences in nature and the outdoors. Institutions such as the National Wildlife Federation (NWF) are beginning to alert the public to this issue. The NWF recently launched its Be Out There
campaign which aims to get children outside for a “Green Hour” to increase exposure to
nature and outdoor play (Coyle, 2010). The National Parks Foundation also recently
launched its own campaign called First Bloom which provides children the opportunity to
be involved in nature activities and also to plant and maintain a native garden in a
national park (www.firstbloom.org). If natural environments are diminishing and efforts
under way to connect children back to nature, what exactly will children get from this
reconnection? Research guides us in recognizing just what the natural environment can
provide for us as adults and children.

When examining the benefits that nature can provide for both adults and children,
nature’s restorative ability often surfaces. In a study at the University of California
Berkley, researchers investigated what types of places college students identified as their
favorite places and why (Korpela, Hartig, Kaiser & Fuhrer, 2001). They found that
natural spaces were overwhelmingly chosen as favorite places (Korpela et al., 2001).
When asked why, the students identified that they felt more relaxed, and able to cope
with stress much easier in these places (Korpela et al., 2001). The health care system has
also taken notice about the healing and restorative aspect of nature. At the Good
Samaritan Hospital in Portland, Oregon, patients, staff and visitors have access to a
healing garden on the hospitals grounds. Working in tandem with landscape architects,
the hospital designed and constructed the garden to use in therapy sessions for those with
various injuries and illnesses (Hartig & Marcus, 2006). It also turned out to be a place
that many employees and visitors used to cope with the stressful environment that often
comes along with working and being in a hospital setting (Hartig & Marcus, 2006).
Restoration of cognitive functioning has also been found for both younger and older children when they spent time in nature. A study by Hartig, Mang and Evans (1991) found that after a walk in park, college students experienced greater cognitive recovery after performing various concentration and recall tasks designed to induce mental fatigue. Research has also shown benefits for younger children’s cognitive functioning. Similar results have been reported for younger children as well. Researchers found that the natural environment served as a restoration agent for children with Attention Deficit Hyperactivity Disorder (ADHD) (Faber & Kuo, 2009). Children diagnosed with ADHD, ages 7-12, were taken on a guided walk in three different settings, two well-kept urban areas, and one park setting. Each child was given a series of puzzles before each walk to induce attention fatigue. They were then taken on the walk in one of the three settings. After returning from the walk, attention was measured using various concentration and impulse control tests. After experiencing the walk in the park, children experienced larger gains in attention than in the other two settings (Faber & Kuo, 2009). It is not only direct contact with nature that makes the difference, but the view, and access to a more natural settings has also been shown to benefit children’s cognitive functioning. According to a study by Wells (2000), children in poor urban areas who experienced a move to a new home that had greater views and access to “green” space, children experienced an increase in cognitive functioning as reported by parents and cognitive testing.

By examining this research together, it is clear that nature can serve as a powerful tool for children and adults. Nature can help to restore cognitive functioning in adults as well as younger children (Hartig, Mang & Evans, 1991; Faber & Kuo, 2009), it can
reduce stress levels (Hartig & Marcus, 2006) and provide educational benefits for children (Wells, 2000).

**Autism Spectrum Disorder (ASD)**

Autism Spectrum Disorder is a pervasive developmental disorder (PDD), which is characterized by impairments in communication skills, social interactions and repetitive behaviors (National Institute of Mental Health). The Center for Disease Control now estimates that 1 in every 110 children have ASD (2011). Because autism is a spectrum disorder, varying degrees of impairments are seen. However because of these specific impairments, tasks that require social interactions, engagement or attention on a specific task and regulating these behaviors are difficult for a child with ASD (National Institute of Mental Health).

**Autism and Attention Behaviors**

Just as children who are typically developing learn and interact with children differently from one another, children with autism also interact and learn differently from one another. However, research has shown that an important attention behavior, joint attention, can be nurtured and is an important part of promoting social interactions. Joint attention at the most general level is the triadic relation between the child, an object and another person (Charman, 2003). Basic joint attention behaviors include pointing, gaze direction toward an object, showing an object, and taking and giving objects and response to name (Naber et al., 2007). This is a core deficit for children with autism (Charman, 2003). According to a 2004 study by Dawson et al., when compared to children with other development delays, children with autism exhibited the most delays in joint attention, social orienting, and attention to others’ distress. This deficit can impede social
and play interactions with other children. In a study that followed children’s joint attention behaviors in relation to social interactions, researchers found that joint attention behaviors seen at age four had an impact on social behavior eight years into the future (Sigman & Ruskin, 1999).

Because joint attention can have such an impact on autistic children’s social interactions, research is being conducted on how to improve and promote this skill. In a recent study, children with autism participated in a joint attention intervention and were tested on the mastery of the skill at the end of the intervention (Gulsrud, Kasari, Freeman & Paparella, 2007). The results showed that children who received that specific joint attention training made extensive gains in joint attention behaviors when presented with unfamiliar stimuli, providing evidence for generalization of the skill beyond the training (Gulsrud, Kasari, Freeman & Paparella, 2007). Imitation has also been found to help increase occurrences of joint attention behaviors in children with autism. In a study by Ingersoll and Schreibman (2006), using a naturalistic behavioral technique to teach imitation skills and behaviors showed promise for serving as an effective technique for young children with autism to learn behaviors such as joint attention. Children in the study increased their imitation skills and were also able to generalize these skills into other setting as well (Ingersoll & Schreibman, 2006). Similar results from a 2003 study by Whalen and Schreibman support the promotion of joint attention training for children with autism. They also suggest that parent training in joint attention behaviors could be an important tool in promoting these skills with their children (Whalen & Schreibman, 2003).
Autism and Social Behaviors

