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The Impact of Natural Playscapes on Toddler Play

Laura J. Pearce
East Tennessee State University

The Impact of Natural Playscapes on Toddler Play

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Laura Pearce

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Dr. Jane Broderick, Chair

Dr. Pam Evanshen

Dr. Julia Atiles

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ABSTRACT

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A distinct lack of data related to the impact of natural environments on children birth to age 3 was identified by a thematic review of the existing literature. With this in mind, the researcher designed a limited scope quantitative study to explore the potential for extending the existing body of research to include this younger age. The study used a time sampling method to code behaviors that occurred in videos collected of children from 12 to 35 month who were playing on the playground at their childcare facility. The playscapes were classified as naturalistic or manufactured. The data was then analyzed using independent t-tests to look for statistically significant variations to the frequent that children engaged in various social and play based behaviors. The results of the study were minimal but were significant enough to support the value of further research involving children birth to three.

DEDICATION

I am dedicating this thesis to my family and colleagues at Rainbow Riders Childcare Center for the support and encouragement they have given me. My husband, Paul, and my four children have supported me in taking time away to focus on the work as well as encouragement to keep going when things became challenging. My colleagues have been a constant source of encouragement, especially Kristi Snyder supporting my educational goals financially as well as flexibility in my work schedule so I could get time to collect data. She has also always been there to encourage me when I was doubting my ability to complete this. I thank them wholeheartedly.

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Chapter 1. Introduction

Throughout the history of the field of child development, there has been ongoing dialogue discussing the significance of nature versus nurture. Within the educational theory of social constructivism, the focus is on how children learn through interactions with their environment as well as with other people in their lives. Urie Bronfenbrenner contributes his perspective on the understanding of development to many early experiences including one in which he observes when his father would "alert [his] unobservant eyes to the workings of nature by pointing to the functional interdependence between living organisms and their surroundings" (Bronfenbrenner, 1995, p. 602). Much of Bronfenbrenner's (1995) earlier work focused on the study and reflection of how behavior and development are influenced by life experiences and environments. Bronfenbrenner (1995) describes his ecological model of development through the conceptual model of nested spheres of interrelated environmental influences on the experiences of individuals. The underlying purpose of this model is to understand how the environment at the various spheres can influence how a person will develop and thus allow intentionality in the design of the environment to encourage the type of development educators want to foster. This view of development and the importance of understanding the relationship between our physical environment and development is the underlying motivation for the proposed study on the impact of natural playscapes on toddler play.

After reviewing the literature on key developmental theories, current available tools used to assess classroom and outdoor environments, and previous research on the relationship between natural playscapes and children's development and health, further research is recommended. This study examines the impact of the style of outdoor playscapes on children ranging from 12-35 months, and the relationship between style of playscape (naturalistic versus manufactured) on the types of play in which toddlers engage. The types of play identified as social and non-social play by Mildred Parten (1932) are the primary categorizations used to analyze the data to look for statistically significant variations in children's engagement based on the type of playscape provided.

Purpose of the Study

In order to help programs make decisions about outdoor environments for children ages 12-36 months, more information is needed to show if type of environment does indeed influence types of play. This study sought to determine if there are quantifiable differences between the environment and types of play. The results can thus be shared to help schools make intentional design decisions to foster the specific types of play they are seeking to promote during outdoor time.

Research Questions

The proposed research question is:

Are there notable variations in the observed rates and types of play occurring in outdoor play environments in children ages 12-35 months based on the type of outdoor play space: naturalistic or manufactured?

It is hypothesized that the two different styles of playscapes (naturalistic and manufactured) will foster different types of play such as unoccupied, onlooker, or associative play.

The null hypothesis is that the classification of playscape will be independent of the type of play in which toddlers engage.

Significance of the Study

This research study was designed to contribute to the growing body of literature related to the impact of outdoor playscapes and children's development. This study focuses on children from ages 12-35 months. The current literature focuses primarily on children 3 years and above, thus making it significant to focus on these younger children. I propose that the findings of the existing studies appear to extend to the younger ages and thus highlight the need for early childhood programs to expand their considerations when developing outdoor learning environments. These considerations should include which types of play they wish to foster, instead of being primarily focused on physical safety and gross-motor facilitation.

Limitations

This study as designed has specific limitations. The primary limitation is that the sample size used in the study is small. Another limitation is that all the programs included in the study are located in one geographic region of the United States, the Greater Appalachian Region. These factors impact the ability to generalize the results. Thus, the significance of this study is to establish the value for expanding the current body of research in the area of environmental impacts of outdoor playscapes on development to include infants and toddlers.

Definition of Terms

"Toddlers", for the purpose of this study, is defined as children ranging in age from 12 to 35 months.

"Naturalistic playscape" is defined as a playscape in which a larger percentage of the physical space and materials provided are naturally occurring or made from raw materials found in nature (DeBord et al., 2005; Malone & Tranter, 2003; Martensson, 2013).

"Manufactured playscape" is defined as a playscape that contains more physical space and materials that are either made from manmade materials or are taken from the naturally occurring state and shaped into something else such as a climber made of wood rather than climbing mounds made out of dirt, grass and other foliage (DeBord et al., 2005; Martensson, 2013; Malone & Tranter, 2003).

"Loose parts" is defined as materials that are separate from structures both natural or manufactured and can be carried to various places in the environments and used in various ways.

They include, but are not limited to, rocks, sticks, leaves, blocks, and sand toys (DeBord et al., 2015).

“Outdoor playscape or environment” is defined as the specific space designated for classrooms to play outside. This is typically, but not always, contained by a fence and provided to a specific age of children enrolled in the childcare program. The regular use of the space by the classroom makes it familiar and a recognized part of the school (DeBord et al., 2005; NAEYC, 2019).

“Microsystem” is defined as the immediate location a person is in at any given time, including the general physical environment and the materials and people within that space. It also incorporates the actions, interactions and influences between these aspects (Brofenbrenner, 1979).

“Mesosystem” is defined as the interconnectivity between microsystems. This system incorporates the combined impact of each microsystem in a person’s life and grows and shifts over time. For example, a person’s microsystem will include various physical locations they spend time in and the various social networks they are directly involved in (Brofenbrenner, 1979).

“Exosystem” is defined as the external systems and environments that impact a person due to indirect influences. Examples include how a parent’s work system indirectly impacts the child at home; these influences occur specifically when the individual is not directly present (Brofenbrenner, 1979).

“Macrosystem” is defined as an individual’s larger culture or subculture (Brofenbrenner, 1979).

“Non-social activities” are activities with no noticeable social component. This includes unoccupied, onlooker, and solitary play (Parten, 1932).

“Social activities” are those activities that involve some level of social interaction and were proposed by Parten (1932) as a series of activities that children proceed through developmentally as they age. These activities include parallel play, associative play, cooperative play, and games with rules (Parten, 1932).

Overview of the Study

This thesis is organized into five chapters. The first chapter covers the introduction as well as details the research question and the basic information related to the purpose, significance, limitations, and terms. Chapter two is a literature review of the existing research related to outdoor environments, tools available to evaluate classrooms and environments, and key child development theories related to the underlying premise of the study. Next is an explanation of the methodology including the instruments being used, how data was collected and coded, and the analysis process used. The fourth chapter is a detailed description of the findings, and the final chapter includes a discussion of the significance of the results, potential ethical biases, and the researcher's conclusions and suggestions for future studies.

Chapter 2. Literature Review

To develop a better understanding of the considerations needed when designing outdoor play spaces educators need to look at the current body of literature related to the impact these spaces have on children as well as our understanding of the impact the physical environment has on child development. In doing so, it is noticeable that there is a limited amount of research available specifically on outdoor environments, especially when focusing on children between the ages of birth through age 3. Most of the research has been conducted focusing on children from ages 3 years and older with minimal inclusion of children 1 to 3 years of age. Noticeable themes emerged from the literature review that have been used to organize this chapter into the following topics: child development theories related to the impact of the physical environment, existing assessment tools, impact of nature-based environments on children's health, impact of outdoor environment on children's development and types of play, and teacher's role in fostering development and health in outdoor environments/classrooms.

Child Development Theories Related to the Impact of the Physical Environment

There are numerous theories of child development. For the purpose of this study the work of Urie Bronfenbrenner, Mildred Parten, and Lev Vygotsky are particularly relevant.

Urie Bronfenbrenner's Theory

Bronfenbrenner has offered a theory referred to as the ecological system of human development (Brofenbrenner, 1979). The system is described as a system of nested levels of environmental factors (microsystem, mesosystem, exosystem, and macrosystem) in which the factors of each level include and influence the levels contained inside. The center of the system represents the individual, and thus it is proposed that an individual's development is impacted continuously by the interactions within and between each of the surrounding levels (Brofenbrenner, 1979).

This approach attempts to illustrate the complexity of the interconnectedness of life. The immediate environment such as the home, the research lab, or the classroom is referred to as the current microsystem. More specifically the *microsystem* consists of all settings and relationships with whom the individual has direct interactions (Brofenbrenner, 1979). The theory of ecology of development maintains that the various microsystems a person interacts within directly impact development and that everyone within a microsystem influences the system. This reciprocal impact is important when conducting research particularly when there are multiple individuals within a physical space at the same time. This creates a shared microsystem, and thus each person is impacting the other. All relationships within the ecology demonstrate reciprocal impact.

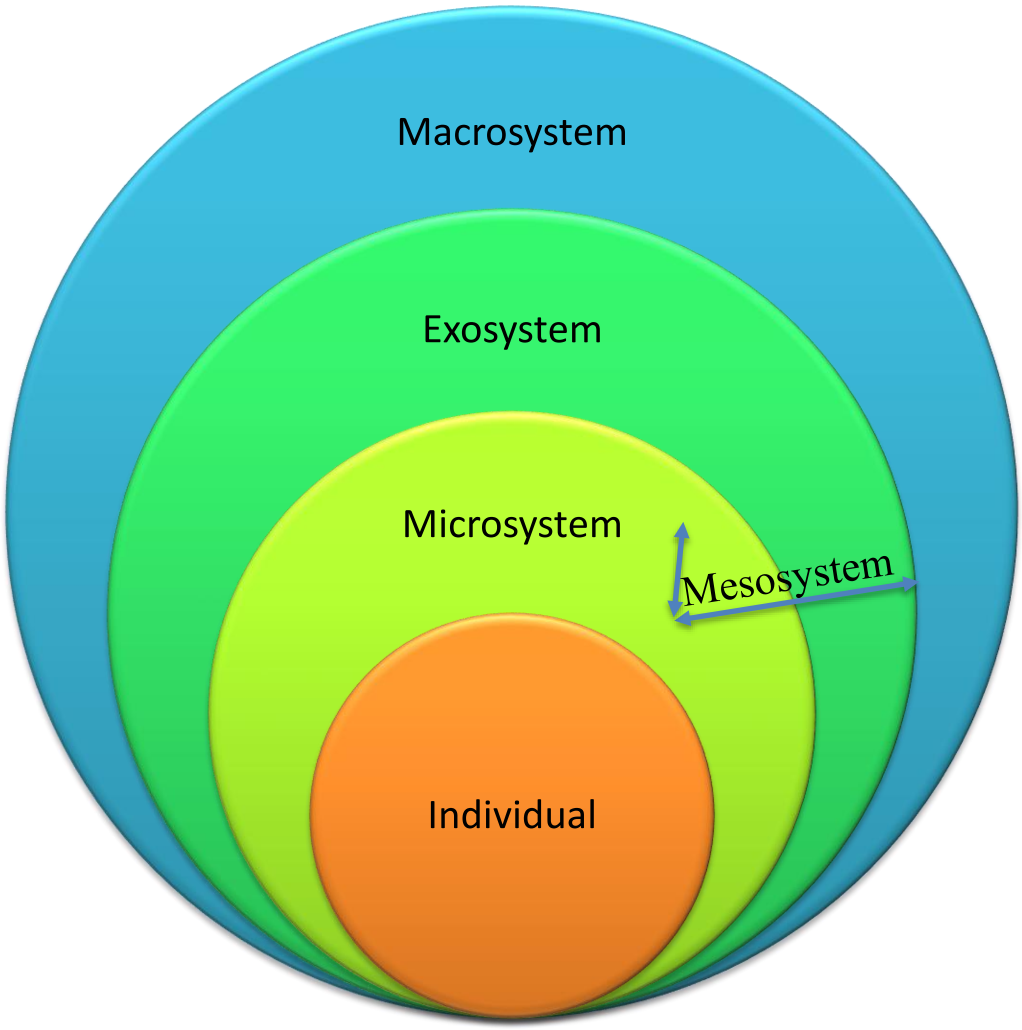
This theory also identifies the reciprocal interaction and impact between a person's various microsystems and the microsystems of the other individuals within a person's environment. This phenomenon can be illustrated when dynamics from a child's home directly impact dynamics at school and vice versa. This interconnectivity can be expanded to the idea that interactions between microsystems for one person can create a ripple effect. Take the idea that through an interaction between a family and a school the school makes a change to a policy. This change will have an impact on the other families attending that school even if they have no direct contact with the initial family. This interconnectivity between microsystems and external environments is defined as the *mesosystem* (Bronfenbrenner, 1979).

Within a community, there will be systems and people that are outside of the direct influence of an individual but can have an impact on a person's development due to indirect influence. These external systems and people are identified as the next tier of the nested environments and are referred to as the *exosystem* (Bronfenbrenner, 1979).

The final sphere Bronfenbrenner identifies within the ecological system of development is the *macrosystem*. This is the outer sphere and is defined as the characteristics of the individual's larger culture or subculture. The macrosystem includes the impact that cultural and subcultural values, beliefs, ideologies, and traditions have on the interactions between and among the other two spheres. This creates similarities and distinct characteristics among the various micro- and exosystems (Bronfenbrenner, 1979). When looking at the macrosystem we see the impact on social structure from religious expectations within theocracies or the impact on society from the economic stability of a country.

Figure 1

Illustration of the Ecological System of Human Development



Note. By Urie Bronfenbrenner.

For this study, the focus is on the principles of microsystems. The characteristics of the outdoor playspace's impact on the interactions between the child and the space, including the interactions between children, is the specific microsystem being examined.

Lev Vygotsky and the Zone of Proximal Development

Vygotsky (1998) presented a view of child development that focuses on development from a different perspective than many that preceeded him. He described development as a complex process that cannot be fully identified if the focus is only on current outcomes. When looking to understand an individual child's development, Vygotsky proposed that we need to understand where the child has been, where they are now, and where they are going, to truly comprehend the development of the child (Vygotsky, 1998). The practice of assessing children for mastery of a skill falls short in helping us understand a child's development because it only tells us the previous development of the child and does not reveal how they are currently developing.

When working with children to determine their development we can discover what skills are emerging by looking at what the child can accomplish with the support of others. When a child can accomplish a task after watching another person complete it or when provided with leading questions, then we are identifying the aspect of development the child is working toward mastering. The "zone of proximal development" is the range of skills between what the child has already mastered and what the child cannot accomplish with support (Vygotsky, 1998). This understanding of how social interactions impact child development has practical implications within the field of education. If the active stage of development is identified, then instruction, experiences, and interactions that provide scaffolding or modeling of these skills can be provided to facilitate maximum developmental outcomes. Vygotsky summarized this concept when he stated, "what the child can do in cooperation today he can do alone tomorrow" (Vygotsky, 1962, p. 104).

If we reflect on the interplay between Brofenbrenner (1979) and Vygotsky's (1998) theories, we can assert that the environmental design of students' educational *microsystem* can have a direct impact on children's opportunities to cooperate and interact with others, thus providing opportunities to enter the *zone of proximal development*. By having research that identifies environmental factors that foster observational behavior and interactive behavior, educators can make informed decisions on the design of school spaces to support the learning desired for that space.

Mildred Parten's Categories of Play

Another important theory to explore as related to the proposed research is the definition of types of play proposed by Mildred Parten (1932). Her work defined two main categories of play with each larger category broken down into more clearly defined styles of play. These categories are based on the level and type of social interaction involved in the play. The first large category is identified as non-social activities which is defined as having no noticeable social component, and the second category is social activities. Each category has multiple subcategories such as unoccupied, onlooker, and solitary for the non-social activities and parallel play, associative play, cooperative play, and games with rules for the social activities (Parten, 1932). Parten proposed that children progress through these types of play in a hierarchal process demonstrating increasing growth in the social and emotional domain of development. In more recent research related to Parten's work, the developmental sequencing of these types of play is brought into question. Instead, it is proposed that these categories of play are present but that the environment, culture, and socioeconomic factors may have a greater impact in the presence or absence of these various types of play (Xu, 2008).

The significance of Parten's work in the planning of outdoor playscapes relates to the work of Vygotsky and Bronfenbrenner. By understanding how the environment impacts children's development and their engagement in Parten's various categories of play, we can then create spaces that foster specific types of interactions or play. Through these interactions and changes to the environment, we can target Vygotsky's (1998) "zone of proximal development" for each child. When applied to the classroom, indoors or outdoors, the key aspect of these theories is the need to foster social interactions between the child, the environment, and others.

From an application perspective, educators utilize outside play spaces for various purposes ranging from a break from the classroom, a shift in focus to gross-motor development, or as an extension of classroom learning. Through a deeper understanding of the potential for fostering different types of play as defined by Parten and how social play can have a direct connection to cognitive development through the effect of Vygotsky's "zone of proximal development," educators can more effectively plan an outdoor playscape to meet their goals for the use of outdoor time within their school.

Existing Assessment Tools for Outdoor Play Environments

Children are spending more and more time in group care settings from younger ages, and therefore these programs need to be able to make informed decisions when designing outdoor playspaces. When looking at early childhood programs, there are two main aspects that are critical for quality support of development, the environment and interactions. Improvements in the understanding of brain development have found some direct impacts on the quality of the physical environment and learning. Jensen (2005) highlights that the quality of the physical environment is largely subconscious but continuous. Through their senses, children determine if the space they are in is "familiar, safe, and friendly" (p. 82). The layout, various characteristics, and elements of the physical space can also influence children's social and physical engagement with materials and people (Jensen, 2005). Beyond the impact of the environment, the second aspect critical to the support of children's development is the quality of adult and child interactions (Pianta et al., 2016).

With the focus of this study on the outdoor environment, a review of the literature on the existing tools for evaluating these outdoor spaces was necessary. However, through the process of reviewing available literature, it appears that programs have limited resources grounded in research that are available to use as guides when planning outdoor spaces. Two sources were identified: the Outdoor Play Environment Categories (OPEC) used by researchers in Sweden and the *Preschool Outdoor Environment Measurement Scale (POEMS)* an environmental rating tool designed to evaluate outdoor environments. Both resources are specifically designed for use in evaluating outdoor environments for preschool children and include considerations for naturalistic aspects.

Outdoor Play Environment Categories (OPEC)

Mårtensson (2013) found that playgrounds are frequently designed such that a focus is on providing physical challenges without attention to social interactions as well as increases in conflict and exclusionary behaviors. OPEC was specifically designed by researchers, including Mårtensson in Sweden, as a tool to categorize outdoor play spaces to evaluate the impact of naturalistic playscapes on children's health. OPEC evaluates the environment using three criteria (Mårtensson et al., 2009). These criteria were each included due to the various impacts they were observed to have on children's play and physical behaviors. The first, "total size of the outdoor area (A)" was included due to the need for significant space where children could both move vigorously and for its effect of creating greater intrigue (Mårtensson, 2013, p. 661). The second criterion is the "proportion of area with shrubs, trees, or hilly terrain (B)" which was selected due to the impact that natural spaces have on children's negotiations and opportunity for conflict resolution (Mårtensson, 2013, p. 661). Finally, "integration between vegetation, open areas and play areas (C)" was to account for the flexibility of the space and the way this integration fosters more dynamic movements and transitions between play (Mårtensson, 2013, p. 662). These elements are each scored on a three-point scale, and then the three scales are averaged to determine the overall score.

Figure 2

Outdoor Play Environment Categories (OPEC)

Outdoor Play Environment Categories (OPEC)

A. Total size of the outdoor area:

1 point $< 1200\ m^2$

2 points 1200-3000 m^2

3 points $> 3000m^2$

B. Proportion of surface with trees, shrubbery or hilly terrain:

1 point little/non-existent

2 points $\leq$ half of the area

3 points $\geq$ half of the area

C. Integration between vegetation, open areas and play areas:

1 point No integration. Open spaces, vegetation and play areas in separate parts of the environment

2 points Either of the following characteristics

(a) trees or shrubbery are adjacent to play areas

(b) open spaces are located in between the play areas.

3 points Both 2a and 2b above is full-filled.

Note. By Martensson, 2013, p. 662.

Preschool Outdoor Environment Measurement Scale (POEMS)

POEMS is a tool created to assess and evaluate outdoor environments designed for programs providing care for children between the ages of 3-5 years old. The scale incorporates numerous aspects of the environment including the domains, “Physical Environment,” “Interactions,” “Play and Learning Settings,” “Program,” and “Teacher/Caregiver Role” (DeBord et al., 2005, p. 4). For this research, the “Play and Learning Settings” domain was used.

Within the Play and Learning Settings component of the POEMS tool, there are specific checklists of features that are recommended to be present in the playspace. These components are physical settings or structures and loose parts (DeBord et al., 2005). Each of these categories are further divided into subcategories of “constructed or manufactured” and “natural.” The tool looks not only for the basic presence of these components but quantifies the variety present within each subcategory. The subcategories are not considered as present if there are not at least 4 distinctly different examples readily available (DeBord et al., 2005). The separation of these components into clear manufactured and natural subcategories demonstrates the value placed on the inclusion of natural elements in outdoor playscapes for preschool-age children (see Appendix A).

NAEYC Environment Guidelines

The OPEC and POEMS scales contribute to the work being done in recent years related to the growing conversation regarding what constitutes a quality outdoor play space. Guidelines provided by organizations such as the National Association for the Education of Young Children (NAEYC, 2019) focus on square footage, safety standards, and the need for clearly defined learning spaces that provide opportunities for a variety of activities ranging from gross motor to artistic endeavors. There is one sub-criterion in the NAEYC guidelines that indicates the need for naturalistic elements, criterion 9B.1 “Outdoor learning environment includes three or more natural elements that children can interact with such as grass, sand, rocks, plants (including gardens) and variations in ground elevation.” (NAEYC, 2019, p 113). There is also a criterion specifying “at least 75 square feet of outside space for each child outside at any one time” (NAEYC, 2019, p. 107).

Impact of Nature-Based Environments on Children’s Health

A commonly referenced work related to the importance of natural experiences on human health is the work by Richard Louv (2008), *Last Child in the Woods*. Louv proposes that society, as a whole and the current generation of children, in particular, is suffering from a reduced level of exposure to the natural world and has coined the idea of a “Nature-Deficit Disorder” (NDD). This disorder is not an official disorder in any medical diagnostic manual but is a concept proposed by Louv to highlight to the greater society the negative impact created when people are isolated from nature.

Louv (2008) provides us with an overview of how contact and involvement with nature, particularly gardens, has historically been embedded in mental health practices beginning over 2000 years ago in Taoism. This has expanded in more recent years to include the health benefits of relationships with animals, particularly pets, including those as simple as fish. He also highlights how society has moved away from spending time in natural surroundings and how this change has impacted not only physical health, such as increased obesity, but also emotional health (Louv, 2008). This historical perspective lays the groundwork for understanding why there is a growing interest in the impact schools and early childhood outdoor environments can have on children’s health. To create environments that foster positive health outcomes, it is important to understand the nature of the outdoor environments that contribute to positive outcomes.

Natural environments and experiences are presented as having a positive impact on humans by helping to stimulate multiple senses as well as giving us the ability to experience a fuller range of emotional responses such as adrenaline and the release of stress when we successfully navigate physically challenging experiences that involve reasonable risks (Louv, 2008). Nature is intrinsically cyclical with clear interdependencies, and when our bodies are disconnected from this environmentally-regulated cycle there can be jarring effects. Louv (2008) argues that when we are disconnected from nature, it creates a human condition that can be likened to formally identified disorders such as separation anxiety disorder. He reasons that these disorders are related to the emotional damage created when humans are separated from people and places to which they are attached. Historically we have had a higher level of attachment to the natural environment, and therefore it is reasonable that this separation from the natural world could create a similar anxiety effect. He terms this condition "Nature-Deficit Disorder (NDD)".

Dickinson (2013) adds to this discussion when she proposes that NDD creates the idea that humans are separate from nature rather than an innate component of nature. She highlights how nature is often discussed in terms of how humans are impacting and impacted by nature as if an outsider. As biological beings, people are by "definition" part of the natural order. This shift in perspective encourages us to not just view outdoor environments from a perspective that they are spaces for exploration and cognitive understanding but to add a spiritual connection and a full sensory experience to one's view of outdoor opportunities where we are in communion with the space (Dickinson, 2013). This shift is in response to Louv's (2008) focus on addressing NDD through the implementation of nature learning experiences based on scientific exploration, such as botany and biology-oriented classes. These experiences are described as immersing ourselves and children in a sensory and open questioning experience before jumping to a factual and naming experience. An example of this type of experience offered by Dickinson (2013) is when a child discovers an insect and inquires about what it is. We encourage the child to examine the insect, how it feels, how it moves, and to watch what it seems to be doing, then we ask the child to hypothesize their own answers. This practice can be expanded to plant and mineral explorations as well.

Within the available literature, the impact of quality outdoor experiences on children's attention has been examined. This is often presented in relation to seeking explanations for the rise in the diagnosis of attention deficit hyperactivity disorder (ADHD). One such study out of Sweden, by Martensson et al. (2009), looked to analyze the potential relationship between the quality of outdoor play spaces and children's attention at the preschool level. They found a correlation between both the quality of the play space and the time children spent outside. The higher the rating of play spaces, according to the outdoor play environment categories (OPEC) and the sky view measurement tool, which places a higher value on naturalistic components of the environment, the better the children's attention ratings (Martensson et al., 2009). The study also found that improvement in attention was related to time spent outside, but there was an upper limit to the benefits, whereas in programs where the majority of the day is spent outside the benefit dropped slightly (Mårtensson et al., 2009). The OPEC tool looks specifically at the square footage of available outdoor play space, the percentage of space that includes plant life beyond grass, and how these naturalistic features are incorporated into the space (Martensson et al., 2009). The ability to focus and be attentive has a direct impact on children's development and therefore can be extended to be a positive health outcome.

To take a more direct look at physical health, it can be proposed that being outside can help minimize the spread of illness, as well as improve general health indicators, such as weight and physical fitness. This aspect of the impact of outdoor experiences has been primarily studied in relation to adults, however, one such study involving young children was conducted in

Sweden by Söderström et al. (2013). The results of this study found a direct correlation between both the quality of outdoor environments, using the OPEC rating tool, and the time spent outside in relation to the health of the children. They also found that the quality of outdoor play environments aligned with the amount of time children spent outside, such that higher quality naturalistic environments accompany longer times outside. The research assessed children's health by assessing body mass index (BMI), waist measurement, cortisol levels in saliva, and parental reports of rates of illness (Söderström et al., 2013).

Overall, there appears to be a direct correlation with not only the time physically spent outdoors but also with the need for a quality naturalistic environment and children's health. These studies specifically apply to the discussions within schools and childcare facilities as to how to design effective outdoor play spaces to maximize positive health outcomes for the increasing number of children who are enrolled in group care settings. When children spend more than eight hours a day, five days a week in group care facilities, the outdoor play spaces are a predominant source of children's outdoor opportunities.

Impact of Outdoor Environment on Children's Development and Types of Play

An additional factor that early childhood experts need to consider is how outdoor environments impact children's development and the types of play in which children engage while outside. Fjortoft (2001), looked at the impact natural environments had on the physical development of children ages 3 to 6 years. The study involved children in kindergarten programs in Norway where each group received 1-2 hours of outdoor play each day. The experimental group was primarily given this time in a relatively large natural space with a variety of topography so that they experienced minimal, periodic time on a more traditional playground space. The control group was provided the reverse experience of regularly spending 1-2 hours a day on their traditionally-designed playground space with sporadic experiences in natural spaces outside of the playground. The results of this study found a statistically significant increase in physical development, particularly in the areas of balance and coordination, with the experimental group (Fjortoft, 2001). So often preschools in the United States focus on large open flat fields for organized sport-oriented activities and fabricated climbing structures. This research provides insight into the value of natural topography for encouraging child-controlled risk-taking and physical exploration.

Other aspects of development explored in the current research related to qualitative case studies where schools took on the process of transforming the outdoor play space opportunities into more naturalistic experiences. The researchers analyzed the changes in children's play styles as well as the teachers' and children's expressed preferences through a planning, action, observation, and reflection process. Two such studies were those done by Nedovic and Morrissey (2013) and Blanchet-Cohen and Elliot (2011). The first study worked with a kindergarten program in Australia as they redesigned their outdoor play space. They focused on several distinct modifications to the play space completed in sequential phases and reported after each phase distinct changes in the play observed. After the first phase, the addition of a teepee as the focal point, staff reported an increase in sustained dramatic play. The children mentally convert the structure into a wide range of concepts from homes to volcanoes. The second phase led to an increased level of large motor and high mobility style play in the area where concrete was changed out for mulch. This provoked questioning related to whether the children found it safer to play uninhibitedly on the mulch rather than the hard surface the concrete provided. The third phase of the redesign involved green plantings, where the children's behavior following this addition was recorded as calmer and more relaxed with a decrease in pushing, shoving, and kicking. The children were observed taking time to stop and carefully explore the plants. When flowers were added to spaces in the grounds there was an increase in group investigations and quiet close examinations of the plants, including experimenting with the soil changes when water was added to the potted plants. Finally, the fourth phase was the addition of natural loose materials which created a practice of "treasure" collecting that appeared to have helped alleviate some children's separation anxiety that had been previously documented during transitions from the family to the classroom in the mornings before the onset of the "treasure" collecting. There was also an increase in dramatic play with the loose materials becoming props in their stories (Nedovic & Morrissey, 2013).

Blanchet-Cohen and Elliot (2011) found similar results, particularly related to the children's behavior in calmer, sustained, and focused play. They also reported closer relationships and richer conversations between students and teachers when in more natural spaces within the play environments.

A more direct comparison of the impact a naturalistic environment has on young children's play is found in the study conducted by Dowdell et al. (2011). Observations of children's play were gathered and coded according to the types of play and levels of social interactions at two distinctly different play environments. One program had an intentionally designed naturalistic outdoor play space while the other had created a completely mock playground space created within an indoor space with artificial turf and other manufactured materials to encourage the types of environments found on traditional playgrounds.

To assess the impact of the environment on the children's play, the observers completed a time sampling data collection process. They used a set of behaviors to sample based on four categories of behaviors: social activities, cognitive activities, physical and motor skills, and others. Dowdell et al. (2011) found that although both settings resulted in active play by children, the quality and quantity of play varied. The natural environment encouraged children to engage in a higher rate of focused explorations and expressions of curiosity as demonstrated through the depth of the children's inquiry-based explorations and variations in dramatic play. The less natural environment produced higher rates of children changing activities and shorter periods of sustained engagement. Behaviors identified as "over-enthusiastic play," which is defined as "fighting or risk-taking behaviors," were observed more in the less natural environment (Dowdell et al., 2011, p. 29). These findings appear to support the existing body of knowledge and align with the current implication that children need access to natural environments and supportive adults. The adult support included a shared curiosity in natural phenomenon by joining the children when engaged in exploration as well as initiating opportunities to explore the natural environment (Dowdell et al., 2011). This study provided a stark variation between manufactured and naturalistic play spaces.

One more developmental benefit of outdoor play spaces can be found in the work done by Sumpter and Hedefalk (2015). Their focus was on the effect of outdoor unstructured experiences on the development of children's mathematical reasoning. This qualitative study demonstrated how children naturally engage in mathematical reasoning when given time in open-ended outdoor exploration with and without teacher engagement. Some of the exchanges observed where children were applying mathematical reasoning occurred when children were interacting with natural elements of the environment, such as when a discussion ensued related to comparative sizes after a young child managed to climb a large rock in the play space. With the current focus in the United States on academic skill progression, this study demonstrates the importance of paying attention to the affordances of the materials provided in outdoor play spaces, with intentional attention to naturalistic elements.

Each of the aforementioned studies focuses primarily on children over the age of 3. Even in studies that included children under the age of three, the younger children were not a significant portion of the participating sample. Blanchet-Cohen and Elliot (2011) conducted their study by working with four different programs providing care for children. One of the three programs was designed for children 3 and under while the other three are noted as working with children ages 3-5 years, 3-4 years, and preschool age respectively. Sumpter and Hedefalk (2015) worked with children ages 1 to 6 years with one of the assistants recording the children who were 1-2 years of age, a second assistant recording children who were 3-4 years of age, and the final assistant recording children who were 5-6 years of age. All shared study results were based on episodes recorded involving children in the older two groups. Fjortoft (2001) worked with children ranging in age from 3-6 years, while Nedovic and Morissey (2013) studied children ranging from 3-4 years of age. Finally, Dowdell et al. (2011) worked with children ranging from age 2-6 with the primary focus being children who were 4 and 5 years old. This focus on children between the ages of 3 and 5 years of age illustrates the need to explore if similar findings can be found when studying the impact of outdoor experiences on development with children under the age of three years.

It is clear from the current body of research that the benefits to child development and diversity of experiences for young children are directly impacted by the design of the outdoor play environment. This research can help educators and program administrators be intentional in the decisions they make. An additional result of the study by Blanchet-Cohen and Elliot (2011) was that educators from the four participating programs reported increased effectiveness of educators utilizing the outdoor space due to their participation in the focus group component of the study. By having opportunities to collaborate and reflect on their experiences and observations with other educators, participant teachers reported being better able to articulate and identify the learning and value of the changes they were making to the environment. This directly relates to the final trend in the research related to designing outdoor play spaces for young children.