Social skills and behaviors are a core deficit for children with ASD. Typically children with ASD are not interested in interacting with others, have difficulty identifying others feelings, and eye contact is limited depending where the child is on the spectrum (CDC, 2011). In the current study, peer models are included to elicit social interactions and attention behaviors from the children with autism. Research supports this type of peer-supported play to increase joint attention and language behaviors. In a recent study, two children with autism were paired with three typically developing peers in 30-minute weekly play group sessions for a total of 16 weeks (Zercher, Hunt, Schuler & Webster, 2001). The typically developing peers were trained on techniques to use during the play sessions with the autistic boys. After the play sessions were completed, the videos were coded for joint attention occurrences along with language and symbolic play occurrences. The results in regard to joint attention were a dramatic increase in joint attention behaviors during the peer-supported play (Zercher, Hunt, Schuler & Webster, 2001). One of the subjects increased from 4.8 occurrences of joint attention behavior during baseline to 21.1 occurrences of joint attention during the peer-supported intervention. (Zercher, Hunt, Schuler & Webster, 2001). Research has also found that stereotypic behavior of children with autism can decrease with increased peer interactions and models (Lee, Odom, & Loftin, 2007). Autistic children in this study exhibited many stereotypic behaviors such as repetitive motor movements (hand flapping, head rolling) and repetitive vocalizations (Lee, Odom & Loftin, 2007). Typically developing peers were trained to initiate social interactions with the children with autism and the stereotypic behaviors were measured as the interactions increased (Lee, Odom, & Loftin,
They found that the stereotypic behaviors decreased when the social interactions increased in the regular play setting (Lee, Odom, & Loftin, 2007).

Because the number of children with autism is on the rise (CDC, 2011), research on interventions that aid children with ASD are important to examine. Specific joint attention training and imitation training have both been found to aid children with ASD in social interactions, decreasing stereotypical behaviors and increasing attention behaviors (Lee, Odom & Loftin, 2007; Gulsrud, Kasari, Freeman & Paparella, 2007).

Connecting Research on Nature to Autism

The only study to examine potential benefits of outdoor experiences for children with autism was conducted by interviewing teachers, parents and volunteers working with children with autism and how they perceived the benefits of taking the child with ASD outside (Chang & Chang, 2010). Basic benefits mentioned by the participants included physical activity, social interactions and communication (Chang & Chang, 2010). Participants also noticed that child specific sensitivities seemed to decrease when the child spent more time outdoors (Chang & Chang, 2010). However, to date no study has employed a direct observational method to determine whether frequencies of specific types of behaviors differ indoors and outdoors. This study aims to address this gap.

Considering the evidence that time spent outdoors in “green” areas can benefit typically developing children and the relative absence of such research on children with ASD, this research aims to examine the potential for experiences outdoors to benefit children with ASD. It is clear that more research needs to done directly with children with autism when they spend time outdoors to see what benefits can identified for this population. This study aims to determine whether participating in activities in an outdoor
“green” context can benefit social behaviors, attention, and self-regulation of children with ASD when comparing their behavior in the same activities in an indoor context. This study will use a case study design to observe behavior of a preschool-aged child diagnosed with ASD engaged in structured play activities indoors and outdoors. The results of this study could aid professionals and researchers in the field by offering a simple tool, time spent in nature, that could provide large benefits to be researched and put into practice to assist child with ASD in their development.
Chapter III

Methods

Design

A case study design was used to conduct this research. A case study design allows the researcher to look at an individual over time and use multiple observations to look in depth at a specific phenomenon (Creswell, Hanson, Clark & Morales, 2007). This type of research design allowed for multiple observations of the child with ASD in order to look in depth at the effect of the settings (indoors or outdoors) on specific behaviors.

Participant

The participant for the study was a child attending a laboratory school run through a University. The child with ASD who participated in the study was a three years old male and attended the younger classroom. He was selected because he was the only child in the classroom diagnosed with ASD. The child was previously diagnosed with ASD through other services prior to attending the laboratory and participating in the support program. Data collection was done between April and June; therefore the participant had seven months of services and individualized programming (speech and language services, behavioral interventions and one-on-one support in the classroom) prior to the study being conducted.

Context/Setting

There are two classrooms in the school and they are divided by age: the younger classroom enrolls children ages 18 months to three years and the older classroom enrolls children ages 3-5. Each classroom follows a consistent daily schedule, which includes
large group time, small group time, outdoor time, music, literacy, and meal times. The laboratory school also housed a grant-funded program designed to support children with ASD and provided classroom and individual programming for the child enrolled in the program. The child with ASD participates in all regularly scheduled classroom activities but is pulled out of the classroom at various times throughout the day to receive special programming including speech and language therapy, and early intervention services.

*Indoor and outdoor settings.*

The focus child participated in eight play sessions, four indoors and four outdoors. The format of the four indoor sessions was identical to the four outdoor sessions, and only the context varied. Each of the four sessions is described in further detail below. The location of activities when outside was beneath a pine tree with branches drooping down near the table, and with shrubs nearby. The table was placed on wood mulch, and the same location was used for all outdoor sessions. No other children were present in the outdoor classroom at the time of the sessions. All sessions took place when the temperature was above 60 degrees F and it was mostly or completely sunny. This location was chosen because of its ‘green’ features and because provided some shade during the activities. It was also located close to the classroom in order to ease transitions to and from the activity. The location of the indoor settings was a small room in the lab school. The room was used for block play and storage and the table was set up in the middle of the room. No other children were present in the room during the sessions. The room was selected because all children were familiar with the space and fewer distractions were present because no other children were present and toys and items were shelved and put away.
Dependent Variables

Social Behaviors

Social behaviors were operationalized for this study as compliance to prompts given by both the teacher and the peers, as well as vocalizations by the child directed toward the teacher or peers. Compliance to a prompt was defined as the child responding to a prompt by engaging in the requested activity. For example, if the child was prompted by the teacher to pass the shovel, the child would then pass the shovel to the peer. All prompts were for simple and discrete play behaviors.

Attention Behaviors

The attention behavior that was included was the amount of time the child with ASD was on task during the activity (in seconds). Being on task is defined as behaviors that demonstrate engagement in the activity. Behaviors include keeping hands in the materials, and looking at the materials or peers with the materials during the activity.