Teachers' Role in Fostering Development and Health in Outdoor Environments/Classrooms

So often in traditional school and childcare programs teachers and program administrators view the time spent in outdoor spaces as opportunities for the children to engage in unstructured play with the teacher taking on the role of observer and safety monitor. The research available regarding the benefits of naturalistic play spaces provides a different perspective on these spaces and the adults' roles for maximizing the benefits provided by the environment.

Educators have offered insight into the common barriers to effectively use outdoor play spaces and green classrooms. An underlying theme that emerges in this data is that teachers are not trained in strategies for effectively embedding the outdoors into educational instruction. The outdoors is frequently regulated to effective environments for teaching science and physical development, specifically gross-motor skills. Since these topics are limited to specific times of the day within the traditional school structure, teachers tend to limit the frequency with which they take children outdoors (Dyment, 2005). When applying this information to younger children, especially infants, it can be predicted that the time outdoors would be extremely limited since many infants are non-mobile and might presumably have limited gains from outdoor gross-motor stimulations, and direct instruction of scientific topics are not typically appropriate for the youngest children. By training teachers to view the outdoor environment as an integral extension of the classroom and providing strategies for effective skill instruction, coupled with spaces designed to maximize the styles of play being sought, this primary barrier can be mitigated.

When teachers take on the role of supporting the children's problem solving and curiosity with excitement, encouragement, and scaffolding, the children can obtain a higher level of skill and knowledge acquisition than when left to explore independently (Blanchet-Cohen & Elliot, 2011). This role can be taken in numerous ways. The work done by Louv (2008) has spurred a movement of nature education programs that focus on nature as a scientific investigation and a process of identifying natural environments and their components. Dickinson (2013) argues that these programs are missing some key components critical to reconnecting children to nature. She proposes that the act of viewing nature from a purely scientific approach inadvertently places humans in control and separate from nature. Teachers, therefore, need to focus on including other experiences for children in which they are a part of natural experiences, and inversely where nature is an integral aspect of non-science-based exploration. This should include bringing activities such as art, music, dramatic play, and literature into natural habitats.

In addition to these studies, Malone and Tranter (2003) observed and explored during the outside time at five schools in Australia how children utilize the time they are given on their school's outdoor play spaces and how these experiences impact children's learning. They focused on children's cognitive play and how they developed nature-based knowledge specific to understanding nature, and how their interactions impact the environment related to becoming positive stewards of nature. The researchers found that children's level of engagement with the environment and others was clearly impacted by the roles the teachers took. When the teachers' primary role was that of monitor, the depth of engagement in longer-term activity and deeper cognitive and social engagement was lower. Schools where the teachers supported the children through active engagement and availability to help such as with organizing group games, supporting risk-taking behaviors for safety, or contributing ideas to the children's construction activities resulted in longer periods of engagement and projects that expanded over days (Malone & Tranter, 2003).

In addition to expanding the types of activities initiated in nature, teachers are encouraged to rethink how children are introduced to items found in nature, such as insects. Rather than jumping to providing names for these, teachers should ask children to provide their perspective on what they have found through open-ended questions aimed at garnering descriptive and comparative analysis. Then after the child has experienced, self-identified, and categorized what they have found, the adult can provide resources or knowledge as to the official identifications (Dickinson, 2013). This view of supporting a reconnect to nature ties well into the play-based child-directed methods of teaching that are commonly found in the field of early childhood education and aligns with the other research related to the types of play naturalistic spaces facilitate. Taking this data and incorporating it into play space design and teacher education programs could reshape the way programs incorporate nature and the outdoors into education.

Chapter 3. Methodology

This quantitative study focused on observations of children's behaviors in their regular school outdoor environment. The observations were recorded quantitatively and then analyzed using statistical analysis to determine significant variations in types of play based on the type of environment.

Sample

Six early childhood programs were identified through the Virginia Quality website (virginiaquality.com) based on the criteria that they provide care to children within the toddler age range and had received a level 4 or 5 quality rating, the highest two levels possible. Web-based mapping was used to take a preliminary satellite-based view of the outdoor environment. All sites located appeared from this initial assessment to have very limited natural components to their playground. This led the researcher to select a program that had two separate large toddler programs that had obtained a level 4 rating.

The next step in this process was to evaluate programs for classification as "naturalistic" or "manufactured." To determine the classification of each of the play spaces, we utilized two tools: the Preschool Outdoor Environment Measurement Scale (POEMS) (DeBord et al., 2005) and the Outdoor Play Environment Categories (OPEC) (Mårtensson, 2013).

There is an emphasis within POEMS on naturalistic aspects and specific guidelines defining features as naturalistic or manufactured. Using this tool, the ratio was calculated of naturalistic features to manufactured features. To qualify as a naturalistic environment, the program needs a ratio on the POEMS scale greater than 1. A program's outdoor space will have a ratio less than 0.75 to qualify as a manufactured environment. This process created a small range where a program may be identified as non-classifiable, at which time the site would be removed from continuing in the study.

The OPEC tool was also utilized during the evaluation of the outdoor play spaces. A program needs to have an average score of 1.75 or higher to qualify as a naturalistic play space. Lower average scores were identified as manufactured. In the case that the results of the two tools did not allow for a clear classification of naturalistic or manufactured, the program was excluded from the sample.

One of the locations was approached to serve as the site for the pre-study, and the director of the program agreed to participate. The other location was approached to serve as an initial site for the full study. The pre-study site was not evaluated for classification as manufactured or naturalistic since the participants would only be used for the initial process to establish reliability between the two researchers and not in the actual analysis of the data. The second location was evaluated using the adapted POEMS tool and obtained a ratio of 9/13 or 0.69. Then the researcher took direct measurements to determine the square footage of the play space as well as evaluating the space according to the OPEC scale. The resulting OPEC score was a 1.66 which also categorized the space as manufactured. Due to the number of toddlers ages 12 months to 36 months, it was determined that another manufactured location was not likely to be needed. Once the informed consent process was completed, we had consent for 30 potential participants, so the 15 participants were selected randomly from this site alone.

With both locations the appropriate informed consent packets were distributed to the families with toddlers enrolled at the site and the teachers of these classrooms. An afternoon was selected for the researcher to be available to answer any questions families and staff may have regarding the study. The information about this meeting was provided with the informed consent packet, and staff were also verbally informed. Once all consent forms were returned at a site, the video collection process was started. For each location, the participant ID for all children whose families elected to allow their child to fully participate in the study was written on index cards. The cards were shuffled, and the needed number of participants was selected (8 for the pre-study and 15 for the full study).

The naturalistic sites were more difficult to find. After exploring the sites through the Virginia Quality database and not finding any that had significant naturalistic elements, the researcher began contacting other early childhood professionals to see if they knew of any programs that had spaces that might fit the study. Two potential locations were identified. One was originally not selected because the primary researcher was working at the center at the time, and it was excluded to help limit potential bias. The other possible location was a center known for the program's curricular focus on nature exploration. The director at this second site agreed to be considered for inclusion. To assist in determining eligibility in the program the director provided the researcher with a video tour of the outdoor play space used by children 12 months to 36 months of age. The video showed that the daily outdoor playspace would not receive an OPEC score at the 1.75 threshold for the naturalistic categorization. The center primarily takes the children once a week to a natural space outside of the play space for more formalized nature experiences. This process eliminated the program from qualifying as a naturalistic play space. At this point, it was determined that the center where the researcher was employed would be the best option for a naturalistic play space for the study. The POEMS assessment resulted in a score of 9/7 or 1.29 and the OPEC assessment resulted in a score of 2.33 and thus these scores qualified the space as naturalistic. The researcher includes the concerns for potential bias represented by using this location in the potential limitations of the study. An additional difficulty with using this site is the small size of the program. At any given time, there are between 12-15 children enrolled that are between the ages of 12 and 36 months. At the time of data collection, there were only 13 children enrolled within the correct age range, and two families declined for their child to be considered for full participation in the study. Because there were several of the older children who were getting ready to move out of the classrooms and new children were going to be enrolled, the time frame for data collection at this site was extended to accommodate the changes in enrollment. This also led to the informed consents being collected in phases based on new enrollment. Each family was provided with at least one week to review the consent packet, and the researcher was readily available to answer questions. No videos were collected during times when a child was in attendance without a consent form on file.

Instruments and Data Collection

OPEC Assessment Form

The following chart, based on the OPEC tool, was completed for each potential program to determine classification before final inclusion in the study. A final average score of 1.75 or higher resulted in a classification of naturalistic; scores lower than 1.75 were classified as manufactured. The version of the OPEC tool that uses the smaller play area calculations was selected for this tool due to the cultural trend for smaller outdoor play spaces in the United States (Mårtensson, 2013).

Figure 3

OPEC Assessment Form

OPEC Assessment Form

A. The total outdoor area accessible to the children.

1 point < 1200 m^2,

2 points 1200-3000 m^2,

3 points >3000 m^2 Score (A)=_____

B. The proportion of the area containing shrubbery, trees or hilly terrain:

1 point little/nonexistent,

2 points < half of the area,

3 points ≥ half of the area Score(B) = _____

C. The degree of integration between vegetation, open areas and play structures:

1 point No integration. Open spaces, vegetation and play areas in separate parts of the environment

2 points Either of the following:

(a) Trees or shrubbery are adjacent to play areas.

(b) Open spaces are located in between the play areas

3 points Both 2a and 2b above is full-filled Score (C)=______

Average Score (A+B+C)/3= _________

Final Classification (circle one) Naturalistic (N) Manufactured (M)

Note. Adapted with permission, from Mårtensson, 2013, p. 662.

Naturalistic to Manufactured Ratio Assessment Form

The naturalistic to manufactured ratio assessment form was developed based on the Preschool Outdoor Environment Measurement Scale "Domain 3: Play and Learning Settings" (DeBord et al., 2005, p. 15). This form was completed along with the OPEC form to determine a program's classification as naturalistic or manufactured for the purpose of this study. Each category within the components must have at least four elements to receive a score. If less than four elements were present, then a score of zero would be entered. A final ratio formed by dividing the total number of naturalistic elements by the number of manufactured elements with a ratio of 1.0 or higher resulting in a naturalistic (N) classification while a ratio of 0.75 was determined as a manufactured (M) classification. Programs that received a ratio between 0.75 and 1.0 would have been determined to be non-classifiable (NC) and the program would have been excluded from the study.

Figure 4

Naturalistic to Manufactured Ratio Adapted from POEMS

Naturalistic to Manufactured Ratio Assessment Form				
Naturalistic Components				
Learning Settings with Natural Elements				
Sand play area	Water play area	Trees		
Grass maze	Flower or vegetable garden	Other		
Safe stepping stones	Easily supervised, cozy natural nook			
Rolling/climbing mound	Animal habitat (eg,. Bird blind, rain garden, butterfly garden, logs, carpet "lift up", bird feeder, ant farm)			**Total Marked (A) =**
Natural Loose Parts				
Smoothed sticks	River stones	Dirt		
Mulch	Pine cones	Leaves		
Shells	Driftwood	Acorns	Other	**Total Marked (B) =**
			Total Natural Elements (A+B) = C	**C=**
Manufactured Components				
Learning Settings with Constructed or Manufactured Elements				
Arts/crafts area	Easily supervised, cozy nook	Raised deck		
Acoustic play area	Anchored play equipment	Play house		
Sitting bench	Crawl-through place (tunnel)	Balance beam		
Woodwork bench	Small stage (including puppet stage)	Other		
				Total Marked (D) =
Manufactured Loose Parts				
Blocks	Skipping rope	Balls		
Manipulatives	Hoses	Water toys	Chalk	
Pieces of cloth	Sand toys	Rings/hula hoops	Other	
				Total Checked (E)=
			Total Manufactured Elements (D+E) = F	**(F) =**
Natural to Manufactured Ratio = C/F				
Final Classification [Naturalistic (N) or Manufactured (M),Non-Classifiable (NC)]				

Note. Adapted with permission from DeBord et al., 2005.

Video Log

Each child participating in the program was video recorded while spending time in the outdoor playscape provided by their childcare program. The researcher logged the video session on the video log with the following information: date of the recording, program's assigned ID, classroom's assigned ID, child's assigned ID, start time of recording, end time of recording, and the researcher's name. The researcher kept a running log of all videos collected.

Figure 5

Video Log

Video Log							
Date	Program ID	Classroom ID	Child ID	Child Description	Start Time	End Time	Researcher

Coding Chart

The following chart (Figure 6) was used by the researcher and assistant to assign codes while reviewing the videos of children playing. A one or two-letter code is associated with each behavior being observed. This chart identifies the codes paired with a short definition of the observable behavior. The behaviors being coded are adapted from the work of Malone and Tranter (2003) based on developmentally typical behaviors for toddlers in conjunction with Mildred Parten's (1932) theory of the development of play. The coding chart was adjusted during the iterative coding to consensus process among raters during the pre-study iterative code to consensus process using video of 8 children from the chosen site for this purpose. The final coding chart (Figure 7) reduced the total number of coded behaviors.

Figure 6

Initial Coding Chart

Coding Chart	
Types of Play	
SP	Solitary Play – plays alone
PP	Parallel Play – alongside others, uses available materials, no direct interaction with other children
AP	Associated Play – plays with others engaged in similar activity. Children may interact over materials and conversation but no mutual goal.
CP	Co-operative Play – group of children work together to meet a specific goal such as building a joint structure or engage in collaborative imaginary play
OP	Observer Play- observing others without engaging in exploration or social interactions.
OE	Over-enthusiastic play - fighting or risk-taking behaviors
Language Actions	
BB	Babble – unidentifiable vocalizations
ST	Self-talk – narration that is does not appear to be directed toward another
P2	Peer to Peer conversation – identifiable verbal communication between peers
CA	Child to Adult conversation – identifiable verbal communication toward an adult
C	Conflict – verbalizations as part of conflict (not productive problem solving)
Physical Actions	
GM	Gross Motor – Physical activity that utilizes large muscle movement (ie running, walking, biking, climbing)
FM	Fine Motor – Use of small muscle skills (ie. lacing, manipulating smaller items, digging)
B	Balance – Activity that requires shifting of balance (ie. walking on thin or uneven surfaces, standing on one foot)
Cognitive Actions	
CO	Constructing activity -building or making objects from loose materials
PI	Purposeful interaction with the materials - shows familiarity with materials or demonstrates a larger goal, ie., bug hunt
EE	Exploring environment - moving in, through and engaging with larger components such as trees, structures, gardens
IA	Imaginative activity - children engage in role play/drama, pretend, make believe, fantasy
RM	Repetitive manipulation of materials - pouring, trial and error spatial exploration

Note. Adapted with permission from Malone & Tranter, 2003.

Figure 7

Final Coding Chart

Coding Chart (2)	
Types of Play and Social Interactions	
SP	Solitary Play – plays alone
PP	Parallel Play – alongside others, uses available materials, no direct interaction with other children
AP	Associated Play – plays with others engaged in similar activity. Children may interact over materials and conversation but no mutual goal.
CP	Co-operative Play – group of children work together to meet a specific goal such as building a joint structure or engage in collaborative imaginary play
OP	Observer Play - observing others without engaging in exploration or social interactions.
OE	Over-enthusiastic play - fighting or risk-taking behaviors or other conflict-based play and actions (ie. Taking another child's toy)
CA	Child and Adult Interaction- time spent interacting with an adult, either child initiated, or teacher initiated.
SF	Self-focused- not interacting with other children, not playing, wandering without apparent purpose, ie. Daydreaming
VI	Communicating with others- verbal or non-verbal interaction with others.
Physical Actions	
GM	Gross Motor – Physical activity that utilizes large muscle movement (ie running, walking, biking, climbing)
FM	Fine Motor – Use of small muscle skills (ie. lacing, manipulating smaller items, digging)
B	Balance – Activity that requires shifting of balance (ie. walking on thin or uneven surfaces, standing on one foot, squatting and standing from squat)
Cognitive Actions	
CO	Constructing activity -building or making objects from loose materials
EE	Exploring environment - moving in, through and engaging with larger components such as trees, structures, gardens
IA	Imaginative activity - children engage in role play/drama, pretend, make believe, fantasy
MM	Manipulation of materials- pouring, trial and error spatial exploration (can be repetitive)
SE	Sensory Exploration – exploring materials through the senses (touching smelling, tasting)
UT	Use of Tools- using open materials as props or tools to manipulate and explore or accomplish some task (ie sticks to stir sand, shovels)

Note. Adapted with permission from Malone & Tranter, 2003.

Behavior Coding Form

The following form was used when reviewing each video clip. The top section was completed before beginning the coding process except for the program classification. Program classification was completed immediately before the data being evaluated. The researcher coded all behaviors observed at each 10-second interval using the coding chart. This form was adjusted for usability purposes during the initial reliability process to maximize functionality.

Figure 8

Time Sampling Coding Form

Date: __________________ **Program ID:** ____________ **Child ID:** _______________

Researcher: ________________ **Program Classification (circle): N M**

Time Interval	Types of Play	Physical Actions	Cognitive Actions	Notes:
0-10				
11-20				
21-30				
31-40				
41-50				
51-1m				
1m-10				
1m11-20				
1m21-30				
1m31-40				
1m41-50				
1m51-2m				
2m-10				
2m11-20				
2m21-30				
2m31-40				
2m41-50				
2m51-3m				
3m-10				
3m11-20				
3m21-30				
3m31-40				
3m41-50				
3m51-4m				
4m-10				
4m11-20				
4m21-30				

Obtaining Participant Permissions

After the program administration agreed to be a research site for the study the OPEC and POEMS' evaluations were completed. The program was then identified as either a naturalistic or a manufactured program and was assigned a program ID which was used for reference purposes in all subsequent work. If a program had not been able to be classified clearly due to a disagreement between the two tools or if the POEMS' ratio is in the indeterminate range, then that program would not have continued in the study.

Once a program received the ID the director and researcher determined which classrooms meet the study requirements of having children enrolled between the ages of 12 and 36 months. The parents of potential child participants in these classrooms were informed of the study and asked to provide consent for their child to take part in the research, which included being recorded while at play in the outdoor space.

Data Collection Process and Coding

Each participating child was assigned a randomized participant identification number and was recorded for a 30-minute session. The researcher used a video recorder and noted the date, time, and video indicators in the video log along with the children's IDs. To make a clear determination as to which child was the primary subject in each recording the researcher noted basic clothing descriptors on the video log. To help minimize the impact the researcher had on the children's behavior, the researcher attempted to remain at the maximum distance that allowed the child to be viewed clearly in the video frame with the camera's maximum zoom set. The researcher moved around the playground and minimized interactions as much as possible. No children acted discomforted by the presence of the researcher; however, some children did attempt to interact with the researcher. When this occurred, the researcher tried to minimize the interaction by acknowledging the child and when necessary, explaining what they were doing. When the videos were coded this was counted as a child and adult interaction and any other applicable codes. This engagement with the researcher was more pronounced at the naturalistic site, which was likely a result of the children's existing familiarity with the researcher outside of the study.

During video review and coding, the researcher and assistant used the tally sheet to record a time sampling of the identified behaviors at 10-second increments for the full observational period for each 30-minute video. Each video is focused on one individual child. This process of 10-second coding intervals focusing on each primary subject individually was adapted from the work of Dowdell et al. (2011).

Reliability

Prior to the study, there was a pre-study phase where an iterative code to consensus process was utilized to train both the primary researcher and the secondary coder. This process entailed the observers coding three shorter video samples that are not part of the final study. They coded together to reach an initial consensus for the coding definitions included on the coding chart. They then coded independently an additional sample of 3 pre-study videos, and their scores were compared. This process was repeated, adjusting the definitions and coding form for clarity and reliability until they were coding the videos with an intraclass correlation coefficient (ICC) estimate of .5 or higher for most behaviors across 3 videos. According to Koo and Li (2016) an ICC of between .5 and .75 is an indicator of a moderate rate of agreement. During this process it was determined that the initial set of behaviors being coded was too broad, and the researchers were missing behaviors. This, along with the difficulty in capturing clear voices of the children with the camera used, resulted in the detailed verbal skills being condensed into one behavior defined as verbal interactions. There were also other minor redefinitions resulting in a smaller list of behaviors. The final adjusted coding chart is found in Figure 7 above (see page 47).

The primary investigator then coded all the study videos, while the research assistant coded one-third of the recordings and completed a separate tally sheet, creating a fully crossed design using a subset of subjects (Hallgren, 2012). A subset consisting of greater than 30 percent of the total subjects meets the standard of excellence for inter-rater agreement as defined by the National Center for Education Evaluation and Regional Assistance (NCEE) (2017). The assistant researcher's sheets were then compared to the primary investigators' data sheets and the intraclass correlation coefficient (ICC) was calculated. The coding was paused after each batch of 10 videos so the ICC could be calculated to monitor for continued reliability and to allow for re-calibration of coding as needed.

Through this process, discussions were had at each point that the coefficient was calculated to identify behaviors where a substantial agreement was not met. This conversation was used to try to clarify variations in the researchers' interpretation of behavior. The final ICC results indicate that for 9 of the coded behaviors the researchers were able to obtain moderate to good levels of agreement: Solitary Play, Observer Play, Child-Adult Interaction, Communication, Gross Motor, Balance, Sensory Exploration, Imaginative Activities, and Use of Tools. The other 8 behaviors failed to meet these standards: Parallel Play, Associative Play, Cooperative Play, Over Enthusiastic Play, Self-focused Play, Fine Motor, Exploring Environment, and Manipulating Materials. Due to the small sample size, the 95% confidence intervals are all fairly large and indicate that the actual agreement for all behaviors may be at least at the moderate level. One coded behavior (Constructing Activities) was not included because there were no instances of the behavior observed in the study. Of the 8 behaviors with poor agreement, one of the behaviors, Cooperative Play, only had instances observed in two of the 10 videos coded. The ICC was calculated for each behavior using SPSS Statistical Package Version 27 (IBM Corp.) based on the two-way mixed effect model, consistency, single rater/measurement convention, ICC(3,1). The ICC estimates and 95% confidence intervals are reported here.

Table 1

Solitary Play ICC

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.842[a]	.487	.958	11.673	9	9	.001
Average Measures	.914[c]	.655	.979	11.673	9	9	.001

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 2

Parallel Play ICC

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.256[a]	-.409	.744	1.689	9	9	.223
Average Measures	.408[c]	-1.383	.853	1.689	9	9	.223

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 3

Associated Play ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.188[a]	-.467	.710	1.464	9	9	.290
Average Measures	.317[c]	-1.750	.830	1.464	9	9	.290

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 4

Cooperative Play ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.273[a]	-.394	.752	1.752	9	9	.208
Average Measures	.429[c]	-1.298	.858	1.752	9	9	.208

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 5

Observer Play ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.863[a]	.543	.964	13.606	9	9	.000
Average Measures	.927[c]	.704	.982	13.606	9	9	.000

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 6

Over-Enthusiastic Play ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.226[a]	-.435	.729	1.583	9	9	.252
Average Measures	.368[c]	-1.543	.843	1.583	9	9	.252

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 7

Child and Adult Interaction ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.667[a]	.108	.905	5.002	9	9	.013
Average Measures	.800[c]	.195	.950	5.002	9	9	.013

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 8

Self-focused ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.048[a]	-.571	.632	1.101	9	9	.444
Average Measures	.091[c]	-2.658	.774	1.101	9	9	.444

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 9

Communicating with Others ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.745[a]	.259	.930	6.838	9	9	.004
Average Measures	.854[c]	.411	.964	6.838	9	9	.004

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 10

Gross-Motor ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.672[a]	.118	.907	5.107	9	9	.012
Average Measures	.804[c]	.212	.951	5.107	9	9	.012

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 11

Fine-Motor ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.061[a]	-.562	.640	1.131	9	9	.429
Average Measures	.115[c]	-2.561	.780	1.131	9	9	.429

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 12

Balance ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.616[a]	.021	.888	4.203	9	9	.022
Average Measures	.762[c]	.042	.941	4.203	9	9	.022

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 13

Exploring Environment ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.270[a]	-.397	.750	1.739	9	9	.211
Average Measures	.425[c]	-1.316	.857	1.739	9	9	.211

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 14

Imaginative Activity ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.761[a]	.292	.935	7.353	9	9	.003
Average Measures	.864[c]	.452	.966	7.353	9	9	.003

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 15

Manipulation of Materials ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.316[a]	-.353	.771	1.925	9	9	.172
Average Measures	.481[c]	-1.091	.871	1.925	9	9	.172

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 16

Sensory Exploration ICC

	Intraclass	95% Confidence Interval		F Test with True Value 0			
	Correlation[b]	Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.545[a]	-.085	.864	3.393	9	9	.042
Average Measures	.705[c]	-.186	.927	3.393	9	9	.042

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Table 17

Use of Tools ICC

	Intraclass Correlation[b]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.549[a]	-.080	.865	3.433	9	9	.040
Average Measures	.709[c]	-.173	.928	3.433	9	9	.040

Note. Two-way mixed effects model where people effects are random and measures effects are fixed.

[a] The estimator is the same, whether the interaction effect is present or not.

[b] Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[c] This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Analysis

An independent-sample *t*-test was conducted for multiple data sets to evaluate whether the mean amount of each of the 17 behaviors coded differs between manufactured (S1) and naturalistic (S2) outdoor play spaces. The frequency that each behavior occurred was the dependent test variable while manufactured or natural is the independent variable.

Chapter 4. Results

The findings of this study resulted in most behaviors not meeting the threshold for statistical significance. After completing the inter-rater reliability process there were nine behaviors included in the primary findings. The data analysis resulted in two behaviors being identified as having statistical significance with *p*-values less than .05. These behaviors were Child and Adult interactions (p = .032) and Balance (p = .018). The independent *t*-test indicates that there is a significant variation between the two groups of data, but not in which direction the variation exists. To identify the environment that the behavior was observed more often the mean values of each program were identified and compared. For each of these behaviors, it was determined that they occurred more frequently on average at the program identified as Naturalistic.

Looking at the rest of the data sets there is one other behavior that had a *p*-value close to the .05 threshold used to establish statistical significance. This behavior was Solitary Play (p = .051). Although this behavior's rate is not deemed significant, the fact that this study was smaller than is recommended for using the independent *t*-test, it could be reasonable to surmise that a larger study may find significance. Solitary play occurred more frequently in the manufactured environment.

Moderate to Good ICC With Statistical Significance

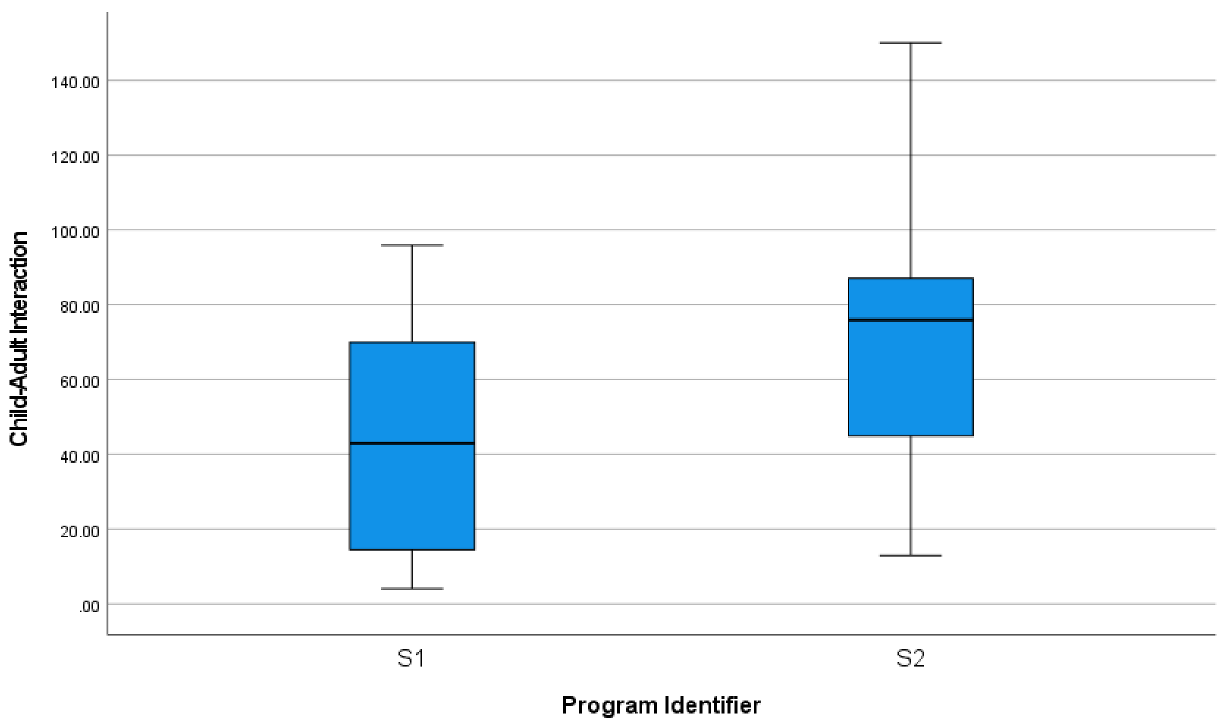
Of the nine behaviors that obtained a moderate to good ICC result, two obtained statistical significance and are detailed below, including the calculation of the Cohen's coefficient and the discloser of any outlying data points. The results of each behavior are followed by the corresponding box plot.

Child-Adult Interaction

The test for child-adult interaction (CA) was significant, $t(28) = 2.259$, $p = .032$. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was rejected. The Cohen's *d* result was .825 which indicates a large effect size meaning there was a notable variation in the actual rate this behavior was occurring. Students in the manufactured environment ($M = 43.47$, $SD = 32.08$) tend to engage in child-adult interactions less frequently than those in the naturalistic environment ($M = 72.13$, $SD = 37.24$). The 95% confidence interval for the difference in means was (-54.66 to -2.67). Figure 9shows the distributions for the two groups.

Figure 9

Distribution of Child-Adult Interaction Frequency for Manufactured and Naturalistic Groups

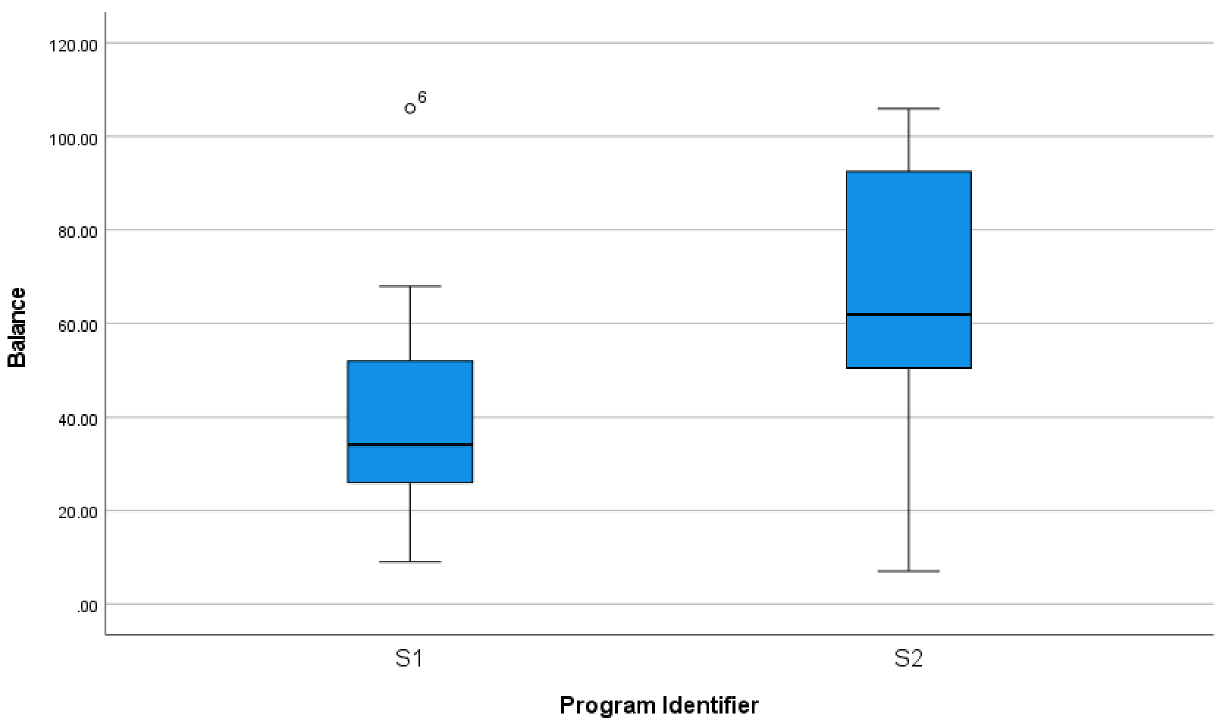


Balance

The test for balance (B) was significant, $t(28) = 2.517$, $p = .018$. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was rejected. The Cohen's *d* result was .919 which indicates a large effect size, meaning there was a notable variation in the actual rate the behavior occurred. Students in the manufactured environment (*M* = 41.53, *SD* = 24.77) tend to engage in balance activities less frequently than those in the naturalistic environment (*M* = 65.80, *SD* = 27.94). The 95% confidence interval for the difference in means was (-44.02 to -4.52). There was one outlier data point identified in the manufactured group. Figure 10 shows the distributions for the two groups.