Self-Regulation

Self-regulation is a multidimensional construct that includes cognition, behavior, physiology, and emotion. Self-regulation was chosen as a dependent variable for this study because of the reported “restorative” aspects of nature, which have been documented for adults but not directly for children. Because one of the central indicators for restoration in previous research was a sense of relaxation, for the purpose of this research the emotional dimension of self-regulation was selected for study. Self-regulation was operationalized as the positive and negative affect displayed by the child.
with ASD as they were participating in the activities. Negative affect was defined as visible distress or protest vocalizations. Positive affect was measured by observing smiles and laughter. Frequency counts of each behavior were coded from video of each play session.

Coding Social Behaviors, Attention Behaviors, and Emotional Expression

Three graduate students were trained to code the video recordings of the eight research sessions. Each coder was introduced to the definitions of each of the codes and examples of each code were reviewed on video. Two of the coders were blind to hypotheses. All sessions were coded independently. Inter-rater reliability among coders was good, with an intraclass correlation of .80 for single measures and .92 for average measures.

Procedures

The child with ASD was supported by one or two typically developing peers who participated in the play sessions with them. These peers were selected from the same classroom as the child with ASD and were peers whom the classroom teachers nominated as supportive of the child with ASD. During the play sessions, the graduate teaching assistant from the classroom facilitated the session. The graduate assistant was chosen because the child was familiar and comfortable with the assistant and the assistant was knowledgeable about routines and schedules for child with ASD.

The child involved in the study participated in identical activities indoors and outdoors. Play materials, peers, positioning of materials and peers, teaching assistant, procedures and transitions stayed consistent throughout each activity. Three different activities were presented; Play dough, sand, and water. Each activity was done both
indoors and outdoors with play dough being repeated a second time at the end of the study. Play sessions lasted five minutes each and all sessions were facilitated by the graduate assistant.

The indoor session occurred at the end of indoor free playtime, while the outdoor sessions occurred at the beginning of outdoor playtime. All outdoor activities were done when no other children were present outside. Transitions to activities were done according to the pictorial schedules used by the child with ASD. Peer play partners were asked to help transition the child with ASD to their schedule and then help guide them to the activity. The graduate teaching assistant in each classroom guided the activity as well as the transitions to the activity.

Each outdoor session was conducted in the same location outside on the lab school playground. The area was located under a large pine tree with wood chips on the ground below. The area was also located near the entrance door to the younger classroom. In the play dough sessions, a square table with 4 chairs was used. The teaching assistant was positioned to the right of the child with ASD, one peer was directly across the table from the child with ASD, and one peer was to the left. Materials included one rolling pin and one and a half quarts of white play dough. In the sand sessions, a sensory table with 2 cubic feet of play sand was used. Children stood next to the table. The teacher was positioned (seated, squatting, or kneeling) to the right of the child with ASD, and the two peers were positioned directly across the table. Materials included four 4-ounce cups and a sand wheel. Cups were positioned so that one was accessible to each child and the teacher. In the water sessions, a square table with 4 chairs was used. The teacher was positioned to the right of the child with ASD, one peer was directly across
the table from the child with ASD, and one peer was to the left. Materials included a 4-gallon plastic tub that is six inches deep, filled with three gallons of water, four toy boats, and four toy dogs. In the play dough sessions (Set B), a square table with 4 chairs was used. The teacher was positioned to the right of the child with ASD, one peer was directly across the table from the child with ASD, and one peer was to the left. Materials included one and a half quarts of white play dough.

Each indoor session was conducted in a breakout room located at the lab school. Breakout rooms are smaller rooms located outside of the classroom and each serve different purposes (ex. Art studio, block room, research room). Each breakout room used was familiar to all participants. The materials and positioning of all participants were the same as the outdoor sessions conducted. All sessions were video recorded.

Procedures for Activities

Play dough (Set A)

The teacher introduced the activity by stating, “I am going to show you two ways to make pancakes with play dough and then you can try it. Watch me.” She then took a handful of play dough that is approximately ¼ cup and flattened it with her hand. She then told the group, “Now you do it.” The teacher then asked each individual child: “Can you do it?” As the children worked with their play dough the teaching assistant used behavior reflections like, “I see you made your play dough pancake flat.”

Next, the teacher stated, “I’m going to show you another way to make a play dough pancake. You can use the rolling pin like this.” The teacher then took another handful of play dough (approximately ¼ cup) and used the rolling pin to make it flat. She then handed the rolling pin to the child to her right and told the child “Now it’s your
turn.” The teacher used a behavior reflection statement and encouraging statement and then told the child “Now it’s (child’s name’s) turn” referring to the child to the right. “Please give the rolling pin to (child’s name).” While the second child rolled the play dough, the teacher made another behavior reflection statement and encouraging statement. The teacher then told the child “Now it’s (child’s name’s) turn. Please give the rolling pin to (child’s name).” The teacher then made another behavior reflection statement and encouraging statement. The child with ASD was last in this case because it is more likely that the child will accept the rolling pin than it is that the child will give the rolling pin to another child. However, after the child with ASD had a turn, the teacher gave the child an opportunity to share the rolling pin with the teacher. The teacher said, “(child’s name), I would like another turn. Please give me the rolling pin.” The teacher then put out her hand to receive the rolling pin. If the child did not give the rolling pin to the teacher, the teacher re-stated her statement in the form of a question. After receiving the rolling pin, the teacher stated “It’s time to go (inside or outside).” The teacher then prompted the child with ASD to check their pictorial schedule to see what the next activity would be. The teacher then guided the children to their next activity.

Note: Children were permitted to manipulate the play dough in any acceptable way (no eating or throwing) during the activity. For example, while other children are using the rolling pin, children can mold their play dough however they want.