Figure 10

Distribution of Balance Activities Frequency for Manufactured and Naturalistic Groups



Moderate to Good ICC Without Statistical Significance

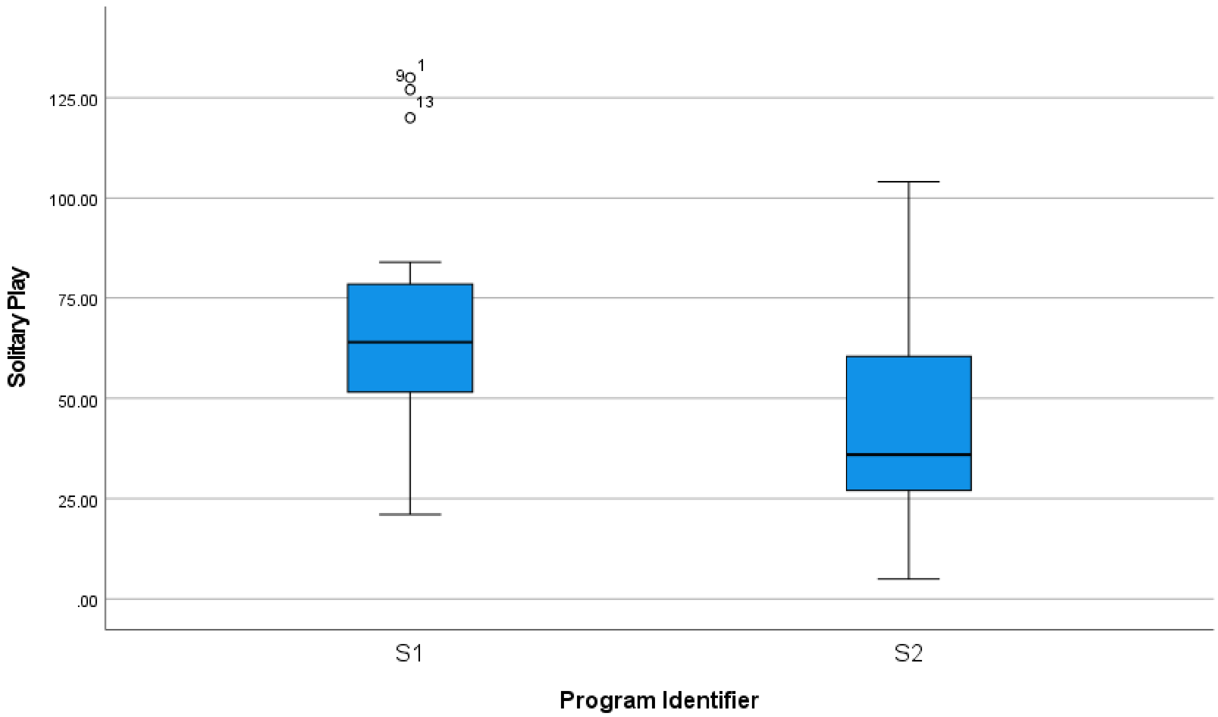
The seven behaviors that obtained a moderate to good ICC, but did not obtain statistical significance, are detailed below, including the calculation of the Cohen's coefficient and the discloser of any outlying data points. The results of each behavior are followed by the corresponding box plot.

Solitary Play

The test for solitary play (SP) was not significant, t(28)= 2.036, p=.051. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .743 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=69.67, SD=34.54) tend to engage in solitary play at about the same level as those in the naturalistic environment (M=45.40, SD=30.64). The 95% confidence interval for the difference in means was (-.15 to 48.68). There were also three outlier data points found in the manufactured group (S1). Figure 11 shows the distributions for the two groups.

Figure 11

Distribution of Solitary Play Frequency for Manufactured and Naturalistic Groups

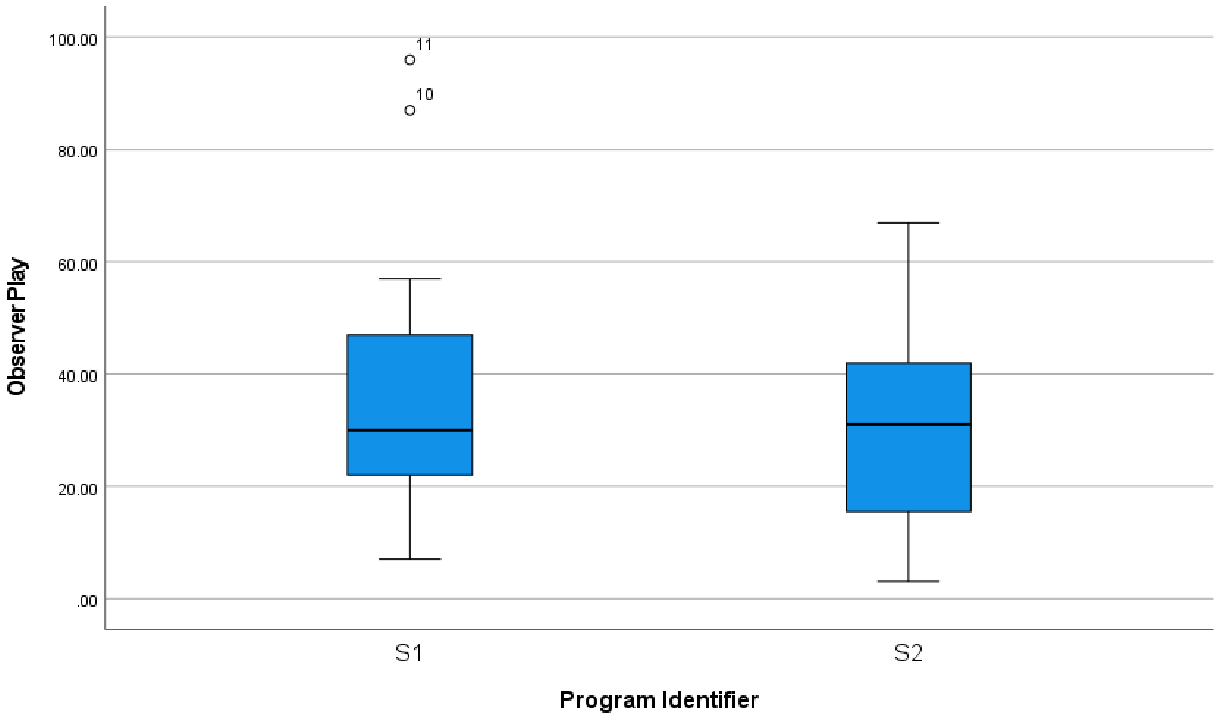


Observer Play

The test for observer play (OP) was not significant, t(28)=.704, p=.487. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .257 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=37.60, SD=25.83) tend to engage in observer play at about the same level as those in the naturalistic environment (M=31.67, SD=19.96). The 95% confidence interval for the difference in means was (-11.33 to 23.19). There were two outlier data points identified for the manufactured group. Figure 12 shows the distributions for the two groups.

Figure 12

Distribution of Observer Play Frequency for Manufactured and Naturalistic Groups

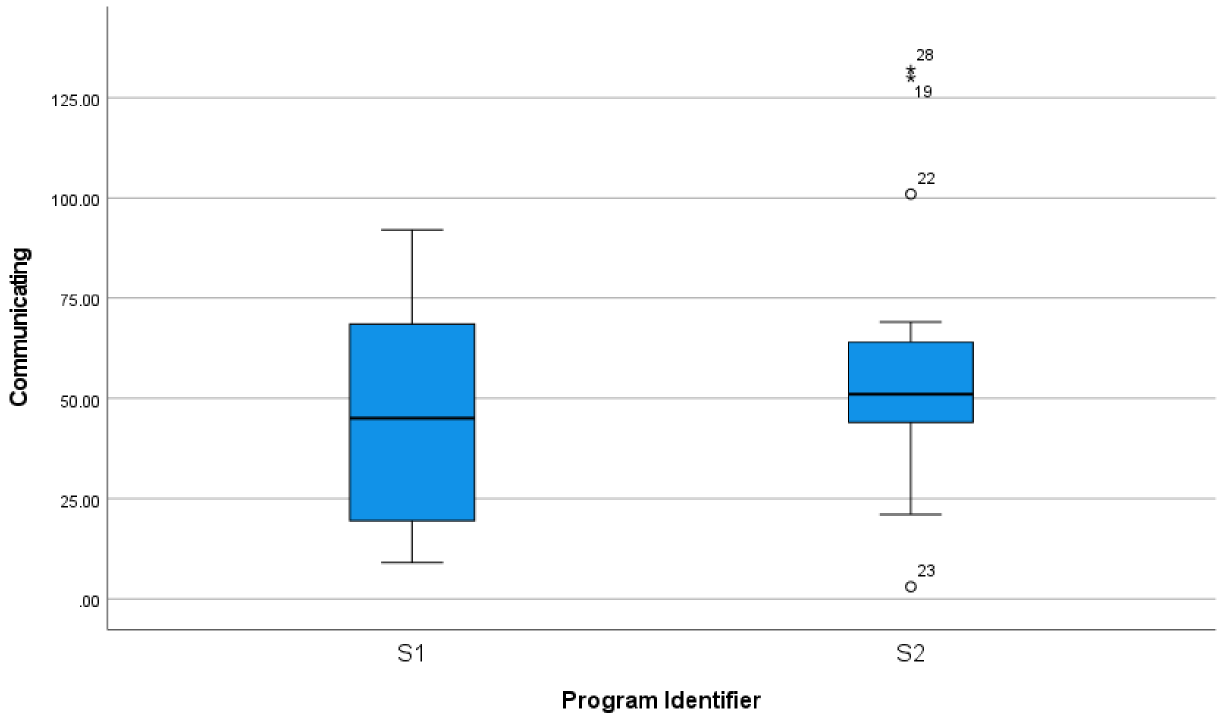


Communicating

The test for communicating (VI) was not significant, t(28)=1.057, p=.299. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .386 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=47.33, SD=28.15) tend to engage in communicating actions at about the same level as those in the naturalistic environment (M=59.80, SD=35.96). The 95% confidence interval for the difference in means was (-36.62 to 11.69). There were two outlier data points and two significant outlier data points identified in the naturalistic group (S2). Figure 13 shows the distributions for the two groups.

Figure 13

Distribution of Communicating Frequency for Manufactured and Naturalistic Groups

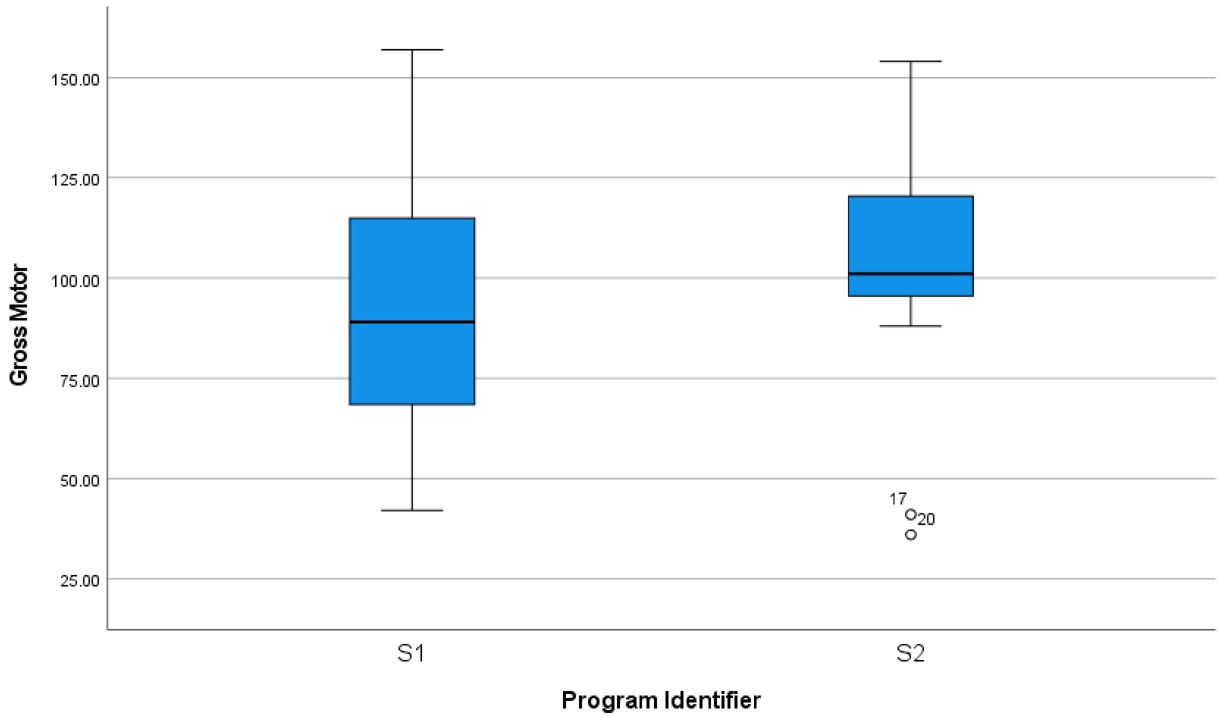


Gross Motor

The test for gross motor (GM) was not significant, t(28)=.764, p=.451. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .279 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=94.4, SD=35.67) tend to engage in gross-motor activity at about the same level as those in the naturalistic environment (M=104.0, SD=33.09). The 95% confidence interval for the difference in means was (-35.33 to 16.13). There were two outlier data points identified in the naturalistic group. Figure 14 shows the distributions for the two groups.

Figure 14

Distribution of Gross-Motor Activity Frequency for Manufactured and Naturalistic Groups

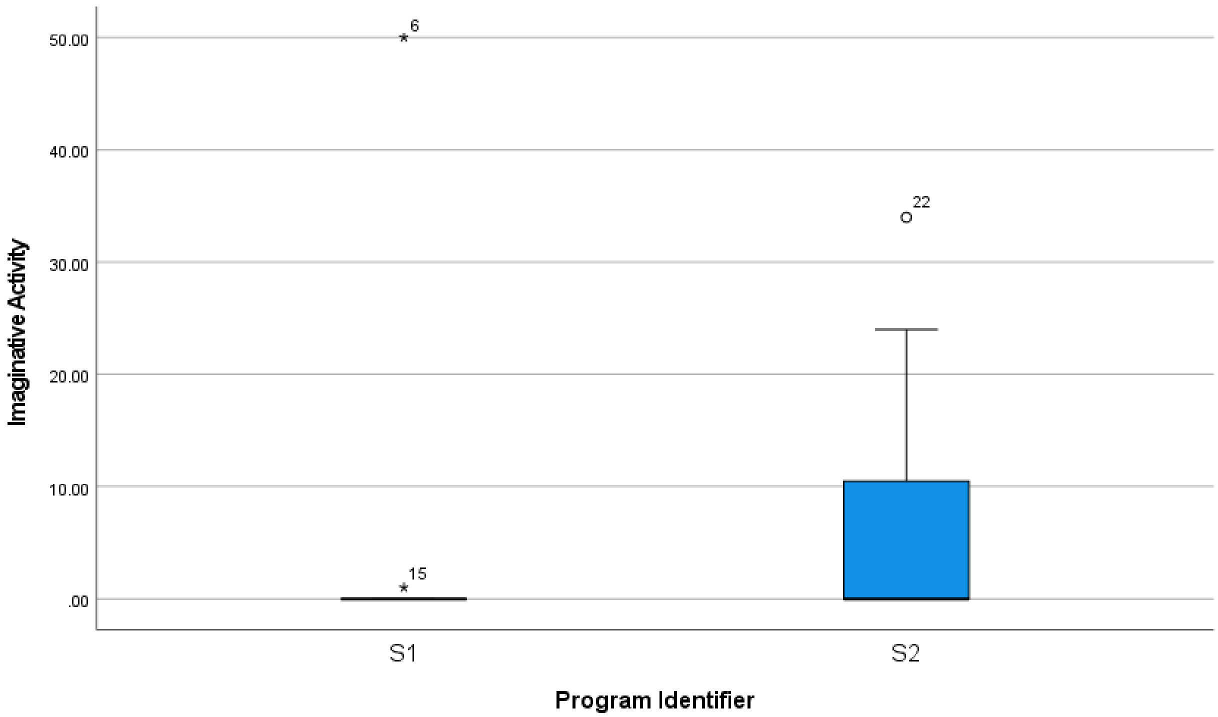


Imaginative Activity

The test for imaginative activity (IA) was not significant, t(28)=.778, p=.443. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .284 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=3.40, SD=12.89) tend to engage in imaginative activities at about the same level as those in the naturalistic environment (M=6.87, SD=11.48). The 95% confidence interval for the difference in means was (-12.60 to 5.67). There were two significant outlier data points found in the manufactured group and one outlier data point in the naturalistic group. Figure 15 shows the distributions for the two groups.