Sand

The teacher then asked the children: “Do you know how to make the sand wheel turn?” She then listened to their responses; if one or more children knew how to make it turn, she invited them to show the others: “(child’s name), show us how you can make
the wheel turn.” After the first child poured the sand into the hopper at the top of the wheel, the teacher stated: “Let’s all take turns making the wheel turn.” If none of the children were able to state that they know how to make the wheel turn, the teacher stated: “I will show you how to make the wheel turn. You scoop the sand with your cup and you pour it in the top like this” and she demonstrated, scooping the sand and pouring it into the top of the wheel. She then stated: “Let’s all take turns making the wheel turn.” She then turned to the child with ASD and invited the child first: “(child’s name), scoop the sand and pour it into the wheel like I did.” If the child did not perform the activity, the teacher then re-stated the direction. If the child still did not perform the activity, the teacher stated that it is the child’s turn who was directly across the table from the child with ASD, “OK, now it’s (child’s name’s) turn. (child’s name), scoop the sand and pour it into the wheel like I did.” She then repeated the procedure with the next child, and then gave the child with ASD another opportunity to perform the activity, using the same procedure: “(child’s name), it’s your turn now. Scoop the sand and pour it into the top like I did.” After any child performed the activity, the teacher used a variety of behavior reflection statements such as, “You did it!” and “You made the wheel turn!” The teacher also offered encouragement when needed, for example, “I think you can do it. Do you want to try again?” and offered specific suggestions that helped the child to be successful. After each child had a turn (and the child with ASD had a second opportunity to take a turn), the teacher began the transition to the next activity. She told the children “We all had a turn. Now it’s time to go (inside or outside).” The teacher used the pictoral schedule in the same manner as the previous transitions. The teacher then guided the children to their next activity.
Note: Children were permitted to manipulate the sand in any acceptable way (no eating or throwing) during the activity. For example, while other children are taking a turn pouring sand into the wheel, a child may let the sand run through their fingers, scoop the sand with their cup, etc.

_Water_

A square table with 4 chairs was used. The teacher was positioned to the right of the child with ASD, one peer was directly across the table from the child with ASD, and one peer was to the left. Materials included a 4 gallon plastic tub that is six inches deep, filled with three gallons of water, four toy boats, and four toy dogs.

The teacher introduced the activity by saying “Look! There are dogs swimming in the water. I’m going to help one of the dogs get onto a boat to rest.” The teacher then took one of the dogs and placed it onto a boat. She then stated “OK, go ahead and play, and remember to all play together.” The teacher interacted with one of the boats and dogs, and made one behavior reflection statement to each child during the next one and a half minutes. During the following minute, the teacher asked one of the peers to offer a toy to the child with ASD (note that there were enough boats and dogs for each child to have one, with one left over): “(child’s name), please give my dog to (child’s name).” After three minutes of play, the teacher stated: “Now it’s time to go to family block time.” The teacher will use the pictoral schedule in the same manner as the previous transition. The teacher then guided the children to their next activity.

_Play dough (Set B)_

The teacher introduced the activity, “Guess what? We are going to make a pizza together!” The teacher then took a handful of play dough approximately 1 cup in volume.
and flattened it out in the middle of the table, and said, “Look. I made a pizza crust. We are all going to put something on the pizza.” She then gave each child a handful of play dough (approximately 1 cup in volume) and said, “I am going to put some cheese on the pizza.” She then tore a few small pieces of play dough off her handful of play dough and put it on the pizza. The teacher then turned to the child with ASD and said, “(child’s name), it’s your turn to put something on the pizza. Please put some cheese on the pizza like I did.” If the child did not engage in the activity, the teacher repeated the directive one more time. If the child still did not engage in the activity, the teacher said say, “Maybe you will want a turn later.” The teacher then turned to the child to the left and stated, “(child’s name), it’s your turn to put something on the pizza. Please put something on the pizza like I did.” The teacher repeated this procedure with the second peer. If the child with ASD did not participate during the first turn, the child was given another turn with the same procedure, “(child’s name), it’s your turn to put something on the pizza. Please put something on the pizza like I did.” After each child had a turn, the teacher will stated, “Now it’s time to go (inside or outside).” The teacher used the pictoral schedule in the same manner as the previous transitions. The teacher then guided the children to their next activity.

Plan for Analysis

The visual inspection method was used to determine whether behaviors differed as a function of context (indoors or outdoors). This method involves graphing behaviors as a function of context, with dependent variables on the Y axis and sessions on the X axis. Sessions are marked as indoors or outdoors so that visual inspection can determine whether each dependent variable differs as a function of context. The method of visual
inspection is commonly used among studies using this design (Hojem & Ottenbacher, 1988).
Chapter IV

Results

The first set of analyses presented is the self-regulation variable, operationalized as positive and negative affect. Next, analysis of the attention behavior variable will be presented, time on task. Lastly, analysis of the social behavior variables will be presented, the number of compliances to prompts given by the teacher or peer as well as vocalizations to the teacher or peer.

Social Behaviors

The social behaviors were measured by examining the compliances to prompts given to the child with ASD from either the teacher or peer. In order to create a percentage of time the child compliance, a ratio was computed. The number of times the child complied with a prompt from a teacher (ex. Pass the roller) was divided by the total number of times the teacher prompted the child. The same ratio was computed for the prompts provided by peer. An occurrence of 0 indicates that no prompts were given from the peer or teacher and therefore no amount of compliance could be calculated. Overall, compliance with requests was quite high, ranging from 75% to 100% for compliance with teacher requests and ranging from 60% to 100% for peer requests. The proportion of compliances with peers was nearly identical across indoor and outdoor settings. The compliance with the teacher was also similar between the two settings with the highest amount of compliance occurring during an indoor sand session. Table 1 presents the percentages calculated for each session and these results are presented graphically in Figure 1.
A second measure of social behaviors was constructed by counting the number of vocalizations by the target child toward the teacher or peers. The child produced the highest number of vocalizations during the indoor sessions, with the most vocalizations occurring during the indoor sand session. The data for vocalizations is presented in Table 2 and Figure 2.

Table 1. Social Behaviors by Sessions – Complies with Teacher or Peer Request

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Complies with Teacher Request</th>
<th>Complies with Peer Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water Outside</td>
<td>0.83</td>
<td>0.6</td>
</tr>
<tr>
<td>2. Water Inside</td>
<td>0.83</td>
<td>0.67</td>
</tr>
<tr>
<td>3. Play dough 1 Outside</td>
<td>0.75</td>
<td>1</td>
</tr>
<tr>
<td>4. Play dough 1 Inside</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5. Play dough 2 Outside</td>
<td>0.83</td>
<td>0</td>
</tr>
<tr>
<td>6. Play dough 2 Inside</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7. Sand Outside</td>
<td>0.71</td>
<td>--</td>
</tr>
<tr>
<td>8. Sand Inside</td>
<td>0.71</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 1. Social Behaviors by Sessions – Complies with Teacher or Peer Request

![Indices of Social Behavior by Session](image)

Table 2. Social Behaviors by Sessions – Vocalizations

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Vocalizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water Outside</td>
<td>2</td>
</tr>
<tr>
<td>2. Water Inside</td>
<td>2</td>
</tr>
<tr>
<td>3. Play dough 1 Outside</td>
<td>3</td>
</tr>
<tr>
<td>4. Play dough 1 Inside</td>
<td>3</td>
</tr>
<tr>
<td>5. Play dough 1 Outside</td>
<td>0</td>
</tr>
<tr>
<td>6. Play dough 2 Inside</td>
<td>4</td>
</tr>
<tr>
<td>7. Sand Outside</td>
<td>2</td>
</tr>
<tr>
<td>8. Sand Inside</td>
<td>10</td>
</tr>
</tbody>
</table>
Attention Behaviors

Attention was operationalized as the proportion of time on task, and this was computed by subtracting the total number of seconds the child was off task by the total number of seconds in the session. A ratio was then created by dividing the number of seconds the child was on task by the total number of seconds in the session. This created the proportion or ratio of time that the child was on task during the activity. Overall, the proportion of time on task ranged from .58 to .98, which is very high. Time on task was higher in two indoor sessions, water and play dough 1, and lower in two indoor sessions, sand and play dough 2. This indicates that the time on task was approximately evenly distributed when considering the overall sessions. The outdoor activities stay around the same proportion of time on task with the outside sand session being the highest for the outdoor session at .98. The indoor sessions also stay consistent but have some major changes when the 4th play dough session and the sand session are examined. These two
sessions represent the lowest proportion of time on task out of all the sessions conducted.

The results from each session are presented in Table 3 and Figure 3.

**Table 3. Attention and Engagement by Session**

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Proportion of Time on Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Water Outside</td>
<td>0.95</td>
</tr>
<tr>
<td>2. Water Inside</td>
<td>0.98</td>
</tr>
<tr>
<td>3. Play dough 1 Outside</td>
<td>0.87</td>
</tr>
<tr>
<td>4. Play dough 1 Inside</td>
<td>0.96</td>
</tr>
<tr>
<td>5. Play dough 2 Outside</td>
<td>0.87</td>
</tr>
<tr>
<td>6. Play dough 2 Inside</td>
<td>0.58</td>
</tr>
<tr>
<td>7. Sand Outside</td>
<td>0.98</td>
</tr>
<tr>
<td>8. Sand Inside</td>
<td>0.86</td>
</tr>
</tbody>
</table>

**Figure 3. Attention and Engagement by Session**
Self-Regulation

Self-regulation was measured by counting the number of occurrences of either positive or negative affect during each activity. An occurrence of 0 means that there was no occurrence of the positive or negative affect as the child participated in the session. Positive affect scores ranged from 0-2 and negative affect scores ranged from 0-5. Positive affect is highest in two of the outdoor sessions (water and play dough) and negative affect is at the lowest in these same sessions as well. Negative affect is highest during the first play dough session outside but stays consistent around 0 and 1 occurrences throughout the other sessions. The results are presented in Table 4, Figure 4, and Figure 5.

Table 4. Self-Regulation by Session

<table>
<thead>
<tr>
<th>Session</th>
<th>Positive Affect</th>
<th>Negative Affect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Water Outside</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2.Water Inside</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.Play dough 1 Outside</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>4.Play dough 1 Inside</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5.Play dough 2 Outside</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6.Play dough 2 Inside</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7.Sand Outside</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8.Sand Inside</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Figure 4. Self-Regulation by Session – Positive Affect

Figure 5. Self-Regulation by Session – Negative Affect
Chapter V

Discussion

The purpose of this study was to test the hypothesis that social behaviors, attention, and self-regulation of a child with ASD would be enhanced during outdoor play compared to indoor play. Specifically, this study compared: (1) social behaviors of children with ASD indoors and outdoors; (2) attention and engagement of children with ASD indoors and outdoors; and (3) self-regulatory behaviors of children with ASD indoors and outdoors, operationalized as emotion regulation. When comparing social behaviors indoors and outdoors the results did not indicate that one setting had a clear advantage over the other. When examining attention and engagement the results indicate a slightly higher amount of time on task when outside, but the difference between the indoor and outdoor sessions are not large. With self-regulation behaviors the highest amounts of positive affect were found in the outdoor sessions. However the differences again were not large between the two settings and in one instance the negative affect was much higher in one of the outdoor sessions. Overall, the evidence does not clearly favor one context over the other.

There could be many different reasons as to why the results show such similarity in across the two settings in the behaviors measured in this study. One reason may be that the outdoor setting does not provide the same kinds of restorative benefits for children with ASD that have been observed for typically developing children and for adults. Attention, cognition, and self-regulation have been studied in children and adults, but social behavior, self-regulation, and attention as operationalized in this study has not. Children with ASD function much differently than any other population that has
documented restorative benefits from nature. It could be that nature may hold a different type of restorative benefit for children with ASD, which was not apparent through this type of study. It is also possible that specific behaviors that were operationalized did not accurately capture the effect the setting may have had on the child with ASD. Providing different ways of operationalizing behaviors may be a key to understand if the outdoor environment has a different effect on children with ASD. Observing instances of eye contact, measuring instances of repetitive behaviors, and imitation behaviors may be different ways to operationalize the variables and observe if different results are generated.