Figure 15

Distribution of Imaginative Activity Frequency for Manufactured and Naturalistic Groups

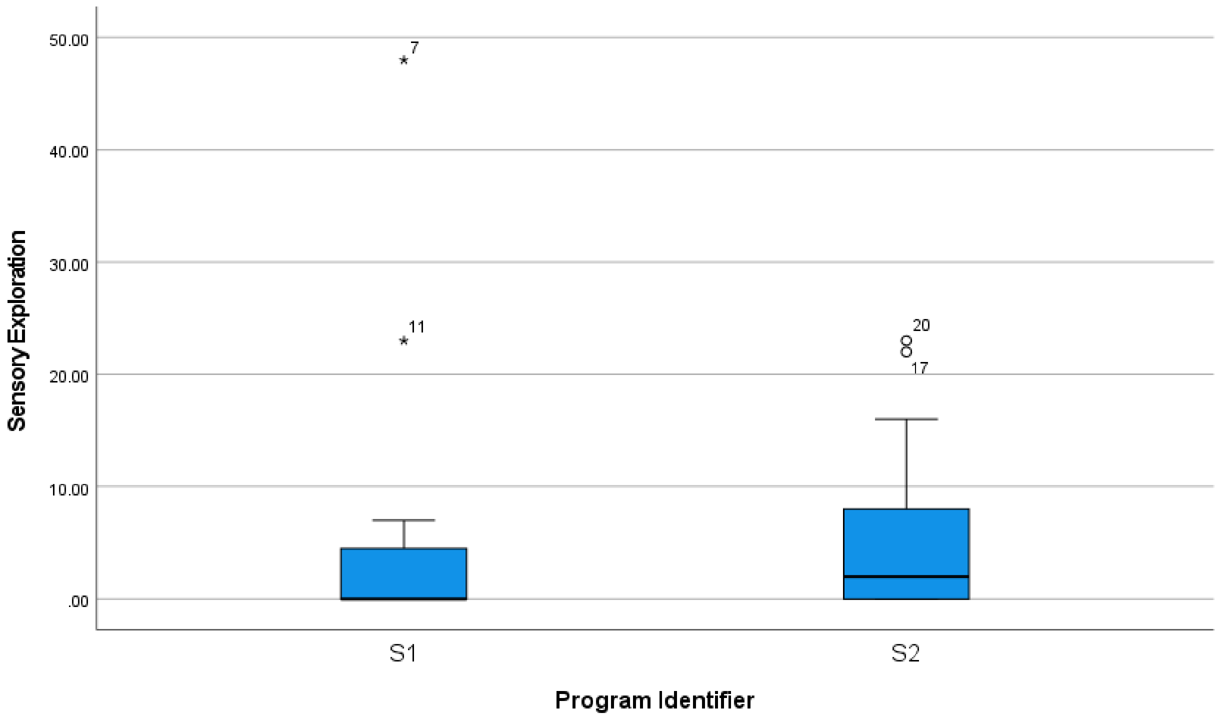


Sensory Exploration

The test for sensory exploration (SE) was not significant, t(28)=..050, p=.961. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .018 which indicates a small effect size meaning there was an insignificant variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=5.80, SD=13.18) tend to engage in sensory explorations at about the same level as those in the naturalistic environment (M=5.60, SD=8.40). The 95% confidence interval for the difference in means was (-8.07 to 8.47). There were two significant outlier data points found in the manufactured group and two outlier data points found in the naturalistic group. Figure 16 shows the distributions for the two groups.

Figure 16

Distribution of Sensory Exploration Frequency for Manufactured and Naturalistic Groups

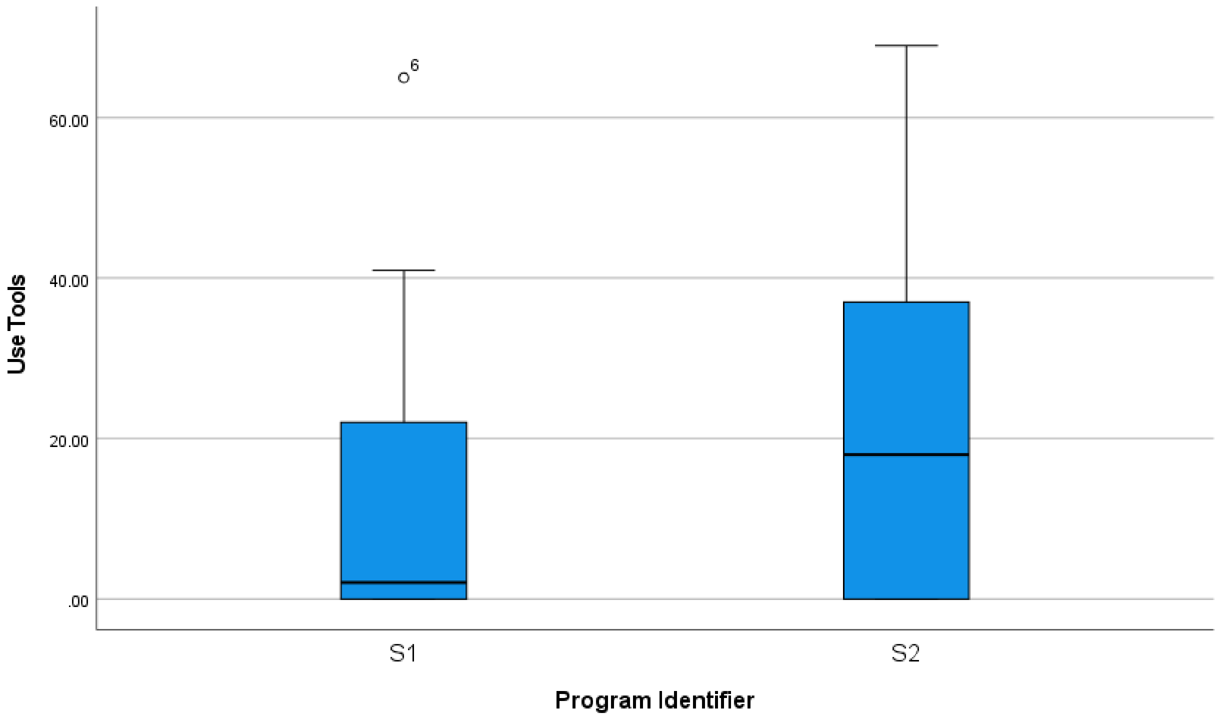


Use of Tools

The test for use of tools (UT) was not significant, t(28)=1.011, p=.321. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .369 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=13.40, SD=20.06) tend to use tools at about the same level as those in the naturalistic environment (M=21.53, SD=23.82). The 95% confidence interval for the difference in means was (-24.63 to 8.36). There was one outlier data point found in the manufactured group. Figure 17 shows the distributions for the two groups.

Figure 17

Distribution of Use of Tools Frequency for Manufactured and Naturalistic Groups



Poor ICC With Statistical Significance

Poor interclass correlation limits the validity of the *t*-test results. Due to the small group sizes the ICC 95% confidence interval for all behaviors with poor ICC reached into the moderate to good range. These confidence intervals indicate that the actual level of agreement may be within acceptable limits. This potential leads to the value in still reporting the results of the *t*-test, although they should be considered separately from those behaviors where moderate or good ICC was obtained.

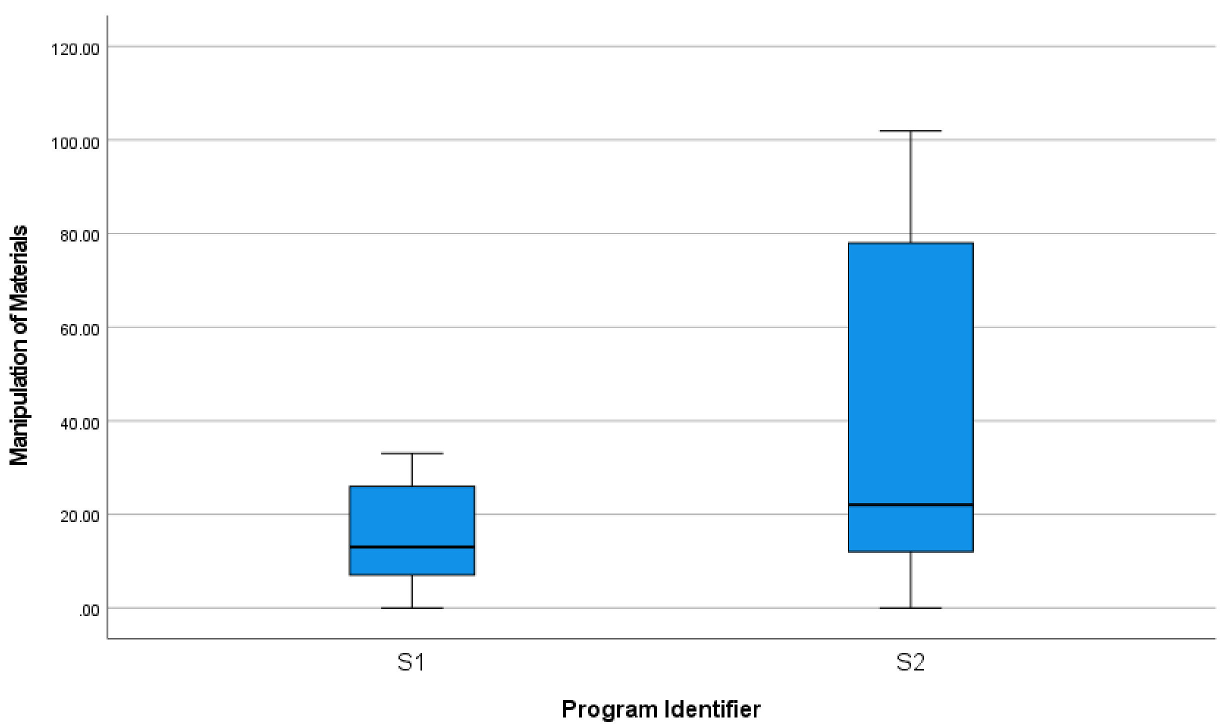
Within this group of behaviors, there was one behavior that met the standard for statistical significance with a *p*-value less than .05. Manipulation of Materials (p=.012) was observed more frequently in the program identified as Naturalistic.

Manipulation of Materials

The test for manipulation of materials (MM) was significant, t(28)=2.70, p=.012. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was rejected. The Cohen's d result was .986 which indicates a large effect size, meaning there was a notable variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=15.53, SD=11.81) tends to engage in the manipulation of materials less frequently than those in the naturalistic environment (M=42.07, SD=36.19). The 95% confidence interval for the difference in means was (-47.27 to -5.79). There were no outlier data points found in either group. Figure 18 shows the distributions for the two groups.

Figure 18

Distribution of the Manipulation of Materials Frequency for Manufactured and Naturalistic Groups



Poor ICC Without Statistical Significance

The final set of results falls into the category of poor ICC while also not finding a significant variation in the rate the behavior occurred between the two environments. This group of behaviors are notable in that the absence of variation indicates these behaviors do not appear to be significantly impacted by the addition or omission of natural elements in the outdoor play environment.

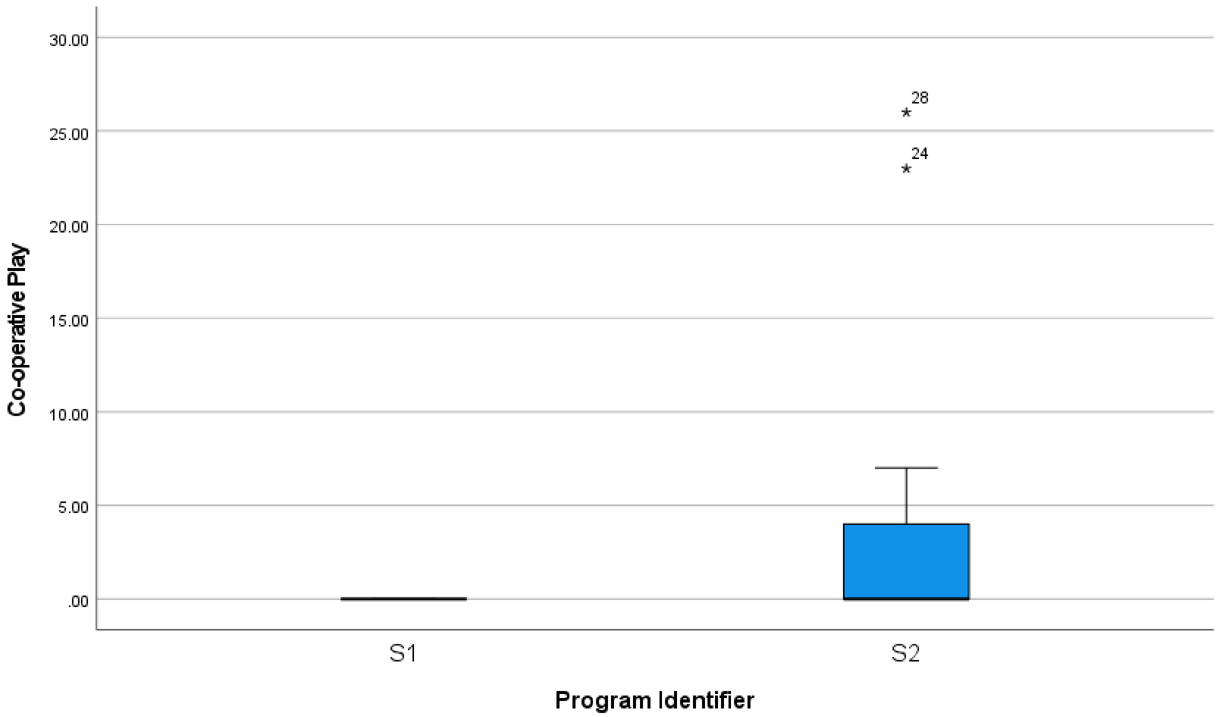
Within this set of results there was one behavior which resulted in a score close to the .05 threshold. This was Cooperative Play (p=.064). Although this is above the cut off it also was the one behavior that was not observed at all at the program identified as manufactured and therefore may actually be significant if there had been a larger sample size used in the study.

Cooperative Play

The test for cooperative play (CP) was not significant, t(28)=.1.926, p=.064. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .703 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=0.00, SD=0.00) tend to engage in cooperative play at about the same level as those in the naturalistic environment (M=4.27, SD=8.58). The 95% confidence interval for the difference in means was (-8.81 to .27). There were two significant outlier data points identified in the naturalistic group. Figure 19 shows the distributions for the two groups.

Figure 19

Distribution of Cooperative Play Frequency for Manufactured and Naturalistic Groups

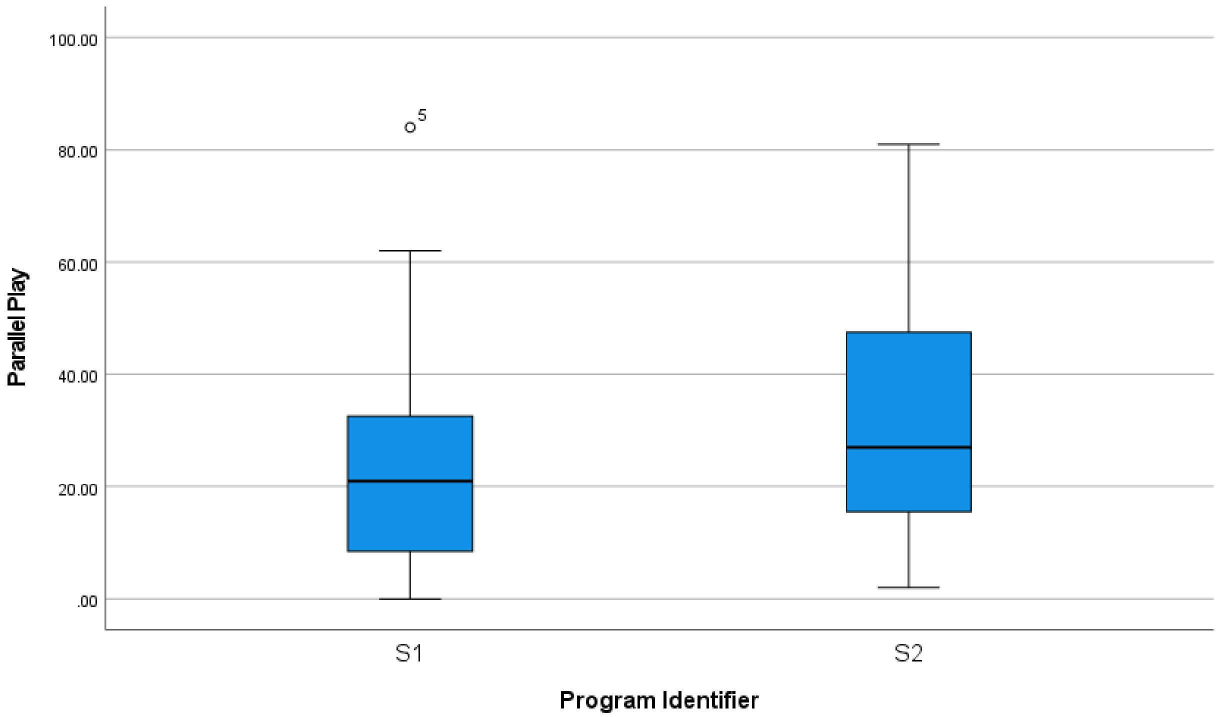


Parallel Play

The test for parallel play (PP) was not significant, t(28)=.798, p=.431. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .292 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=25.27, SD=24.25) tend to engage in parallel play at about the same level as those in the naturalistic environment (M=32.33, SD=24.22). The 95% confidence interval for the difference in means was (-25.20 to 11.06). There was one outlier data point identified in the manufactured group. Figure 20 shows the distributions for the two groups.