Despite inconclusive findings, this study adds to a growing body of research on potential benefits of nature for children. The only other published study examining benefits of time outdoors for children with ASD utilized teacher, volunteer, and parent reports of the perceived benefits of children with ASD spending time outdoors (Chang & Chang). Chang & Chang reported that teachers, volunteers and parents of children with autism saw communication increase, more emotions were observed and interactions increased when more time was spent outdoors. This study contributes to the literature by beginning to use direct observations of behavior of children with ASD in indoor and outdoor settings.

Results of this study also differ from findings reported by Faber Taylor & Kuo (2009), who found that cognitive function of children ages 7-12 diagnosed with ADD or ADHD improved significantly after a walk in a natural area compared to a walk in an urban area. The current study is not directly comparable because the participant was preschool aged and diagnosed with ASD, and attention was measured as engagement in
the task, operationalized as the proportion of time on-task rather than performance on cognitive tasks. It would be useful for future research to examine a variety of indices of attention/engagement in both age groups and across the range of typically developing children as well as those diagnosed with attention deficits or ASD.

Results from this study also differ from those found by Wells (2000). Cognitive functioning increased for children who moved to ‘greener’ environment, and academic gains were also observed after the move (Wells, 2000). The current study is not directly comparable to this study because the participants in the previous study were typically developing and older than the child in the current study. In addition to the differences in participants, the outcomes for the studies were also different. Cognitive functioning and academic performance were assessed in the Wells (2000) study, and behaviors indicative of attention and engagement were assessed in the current study.

The current study can also add to the knowledge base on joint attention for children with ASD. Multiple studies have found that specific joint attention training can increase both social skills and attention behaviors in children with ASD (Gulsrud, Kasari, Freeman & Paparella, 2007). The current study supports the need to continue research in how to best support children in developing joint attention skills by incorporating different settings such as the outdoor environment.

Limitations

As with all research, limitations were encountered in this study. With the target child participating in an individualized program where the child was pulled from the classroom at several times during the day for support services, the ability to fit in the sessions proved to be challenging and therefore the sessions happened over a longer
period of time than would have been optimal. With the longer time frame the child made developmental progress and learned new skills that could have contributed to the level of engagement in the activities and the ability to comply with prompts given. In addition, in part because of the intensive services the child was receiving he was functioning at a relatively high level as evidenced by the relatively high proportion of compliances to teacher and peer requests, low level of negative affect, and high level of time on task. Thus, a “ceiling effect” may have been operating and results may differ for a child who had not received such intensive supports or who is not functioning at the level of the participant in this study.

The activities designed for this study were highly structured and provided a high level of support for the participating child. This also may have contributed to the lack of differences between settings. It is possible that differences may be evident if children’s behavior was compared indoors and outdoors while engaged in less structured activities such as free play outdoors and free play indoors. Also, activities such as group reading activities that require some structure, but still allow for behaviors to be observed, maybe appropriate activities to consider.

Another limitation encountered throughout part of the study was that the target child was potty training. This involved a strict routine in which the child did not participate in regular scheduled activities in the classroom. Apart from meal times and occasional breaks, the child spent all day on the toilet. Programming and any special services were done in the bathroom. The child was able to come and participate in the study sessions during this time. This occurred during play dough sessions 1 and 2. Therefore when participating in the study activities the child’s schedule was abnormal
and causing higher levels of stress than usual. This may have contributed some of the higher levels of protest behaviors and decreased ability to focus on the activity.

Implications for Future Research and Practice

At a minimum, results of this study indicate that a child with ASD performs as well outdoors as indoors. Many educators are reluctant to bring their practice outdoors, thinking that there are more distractions for the child. In fact, the special education professionals who work with the target child in this study were skeptical that he would participate in the activities while outdoors because of potential distractions. Future research should include participants who vary on the spectrum of ASD, and specifically include participants with sensory integration challenges because the calming effects of the outdoor environment may be especially beneficial for such children. Future research should include a larger number of participants and consistent and longer term exposure to structured time outdoors for children with autism. By having a larger number of participants with varying skills (high functioning to low functioning) the role of the outdoors for these children might be observed. Also, by looking at behaviors over a longer period of time, possibly having activities twice a week over a period of months, perhaps more trends could be observed.

Future practice should also focus on adding structured time outdoors in combination with other forms of intervention to see if the context of an intervention already in place could help improve the functionality of the intervention. This area of research holds potential benefits to many different professional and non-professional groups including teachers, para-professionals, administrators and parents of children with
autism. By continuing this research, all of these groups could hold a powerful research-based practice to aid in helping children with autism.
References


Appendix A

Informed Consent
Fresh Air and Sunshine – 2:
The Science Underpinning the Benefits of Nature for Children’s Development

Your child is invited to participate in a study of the benefits of outdoor activity in natural areas for children’s development. This study in particular focuses on potential benefits for children diagnosed with Autism Spectrum Disorders, and your child is invited to participate because he or she is enrolled in Project EXCEED. If you give consent for your child to participate in this study, he or she will be observed while engaged in identical planned activities indoors and outdoors. The activities are typical preschool activities such as playing with play-dough, sand, and water. Your child will participate in the activity with two classmates for approximately 10 minutes indoors in the research room of the Ruth Staples Child Development Lab, and also participate in the same activity outdoors approximately one week before or after (the order of indoors and outdoors will be counterbalanced). Your child will participate in a total of 8 sessions (4 indoors and 4 outdoors). The sessions will be video recorded so that we can analyze behavior afterward. All sessions will take place between 9:00 and 11:30 am. Your child will be invited to participate in the research session in the same manner in which he or she is invited to participate in other curricular activities, and if he or she chooses not to participate before or during the sessions, he or she will be allowed to choose an alternative activity.