Figure 20

Distribution of Parallel Play Frequency for Manufactured and Naturalistic Groups

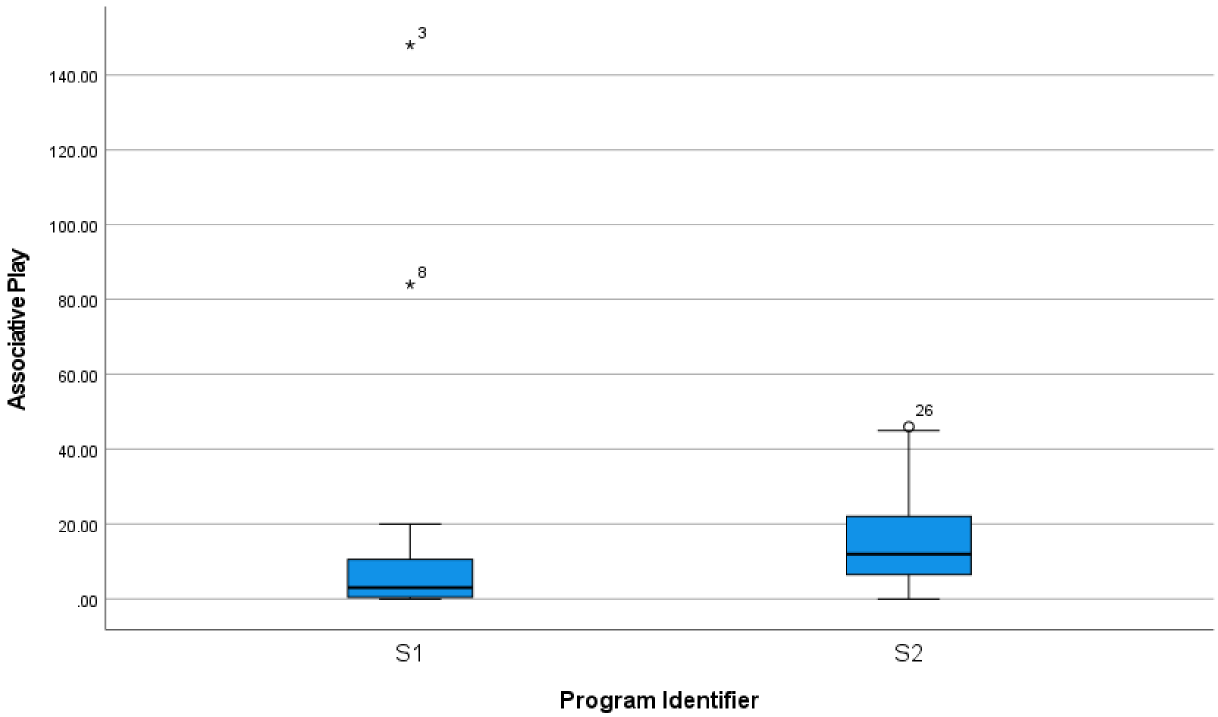


Associative Play

The test for associative play (AP) was not significant, t(28)=.256, p=.800. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .094 which indicates a small effect size meaning there was a minimal or insignificant variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=19.80, SD=41.28) tend to engage in associative play at about the same level as those in the naturalistic environment (M=16.87, SD=16.10). The 95% confidence interval for the difference in means was (-20.50 to 26.37). There were two significant outlier data points identified in the manufactured group and one outlier data point identified in the naturalistic group. Figure 21 shows the distributions for the two groups.

Figure 21

Distribution of Associative Play Frequency for Manufactured and Naturalistic Groups

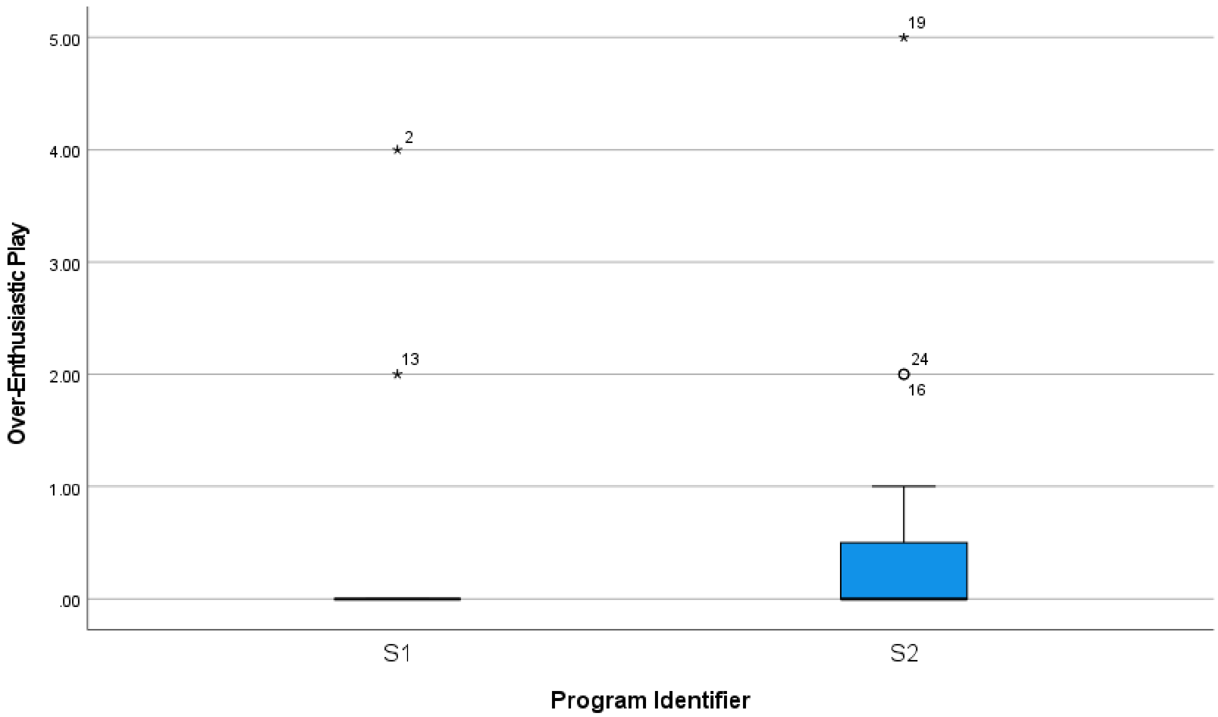


Over-Enthusiastic Play

The test for over-enthusiastic play (OE) was not significant, t(28)=.576, p=.569. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .211 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=.40, SD=1.12) tend to engage in over-enthusiastic play at about the same level as those in the naturalistic environment (M=.67, SD=1.40). The 95% confidence interval for the difference in means was (-1.21 to .68). There were two significant outlier data points identified in the manufactured group and one significant outlier data point and two outlier data points identified in the naturalistic group. Figure 22shows the distributions for the two groups.

Figure 22

Distribution of Over-Enthusiastic Play Frequency for Manufactured and Naturalistic Groups

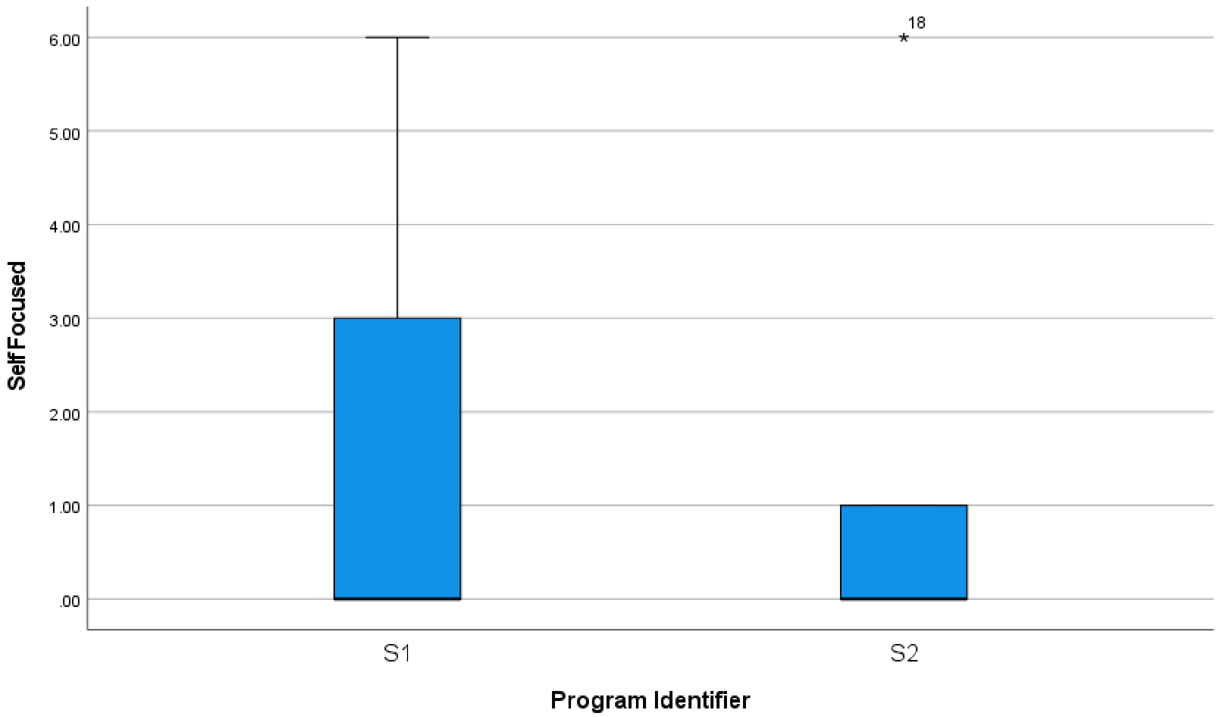


Self-Focused

The test for self-focused (SF) was not significant, t(28)=1.184, p=.246. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .432 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=1.60, SD=2.38) tend to engage in self-focused activities at about the same level as those in the naturalistic environment (M=.73, SD=1.53). The 95% confidence interval for the difference in means was (-.63 to 2.37). There was one significant outlier data point identified in the naturalistic group. Figure 23 shows the distributions for the two groups.

Figure 23

Distribution of Self-Focused Activity Frequency for Manufactured and Naturalistic Groups

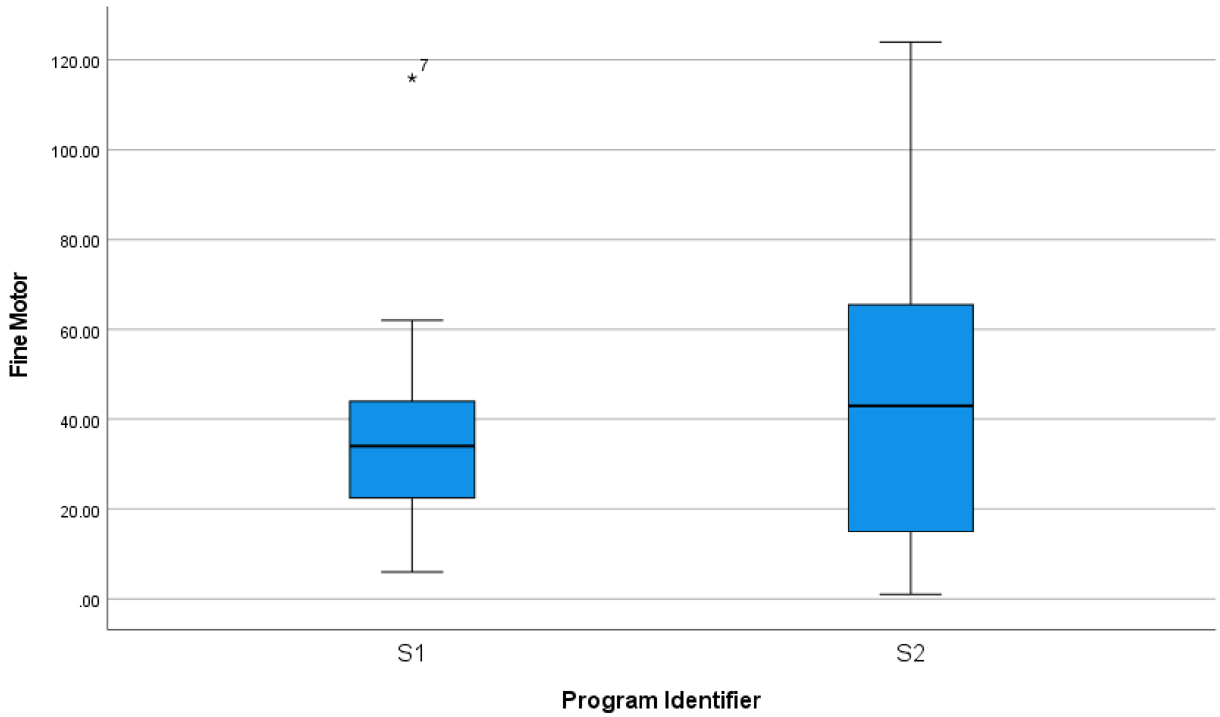


Fine Motor

The test for fine motor (FM) was not significant, t(28)=.411, p=.684. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .150 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=37.73, SD=26.98) tend to engage in fine-motor activities at about the same level as those in the naturalistic environment (M=42.33, SD=33.89). The 95% confidence interval for the difference in means was (-27.51 to 18.31). There was one significant outlier data point identified in the manufactured group. Figure 24 shows the distributions for the two groups.

Figure 24

Distribution of Fine-Motor Activity Frequency for Manufactured and Naturalistic Groups

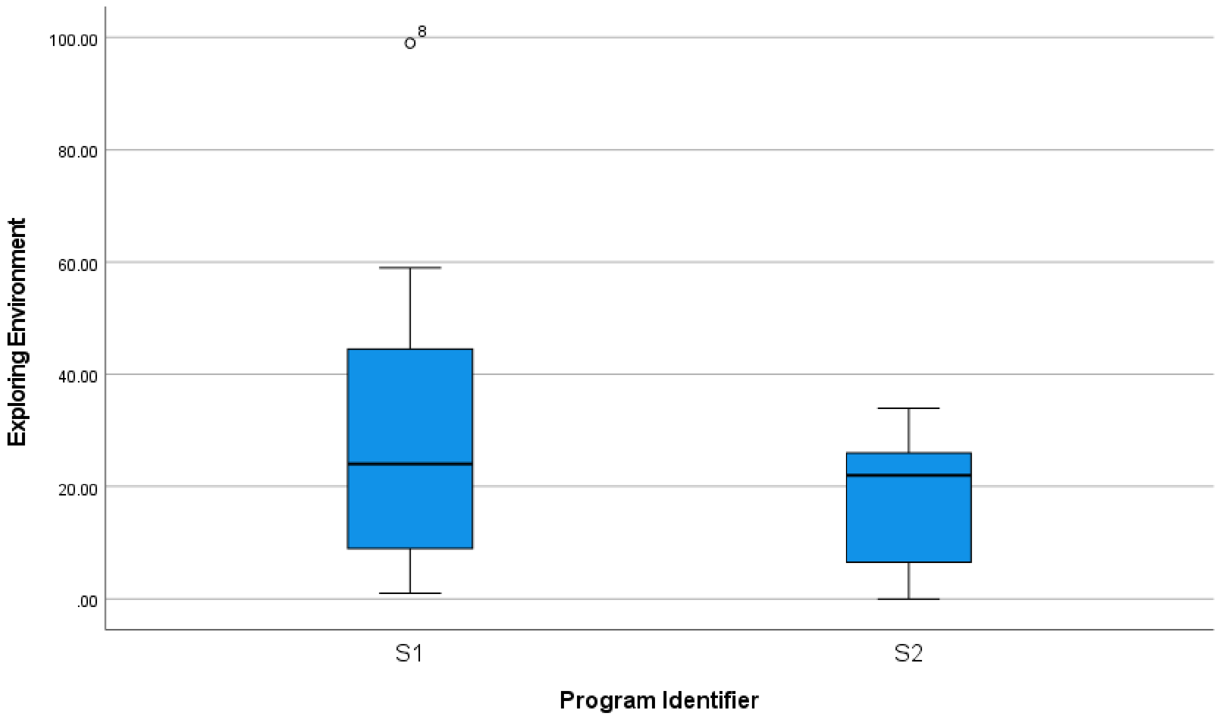


Exploring Environments

The test for exploring environments (EE) was not significant, t(28)=1.786, p=.085. Therefore, the null hypothesis that the classification of playscape will be independent of the type of play in which toddlers engage was retained. The Cohen's d result was .652 which indicates a medium effect size meaning there was a moderate variation in the actual rate this behavior was occurring. Students in the manufactured environment (M=30.27, SD=27.35) tend to engage in exploring environment activities at about the same level as those in the naturalistic environment (M=16.47, SD=12.12). The 95% confidence interval for the difference in means was (-2.02 to 29.62). There was one outlier data point identified in the manufactured group. Figure 25 shows the distributions for the two groups.

Figure 25

Distribution of Exploring Environment Frequency for Manufactured and Naturalistic Groups



Summary

Overall, this study generated limited results with only nine behaviors being able to be evaluated due to lack of inter-rater reliability. Of these nine behaviors, only two resulted in statistically significant results with an additional behavior that was extremely close to obtaining significance. The remaining eight behaviors that did not meet the inter-rater reliability standards yielded an additional behavior with statistically significant results and two additional behaviors which were close to obtaining significance. With a larger group size and stronger inter-rater reliability, there may have been more robust results.

Chapter 5. Discussion

In order to apply the results of this study, there needs to be an open reflection on the limitations and potential ethical biases that exist within the study. This reflection allows us to recognize where improvements could be made to future studies as well as the possible implications and applications of the study's results.