There are no anticipated risks to your child as a result of participating in this research. There are no direct benefits to you or your child. However, information that we gain from this research may be used to improve educational practices for children diagnosed with ASD. Your child will receive an age-appropriate book as a thank you for participation. Any information obtained during this study which could identify you or your child will be kept strictly confidential. The data will be stored in a locked cabinet in the investigator’s office and will only be seen by the research team. An identification number will be used instead of your name or your child’s name on all research assessments. The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as group data. We will never identify individual children or parents in any of our reports.

You may ask questions concerning this research and have those questions answered before agreeing to participate or during the study. If you have questions, you may contact the investigator, Dr. Julia Torquati (402) 472-1674. If you have questions concerning your rights as a research participant that have not been
answered by the investigator, you may contact the University of Nebraska-Lincoln Institutional Review Board (402) 472-6965.

You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, your child’s early education program, or the University of Nebraska. Your decision will not result in any loss of benefits to which you are otherwise entitled.

You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented. You will be given a copy of this consent form to keep. Please indicate whether or not you want to be in this research study by checking one of the statements below and signing your name.

Sincerely,

Julia C. Torquati, Ph.D.
(402) 472-1674

<table>
<thead>
<tr>
<th>Informed Consent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Child’s Name:</td>
</tr>
<tr>
<td>First Name</td>
</tr>
<tr>
<td>Your Child’s Birthdate: <strong>/</strong>/____</td>
</tr>
<tr>
<td>Please check one of the boxes below.</td>
</tr>
<tr>
<td>☐ Yes, I agree for my child to participate in this study. I understand the purpose of this study and how it will be conducted. All of my questions about the study have been answered. I also understand that I should keep the second copy of this consent letter for my records.</td>
</tr>
<tr>
<td>☐ No, I do not agree for my child to be in this study at any time.</td>
</tr>
<tr>
<td>Signature: ___________________________ Today’s Date: __________</td>
</tr>
<tr>
<td>Your Name (please print): ___________________________</td>
</tr>
</tbody>
</table>
Informed Consent

Fresh Air and Sunshine – 2: The Science Underpinning the Benefits of Nature for Children’s Development

Your child is invited to participate in a study of the benefits of outdoor activity in natural areas for children’s development. If you give consent for your child to participate in this study, he or she will be observed while engaged in identical planned activities indoors and outdoors. The activities are typical preschool activities such as playing with play-dough, sand, and water. Your child will participate in the activity with two peers for approximately 10 minutes indoors in the research room of the Ruth Staples Child Development Lab, and also participate in the same activity outdoors approximately one week before or after (the order of indoors and outdoors will be counterbalanced). Your child will participate in a total of 8 sessions (4 indoors and 4 outdoors). The sessions will be video recorded so that we can analyze behavior afterward. All sessions will take place between 9:00 and 11:30 am. Your child will be invited to participate in the research session in the same manner in which he or she is invited to participate in other curricular activities, and if he or she chooses not to participate before or during the sessions, he or she will be allowed to choose an alternative activity.

There are no anticipated risks to your child as a result of participating in this research. There are no direct benefits to you or your child. However, information that we gain from this research may be used to improve educational practices for children diagnosed with ASD. Your child will receive an age appropriate book as a thank you for participation.

Any information obtained during this study which could identify you or your child will be kept strictly confidential. The data will be stored in a locked cabinet in the investigator’s office and will only be seen by the research team. An identification number will be used instead of your name or your child’s name on all research assessments. The information obtained in this study may be published in scientific journals or presented at scientific meetings but the data will be reported as group data. We will never identify individual children or parents in any of our reports.

You may ask questions concerning this research and have those questions answered before agreeing to participate or during the study. If you have questions, you may contact the investigator, Dr. Julia Torquati (402) 472-1674. If you have questions concerning your rights as a research participant that have not been answered by the investigator, you may contact the University of Nebraska-Lincoln.
Institutional Review Board (402) 472-6965.

You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, your child’s early education program, or the University of Nebraska. Your decision will not result in any loss of benefits to which you are otherwise entitled.

You are voluntarily making a decision whether or not to participate in this research study. Your signature certifies that you have decided to participate having read and understood the information presented. You will be given a copy of this consent form to keep. Please indicate whether or not you want to be in this research study by checking one of the statements below and signing your name.

Sincerely,

Julia C. Torquati, Ph.D.
(402) 472-1674

<table>
<thead>
<tr>
<th>Informed Consent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Child’s Name:</td>
</tr>
<tr>
<td>__________________________________________________________________________</td>
</tr>
<tr>
<td>First Name</td>
</tr>
<tr>
<td>Your Child’s Birthdate: ____/<strong>/</strong> __ __ __</td>
</tr>
<tr>
<td>Please check one of the boxes below.</td>
</tr>
<tr>
<td>☐ Yes, I agree for my child to participate in this study. I understand the purpose of this study and how it will be conducted. All of my questions about the study have been answered. I also understand that I should keep the second copy of this consent letter for my records.</td>
</tr>
<tr>
<td>☐ No, I do not agree for my child to be in this study at any time.</td>
</tr>
<tr>
<td>Signature: ___________________________________________ Today’s Date: ________</td>
</tr>
<tr>
<td>Your Name (please print): ___________________________________________________________________________</td>
</tr>
</tbody>
</table>
Appendix B

Fresh Air and Sunshine – ASD Project Observational Codes

Note child name and coder name on each code sheet.