Limitations

This study is an initial study to look at whether the current research findings may apply to younger children. Several factors could have impacted the results of this study. First, there was a limited sample size being utilized. With this limited scope, we can see possible correlations, but the results are not able to be generalized without additional studies. In addition to the limitation to the scope of the study, it also led to the need to use multiple *t*-tests instead of other analysis methods such as ANOVA or MANOVA. MANOVA would have also resulted in a need to change the research question since it would not have looked at the impact of the environment of each of the behaviors included in the study but more generalized categories of behaviors. The use of the multiple *t*-tests also weakens the validity of the statistical significance since there was not a control in place for the impact the existence of each behavior had on the possibility of the other behaviors occurring.

Another concern with the design is controlling for program practices and the influence in teacher behaviors and frequency with which the children are given outdoor opportunities. According to Bronfenbrenner's (1979) theory of ecological systems, researchers should be aware of the impact on research subjects by various microsystems as well as the reciprocal impact microsystems have on each other (Bronfenbrenner, 1979). When assessing the impact of the physical environment on children's development there are many other factors within the subjects’ ecological systems that will also impact their development. One component found within a school setting that is known to impact children’s general development and play is the overall quality of the educational setting and specifically the child-to-teacher interactions (Bronfenbrenner, 1979; NAEYC, 2015; Pianta et al., 2016). Pianta et al. (2016) stated that physical and structural aspects of early learning programs have minimal impact on child learning. Instead, they offer that research supports the finding that the quality of child-to-adult interactions is the component that has the greatest impact.

To account for the impact this will have on the results we used a basic level of control in the design of this study. We limited the selection of research participants to those children enrolled in childcare programs who have demonstrated a higher quality level through their participation in the Virginia Quality program. This program is the quality rating and improvement system for the state of Virginia. As a part of participating in this program and achieving a level of 4 or higher, the staff have been assessed using both the setting appropriate Environmental Rating Scale (ERS) and Classroom Assessment Scoring System (CLASS) (Virginia Department of Social Services, 2015). By limiting the participants to children who are participating in high-quality childcare programs, we are creating a more homogeneous grouping of subjects based on this confounding influence.

The full impact of program and teacher quality interactions is not something that can be fully controlled for. Even when programs are selected based on quality assessment standings that include higher levels of quality teacher interactions, there will always be a level of variation from day to day and teacher to teacher (Brofenbrenner, 1979). These ongoing variations will impact the children’s behavior at the time of the study. Therefore, the results will need to be interpreted with these other contributing factors in mind.

Another limitation to this study was the fact that both programs, although meeting the criteria for the classification designation they received, were close to the non-classifiable range. A sign that this may have impacted the results of the study was how much of the time children were recorded engaged in the more naturalistic components found in the manufactured environment. Expanding the range set for non-classifiable environments could have minimized this limitation.

A final, and significant, limitation to this study was the fact that inter-rater reliability was not able to be obtained for a significant percentage of the behaviors. These eight behaviors were found to be below the .5 threshold for inter correlation coefficient. With that in mind, their statistical analysis was not included in the findings. The results of the inter-rater reliability process were most likely impacted by two main factors. The first factor is likely the small study size. As mentioned previously this limits the application of the results, but when reflecting on the ICC, all eight behaviors that failed to reach the .5 threshold had large 95% confidence intervals, and those intervals indicated that the actual ICC may have met the .5 threshold.

Another contributing factor to reflect on related to inter-rater reliability is the length of time between when the behavior coding process started and when it was completed. Due to several non-study-related factors the coding process took significantly longer than would have been ideal. The coding process was started right as the COVID-19 pandemic hit the United States which impacted both researchers' schedules and availability. This and several other situations impacted the time frame in which the coding process took place. Inter-rater reliability depends on the ability of the raters to maintain consistency in the coding process, and the extended time taken could have impacted this consistency.

Ethical Bias

The researcher also needed to control for her own influence in the behaviors of the participants, by minimizing interaction and maintaining a role of observer. This distance should be enough to maintain separation and minimal interference while still allowing the video recording to capture clear footage and sound. This control proved to be more challenging than anticipated, particularly since the naturalistic environment ended up being a program that the primary researcher was regularly associated with, and therefore the children knew her and were comfortable seeking her out for interactions when she was recording.

Another possible source for bias is the researcher's philosophical preference for constructivist teaching practices and naturalistic playscapes. The design of the study helps to minimize this bias in the statistical analysis, but the researcher needed to keep this in mind and reflect on this in the analysis and summation of the findings.

Conclusion and Future Study

There is a growing body of research supporting the need to re-evaluate how educational programs should design and utilize natural environments to support greater health and development for children. Within this research, there remains a distinct lack of focus on the youngest population.

The growing need in the United States for full-day infant and toddler care provides a distinct need for understanding the effects of institutional outdoor play spaces for this population. Before being able to obtain clear statistical gains in development created by outdoor environments, we need to gain an understanding of the impact different styles of outdoor environments have on infant and toddler engagement and styles of play. The results of this study showed that the impacts of naturalistic play spaces may be notable. It is not a clear result, but with such a small sample and the limitations that existed, the fact that three behaviors met the standard for statistical significance shows the value in looking more deeply. Smith (2009) highlights Piaget's theories of development and identifies the final two substages of sensorimotor development as "tertiary circular reactions and internal representations." These are the stages where children gain cognitive skills through the frequent and repetitive opportunities to explore materials. This exploration is typically with a trial-and-error process gradually gaining the ability to predict the outcomes of their actions. The fact that the manipulation of materials was one of the three behaviors found to have a statistically significant variation between the two environments supports the need to look more closely at this relationship if educators want to strategically plan the outdoor learning environment to support toddlers' progression through the sensory-motor stage.

The study's finding that children were more engaged in child and adult interactions in a naturalistic play space is also significant for toddler educators. Vygotsky's (1998) zone of proximal development and importance of scaffolding supports the value of educators engaging with children during their explorations. The fact that children and teachers spent more time engaged in interactions is significant but looking closer at the types of interactions would increase the value of this correlation. Having more interactions is valuable, but are these interactions primarily basic care and safety interactions or meaningful contextual interactions?

The third behavior to obtain statistical significance was balance. This result aligns with the finding of Fjortoft (2001) which found that greater time spent in a naturalistic outdoor environment had a statistically significant impact on the development of balance and coordination in children ages 3-6. This parallel finding is encouraging for the potential of future studies seeking to explore how existing studies can be applied to younger children.

Finally, although a control for other influences related to the quality of teacher interactions was used, it could be strengthened in future studies. The Virginia Quality program and other systems for ongoing monitoring and assessment for quality are by nature limited. These programs do sporadic assessments, and between assessments, there can be changes to staff and practices that would not be reflected in the program's current rating. To have a stronger control for the impact of the quality of teacher interactions, the researcher could include a CLASS assessment as part of the pre-study process of identifying and classifying programs for inclusion in the research.

Another limitation that existed in this study was the struggle to obtain inter-rater agreement. Several factors impacted this issue. One was the length of time it took for the two researchers to complete the coding of the videos. A greater length of time between training in an observational tool and the actual coding using the tool leads to observer drift and a decrease in reliability as the observer's personal experience and knowledge impacts their judgement in coding (Qi et al., 2018). I also offer that the number of total behaviors that were coded also likely made maintaining agreement a challenge. For future studies, it should be a consideration to narrow the focus to fewer behaviors and limit the time between training on the coding tool and the actual coding of behaviors.

Overall, this study provides initial insight into how the existing body of research on the impact of the outdoor environment on child development, health, and learning can and should be expanded to include children under the age of three years old.

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APPENDICES

Appendix A: Excerpt from Preschool Outdoor Environmental Measurement Scale

3 Domain 3: Play and Learning Settings

Check Y if item is present. Check N if item is not present

Features

3.1. The outdoor area contains an adequate variety of play and **learning settings with constructed or manufactured elements.** At least four (4) of the following should be available for the children to use:

- arts/crafts area
- acoustic play area
- sitting bench
- woodwork bench
- easily supervised, cozy nook
- anchored play equipment
- crawl-through place (tunnel)
- small stage (including puppet stage)
- raised deck
- play house
- balance beam or opportunities to balance
- other

Total Checked →

3.2. The area contains an adequate variety of play and learning settings with **natural elements.** At least four (4) of the following should be available:

- sand play area
- grass maze
- safe stepping stones
- rolling/climbing mound
- water play area
- flower or vegetable garden
- easily supervised, cozy natural nook
- animal habitat (e.g., bird blind, rain garden, butterfly garden, logs, carpet 'lift-up,' bird feeder, ant farm)
- trees
- other

Total Checked →

3.3. A **multipurpose, open, grassy area** is available for large group games, running, dramatic play, music and movement, parachute play, social gatherings, etc. (Note: Measure this by imagining 15 preschool children holding hands in a circle.)

3.4. A variety of **horizontal, elevated work surfaces** are available (e.g., picnic table, stump, counter, raised deck) for art, dramatic play, etc. There should be at least two surfaces present.

3.5. Circulation areas are ample and pathways can be used by wheeled toys (sufficient space available to accommodate wheeled toys for the children in the group).

3.6. Play materials and equipment are developmentally **appropriate.**

Materials and Loose Parts (observed)

3.7. Enough outdoor toys are available for all children to use without undue competition.

3.8. Play materials and toys can be reached and played with by children.

3.9. Wheeled toys such as tricycles, wagons, and wheelbarrows **are available.**

3.10. Storage is adequate for outdoor toys, loose parts, and supplies.

3.11. At least four (4) **manufactured loose parts are available:**

- blocks
- manipulatives
- pieces of cloth
- skipping rope
- hoses
- sand toys
- balls
- water toys
- rings/hula hoops
- chalk
- other

Total Checked →

3.12. At least four (4) of these **natural loose parts are available:**

- smoothed sticks
- mulch
- shells
- river stones
- pine cones
- driftwood
- dirt
- leaves
- acorns
- other

Total Checked →

3.13. A variety of **decorative, colorful, and stimulating elements,** at least three (3), are used to enliven the character of the area:

- banner
- chime
- decorative object (wreath, lantern, mosaic, topiary, fence weaving, weather vane, pinwheel, whirligig, whimsical sign, garland)
- wind sock
- statue
- gazing ball
- flag
- cultural artifact
- other

Total Checked →

Total items Y N

Total the number of items checked as present.
Divide by the maximum number of items in this domain and multiply by 100.

Calculate % ÷13 x 100

Domain 3 %

15

(DeBord, Hestenes, Moore, Cosco, & McGinnis, 2005, p. 15)

Appendix B: Behavior Mapping Definitions Form

Social Interaction	
SP	**Solitary Play –** plays alone no reference to others
PP	**Parallel Play –** alongside others, uses available materials, no influence on other children
AP	**Associated Play –** plays with others engaged in similar activity. Communication and materials exchanged no overall goal to activity
	Co-operative Play – group of children organise themselves with a specific goal in mind ie. team game, drama
TP	**Two people**
SG	**Small group (3-6 approx.)**
LG	**Large group (7+ children)**

Play Behaviour	
SF	**Self- focused** (not interacting with other children, not playing ie. daydreaming, reading)
IP	**Inside physical environment** (goes into school building)
OO	**Observing others** (adopts role of onlooker- not interacting with other children)
VI	**Verbally interacting with others** (talking with one or more children)
CO	**Constructing activity** (building or making objects from loose materials)
IE	**Close interaction natural environment** (located in & using nature ie. insect hunt, make daisy chains)
EE	**Exploring environment** (moving in, through and engaging with natural environment ie. climbing trees)
IA	**Imaginative activity** (children engage in role play/drama, pretend, make believe, fantasy)
FE	**Playing free equipment** (using bats, balls not a game - ie. bouncing ball against wall)
FS	**Playing on fixed structure** (using designed and constructed fixed playgrounds)
TG	**Participating structured team game** (games with negotiated rules and roles, ie. football, basketball)
OP	**Observing participant** (waiting to have a turn during a team game)
ML	**Moving between locations** (not engaged in a structured play activity - define movement ie. running, walking)
CA	**Changing activity** (where no play activity is yet evident)
O	**Other** (include short description)

(Malone & Tranter, 2003)

Appendix C: Permissions to Use Other Researchers' Tools

Communication with Karen DeBord seeking permission to use the POEMS tool to establish a ratio to classify outdoor play environments as manufactured or naturalistic.

Gmail

Laura Pearce <lpearce227@gmail.com>

Rainbow Riders Introduction

Karen DeBord <debordk@gmail.com> Fri, May 18, 2018 at 11:43 AM
To: Laura Pearce <lpearce227@gmail.com>, Nilda G Cosco <ngcosco@ncsu.edu>

Laura,
We are happy for you to extend the body of literature concerning outdoor play for children, particularly in natural play scapes. Thank you for giving credit and your work to the authors of POEMS.

I am looking forward to seeing your results. Best wishes.

Karen DeBord

Bedford Landings B & B
Www.bedfordlandings.com
Sent from my iPhone
[Quoted text hidden]

Communication with Dr. Fredrica Martensson to seek permission to use the OPEC rating scale in this study.

[EXTERNAL] SV: Request regarding use of Outdoor Play Environment Categories

Fredrika Mårtensson <fredrika.martensson@slu.se>

Tue 2/12/2019 1:36 PM

To: Pearce, Laura <PEARCEL@mail.etsu.edu>
Cc: Broderick, Jane Tingle <BRODERIC@mail.etsu.edu>; Cecilia Boldemann (Cecilia.Boldemann@ki.se) <Cecilia.Boldemann@ki.se>

1 attachments (701 KB)

Children and nature-Wells, Jiminez and Martensson- in Van den Bosch 2018.pdf;

Dear Pearl
Your study of children´s play is sounds important indeed in its comparison of children´s play behavior at micro level. Videorecordings of outdoor play at preschools was how my research started out and it was actually based c such material the play categories were developed together with Cecilia Boldemann.

The scale has an adaption to circumstances with more limited access to space which we developed for the South of Sweden and Raleigh in North Caroline. In this lower than 1200 square meter is 1 point. See if this helps you. Attached you have a chapter on this.

Our standards recommended are more spacious, but unfortunately they are not regulated by law so not all follow these. However 40 squaremeter per child is advised for preschool settings and minimum 300 squaremeter. According to my experience this last figure is most important of the two. For the dynamics of play behavior acros a settings to evolve the surface need to have a minimum size, while many children are not so much an obstacle but to some extent also imply play opportunities. For the physical activity we actually saw positive effects also far above 3000 meter. So space do matters. On the other hand the complexity and variation which natural elements contribute with can do a vast difference when comparing same-size areas.

We are happy to see new efforts of testing what variation in outdoor quality imply for children´s play. The idea behind this tool is that a large areas which are green and varied do trigger to health promoting play flow of vigorous activity and to less extent if space is smaller. It will be interesting to see what you find. I am also very curious on how you code play?

Best wishes
Fredrika Mårtensson

Associate professor
Department of Work Science, Business Economics and Environmental Psychology
Swedish University of Agricultural Sciences (SLU), PO Box 88, SE-230 53 Alnarp, Sweden

Visiting Address: Slottsvägen 5
fredrika.martensson@slu.se
+46(0)40-415453
+46(0)727402262

Fredrika

Communication with Dr. Karen Malone to obtain permission to modify and use the behavior coding system.

[EXTERNAL] Re: Request related to research "Nature and Its Influence on Children's Outdoor Play"

Karen Malone <K.Malone@westernsydney.edu.au>

Sun 6/10/2018 2:42 AM

To: Pearce, Laura <PEARCEL@mail.etsu.edu>
Cc: Tonia Gray <T.Gray@westernsydney.edu.au>

1 attachments (5 MB)

MaloneChildenvironmentsreport.pdf;

Dear Laura
Dthank you for your email and interest in our shared work on children's experiences of the world. Professor Gray was not involved in the development of these behaviour coding or recording sheets that were adapted and used by our shared student in her honours project with very young children own a EC centre. The methodology for her study came from a project I conducted with Professor Paul Tranter of UNSW where we developed the schedules as part of an ARC research project back in 2002-2003 with primary age children. You are welcome to modify and use these behaviour mapping tools as long as you acknowledge Tranter and myself from the original report. The following publications show the original work we published in journals and I have attached the project report. WE did not apply any quantitative tests/analysis to verify the codes but adapted them ourselves from earlier research and behaviour/social/play coding done in previous studies at the time.
Warm regards Karen

References to look at:

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VITA

LAURA PEARCE

Education:	Master of Arts in Early Childhood Education, East Tennessee State University, Johnson City, Tennessee, 2021
	Bachelor of Science in Human Development-Child Development, Virginia Tech, Blacksburg, Virginia, 1995
Professional Experience:	EHS Child Development Specialist, Maryland Family Network; Baltimore, MD, 1 year
	Director, Rainbow Riders Childcare Center at SMLC; Blacksburg, VA, 5 years
	Co-Director, Rainbow Riders Childcare Center at CRC; Blacksburg, VA, 6 years
	Mentor Teacher, Rainbow Riders Childcare Center; Blacksburg, VA, 12 years