1. Prompts from teacher: This refers to directives from the teacher: “Now you do it” or “Ben’s turn” or “put in.”
2. Complies with teacher prompt: The child does what the teacher is asking him/her to do.
3. Prompts from peers: This refers to directives from peers, as above with teacher.
4. Complies with peer prompt: The child does what the peer is asking him/her to do.
5. Number vocalizations in response to teacher or peer: The child repeats what the teacher or peer tells him/her to say, or responds to vocalization in another way (for example answers question).
6. Expressions of positive affect: Visible smiling or laughing
7. Expressions of negative affect: Distress or protest vocalizations
8. Time off task: this refers to wandering away, taking hands out of materials and looking elsewhere; note that if the child has hands in sand, play dough, or water, they are usually engaged. This code refers to when the child is doing something completely different than the tasks provided.
9. Total session time (beginning time to end time) will be determined prior to coding by the research coordinator (Mollie).
10. Teacher prompts give tool to child: Refers to teacher’s instruction to the child to take the roller (play dough) or scoop (sand).
11. Complies with teacher (give tool): The child puts hand out and receives tool (roller or scoop).
12. Prompts from peer (give tool to child): Refers to the peer handing the tool (roller or scoop) to child.
13. Complies with peer (receive tool): Refers to the child putting out a hand and receiving the tool (roller or scoop).
14. Prompts to give tool to peer or teacher: Refers to directives to the child to give the tool (roller or scoop) to peer or teacher. Note that this could take the form of “my turn” or “Tahlia’s turn” or “give scoop” for example.
### Observational Codes - Children with ASD

<table>
<thead>
<tr>
<th></th>
<th>Child:</th>
<th>Coder:</th>
<th>Notes</th>
</tr>
</thead>
</table>

#### Water Session 1:
- Number of prompts from teacher:
- Number of complies to teacher:
- Number of prompts from peers:
- Number of complies to peers:
- Number vocalizations in response to teacher or peer:
- Expressions of positive affect
- Expressions of negative affect
- Time off task (in seconds)
- Total session time (in seconds)

#### Water Session 2:
- Number of prompts from teacher:
- Number of complies to teacher:
- Number of prompts from peers:
- Number of complies to peers:
- Number vocalizations in response to teacher or peer:
- Expressions of positive affect
- Expressions of negative affect
- Time off task (in seconds)
- Total session time (in seconds)

#### Play Dough Session 1 (roller):
- Number of prompts from teacher (give tool to child):
- Number of complies to teacher (receive tool):
- Number of prompts from teacher (pat play dough):
- Number of complies to teacher (pat play dough):
- Number of prompts from peer (give tool to child):
- Number of complies to peer (receive tool):
- Number of prompts to give tool to peer or teacher:
- Number of complies (gives tool to peer or teacher):
- Number vocalizations in response to teacher or peer:
- Expressions of positive affect
- Expressions of negative affect
- Time off task (in seconds)
- Total session time (in seconds)

#### Play Dough Session 2 (roller):
- Number of prompts from teacher (give tool to child):
- Number of complies to teacher (receive tool):
- Number of prompts from teacher (pat play dough):
- Number of complies to teacher (pat play dough):
- Number of prompts from peer (give tool to child):
- Number of complies to peer (receive tool):
- Number of prompts to give tool to peer or teacher:
- Number of complies (gives tool to peer or teacher):
- Number vocalizations in response to teacher or peer:
- Expressions of positive affect
- Expressions of negative affect
- Time off task (in seconds)
- Total session time (in seconds)

#### Play Dough Session 3 (pizza):
- Number of prompts from teacher:
- Number of complies to teacher:
- Number of prompts from peer:
- Number of complies to peer:
- Number vocalizations in response to teacher or peer:
- Expressions of positive affect
- Expressions of negative affect
- Time off task (in seconds)
- Total session time (in seconds)
<table>
<thead>
<tr>
<th><strong>Play Dough Session 4 (pizza):</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of prompts from teacher:</td>
<td></td>
</tr>
<tr>
<td>Number of complies to teacher:</td>
<td></td>
</tr>
<tr>
<td>Number of prompts from peer:</td>
<td></td>
</tr>
<tr>
<td>Number of complies to peer:</td>
<td></td>
</tr>
<tr>
<td>Number vocalizations in response to teacher or peer:</td>
<td></td>
</tr>
<tr>
<td>Expressions of positive affect</td>
<td></td>
</tr>
<tr>
<td>Expressions of negative affect</td>
<td></td>
</tr>
<tr>
<td>Time off task (in seconds)</td>
<td></td>
</tr>
<tr>
<td>Total session time (in seconds)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sand Session 1:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of prompts from teacher (take scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies to teacher (receive scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of prompts from teacher (give scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies with teacher (receive scoop)</td>
<td></td>
</tr>
<tr>
<td>Number of prompts from peer (take scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies to peer (receive scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of prompts to give scoop to peer:</td>
<td></td>
</tr>
<tr>
<td>Number of complies with give scoop to peer:</td>
<td></td>
</tr>
<tr>
<td>Number vocalizations in response to teacher or peer:</td>
<td></td>
</tr>
<tr>
<td>Expressions of positive affect</td>
<td></td>
</tr>
<tr>
<td>Expressions of negative affect</td>
<td></td>
</tr>
<tr>
<td>Time off task (in seconds)</td>
<td></td>
</tr>
<tr>
<td>Total session time (in seconds)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sand Session 2:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of prompts from teacher (take scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies to teacher (receive scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of prompts from teacher (give scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies with teacher (receive scoop)</td>
<td></td>
</tr>
<tr>
<td>Number of prompts from peer (take scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of complies to peer (receive scoop):</td>
<td></td>
</tr>
<tr>
<td>Number of prompts to give scoop to peer:</td>
<td></td>
</tr>
<tr>
<td>Number of complies with give scoop to peer:</td>
<td></td>
</tr>
<tr>
<td>Number vocalizations in response to teacher or peer:</td>
<td></td>
</tr>
<tr>
<td>Expressions of positive affect</td>
<td></td>
</tr>
<tr>
<td>Expressions of negative affect</td>
<td></td>
</tr>
<tr>
<td>Time off task (in seconds)</td>
<td></td>
</tr>
<tr>
<td>Total session time (in seconds)</td>
<td></td>
</tr>
</tbody>
</table>